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45th Apimondia Congress



45th APIMONDIA INTERNATIONAL APICULTURAL CONGRESS

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ABSTRACT BOOK



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Dear Distinguished Participants,

On behalf of the Local Scientific Committee and my country, It is my honour to welcome you in Istanbul, in the city where continents meet for the 45th Apimondia International Apicultural and also for the 120th Anniversary of Apimondia Congresses.

We have nearly 700 oral and poster presentations for the congress. We are going to discuss the problems of beekeeping and beekeepers about 5 days and we are going to look for solutions together.

We will try to make the beekeeping industry a source of profit by having the power of being together under the roof of Apimondia. We all know that the problems, risks and losses of beekeepers and bees are the same all over the world. For this reason, solutions must also be sought in common.

During the congress Bee Biology, Beekeeping Technology and Quality, Bee Health, Beekeeping for Rural Development, Pollination and Bee Flora, Beekeeping Economy and Apitherapy will be discussed in detail. Some subjects will be elaborated by the keynote speeches, plenary sessions and roundtable meetings. Our aim is contribution to the development of beekeeping and minimizing the risks may arise.

Together with the scientific sessions, for the first time in this congress, we'll organize the "Continents are Talking" round table series to increase the share of knowledge in the Beekeeping World. Beside this OIE- World Organisation for Animal Health will also hold annual bee disease meeting in a special session during the congress.

In our changing world, especially environmental factors, climate changes have many negative effects on our beekeeping. Especially environmental pollution and pesticides are serious threats to our bees. For this reason, the importance of congresses like Apimondia is increasing. The topics and information exchanged here will be very useful for all of our beekeepers. The main goal in these congresses is to share knowledge and experience and to increase the field efficiency and healthy production.

We hope that all guests from about 105 countries will have a efficient congress. Throughout the Congress you will have the opportunity to see the beauty of our city and our country you will experience the Turkish hospitality.

I welcome you all again to Istanbul, the Cradle of Civilizations and wish you to have an unforgettable congress.

Best Regards

On behalf of the Local Scientific Committee

Prof. Dr. Levent Aydın

President – Local Scientific Committee

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ORAL PRESENTATION ABSTRACTS



KEYNOTE SPEECH / September 30th, 2017

Future of Beekeeping **Osman Kaftanoglu** **School of Life Sciences, Arizona State University, USA**

Honey bees have successfully lived on earth for over 80 million years without men's interference and we are talking about declining bee populations and extinction of some native pollinators in recent years. There are over 83 million honey bee colonies in the world. Within last 50 years the world managed honey bee colony number increased from 49 million to 83 million, and total honey production increased from 68,000 tons to 1,680,000 tons. China is the world's leader in beekeeping; having the highest number of honey bee colonies, the largest producer of honey, royal jelly and other bee products. Turkey is the second most honey.

In recent years honey bees are facing many problems mainly; pests and pathogens, environmental stressors and loss of genetic diversity. Honey bee pests and pathogens are the main problems of world beekeeping. The most devastating problem is the Varroa destructor. The European honey bee colonies die off within a couple of years if they are not treated. However the Africanized bees are more tolerant to diseases and parasites and they can survive without any treatment.

Honey bees are also facing serious environmental stressors such as habitat destruction by human (deforestation, forest fires, urbanization), exposure to agrochemicals, mismanagement, global warming and climate change. Honey bees are social insects and they can regulate the temperature inside the hive. They will survive and adapt to new conditions as long as they have water and uncontaminated nectar and pollen sources nearby to forage. High temperatures in the hot and dry areas will reduce the lifespan of the bees. With the reduced lifespan the colony population will be smaller and the honey yield will be much less. In the warmer climates colonies will have brood all year round and it will be more difficult to control parasitic mites like Varroa destructor and Tropilaelaps mercedesae. Similarly Nosema ceranae virulence and infections will multiply with the increased temperature. Moreover global warming will increase the reproduction of the pest insects and they will have more generations in a year. Some secondary pests will become major pests in many agricultural crops. More frequent uses of agrochemicals will also kill the bees and most of the agricultural fields will not be suitable for beekeeping. All these stressors will have a greater pressure on honey bees and it will be more challenging to have healthy and productive colonies in the future. Even though the numbers of colonies are increasing in many developing countries there will be shortage of bees and pollination deficiencies in developed countries especially the US. The value and the importance of bees and beekeeping will increase. After the introduction of Africanized bees in Brazil in 1956 and invasion, they replaced the European bees in South and Central America. With the global warming they will continue expanding the territory. If beekeepers switch to the Africanized colonies, their migration will be faster and the Africanized bees will probably invade the whole continent in the near future. Then the conservation of genetic material will be necessary by the long term storage of honey bee semen and instrumental insemination of queen honey bees. There should be more research and funding for the cryopreservation of honey bee semen for the conservation of pollinators. Instrumental insemination will be more common in the near future to prevent the European honey bees from becoming Africanized.

There will be more research on the control of honey bee parasites and pathogens. Scientists have already started working on the genetic control of varroa mite by using mRNAi techniques. It is possible to develop transgenic bees resistant to varroa mite or resistant to pesticides. Do we really want transgenic bees? Developing transgenic bees will further reduce the genetic diversity and make the beekeepers dependent on the big companies who develop the technique as happened in the hybrid seed industry.

There is an ongoing research to develop vaccines for the American foulbrood and European foulbrood diseases in the US and Europe. With the development of vaccines, long term solution for bacterial diseases will be possible.

Almond pollination is the world most organized industry. The almond acreage is increasing every year, but honey bee populations are declining and growers are paying up to \$200 per colony for pollination. Almond growers are supporting the research on self-fertile almond varieties. If the self-compatible almond varieties become popular the number of colonies will further decline in the USA in the near future.

There have been some technological improvements in the beekeeping industry and honey bee colony managements in recent years. There are many remote hive monitoring and colony management systems. Hive temperature, humidity, weight changes, sounds, foraging activity can be recorded and monitored without visiting the apiaries by using smart phones. There are some efforts to develop sensors to detect the presence of queen bees in the hive. When these queen detectors become available it will greatly help beekeepers to identify the queenless colonies and prevent some colony losses and occurrence of laying worker colonies.

As a summary, varroa and disease problems, habitat destruction, pesticides problems, reduced genetic diversity, failing queens and consequently declining honey bee populations will be the main concern in the future. There is a great concern for the decline of bees in many countries. Proper beekeeping education should be given in all levels of schools starting from the elementary school for the awareness of the problems. Honey bees will be the major pollinators of our agricultural products in the future and they will survive as long as the human survive. Extinction of honey bees will lead to extinction of human being. We need to conserve nature and save our bees for our future.

KEYNOTE SPEECH / October 1st, 2017

Sub-lethal Stress That Affects Behavior: Comparisons of Native and Imported Races of Honey Bees Brian H. Smith

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Honey bees (*Apis mellifera*) occur in and thrive almost all major types of climates, ranging from tropical to temperate and arid desert ecosystems. The species likely originated in Africa and expanded broadly into Eurasia, and more recently was introduced into the Americas. This geographic range expansion has led to the diversification of at least 28 different subspecies. One key to the success of honey bees in all of the different environments may lie in adaptation to local conditions that place different kinds of physiological stress on honey bees. Because of this diversity of physiological responses to environmental conditions, it is likely that honey bees that have been adapted to one set of local conditions are now widely dispersed outside of their normal geographic regions by commercial beekeeping. It may therefore be that these 'introduced' honey bee races face physiological challenges from their new climate. If so, these challenges present an opportunity to study the process of physiological adaptation. Our objective was to compare native to introduced races of honey bees in different, challenging climates. We chose the desert in north central Saudi Arabia for this study. One race of honey bee, *A. m. yemenitica*, is native to Saudi Arabia and is used widely for honey production and pollination through the region. Yet introduced races of honey bees – *A. m. carnica* and *ligustica* - are widely distributed in Saudi Arabia. These bee races are bred in other countries and imported annually in order to boost agricultural production. In Saudi Arabia these introduced races are exposed to ambient temperatures reaching 50°C and very low relative humidity in the summer. Thus we made use of this natural experiment to study both native and introduced races side-by-side across seasons to evaluate whether native and introduced races differ in ways that could reflect physiological adaptation to local conditions. We used assays of water and sugar responsiveness in parallel in different races of honey bees at different times of year in Saudi Arabia. We show how species and races differ in responsiveness to water and sugars, which most likely reflects different responses to thermal stress. In particular, the native race – *A. m. yemenitica* – show patterns of responding that are consistent with stress tolerance. These differences could represent physiological adaptation to local environmental conditions, which will be an important consideration for importation of honey bee races for commercial beekeeping.

KEYNOTE SPEECH / October 2nd, 2017

“Improving The Quality and Productivity of Apitherapy Products”

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Apitherapy is one of the fastest growing areas of interest among beekeepers worldwide. Beekeepers are interested in the techniques that they can use to produce honey bee hive products such as beeswax, honey, pollen, propolis, royal jelly and venom. Naturally the efficient production of large quantities is important, but so is the purity of the products obtained. In recent years, medical problems such as pathogen resistance to antibiotics have caused a renewed interest in the medicinal use of hive products, long used in folklore and traditional medicine, allowing them to take their place among the modern armoury of drugs. Whilst many scientific studies have shown efficacy and safety, many other claims that have been made lack scientific credibility. As with any drug of biological origin, a thorough understanding of the mode of action, and the standardisation of concentration of the active ingredients, together with standardisation of testing methods, are essential. The fact that reports of the efficacy of hive products are often anecdotal, and have hitherto been published in a wide array of journals, books and ephemeral literature, has arguably slowed the acceptance of the use of hive products in “conventional” medicine. This talk will review recent advances in the production of hive products, and attempts at standardisation of research methods and quality evaluation. The forthcoming Volume 3 of the already established COLOSS BEEBOOK will further encourage the use of standard methods.

Key words: Apitherapy, hive products, beeswax, honey, pollen, propolis, royal jelly, venom

APITHERAPY

[Abstract:0036]

Synergistic Antibacterial Interaction between Yemini Sidr and Manuka Honey against Some Human Pathogens

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Antimicrobial resistance (AMR) is a critical health issue today. Over several decades, to varying degrees, bacteria causing common infections have developed resistance to each new antibiotic, and AMR has evolved to become a worldwide health threat. Due to increasing development of resistance by microorganisms, numerous studies have been conducted to find new alternative sources of antimicrobial agents, especially from natural sources. Honey is an ancient remedy that has recently been introduced into modern clinical practice in developed countries. The aims of this project were to examine the antimicrobial properties of yemini sidr and Manuka honey against various Gram-positive and Gram-negative bacterial strain including MRSA. Agar well diffusion assays, minimal inhibitory concentration (MIC), minimal bactericidal concentration (MBC), fractional inhibitory concentration (FIC) index, scanning electron microscopy (SEM) and Time-kill assay were used to check the antimicrobial and synergistic effect of both honeys. Values Inhibition zones ranged from 9.52 to 17.50 mm and 07.19 to 15.9 mm respectively for sidr and Manuka honey. The MIC value of both honey decreased significantly when mixed together and showed synergistic effected as interpreted by Checkerboard fractional inhibitory concentration(FIC) index. SEM images showed that the number of cells decreased significantly on the established biofilm of MRSA, when treated with both honey alone and/or in combination as compared to biofilm treated with artificial honey. Here we demonstrated that bacterial pathogens and MRSA biofilm are susceptible to sub inhibitory concentrations of sidr and Manuka honey alone and in combination. Combination of the sidr and manuka honeys could lead to the development of new broad-spectrum antimicrobials that have the potential to prevent the emergence of resistant bacterial strains and could be a valuable antimicrobial agent for management of infections caused by these organisms

[Abstract:0055]

ARC (Apiceutical Research Centre) – An International Centre for Research into Sustainable Medicine and Sustainable Bee Keeping

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James Fearnley has been researching and manufacturing propolis products for the last 25 years.

He has published the principal work in English on Propolis and has been involved in the publication of 12 peer reviewed papers on numerous facets of propolis including its effectiveness against MRSA. The last 25 years has seen a worldwide surge in scientific interest in the medicinal potential of bee hive products - propolis, honey, bee venom, bee bread, wax and royal Jelly. The same period has seen both a serious decline in honey bee populations round the world as well as a deep crisis of confidence in traditional, orthodox, pharmaceutical medicine.

Fearnley established ARC six years ago to provide a focus on research into the medicinal properties of bee products - Apiceuticals - as well as sustainable beekeeping. Research conducted by the centre is exploring the unique relationship between human disease patterns in specific geographic areas and the biological properties of propolis collected in those areas.

BeePharmaAfrica, a project created by ARC five years ago, has carried out research in six African countries exploring the relationship between the geographic/biological properties of propolis and its medicinal benefits.to the local population

ARC developing a BeePharmaIndia Project

ARC is managed by a international board which brings together scientists, apiculturists and manufacturers. ARC recently co-sponsored an international conference on propolis at the University of Strathclyde Scotland and is home to the International Propolis Research Group which is organising a second international conference in Bulgaria in 2018. ARC is planning to build a physical centre for education and research into both Apiceuticals and sustainable bee keeping on the North York Moors in the UK.

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[Abstract:0069]

Impact of Acacia Honey on Biofilm Inhibition in Bacteria with the Help of Atomic Force Microscopy

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BACKGROUND: Bacterial resistance to common antibiotics has emerged as a challenge in recent years. One of the main causes of this growing concern is the formation of biofilm by bacterial cells held together in an extracellular matrix in the form of sessile communities. Biofilm provides protection from various physical and chemical stresses including antibiotics. Preventing bacteria form biofilm formation is therefore an important medical challenge and needs to be ascertained.

OBJECTIVE: To ascertain the efficacy of Acacia honey for the prevention of biofilm formation in bacteria.

METHODOLOGY: Biofilm formation was observed in MHB (Mueller Hinton Broth, Sigma-Aldrich) media, supplemented with Acacia honey on microliter glass plates at 37°C for 24 hours. Inhibitory effects of two dilutions of Acacia honey (9% and 13 % (w/v) were tested) on the grown up Bacillus strain ADQ biofilm. The established and interrupted biofilm developments were then examined by using high-resolution topographical images obtained through Atomic Force Microscopy (AFM).

RESULTS: The tested dilutions of Acacia honey (9% and 13 % (w/v)) induced significant inhibitory effects on the formation of Bacillus strain ADQ biofilm. Exposure of Bacillus strain ADQ biofilms to 9 % and 13 % (w/v) Acacia honey in LB (Luria Broth) agar media resulted in significant morphological changes in bacterial cells.

CONCLUSION: It has been concluded from the obtained results that Acacia honey is a potent inhibitor of biofilm formation in bacteria.

[Abstract:0087]

Potential Protective Effects of Bioactive Constituents from Chinese Propolis against Acute Oxidative Stress Induced by Hydrogen Peroxide in Cardiac H9c2 Cells

Liping Sun

Liping Sun

Chinese propolis (CP) is known as a health food but its beneficial effects in protecting cardiomyocytes remain elusive. Here, we investigated the effects of CP and its active compounds on hydrogen peroxide (H₂O₂) induced rats cardiomyocytes (H9c2) oxidative injury. Cell viability decreases induced by H₂O₂ was mitigated by different CP extracts using various solvents. From these active fractions, six active compounds were separated and identified. Among tested isolated compound, the cytoprotective activities of three caffeates, caffeic acid phenethyl ester (CAPE), benzyl caffeate (BZC) and cinnamyl caffeate (CNC), exerted stronger effects than chrysin, pinobanksin and 3,4-dimethoxycinnamic acid (DMCA). These three caffeates also increased H9c2 cellular antioxidant potential, decreased intracellular calcium ion ([Ca²⁺]_i) level and prevented cell apoptosis. In summary, our study provides an important basis for the use of Chinese propolis for the prevention and treatment of cardiovascular diseases. The crude Chinese propolis extract as well as its isolated compounds caffeate derivatives (CAPE, BZC and CNC) could mostly possibly be useful for the development of new anti-myocardial ischemia drugs, depending on their in vitro activity. However, further in vivo pharmacological and toxicity studies are necessary for its potential clinical usages. Overall, the cardiovascular protective effects of the CP which might attribute to its caffeates constituents (CAPE, BZC and CNC) and provide evidence for its usage in complementary and alternative medicine.

[Abstract:0102]

The mixture of Honey, Royal Jelly and Coenzyme Q10 Improves the Indicators of Heart Rate Variability in Elite Athletes

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The aim of the research was to show the effects of royal jelly and ubiquinone-10 (coenzyme Q10) suspended in bee honey on indicators of heart rate variability of the elite sportsmen in precompetitive period. 24 first-class athletes were subject to the study. The athletes with similar functional and morphological characteristics were assigned to 2 groups each with 12 subjects. 10 g mixture of honey + native royal jelly + coenzyme Q10 were given to the first group and 10 g placebo (honey) to the second group. All sportsmen performed a control test in the form of anaerobic interval physical workload. Electrocardiogram recording was carried out before starting physical activity and in 3 minutes after its completion. Cardiorhythmogram was tested by means of variation pulsometry, statistical method and spectral analysis of cardiointervals. So, TI in the first group decreased by 28,6%, but on the contrary R significantly increased by 142,9% after exercise on the 10th day of the research. Such parameters as RMSSD and SDNN significantly increased by 441,5% and 187,4% respectively. It indicates increased vagus nerve activity combined with sympathetic regulation weakening. Increase in the power spectrum in the VLF on the background of a statistically significant change in TF (465,7%) compared with control values after physical activity may indicate a mobilization of energy and metabolic reserves in the body in response to the taking mixture of royal jelly and ubiquinone-10. Thus, analyzing the dynamics of the studied parameters, it is possible to assess the achievement of a positive adaptation effect in athletes after administration royal jelly and coenzyme Q10, which is indicative of an ergogenic effect of this combination of substances.

[Abstract:0115]

Royal Jelly and Coenzyme Q10 Affect the Saliva Prooxidant/antioxidant Balance in Highly Qualified Athletes

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The purpose of the study was to investigate free radical production and antioxidant buffering in highly qualified athletes' saliva after taking royal jelly and ubiquinone-10 (coenzyme Q10) suspended in bee honey in precompetitive period. 24 highly qualified athletes were recruited to perform an anaerobic interval physical test. The sportsmen with similar functional and morphological characteristics were assigned to 2 groups each with 12 subjects. 10 g mixture of honey + native royal jelly + coenzyme Q10 were given to the first group and 10 g placebo (honey) to the second group. The participants provided samples of saliva before and after the exercise that were analyzed for biomarkers of oxidative stress such as intensity of free radical processes (S and I_{max}), total antioxidant capacity (Z) and products of lipid peroxidation (LPO). Free radical processes intensity were measured by induced biochemiluminescence method (BChL). The level of products of LPO: dien conjugate (DC), trien conjugate (TC) and Schiff Based (SB) were determined. So, S and I_{max} indicators significantly decreased by 25,4% and 32,1% respectively. Index Z after exercise also decreased by 4,9% in the first group. Thus, TC and SB presence in saliva in the post-physical-load state statistically significantly decreased by 11,4% and 34,9% compared with values in the placebo group. Based on the results of this study, it can be concluded that on the one hand taking the mixture of royal jelly and ubiquinone-10 reduces potential capacity to free-radical oxidation. On the other hand the saliva can be used as a highly informative biological marker of the non-invasive research when assessing the indicators of oxidative stress in the practice of sports medicine.

[Abstract:0120]

Antibacterial Activity of Propolis Nano-particle and Propolis Against Gram Negative-Bacteria Escherichia Coli

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Nano-particles due to a wide variety of potential applications in biomedical are the great scientific interest. Propolis, natural antibiotic, has been used as a remedy drugs since ancient times. Honey bees generally use it as a sealer the hive to sterile and prevent from development of microbial diseases. Antimicrobial activity of propolis is mostly related to resinous collected from buds of plants surrounding the hive by honey bees. The aim of this study was characterization of propolis Nano-particle and comparison its antibacterial activity with propolis. Crude samples of honey bee (*Apis mellifera*) propolis was collected from Morad Byge apiary in Hamadan province of Iran. The propolis was extracted with 70% ethanol and propolis Nano-particle was prepared by using milling media method (balls/rods). The size and structural modification of Nano-propolis were determined by using dynamic light scattering (DLS) and fourier transform infrared spectroscopy (FTIR), then confirmed by using scanning electron microscope (SEM). The antibacterial activity of propolis and Nano propolis against gram negative- bacteria *Escherichia coli* (ATCC 25922) were evaluated by agar well diffusion methods. The range of Nano-propolis size preparation was determined between %60.6<100, %24.3=100 and 15.5>100 nm. Antibacterial activity of propolis Nano-particle against *Escherichia coli* was significantly better than the propolis (p<0.05). Results indicated that nanostructure of propolis is important for improving its antibacterial activity.

[Abstract:0187]

Stress Reaction of Organism to the Action of Bee Venom

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Bee venom is the most effective means of apitherapy, herewith is the stressing agent for organism. Stress response is connected with stereotypic complex of changes and is in the multilevel nature, due to the development of stress reactions and adaptation process of organism. But the question remains open: what stressing reaction features occur under effect of bee venom. Purpose of the work: to compare the effect of various stress agents on organism. The research of different kinds of stress effect on rats was carried out in this work: hypoxia, immobilization, intraperitoneal of bee venom or adrenaline. As a stressing reaction indicator electrophoretic mobility of erythrocytes was studied. It allows to describe stress-responsible systems activation, in particular sympatho-adrenal system and pituitary-adrenal system. It was shown, that all kinds of stress cause typical two-phase reaction of organism: primary sympatho-adrenal system activation and subsequent pituitary-adrenal system activation. During experiments some features of stressors effect was defined. Hypoxia and immobilization caused more pronounced first phase of stressing reaction with subsequent short second phase. Adrenaline effect was accompanied by even more pronounced first phase in comparison with hypoxia and immobilization. Bee venom, on the contrary, was characterized by short first phase and caused significant manifestation of second phase, which is associated with the development of resistance of the organism. It should be noted, that dynamic of second phase under bee venom effect was coupled with increased of cortisol levels by more than two times.

Thus antichloristic and antirheumatic effects of apitoxin can be described as stressing reaction evolution caused by apitoxin effect, which cause rather long phase of organism resistance. This phase is compensatory and connected with increasing of circulating glucocorticoids level. The hormones increase is aimed at eliminating the pathogenic stress factor.

[Abstract:0210]

Immune Potential Activity of Honey

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BACKGROUND

Apitherapy referred to uses of honeybee products for therapeutic purposes. The apitherapy term comes from the Latin *apis*, which means "bee.", or bee therapy. Bee products included venom, bee pollen, raw honey, royal jelly, and propolis. These products from bees that are generally considered to have medicinal effects. A great interest in last decade of biologist, medical doctors and scientists are directed due to their biological and phytochemical activities of apitherapy.

OBJECTIVE

The aim of this review was evaluated the immune potential activity of Honey.

CONCLUSION:

Honey contain physiologically active substances from floral origin of bee and plants. Honey acts upon both innate and adaptive immune response. At different levels, in the human innate response, these compounds decrease proinflammatory cytokine synthesis (IL-2, IL-12 and IL-4), inactivate both the classical and alternative complement pathway, and decrease superoxide anion production in neutrophils. Where in adaptive immune response, honey induce the increase of antibody production by plasma cells, enhance the secretion of TGF- β after the activation of T regulatory cells.

[Abstract:0218]

Opportunistic Protozoan Infection in HIV Patients after Provision of Propolis in Dr Soetomo General Hospital Surabaya

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Introduction: Intestinal protozoa is one of the etiology of gastroenteritis in developing countries, especially Indonesia as one of the Tropical regions that become endemic areas for intestinal protozoa where some intestinal protozoa can be the cause, opportunistic infection in HIV patients. HIV patients with CD4+ < 200 cell/μl are easily infected by intestinal protozoa causing broad clinical symptoms including diarrhea and even death But this can be prevented by understanding the various risk factors that play a role in the pathogenesis of intestinal protozoan infection

Objektive: To know the presence of opportunistic intestinal protozoa infections after provision of propolis in HIV patients who came to Dr Soetomo General Hospital Surabaya.

Methode: Patients who come to the Dr Soetomo General Hospital Surabaya with Age above are greater than 25 years and less than 50 years, from HIV patients in June 2016 to December 2016. Patients are willing to be interviewed and follow the research. In addition, patients are also willing to perform parasitological examination of the feces in a microscopic manner with the staining method Ziehl-Neelsen (ZN) and CD4 + testing using flow cytometry techniques.

RESULT: Eighteen (18) patients who came to Dr. Soetomo General Hospital Surabaya have been successfully examined, found an opportunistic infection in one patient with CD4 = 957, and found protozoa intestine blastocystis hominis.

CONCLUSION: Although there is one HIV positive patient found Blastocystis hominis, but still need vigilance to maintain environmental sanitation conditions in place of HIV patients located. An increase in CD4 cell count in early June 2016 compared to CD4 in December 2016 to all patients who came to Dr Soetomo General Hospital Surabaya after administration of propolis

[Abstract:0221]

Potential Mechanistic Basis for Honeybee Propolis Used in Modern Medicine: Caffeic Acid Phenethyl Ester Suppresses Stress Induced Damage via Modulation of Some Signalling Pathways

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Propolis, a natural product originated from plant resins and a resin-like substance produced by honeybees, has been widely used for a long time in folk medicine for human in many parts of the world. Human illness against which propolis consumption can help protect are at least classified as follows: (i) severe clinical disorders including myocardial ischemia-reperfusion induced myocardial damage, Helicobacter pylori infection in gastrointestinal, interstitial lung diseases, high fat diet-induced obesity, hepatic fibrosis, aberrant glucose metabolism, hypertension mediated cardiac impairment, (ii) aging related diseases including asthma, diabetes and neurodegenerative disease, and (iii) various types of cancer. However, the molecular and cellular mechanism responsible for the action(s) of this preventive and therapeutic agent remains unknown. Caffeic acid phenethyl ester (CAPE), the ester of caffeic acid and phenethyl alcohol, is a major component of tropic propolis. The ester is known to have numerous beneficial effects observed from in vitro pharmacology studies, such as antioxidant, anti-inflammatory, immunoregulatory anti-cancer and so on. The literature search in this review elaborates that CAPE suppresses stress induced damage via modulation of some signalling pathways, including G-protein coupled receptor protein signaling cascade, receptor tyrosine protein kinase signal transduction pathway, and adenosine monophosphate-activated protein kinase molecular switch. These data provide a potential mechanistic basis for propolis used in modern medicine.

[Abstract:0225]

Propolis as a Candidate of Anticancer Drugs with "In-Silico" Approach from its Flavonoid Content

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Propolis can be used as a cure for cancer especially in its flavonoid content. Among them are apigenin, galangin, chrysin, quercetin, pinobanksin, pinocembrin, and tectochrysin. In the process of inhibition of cancer development can be seen by testing the flavonoid component in in-silico approach. Histone acetyltransferase p300/CBP-associated factor (HAT PCAF) is an enzyme that catalyzes transfer of acetyl group from acetyl-CoA to lysine on histone and HAT PCAF can be used as enzyme for in-silico approach. The purpose of this study was to examine the potency and inhibition mechanism of HAT PCAF by propolis flavonoids by using in-silico approach method. Results showed that propolis flavonoids can inhibit acetylation of histone by HAT PCAF. Propolis flavonoids were able to inhibit the binding of acetyl-CoA, histones, or acetyl-CoA and histone by HAT PCAF by a noncompetitive and competitive inhibition. Inhibition conducted have shown good affinity with low affinity energy. The lowest Gibbs free energy value in this study was shown by apigenin and tectokrisin bonded with HAT PCAF in ring B with a value of -8.3 kcal / mol, while the lowest Gibbs free energy value for galangin and pinobanksin that binds to the ring A HAT PCAF was -7.2 kcal / mol.

[Abstract:0228]

"Apitoxines in the Treatment of Multiple Sclerosis"

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For the last few years scientists haven't made much progress in the treatment of Multiple Sclerosis. The disadvantages of widely used medicines such as betapheron, copaxon and rebif are as follows: they cost much, one should use them continuously, there is no strong influence on destroyed myelin. As a result there is no good dynamics in the treatment of MS. We've worked out the course of treatment based on the usage of injections of bee venom's fractions which influence the neurological status, hold up demyelination, stabilize the index of red blood, decrease neutrophilic and monocyte leukocytosis and plazmatic reaction of lymph tissue.

Apitoxines increase the activity of autoimmune inflammation, activating hypothalamus-hypophysial-epinephrosis system and throwing out endogenous corticosteroids into blood stream. The composition of bee venom's fractions consists of a lot of active peptides, amino-acids, microelements which improve metabolic immune process by regulation of vegetal nerve system, normalize vascular tonus, increase resistance of an organism in general. At the same time there lot of aminoacides which stabilize and improve the work of nervous system (causing the so-called nerve-growth factor). The treatment also includes medicines on the basis of propolis, apilac which have a positive influence on spastic syndrome, decrease convulsion readiness, improve coordination.

The course of treatment lasts 15-20 days. The patient receives it once in 6 month. The whole number of patients are 1500.

We got the following RESULTS:

GROUPS OF DISABLEMENT

- I. Hard movement disorders, disabled
- II. Disabled, with non hard disorders
- III. Work-abled with light disorders
- IV. Work-abled with insignificant disorders

QUANTITY DEGREE OF IMPROVEMENT (%)

198 30%
287 48%
412 64%
603 86%

It is indisputable fact of effective influence of apitoxines on this disease that is why bee-keepers practically don't suffer with MS!

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[Abstract:0238]

Effects of Flavonoids Rich Propolis Ethanolic Extract from Three Different Malaysian Stingless Bee, *Trigona apicalis*, *Trigona itama* and *Trigona thoracica*, on the Expression of Adhesion Molecules in Stimulated HUVEC EA.hy926

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Many anecdotal claims on the medicinal values of propolis belonging to the stingless bee, but little is known about the role of stingless bee propolis extracts in the modulation of the surface membrane expression and its antioxidant activities that lead to its medicinal properties. The present study investigated three different species of propolis extract on the expression of intercellular adhesion molecule-1 (ICAM-1) and vascular adhesion molecule-1 (VCAM-1) on endothelial cells stimulated with tumor necrosis factor- α (TNF- α). The polyphenolic contents and antioxidant activities were also investigated. Primary cultured Human Umbilical Vein Endothelial Cells (HUVEC) were incubated with 10 ng/ml (ICAM-1) and 30 ng/ml (VCAM-1) of TNF- α for 6 hours. Endothelial surface membrane expression of ICAM-1 (CD54) and VCAM-1 (CD106) were examined by flow cytometry, and the cell viability by trypan blue exclusion assay. Antioxidant activity of the propolis samples were examined by DPPH, ABTS and FRAP assay. Total phenolic contents were determined by using Folin-Ciocalteu reagent while total flavonoid content using the aluminium chloride colorimetric method. Flow cytometry analysis exhibited that endothelial cells expressed ICAM-1 and VCAM-1 when activated with TNF- α . All propolis samples revealed strong inhibition activities. The overall antioxidant activities of the propolis extracts remained relatively high and corresponded well to the determined total polyphenol contents. Among three different species, *Trigona thoracica* was found to be the most potent propolis sample in both test. As natural modulators of pro-inflammatory mediators, stingless bee propolis extract may have potentials as new anti-inflammatory agent, and aid future therapeutic approach for clinical purposes.

[Abstract:0280]

Effects of Bee Pollen on Methotrexate-Induced Testicular Damage in Rats

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This study investigated the probable protective effects of bee pollen, an apitherapical product, against methotrexate- (MTX-) induced testis damage. Thirty two Sprague Dawley male rats (about 200-250 g) were used. Rats were divided into 4 groups; control, MTX, Pollen and MTX + Pollen (n=8). The MTX was administered intraperitoneally on day 7 on a single dose, pollen was administered oral gavage for 10 days. On day 10 of the experiment, the rats were decapitated and samples were collected for analysis. Serum testosterone levels, MDA levels, superoxide dismutase (SOD) and catalase (CAT) activity in tissue were evaluated. The MTX group had significantly higher testosterone level than the control group, the MTX+Pollen group had significantly lower testosterone level than the MTX group ($p<0,05$). Additionally, the MTX group had significantly higher MDA level than the control group, the MTX+Pollen group had significantly lower MDA level than the MTX group ($p<0,05$). The MTX group had significantly higher SOD enzyme activity than the control group, the MTX+Pollen group had significantly lower SOD enzyme activity than the MTX group. CAT enzyme activity was not statistically significant. As a result, bee pollen was shown to be protective effect against MTX-induced testicular tissue damage. Acknowledgment: This study was supported by the project 2015.53007.110.03.01 from BAP Coordinator of Recep Tayyip Erdoğan University.

[Abstract:0284]

Bioactive constituent of Chinese Propolis, Pinocembrin, Triggers a Mitochondrial-independent Apoptosis via Caspase cascade Pathway in B16F10 Melanoma Cells

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Melanoma is one of the most virulent cancers, characteristic with its high metastasis and resistance to chemotherapeutic drugs. Nevertheless, therapeutic approaches are quite limited. Here, we firstly proved that Chinese propolis (CP), one flavonoid rich hive products, has potent anti-proliferative effects in mice B16F10 melanoma cells. Moreover, we also screened nine bioactive constituents in CP, to identified the active component response for its anti-tumor effects by Cell counting Kit-8 and LDH cytotoxicity Assay. Among these constituents, pinocembrin (5,7-dihydroxyflavanone) showed the strongest effects against B16F10 cell proliferation. Proapoptosis induced by pinocembrin also was investigated by TUNEL assay and Annexing FITC/PI. Next, the processing of pro-caspase-3, pro-caspase-8, pro-caspase-9, pro-caspase-7 and PARP were notified in pinocembrin treated B16F10 cells. Interestingly, there was no cytochrome C releasing accompany with this process, also no changes was observed regarding bcl-2 family proteins (Bcl-2, Bid and Bax), indicating that the activation of executioner caspases were not initiated by apoptosome. Further experiments demonstrated that the upregulation of caspase-12 and increasing level of intracellular Ca^{2+} influx may responsible for the activation of caspase-9. Meanwhile, the B16F10 cell tended to be arrested at the G1/S cell cycle stage after treatment. Taken together, we assumed that pinocembrin preserves anti-melanoma activity and is capable of triggering cell death via mitochondrial-independent pathway.

[Abstract:0288]

In-vitro Antibacterial Effect of Three Propolis Samples from Turkey on Some Biofilm Forming Bacteria

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Propolis is a multifunctional natural honey bee (*Apis mellifera* L.) product which has been used for its medical benefits, including antimicrobial effect, since ancient times. It is a yellowish green or a brownish, adhesive, resinous substance which collected from the leaf buds of various trees and transformed to gummish material by worker bees. Propolis took a place in London pharmacopoeia as an official drug in the 17th century. Today it is available in the form of pure or combined capsule, tablet, extract, powder and as an active substance in cosmetics. Its composition varies between regions and among seasons as a result of the floral variation but in general it is composed of 50% resin and vegetable balsam, 30% wax, 10% essential and aromatic oils, 5% pollen and 5% various other substances, including organic debris. Antibacterial activity of propolis is reported to be due to flavonoids pinocembrin, galangin, pinobanksin and ester of coumaric and caffeic acids. The aim of this study was to evaluate the effectiveness of three propolis sample from different regions of Turkey on some biofilm forming human pathogens. After extraction in ethanol and GC-MS (Agilent, GC 6890N-MS5973) analysis of samples, antimicrobial activity studies were carried in accordance with EUCAST recommendations by disc diffusion method at two concentrations (100% and 50%). Microorganisms used in the experiment were *Staphylococcus aureus* ATCC 29213, *Staphylococcus epidermidis* ATCC 35984, *Escherichia coli* ATCC 35218, *Enterococcus faecalis* ATCC 29212, *Klebsiella pneumoniae* RSKK 574, *Pseudomonas aeruginosa* ATCC 27853. Test results indicates that all samples were showed significant antibacterial activity. The largest zone diameter was 17.3 mm on *S. aureus* and 14.6 mm on *S. epidermidis* for 50% and 100% concentrations, respectively. The narrowest zone diameter was observed on *P. aeruginosa* with 9 mm and 7 mm for 50% and 100% concentrations, respectively. It was observed that the effect on the Gram (+) bacteria was more prominent than on Gram (-) ones. Results of this study shows that ethanol extracts of propolis may be used as antimicrobial agent in combination with antibiotics and synergistic effect studies will be carried out with taking these results into account.

[Abstract:0303] / PLENARY TALK

Integrated Apitherapy in Multiple Sclerosis – Clinical Study for 80 Patients in One Year of Treatment

Cristina Aogan

Apitherapy Commission of Apimondia

Demielization condition, named multiple sclerosis as disease, is a degeneration in the nervous tissue. The affected cells are oligodendrocytes. Patients develop various types of symptoms, of which the most threatening is the progressive paralysis. For the diagnose, the key consist in demielization lesions on MRI. The treatment we apply is a complex one, including apitherapy (with bee venom or apitoxin, royal jelly, apilarnil, propolis, pollen, honey) along with phytotherapy, diet, psychotherapy, life style corrections, elements of Ayurveda and/or traditional Chinese medicine, applied respecting the needs of each patient.

Patients in this study were treated between 2003 – 2017. Were selected those who respected the treatment for longer than one year, generally for many years; preferable having MRI before and after around one year of treatment. The age of patients is various, mainly young persons (they addressed more to the office). We watched the clinical evolution of five main symptoms, in parallel with the psycho-emotional disorders and the evolution of MRI imagines.

Results after one year of treatment:

For the patients with the age under 40 years and for those near the debut (less than two years), the symptoms were recovered more than 80% of the initial intensity to about 60 % of patients (exact calculation will be provided in conference). Only about 6 % (exact calculation will be provided in conference) had a small improvement of the symptoms, under 20 % of the initial intensity.

On MRI an important part of the patients (exact calculation will be provided in conference) had improvements of the imagines, meaning that some disappeared or diminished. Others were stationary.

The best results, clinically and on MRI, were for the patients with a good psycho-emotional condition. The worst results were for the patients with a dis-balance in the psycho-emotional condition (exact calculation for both situations will be provided in conference). The patients near the debut, those who are young and those with positive psychic have the best chances to be completely recovered and to have a normal life. They had good improvements on MRI imagines.

[Abstract:0305]

The Isolation of Triterpenoid Derivatives from Southern Asian Region Propolis and its Anti Proliferative Effects on A2780 Cell Line

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Propolis is made up of a mixture of resinous substance secreted by plants that was collected by honeybee and combined with its saliva, which will form it to bee glue. Propolis is used as defence substance to protect the beehive from other insect predation. Besides preserving the beehive from intruders, propolis has also shown therapeutic benefits in traditional and conventional medicine. In this study, metabolomics tools have been applied employing liquid chromatography-high resolution mass spectrometry (LC-HRMS) and nuclear magnetic resonance (NMR), in a way to investigate the chemical profile of the collected propolis, thus will give insight in targeting its bioactive metabolites.

A green propolis sample was donated by Mrs. Cathie from Eco Bee Shop Sdn. Bhd. Johor, Malaysia. The propolis sample (10g) was subjected to extraction using 1:1 ratio of water to methanol, followed by acetone and methanol to obtain the crude extract. All extracts were screened for anti proliferative activity against the ovarian cancer cell line (A2780). The obtained HPLCMS data was processed with MZmine 2.10 and was dereplicated using an in-house Excel Macro to match the MS data to compound hits from the Dictionary of Natural Products 2016 (DNP) database. A supervised multivariate analysis was done by orthogonal partial least squares discriminant analysis (OPLS-DA) in SIMCA-P 14.0 to predict and pinpoint the plausible bioactive components. In conclusion, two triterpenoid derivatives were isolated from the predicted set of bioactive metabolites. The structures were elucidated by 1D and 2D NMR experiments.

[Abstract:0313]

The Usage of Bee Hive - and Bee Hive Air- therapy for Treatment of Asthmatic Reactions of Beekeeper's Children Having Bee Venom Allergy

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³Vice President of the International Federation of Apitherapy

There are two different approaches to use the bee hives for healing porposes. The first is using the air - this is the bee hive air therapy. The second uses all effects of the bee hives, besides the air the warmness, the micro vibration, negative ions and the sound of the hives - this is the bee hive therapy. Both therapies has long tradition from Austria, Germany, over Russia, Ukraine and Slovenia to Romania and Hungary. There are also high end medical examinations in the different countries about the healing effects of this kind of treatments. We will compare the international results with our own ones.

The patient is a 9 years old boy, son of a beekeeper. The children of beekeepers are often allergic to bee stings. This patient also. Laboratory reseaches are done to identify the cause for this. Parallel to the bee hive and bee hive air treatments we monitored with the standard "alleopathic" methods the lung functions and the immunological status. Our results confirm the previous international research results, the bee hive air therapy and the bee hive therapy is stong supporter of the healing processes and helping by desensibilisation for allergic patients.

The risk for children of bee keeper can be minimied by using this "new" techniques.

[Abstract:0321]

Treatment of Upper Tract Respiratory Infections by 3% Ethanol Extracts of Propolis

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Effects of 3% Ethanol Extract of Propolis (EEP) (Gripoli), produced by Arı Farma Ltd., were tested on 19 patients having Upper Respiratory Tract Infections (URTI) by applying 3 x 1 spray a day for ten days to the mouth and throat. Ten of the patients were female between the ages of 27-55 all married, while 9 of the patients were male between 25-61, all married except one. Patients were first examined and after the treatment and throat swap cultures were performed and none of the patients found to have A group haemolytic streptococcal infections in the tests. Out of 19 patients treated, 18 showed complete recovery and only one did not report a disease progress. Out of 19 patients; symptoms of URTI, acute tonsillitis, acute rhino pharyngitis, pharyngitis, nasopharyngitis, allergic rhinitis completely disappeared on 6, 6, 2, 2, 2, 1 patients respectively. Two patients having acute tonsillitis and one having nasopharyngitis had also Candida stomatitis and all the three patients also showed recovery of Candida stomatitis. No negative effects and complaints were observed on the patients.

[Abstract:0360]

In-vitro Evaluation of Antimicrobial Effect of Turkish Propolis Against Human Fungal Pathogens *Candida Albicans* and *Candida Parapsilopsis*

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Propolis is the one of the natural products of honeybees (*Apis mellifera* L.) that using for preventing hive from external factors. This product based on resinous paste is the composition of secretion of plants, pollen and enzymes has also antimicrobial activity. It has a long history of being used in traditional medicine dating back at least to 300 BC and has been reported to have a broad spectrum of biological activities. Nowadays, it is available in different forms like capsule, tablet, extract, powder and cosmetic products. Propolis is composed of 50% resin and vegetable balsam, 30% wax, 10% essential and aromatic oils, 5% pollen and 5% various other substances, including organic debris. Its active components varies according to vegetation. Antibacterial activity of propolis is reported to be due to mainly flavonoids, pinocembrin, galangin and pinobanksin and ester of coumaric and caffeic acids. The aim of the study was to investigate the antimicrobial activity of three propolis samples against *Candida* spp. which cause oropharyngeal, genital or invasive types of Candidiasis. Three propolis samples were collected from different regions of Turkey by using special propolis traps. After extraction in ethanol all samples analysed in GC-MS (Agilent, GC 6890N-MS5973). Antimicrobial activity studies were carried in accordance with EUCAST recommendations by disc diffusion method. Microorganisms used in the experiment were *Candida albicans* ATCC 10231, *Candida albicans* ATCC 033 and *Candida parapsilopsis* ATCC 22019. All determinations were made in triplicate. Test results indicates that all three samples were showed significant antifungal activity. Mean zone diameters were 15 mm and 12,55 mm for 50% and 100% concentrations, respectively in *Candida albicans* ATCC 10231; 15,67 mm and 13,89 mm for 50% and 100% concentrations, respectively in *Candida albicans* ATCC 033 and finally 15,78 mm and 13,22 mm for 50% and 100% concentrations, respectively in *Candida parapsilopsis* ATCC 22019. Results of this study showed that ethanol extracts of propolis may be used as antimicrobial agent in combination with antibiotics and synergistic effect studies will be carried out according to these results.

[Abstract:0369]

Water Soluble Propolis with Higher Bio Availability

Thomas Gloger

Api-Zentrum-Ruhr

The bees collect for their own need of propolis from different plant species. Depending on the habitat these have differing water solubility, as hydrophobic and high melting/boiling fractions are present in higher percentage. Sometime it is wished to extract only the water soluble parts. From a therapeutically view and from good reason it has become generally accepted to use Propolis extract with 60-70% ethanol. This method avoids extracting too many waxy parts, which functions only as ballast. At the same time all parts which are oxidized by the oxygen of the air and aged were sorted out. The oral intake of Propolis drops with this high alcohol concentration causes troubles. When dropped into water the hydrophobic parts flocculate. When smaller quantities are insalivated this effect is not so extreme. Still clumps and droplets are formed. These must be dispersed by the passage through the human column. Only when the peristaltic and the specific carrier systems work in an optimal way, this can be expected. Does a patient take a bigger quantity at the same time in a big mouthful, as he dislikes the taste of Propolis anyway, the likability is high that this intake stays completely inefficient and is excreted. Alternatives for the ethanolic extract are these with glycerin. This needs a much higher operative efforts like e.g. a pressure vessel. This is not accessible for bee keepers or apitherapeuts.

When a natural auxiliary material like lecithin is used, the lecithin can surround the insoluble in small vesicles. It works like an emulsifier. These vesicles are similar to membranes produced naturally in the body, as it is the same building block. These vesicles are now much smaller as these little resin droplets with the intake without lecithin. They are compatible with the body's own carrier systems. And therewith all components of the propolis is available for the resorption.

In this presentation it will also be practically demonstrated how with the help of a simple recipe every bee keeper/apitherapeut can produce a highly bio available Propolis solution from his own Propolis.

[Abstract:0389]

Beehive Products in Modern Medicine

Lyousi Badiia

University Sidi Mohamed Ben Abdallah, Laboratory of Physiology-Pharmacology & Environmental Health

Various products derived from honeybees have remarkable activities, including antimicrobial, antioxidant, anti-inflammatory, antidiabetic, anti-tumor, hypotensive, hypolipidemic, analgesic, as well as neuro-, and hepato-protective, and immune-modulating properties. Thus, bee products have potential for use in therapy as diuretics, antidiabetic, antihypertensive, antilipidemic, antianemic and wound healing agents. Since, oxidation/peroxidation involving reactive oxygen species (ROS) is an important contributor to the cause of major chronic diseases, such as diabetes, hypertension, nephropathy, heart disease, cancer, etc., there is emphasis on determination of antioxidant activity of bee products such as honey, propolis, pollen, royal jelly, and beebread, and the protection bee products offer against ROS-induced damage in human diseases. In this regard, the antioxidant activity and chemical composition of samples of honey, royal jelly, propolis, pollen and beebread, collected from diverse places in Morocco, have been investigated using the standard methods (DPPH, ABTS, ORAC, and chelating activity). It was discovered that the capacity for preventing lipid peroxidation and free radical scavenging were generally correlated with the phenol and flavone content of the samples. In the animal model (streptozotocin-induced diabetic rats with ROS-induced nephropathy), propolis and bee pollen exhibited a remarkable protective effect on glucose homeostasis and kidney function. If such a protective effect can be reproduced in humans, it will be a great achievement. It was also determined that the therapeutic effects of bee products are mediated via modulation of some signaling pathways, including G-protein coupled receptor protein signaling cascade, receptor tyrosine protein kinase signal transduction pathway, and adenosine monophosphate activated protein kinase molecular switch. These data provide a potential mechanistic basis for therapeutic effects of bee products. Furthermore, several studies, including ours, have revealed that the observed beneficial effects of bee products may be as a result of synergistic action of the complex constituents.

[Abstract:0393]

Antioxidant Activity and Protective Effect of Bee Bread (Mixture of Honey and Pollen) in Aluminum-induced Anemia, Elevation of Inflammatory Markers and Hepato-renal Toxicity

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Aim of the study: The aim of the study is to evaluate the ability of bee bread (mixture of honey and pollen) to protect against anemia, inflammation and hepato-renal toxicity induced by aluminum.

MATERIAL-METHODS: For the analysis of the composition of our bee-bread, tests were done to study the percentage of Moisture, protein, fat, fiber, ash, total carbohydrate, phenol, and flavonoids content and we also evaluated antioxidant capacity by DPPH, ABTS, Reducing Power tests, then sixteen rats were divided into four groups, two groups are treated by co-administration of aluminum (AlCl₃·6H₂O (662.2 mg/kg BW)) with two different concentrations of hydro-ethanolic extract of Bee bread (Al+Bb) (500mg / kg BW) and (750mg / kg BW), a group treated with (AlCl₃·6H₂O (662.2 mg/kg BW) only, and the last group treated with distilled water (control). The measured parameters are: hematocrit %; red blood cells (RBC); platelets; hemoglobin (Hb); lymphocytes; monocytes; mean corpuscular volume (MCV); mean corpuscular hemoglobin concentration (MCHC); leucocytes (wbc); sodium; potassium; urea; renal clearance, CRP, ALT, AST.

RESULTS: The results show a protective effect of Bee bread extract against anemia induced by aluminum in Wistar rats, and against inflammation and the elevation of the blood urea levels.

CONCLUSION: the results of this study might pave the way to use bee bread in prevention of anemia, inflammation and hepatorenal toxicity this protection could be due thanks to its antioxidant and anti-inflammatory effects.

[Abstract:0409]

Antimicrobial Potential of *Melipona beecheii* Honey on Bacteria Related to Foodborne Diseases and the Effect on their Virulence Genes

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Foodborne Diseases is a serious public health problem, in recent years there has been an increase in the presence of several pathogenic bacteria in different countries. Among the bacteria related to these diseases are *Listeria monocytogenes* and *Escherichia coli* O157: H7 caused acute diarrhea. Unfortunately, current treatments have proved ineffective in combating these pathogens. One of the options to face these pathogens is the study of natural products, such as melipone honey. The main goal of this work was to evaluate the antimicrobial activity of melipone honey against *Listeria monocytogenes* and *Escherichia coli* O157: H7 as well as the effect of honey on their virulence genes. Honey of *Melipona beecheii* was collected in the municipality of Mani Yucatan. The antimicrobial activity of this honey was determined by disk diffusion, the minimum inhibitory concentration was determined by macro dilution method. The killing kinetics against both pathogens were also determined. Expression gene analysis was performed by qRT-PCR. Melipone honey showed a steady antimicrobial activity, inhibiting the growth of *L. monocytogenes* (gram positive) and *E. coli* O157:H7 (gram negative); in addition, it was determined that only 17% (V / V) is required to inhibit the growth of both pathogens. Moreover, when evaluating the killing kinetics, it was observed that honey could remove 98% of *L. monocytogenes* and 95% of *E. coli* in 60 min. On the other hand the qRT-PCR analysis showed that melipone honey can interact with the mechanisms of bacterial transcription, repressing several bacteria virulence genes, such as the *inlA* (internalin A) gene of *L. monocytogenes* and the gene *Stx1* (Shiga toxin) and *eae* (intimin) of *E. coli*. *Melipona beecheii* honey can inhibit the growth of pathogens such as *L. monocytogenes* and *E. coli*, showing a bactericidal effect for both bacteria, besides that, melipone honey can repress genes related to the virulence of both pathogens.

Abstract:0431]

Potential Protective Effect of 10-HDA from Royal Jelly against Inflammation Induced by Lipoteichoic Acid

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Royal jelly (RJ) is known for its diverse biological activities and complicated chemical compositions. 10-HDA (Trans-10-hydroxy-2-decenoic acid) is the exclusive fatty acid in royal jelly (RJ). In the present study, we evaluated the *in vitro* anti-inflammatory effect of 10-HDA in LTA (Lipoteichoic acid from *Staphylococcus aureus*) induced RAW 264.7 macrophages. The results showed that 10-HDA had potent, dose-dependent inhibitory effects on the release of the major inflammatory mediators and nitric oxide. Several key inflammatory genes, such as interleukin-1 β (IL-1 β), IL-6, MCP-1 and COX-2 have also been suppressed by 10-HDA. Furthermore, the effects of 10-HDA on LTA-induced pulmonary damage were also examined in mice. we found that the administration of 10-HDA (100 mg/kg) provided protective effects by attenuating lung histopathological changes and modulating the secretion of LTA-stimulated inflammatory cytokines, such as IL-10, MCP-1 and TNF production in mice. The results reveal the potent anti-inflammatory properties of 10-HDA and provide biological information for using RJ against inflammatory diseases.

[Abstract:0444]

Antimicrobial Activity of Honey Samples from the Republic of Macedonia

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The antimicrobial activity of honey was determined against four species of microorganisms: *Staphylococcus aureus*, *Salmonella* spp., *Escherichia coli*, *Candida albicans*.

Thirty honey samples from the Republic of Macedonia, each with 4 different concentrations: 100%, 50%, 25% and 12, 5% were used for determination of its antimicrobial activity with gel diffusion test. Antimicrobial activity was recorded against all four species of microorganisms: *Staphylococcus aureus*, *Salmonella* spp., *Escherichia coli*, *Candida albicans*.

Out of 30 honey samples with 100% concentration, 56, 7% showed antimicrobial activity against *Staphylococcus aureus* and the inhibition zone was 10-14 mm. 3,3 % of total honey samples with concentration of 50% showed antimicrobial activity, while the honey with 25% and 12,5% concentration did not express antimicrobial activity against *Staphylococcus aureus*.

Eleven samples with 100% concentration expressed antimicrobial activity against *Salmonella* and inhibition zone was 10 - 20 mm. 10% of total samples with 50% concentration had antimicrobial activity, while with decrease of the concentration to 25% the antimicrobial activity was registered in 6,6% of the total samples. Inhibition zone of honey (concentration 100%) against *Escherichia coli* was 10 mm (in 40% of the samples), 12 mm (3, 3% of the samples) и 14 mm (6, 7% of the samples). Forty percent of the samples with 100% concentration had antimicrobial activity against *Candida albicans*, and the inhibition zone was 10, 12 и 16 mm.

Significant decrease of the antimicrobial activity against *Candida albicans* was determined in samples with 50% concentration (3,3% of total samples) and the inhibition zone was 10 mm. Based on the results, it can be concluded that highest concentrations of honey showed highest antimicrobial activity, while the decrease of the concentration of honey resulted with decline in their antimicrobial activity.

[Abstract:0456]

Effect of N Chromosome Royal Jelly on White Blood Cell Count

Hossein Yeganehrad

Caspian Apiaries

Aggressive chemotherapy can lower white blood cell counts in patients resulting in a weakened immune system. Cancer patients who have neutropenia have a higher risk of infection particularly if their white blood cell count remains low for long periods of time. The aim of this presentation is to assess the effect of n chromosome royal jelly on white blood cell count in patients post chemotherapy. Two separate studies were conducted to assess the association between the use of n chromosome royal jelly and increased white blood cell count in 42 chemotherapy patients. The patients, ranging in age from one to twelve years, suffered from low white blood cell count resulting from chemotherapy treatment. Patients in the test group consumed n chromosome royal jelly and those in the control group were given a placebo. Patients consuming the n-chromosome royal jelly showed an increase in white blood cell count. Patients with initial white blood cell counts of 1.0 to $3.6 \times 10^3/\text{mm}^3$ now had counts between 4.0 to $8.5 \times 10^3/\text{mm}^3$. White blood cell counts were significantly different between the test and control groups. In conclusion, n chromosome royal jelly was found to increase white blood cell count in patients who have undergone chemotherapy. This may be an alternative to reduce autoimmune diseases and reverse the effects of chemotherapy on white blood cells.

[Abstract:0469]

The Efficacy of Apilarnil Administration on Sex Characteristics of Male Broilers

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Apilarnil, drone bee larvae, is a natural bee product rich in androgenic hormones which stimulate sexual development. Drone larvae extract gives successful results in males by the stimulation of the spermatogenesis that affects the sexual dynamics positively and creates an androgenic effect. Few studies conducted with broilers to determine the effects of apilarnil administration on sexual development. In our research, the administration of 4 g/day apilarnil to male broilers during growth period is stimulated the development of secondary sex characteristics (length of comb and length and width of wattle) of male broilers. In our further study, low (2.5 g/bird) and high (7.5 g/bird) doses of apilarnil administration increased testicular weight, testosterone concentration and comb growth in males. The results revealed that it may be possible to stimulate precocial sexual development and early sperm production with apilarnil administration at an early age and apilarnil has mainly androgenic (testosterone-like) effects on male broilers. According to these findings, early sexual maturation by apilarnil administration may provide an opportunity for extension of reproductive lifespan and decreased generation time in males of elite stock, thereby, also reducing costs in the poultry sector.

[Abstract:0481]

Antioxidant Content of Propolis Extracts from Different Geographical Sources

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SBS Scientific Bio Solutions Inc.

Propolis is the general name of resinous material which is collected from various herbal sources by honey bees. Even though the composition of Propolis changes according to its source, it contains 50-60% resins and herbal balsam, 30-40% bees wax, 5-10% essential oils, 1-5% pollen and 1-5% other materials. Propolis, especially its ethanolic extracts, act as an antioxidant, antibacterial, antifungal, and anti-viral agent and has hepatoprotective effects. Propolis is also used for Apitherapy to increase immunity against many chronic diseases. Propolis has a high antioxidant content but its bioavailability is only 2% in its raw form and must be extracted to be used by humans. Extraction method varies according to the solvent used and the technique that wax and impurities are eliminated. After extraction, propolis becomes rich in phenolic and flavonoid substances and exhibits high antioxidant activity. This study demonstrates that products in the market contain low quantity of propolis, contrary to what is indicated on their labels. 54 products, which are being sold in Korea, UAE, Spain, USA, Japan and Turkey had been purchased from different retail shops and pharmacies in 2016 and 2017. All the products were in liquid form and mentioned to be propolis drops or sprays on their labels. Products were analyzed for their phenolic and flavonoid contents and antioxidant capacity by Folin-Ciocalteu, Total Flavonoid Content and CUPRAC methods respectively by using gallic acid, quercetin and Trolox as standards. Test results indicated that 30 products scored less than 50 mgTE/mg, 10 products scored between 50-150 mgTE/g and 9 products scored above 150 mgTE/g. Results were compared to ethanolic extracts of propolis (20% and 30% propolis extract) collected from Turkey in 2016 and extracted in our laboratory. The results of these samples were between 250-350 mgTE/g. Propolis is regarded as a natural healing source by many people. Thus, consumers should not be misinformed about the content of products and a standard must be established to regulate the content of products and take unfair competition under control on the market.

[Abstract:0526]

The Protective Effects of Propolis and Flunixin Meglumine on Antioxidant Status of Liver and Kidney Tissues, and Serum TNF- α Levels in Rats Induced by Copper

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This experiment was conducted to determine the protective effects of propolis and flunixin meglumine on antioxidant status of liver and kidney tissues and serum TNF- α levels in rats induced by copper. In this study were used 36 male Sprague-Dawley rats which are housed. Animals were randomly divided into six groups; control, copper sulphate (Cu-500mg/kg Body weight (BW)/day, gavage), flunixin meglumine (FM-2.2mg/kg BW/day, ip), propolis (P-100mg/kg BW/day, gavage), copper sulphate+flunixin meglumine (Cu+FM-500 mg/kg BW/day of copper sulphate by gavage and 2.2 mg/kg BW/day of flunixin meglumine, ip) and copper sulphate+propolis (Cu+P-500mg/kg BW/day of copper sulphate, and 100 mg/kg BW/day of propolis by gavage) during 21 days. In our study, Cu excess significantly increased MDA indicating oxidative stress in liver and kidney tissues ($P<0.001$). Propolis and flunixin meglumine administration significantly decreased MDA levels in liver and kidney tissues ($P<0.001$). GSH levels, SOD and CAT activities in the liver and kidney tissues were found to be significantly lower than those of rats in the control group, flunixin meglumine and propolis groups ($P<0.001$). Propolis and flunixin meglumine treatments partially ameliorate the Cu-induced imbalance in the oxidant-antioxidant systems of both liver and kidney tissues. Especially in regards to propolis supplementation in rats that have been treated with Cu, significant increases of SOD, CAT and GSH were observed ($P<0.001$). Serum TNF- α levels of the Cu group were significantly higher ($P<0.001$) than those of other groups. However, serum TNF- α levels were significantly lower in the Cu+FM and Cu+P groups ($P<0.001$). Propolis administration to rats with induced Cu showed decreased TNF- α level. In conclusion, propolis that is natural bee product appeared to ameliorate adverse effects on food intake, liver and kidney tissues caused of the Cu toxicity by scavenging the free radicals and increasing the antioxidant activities. Besides, propolis supplementation instead of flunixin meglumine that is no natural may be used as a good option to diminish the negative effects of Cu on rats.

[Abstract:0534]

Water Extracts of Turkish Propolis Induces Human Laryngeal Epidermoid Carcinoma Cells Arrest in S Phase

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AIM: Propolis is effective as an antitumoral agent due to its antioxidant composition. Cytotoxic mechanisms of propolis have been reported as induction of apoptosis and antiproliferation of the cell cycle. Antiproliferative studies have been increased for various propolis extracts including alcoholic and water. In the present study, aim is to investigate antiproliferation of cell cycle by DNA analysis and affecting genes by cell cycle genes analysis in human laryngeal epidermoid cells (HEp-2) incubated with water extract of Turkish propolis (WETP).

MATERIALS-METHODS: HEp-2 cells as cancer cells and peripheral blood monocyctic cells (PCMB) isolated by Ficoll density gradient centrifugation method as control cells were used. WETP of 600 μ g/ml was incubated with HEp-2 and PCMB cells for 72 hours. Proliferation was followed by flow cytometric DNA cycle analysis (Cycle Test Plus DNA reagent kit, Becton-Dickinson FACSCalibur). Determination of gene expression profiling of human genes involved in cell cycle regulation was done with human cell cycle regulation panel 96 (Roche). In this assay, RNA isolation, cDNA obtaining and RT-PCR methods were applied. Expression level of each target gene for propolis and negative control groups was calculated relatively using 60S ribosomal protein L13a as housekeeping gene.

RESULTS: In propolis group, S phase % was found as 0.44 for PBCM cells and as 80% for HEp-2 cells in DNA cycle analysis. In gene expression analysis, a few gene levels including BAX, Cyclins D and T1, growth arrest and DNA damage inducible protein increased, while most of the panel genes including cyclins (A2, B1, B2, C, D3, E1, E2, F, G, G2, H, T2), cyclin-dependent kinases (CDK2, CDK4, CDK5M, CDK6, CDK7), p21, p27, c-myc, dual specific protein phosphatase, cell division control protein20 decreased.

CONCLUSION: WETP induces HEp-2 cells arrest in S phase by regulation of cell cycle genes especially cyclins and cyclin-dependent kinases. Therefore, WETP may be used safely in apiterapical applications.

[Abstract:0552]

Creating a Synergy Effect by Mixing the Propolis of Different Countries

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Propolis is a traditional nutritional supplement produced by honeybees and widely used to treat several diseases as a folk remedy around the world. Honeybees collect from some plants resins and balsamic substances, these substances are transported to beehives and mix it with their own secretions, and used to close the apertures and to protect the beehives against intruders, the bacterial, viral and fungal contamination. Propolis contains numerous chemical ingredients, including cinnamic acid derivatives (e.g., p-coumaric acid, drupanin, artemillin C, and baccharin, benzoic acids, substituted phenolic acids, flavonoids, and amino acids. And the chemical composition of propolis depends on various factors, such as the geographical origin, types of plant sources, and season of the year. The wide application of propolis in modern medicine has drawn growing attention to its chemical composition. Many studies including our own research data have revealed that the observed effects might be the result of synergistic action of its complex constituent. In order to assist or enhance in the maintenance or improvement of general well-being and anti-aging, we have prepared propolis cocktail, which is selected the characteristic of its different complex constituent. In conclusion, these data open up a new perspective for the development of propolis related industry.

[Abstract:0563]

Medicinal Activities of Chestnut Honey and Pure Chestnut Pollen

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It is known that the usage of honey as therapeutic agents is not new. In the old times, honey is used by the local people as food as well as medicines, particularly antiseptic, antimicrobial, digestive system disorders, wound and burn healing. Chemical components of honey depends on; obtaining season, collecting nectar from which plants and climatic conditions. Turkey has a rich flora and there are many different varieties of honey production. But scientific publications about chemical and biological properties of honey is so limited. Thus, our aim was to investigate and comparison of antioxidant, anticholinesterase and tyrosinase enzyme inhibition activities of pure chestnut pollen and chestnut honey.

In this study, Chestnut honey and pure chestnut pollen collected from Bursa in Turkey. Chestnut honey dissolved in water and five different concentration solutions prepared (2,5, 5, 10, 20, 40 %). Chestnut pollen extracted with methanol and evaporated solvent under vacuum. After preparing solutions, Antioxidant activity performed four different METHOD: β -carotene linoleic acid bleaching assay, DPPH, ABTS cation radical scavenging activity and CUPRAC ion reducing methods. Anticholinesterase activity performed with two different enzyme: acetylcholinesterase and butyrylcholinesterase and also tyrosinase enzyme inhibition activities evaluated spectrophotometrically.

In β -carotene linoleic acid bleaching assay, honey sample and chestnut pollen showed high activity $98,72 \pm 0,74$ % at 40 % concentration and $90,20 \pm 0,85$ % at $800 \mu\text{g/mL}$ concentration respectively. At the same concentrations, chestnut honey and chestnut pollen sample exhibited $62,15 \pm 0,41$ % and $73,75 \pm 1,18$ % inhibition respectively in DPPH radical scavenging activity test. According to ABTS cation radical scavenging activity chestnut honey and chestnut pollen exhibited $84,25 \pm 1,47$ % and $94,52 \pm 0,05$ inhibition respectively. While chestnut honey exhibited $58,76 \pm 0,72$ % and $43,96 \pm 0,85$ % inhibition, chestnut honey showed $69,56 \pm 0,47$ % and $64,00 \pm 0,18$ % inhibition against acetylcholinesterase and butyrylcholinesterase enzymes. According to tyrosinase enzyme inhibition, chestnut honey and chestnut pollen showed $78,22 \pm 0,90$ % and $67,90 \pm 1,05$ % respectively. These results showed that, chestnut honey is valuable functional food for health. Activity results of chestnut honey and pure pollen extract is parallel to each other. Pollen density is major factor to increase medicinal activities of honey.

[Abstract:0569]

The Implementation of Ovule Propolis as a Therapy in Patients with Vaginal Candidiasis

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Vaginal candidiasis is one of the female reproductive health problems characterized by vaginal discharge and itching. Treatment of fungal infections caused by *Candida* is usually given the Azol group of drugs. Recently, however, it has been found that some of the *Candida* species are becoming resistant to the Azol group, so that alternative effective drug is needed as a vaginal candidiasis therapy. Propolis containing polyphenols and flavonoids are known to have anti-inflammatory, anti-viral, antioxidant, and antimicrobial activity. In this study, ovule preparations (vaginal suppositories) containing active wax propolis and base will be applied to treat patients with vaginal candidiasis disease. This ovule preparation is more effective because it has a faster working effect on the affected area and does not irritate the digestive tract. The addition of propolis wax will be the new breakthrough in ovule preparations given the wax propolis contains antimicrobial substances. This study aims to implement the innovative formulation of the drug by using an effective and safe propolis wax material for therapy in patients diagnosed with vaginal candidiasis. The research design used was the benefit assay with the research subjects were the women who came to the Polyclinic of Obstetrics-Gynecology Cipto Mangunkusumo Hospital or to the Tasik Health Center that meets the inclusion criteria and signed the informed consent. Sixty subjects were randomly assigned to 2 groups, those receiving treatment with propolis ovules and a control group receiving standard treatment with nistatin ovules for therapy of vaginal candidiasis. All research methods used have been approved by the Ethics Commission of the Faculty of Medicine, University of Indonesia. The result to be achieved in this study was ovule propolis products that proved to be effective, safe and affordable as a treatment of vaginal candidiasis.

[Abstract:0579]

Apiculture Intervention for Malaria-Mitigation in Nigeria (Project AIM)

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Apis Interactive Network Limited

Introduction

Bee keeping can serve as a tool for reducing the prevalence of Malaria through the use of Beeswax Mosquito Repellent Candles.

Malaria is a life-threatening disease caused by parasites transmitted to people through the bites of infected female *Anopheles* mosquitoes.

Between 2000 and 2015, the rate of new malaria cases fell by 37% globally; malaria death rates among populations at risk fell by 60% among all age groups, and by 65% among children under 5.

Sub-Saharan Africa carries a disproportionately high share of the global malaria burden. In 2015, the region was home to 88% of malaria cases and 90% of malaria deaths.

Source: <http://www.who.int/mediacentre/factsheets/fs094/en/>

The Economic Impact of Malaria on Nigeria...

Malaria is responsible for 60% outpatient visits, 30% childhood death, 25% death in children below 1 year and 11% maternal death. Malaria costs Nigeria 132 billion Naira annually.

Our Intervention...

To significantly reduce or wipe out malaria, only an intervention that is indigenous, sustainable and consistently accessible to Rural and Urban dwellers will be tenable. Industrial production and circulation of Beeswax Candles (with Citronella aroma) that can mitigate malaria through repelling mosquitoes by Artemisinin-based combination therapies. while at the same time adding economic value to the rural farmers (who would be engaged as Bee keepers for Beeswax resource) and available unemployed women/youth (who would be engaged in producing and marketing the candles).

Citronella Beeswax Candles are, effective mosquito/insect repellent, organic & Environmentally safe(Bio degradable/ Aroma therapeutic, slower combustion, brighter illumination, negligible toxin emission, environmentally safe)

Research Summary

55 volunteer households given samples of Citronella/beeswax candles.

51% observed 80% reduction of mosquito presence.

24% observed 95% reduction.

8% experienced less than 10% reduction.

78% experienced no malaria infections.

Our Action Plan

Carry out a more comprehensive research project targeting 500 rural households in Nigeria within a research relevant window of 3-5 months between the months of June- October when population levels of the female *Anopheles* mosquitoes are highest.

Conclusion

This initiative is aimed at exploiting the broad spectrum benefits of bee products and utility of beekeeping in Nigeria & Africa.

[Abstract:0623]

Antioxidant and Tyrosinase Enzyme Activities of Heather Honey in Different Region of Southwestern Anatolia

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Erica species are called "püren", "funda", "tree heath" in Turkey. *Erica* species are spread along the coast of Turkey. *Erica* is an important source of nectar for beekeeping. *Erica* species are used to combat soil erosion in many countries. Besides, it is an important resource for making bush broom in Turkey. In this study, heather honey that is produced in different regions of Turkey and honey majorly consisting of laurel and carob pollens as secondary metabolites are studied. Thus, considering that laurel and carob are significant nectar sources for heather honey, their effects on the medical activities of heather honey are examined. For this purpose, honey samples during heather honey (PB) period from three different locations in the Southwestern Anatolia are obtained. According to pollen analysis, those who have more than 70% of the *Erica* pollens are defined as heather honey. For the analysis of other heather honey; honey consisting of more than 45% heather pollen and honey consisting of laurel and carob pollens in secondary level are chosen as the materials of this study for comparative purposes. The antioxidant activities of heather honey are investigated through β -carotene/linoleic acid color expression, ABTS cation radical scavenging assay and DPPH free radical scavenging assay methods. According to β -carotene/linoleic acid color expression method, when PB is 10%, the inhibition is 81,14%. When there is a mixture of heather-laurel (PDP), the inhibition is 73,17%, when heather-carob are mixed (PKB), the inhibition is reduced to 64,82%. At the same concentration while PB showed 74.38% inhibition in terms of ABTS cation radical scavenging, the inhibition of mixture of heather-laurel is reduced to 71,55%. PB showed 29,85% inhibitory activity against tyrosinase enzyme, the mixture of PKB showed 20,87% inhibitory activity against tyrosinase enzyme, PDB showed 18,52% inhibitory activity against tyrosinase enzyme.

[Abstract:0633]

Neuromyelitis Optica Treated Successfully with Apitherapy and Phytotherapy – Case Report

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Neuromyelitis optica is a rare disease which combines optical neuritis with myelitis. It seems to multiple sclerosis, but it can be more severe. The main difference between the two diseases is that Neuromyelitis optica has high values of antibody anti-AQP4. It is hard to be treated and for its treatment they are used corticosteroids, immune suppressors and plasma exchange. The paper presents the case of a young lady who was diagnosed with this disease, together with pulmonary hydatid cyst and iatrogenic Cushing's syndrome, after prolonged treatment with cortison. The patient consulted me after 3 years since the disease was diagnosed. She followed the treatment with immune suppressors, plasma exchange and cortison, she had 9 attacks before first consultation (3 attacks of neuritis and 5 of myelitis). She had muscular spasms in her legs and sensory, walking and visual disorders. The treatment consisted from bee products (royal jelly, propolis ethanolic extract, pollen) and herbal extracts (ashwagandha, stinging nettle, yarrow, burdock, melissa, poplar buds, mullein, french marigold, cleavers, calamus). Later, bee venom was included, one session per week, for more than one year. The dosage of bee venom increased gradually to 7 bee stings equivalent. Clinical evolution was very good, symptoms almost disappeared and patient was able to return to work.

[Abstract:0649]

Apitherapy Center of a University Hospital in Turkey

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Apitherapy has a deep historical background in Turkish culture. Turkish Apitherapy Association was established in Istanbul in 2010. Turkish Apitherapy Association has been very keen that there should be professional standards, registration and accountability in all aspects of apitherapy practices in the country. Following the regulation workshops, Legislation for the Apitherapy practices was assigned by the Turkish Ministry of Health in 2014. The first apitherapy clinic approved by the Ministry of Health is the Apitherapy Center of Medipol University Hospital which has been attached to one of the largest private medical schools in Turkey. The apitherapy clinic has been located in Esenler District and it has research units in Beykoz District in Istanbul. The approach of the center is based on evidence based integrative medicine. It has affiliation with the Apitherapy Academy of Prof. Fang Zhu from China who is internationally a well-known pioneer expert in the field and the honorary president of the Turkish Apitherapy Association.

[Abstract:0719]

An Evaluation on Citrus Bee Bread

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Honeybees process the pollens they collect and store them in the honeycomb as “beebread”. In this production process, pollen is first mixed with honey and other bee secretions and left for lactic acid fermentation. The mixture is transformed into beebread in about two weeks. This fermented bee product can be stored in the hive for a long time. In this study, proximate and fatty acids composition of Citrus beebread samples obtained from different geographical origins were determined. Botanical origins of the samples were determined by pollen analysis. A total of thirty-seven fatty acids (FAs) were identified and of these palmitic, stearic, arachidic (saturated) oleic, eicosenoic, erucic, and linoleic acids (unsaturated) were the most abundant in all of the samples. Beebread sample ratios of unsaturated/saturated FAs were ranged between 1.28 and 2.23 indicating that citrus beebread is a good source of unsaturated FAs. The results revealed that Citrus plants preferred or readily available for bees as pollen resource was detected extensively in the beebread samples. It may conclude that the proximate composition and the fatty acid composition of Citrus beebread samples from different geographical origins varied significantly.

[Abstract:0784] / PLENARY TALK

Bee Products - Food - Food Ingredients - Medicines European Food Safety Authority (EFSA)'s Opinions and Their Future

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As an increasing number of foods labelled and advertised in the European Union bear nutrition and health claims, to ensure a high level of protection for consumers and to facilitate their choice, products put on the market must be safe and correctly labelled.

EFSA was asked by the European Commission to evaluate the safety and bioavailability of nutrient sources proposed for addition to the list of permitted substances in Annex II of the food supplements Directive. In July 2009, EFSA completed the first comprehensive assessment of substances used as sources of vitamins and minerals in food supplements, which are currently sold in the EU. Between 2005 and 2009 EFSA examined a total of 533 applications. Of these, 186 applications were withdrawn during the evaluation process, and EFSA received insufficient scientific evidence to be able to assess around half of the remaining applications. Possible safety concerns were identified in relation to 39 applications.

The evaluations were carried out by the Panel on food additives and nutrient sources added to food (ANS). The Panel's evaluations involved judging the safety of a nutrient substance at the intake levels suggested by the applicant based on best scientific knowledge available. The Panel also assessed the bioavailability of the nutrient from the source, which is the effectiveness with which the mineral or vitamin is released from the source into the tissues of the body.

"There is a wide range of nutrients and other substances including, but not limited to, vitamins, minerals including trace elements, amino acids, essential fatty acids, fibre, various plants and herbal extracts with a nutritional or physiological effect that might be present in a food and be the subject of a claim. Therefore, general principles applicable to all claims made on foods should be established in order to ensure a high level of consumer protection, give the consumer the necessary information to make choices in full knowledge of the facts, as well as creating equal conditions of competition for the food industry." (Regulation 1924/2006).

In the opinion of the European Food Safety Authority, to ensure that health claims are truthful, clear, reliable and useful to the consumer in choosing a healthy diet, the wording and the presentation of health claims should be taken into account.

Nutrition and health claims may be used in the labelling, presentation and advertising of foods placed on the market in the Community only if they comply with the provisions of this Regulation and shall be based on and substantiated by generally accepted scientific data.

Thus, common provisions or at least similar to the health claims associated to bee products became a reality. EFSA analysed these claims, but unfortunately for all of us and for all those promoting apitherapy, the verdict for almost all the bee products was negativ. An exception is the bee pollen which still has some pending claims.

Defining these products according to their nutritional and /or therapeutic value, the bee products can be easily included into the category of foods (honey, bee pollen and bee bread), a dietary (food) supplement with an important role in our diet (royal jelly) or products with important physiological effect – in some cases, important therapeutical properties – i.e. propolis.

Unfortunately according to EFSA's evaluation – honey – which is subject to several health claims (antioxidant, antibacterial etc.) is not sufficiently characterized for the claimed effects. The conclusion drawn is that a relationship between the consumption of honey and the claimed effects can not be established. The same conclusions were expressed in EFSA's opinion for both royal jelly and propolis. However, since 2006 the year the Regulation 1924 was issued and 2017 when hundreds, even thousands of scientific papers related to the therapeutic action of bee products have been published in internationally recognized scientific journals or publications, we strongly consider that bee products really need a correct re-evaluation.

Now we can only ask how does the future of the bee products looks like? People who know very well the effects of these precious products are very dissapointed and confused about this labelling.

However, the European Parliament and of the Council issued on March 31st 2004, the DIRECTIVE 2004/24/EC which amends, as regards traditional herbal medicinal products, Directive 2001/83/EC on the Community code relating to medicinal products for human use. The Directive was issued in order to offer a regulated and simplified authorization procedure for traditional herbal medicinal products from the European Union.

Before, no such official authorization procedure existed so that each Member State had its own national regulatory procedure for such products. The Directive regarding the traditional herbal medicines: does not forbid the traditional medicines on the EU market. On the contrary, it introduces a more facile and less costly registration procedure than for other medicines; does not forbid vitamins, mineral based supplements and herbal teas; does not forbid the alternative therapies nor the therapists (practitioners) of homeopathy, medicinal plants and related bibliography.

If the registration and authorization procedure of these valuable natural products is not to laborius and not to expensive, than there is a possibility and a hope for both operators in this sector and consumers to really benefit form the positive health effects of the bee products.

BEE BIOLOGY

[Abstract:0035]

Investigation of Gut Microbial Communities Associated with Indigenous Honey Bee (*Apis mellifera jemenitica*) from Two Different Eco-regions of Saudi Arabia

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The microbial communities associated with the alimentary tract of honey bees are very important as they help with food digestion, provide essential nutrients, protect the host from pathogens, detoxify harmful molecules, and increase host immunity. In this study, the structural diversity of the gut microbial communities of native honey bees, *Apis mellifera jemenitica* from two different geographical regions (Riyadh and Al-Baha) of Saudi Arabia was analyzed by culture-dependent methods and 16S ribosomal RNA (rRNA) gene sequencing. In this study, 100 bacterial isolates were cultivated and phylogenetic analyses grouped them into three phyla: Proteobacteria, Firmicutes, and Actinobacteria. Bacteria in the phylum Proteobacteria were the most dominant (17 species), followed by Firmicutes (13 species) and Actinobacteria (4 species). Some of the identified bacteria (*Citrobacter* sp., *Providencia vermicola*, *Exiguobacterium acetylicum*, and *Planomicrobium okeanoikoites*) were reported for the first time in the genus *Apis*, while others identified bacteria belonged to the genera *Proteus*, *Enterobacter*, *Bacillus*, *Morganella*, *Lactobacillus*, and *Fructobacillus*. To the best of our knowledge, this is the first study on the gut microbiota of the local honey bees in Saudi Arabia

[Abstract:0056]

Factors that Effect the Productivity of Honey Bee (*Apis mellifera* L.) Colony

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Productivity in beekeeping emerges under the influence of many factors as well as in other sectors. Each factor affecting the production process affects the quality and quantity of bee products which is the most important indicator of productivity in the rate of power. Animal breeding "yield = genotype + environment" as equality briefly outline the situation that has emerged.

When we consider the event in terms of productivity in the concept of beekeeping, bees honey, pollen, propolis, royal jelly; quantity and quality characteristics of bee products such as bee venom, the color of all the bees that make up the colony, length, wingspan, external appearance, such as body size, spawning capacity of the Queen bee, worker bee hives executive success in internal service and cleaning behavior, colony development, honeycomb processing activities, aggressive behavior, wintering includes all events. Therefore evaluating events like the queen bee or colony quality it is worth examining not only one character but many of the features in terms of character. Otherwise, the mistake is inevitable. However, it is considered here as having economic importance of bee products.

The most important factor that affects yield and productivity is the genotype consisting of mother and father. If a honey bee colony is meant for queen and 10-15 drone bees mate in the air. Queen bee determines the properties of colony transferring own characteristics and received reproductive properties of drones. Queen bee receives sperm from drones are used in order. Therefore, the characteristics of the colony may change over time. Thus, docile colonies became aggressive and honey production changes to an inefficient state.

This event has effected by significantly environmental factors and order of sperm used by queen bee. Environmental factors affecting productivity include those taken under control the most difficult. Because climatic conditions such as temperature, humidity and wind affect both forage level and pollen and nectar emission of plants. Environmental factors being complement of productivity acting together with genotype determine the productivity of bee colonies. Some environmental factors can be controlled or even features that can be improved.

[Abstract:0101]

Making a Queen: an Epigenetic Analysis of the Robustness of the Honey Bee (*Apis mellifera*) Queen Developmental Pathway

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Specialised castes are considered a key reason for the evolutionary and ecological success of the social insect lifestyle. The most essential caste distinction is between the fertile queen and the sterile workers. Honey bee (*Apis mellifera*) workers and queens are not genetically distinct, rather these different phenotypes are the result of epigenetically regulated divergent developmental pathways. This is an important phenomenon in understanding the evolution of social insect societies. Here we studied the genomic regulation of the worker and queen developmental pathways, and the robustness of the pathways by transplanting eggs or young larvae to queen cells. Queens could be successfully reared from worker larvae transplanted up to 3 days age, but queens reared from older worker larvae had decreased queen body size and weight compared to queens from transplanted eggs. Gene expression analysis showed that queens raised from worker larvae differed from queens raised from eggs in the expression of genes involved in the immune system, caste differentiation, body development and longevity. DNA methylation levels were also higher in 3-day queen larvae raised from worker larvae compared to that raised from transplanted eggs identifying a possible mechanism stabilizing the two developmental paths. We propose that environmental (nutrition and space) changes induced by the commercial rearing practice result in a suboptimal queen phenotype via epigenetic processes, which may potentially contribute to the evolution of queen-worker dimorphism. This also has potentially contributed to the global increase in honeybee colony failure rates.

[Abstract:0112]

Evaluation of Ventilation Activity of Africanized Bees (*Apis mellifera* L.) in Hives Under Sun and Shadow Conditions in the Brazilian Northeastern Semiarid

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Unfavorable climatic conditions have contributed to great economic losses in beekeeping in the Brazilian Northeast Semiarid. The objective of this study was to evaluate how external conditions do trigger ventilation behavior in colonies of africanized bees. The experiment was conducted at the “Fazenda Experimental Rafael Fernandes” of the Universidade Federal Rural do Semiárido (UFERSA), in Mossoró-RN, Brazil. For this, every 15 days (Oct/2014 to Aug/2015), hives in the shade were exposed to the sun and had their activity of ventilation registered at different times (08h00, 09h00, 12h00, 13h00, 15h00 and 16h00), using a total of 12 colonies. The ventilation behavior observed at the colony site was classified at levels 1, 2, 3 and 4, which represent, respectively, none, low, medium and high ventilation activity. The climatological data were monitored through a Meteorological Station. The maximum levels of temperature and solar radiation were observed between 12h00 and 13h00 reaching maximum values of 38°C and 1000W/m², respectively. In the shade, the bees ventilated only at 12h00, 13h00, 15h00 and 16h00 but only at level 2. In the sun, the maximum levels of ventilation activity (level 4) occurred at 08h00, 09h00, 15h00 and 16h00. It is precisely during these periods of time that the bees use to sprinkling of water inside the hive in order to lower internal temperature, period that a large number of bees are recruited for ventilation, as this behavior accelerates evaporation of water. At 12h00 and 13h00 ventilation were minimal and null, respectively. Due to the increase of the internal temperatures the cooling of the hive is no longer sufficient and as bees opt for heat loss by evaporation on the body surface, instead of cooling a beehive with water and ventilation. The increased incidence of ventilation in the sun shows a behavioral deviation when bees do not perform their basic tasks inside the hive to perform thermoregulation work, which requires time and energy. The shading of apiaries in the Brazilian Northeastern Semiarid region can be used as an excellent alternative to prevent bees from diverting energy, resulting in an improvement in the productive and reproductive of the colonies.

[Abstract:0136]

Functional Heterogeneity of Honey Bee (*Apis mellifera*) Hemocytes as Defined by Monoclonal Antibodies

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Nowadays central issue in beekeeping is honey bee health. The wide range of diseases, the increasing use of pesticides in the environment and "factory farming" are causing major losses. In order to find a solution for the damages it is crucial to understand bee immunity. Being a social insect the honey bee (*Apis mellifera*) has communal defense mechanisms, such as hygienic behavior and hive fever. The individual defense involves the machinery of the immune system comprising humoral and cell-mediated responses. Recently considerable efforts are being devoted to characterize honey bee hemocytes, the effector cells of the cell-mediated immunity. Up to now the dye-staining methods and lectin binding assays were used to define the blood cells. Immunological markers, identified by monoclonal antibodies, have been extremely useful in delineation of immune cells in vertebrates and also in several insect species.

In our experiments 'in vivo' and 'in vitro' immunological and molecular technics were combined with functional assays for the characterization and classification of honey bee hemocytes. As a result we developed monoclonal antibodies which distinguished the three main hemocyte types: the melanizing oenocytoids, the phagocytic granulocytes and the aggregating, non-phagocytic plasmatocytes.

By Western-blot, MALDI analysis and RNA interference the plasmatocyte specific marker was found to be the honey bee hemolectin. It is produced by the plasmatocytes forming a fiber matrix of the coagulum around foreign objects which are too large to be eliminated by phagocytosis. Wound healing and coagulation are major factors in the defense against *Varroa* infestation, where the parasite makes an entrance on the cuticle for bacterial, fungal and viral diseases.

With the hemocyte marker panel analytical studies can be carried out to study the cell-mediated immunity of the honey bee and the system could serve as a novel tool for the identification and characterization of hematopoietic tissues and hemocyte lineages.

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[Abstract:0164]

Identification of Suitable Reference Genes for miRNA Quantitation in Bumblebee Response to Reproduction

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MicroRNAs (miRNAs) play an important role in different physiological processes through regulating gene expression. The precise quantification of miRNA expression level is a critical factor in mastering its functions. Here, we evaluate the suitability of two common genes (ACTB, β -actin; GAPDH, glyceraldehyde-3-phosphate dehydrogenase) and ten miRNAs (miR1, miR2, miR14, miR184, miR275, miR276, miR317, miR9a, miR7, miR277) as normalizers for miRNA quantification in head and ovary at different reproductive statuses of bumblebees, *Bombus lantschouensis*. Four different algorithms and one consensus rank approach were employed to analyse the qPCR data. Results show that the candidate reference genes of different reproductive statuses are variable largely across different tissues. For the head and ovary, miR275 was the best candidate. For head, miR275 was the most stable candidate, while the candidate for the ovary was miR277. The miR275 and miR277 combination are identified to be the most confident and suitable reference genes for the head and ovary of bumblebee. To test the best candidate, miR315, which regulated the oviposition of bumblebee, was demonstrated down-regulate based on miR275 normalization. The data presented here indicate that the previous common used reference genes (ACTB and GAPDH) were not suitable for normalizing miRNA expression level in head and ovary under the different productive statuses.

[Abstract:0165]

Transcript Expression Preference of Phosphatidylethanolamine Binding Protein Gene in Bumblebee, *Bombus lantschouensis* (Hymenoptera: Apidae)

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The phosphatidylethanolamine-binding protein (PEBP) family is a highly conserved group of proteins found in a wide range of organism. They play an important role in innate immunity of insect. Little is known on the expression characteristic and function of PEBP in bees. In current study, we cloned the pebp gene and investigated its expression profiles at different developmental stages and reproductive status from bumblebee, *Bombus lantschouensis* (Vogt), which is one of the most abundant pollinators for wild plant and crop in North China. Two transcripts (PEBPX1 and PEBPX2) of pebp gene were cloned for the first time. The transcript PEBPX2 lacked a signal peptide sequence compared to PEBPX1. The full-length cDNA of these two PEBP transcripts is 1005 bp and 915 bp, with an open reading frame of 627 bp and 549 bp, respectively. The expression level of transcript PEBPX2 was much higher than transcript PEBPX1 at most of the developmental stages and under reproductive status. Both of the PEBP transcripts were transcribed highly in the Pbl- and Pbd- pupal stages. Quantitative PCR and Western Blot demonstrated that PEBP was up-regulated significantly in female under egg-laying. In summary, we suggest that levels of these two PEBPs could be related to the regulation of reproduction in bumblebees. The expression of transcript PEBPX2 was more preference than PEBPX1. In addition, both of transcripts play an important role in the metamorphosis development stage of bumblebee pupae.

[Abstract:0175]

Pabp2 Regulates Sex-Specific Alternative Splicing of *Amdsx* by Interacting with *Csd* in *Apis mellifera*

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In organisms a diversity of mechanisms have been evolved to generate the male and female. The sex of the honeybees (*Apis mellifera*) is determined by heterozygosity at a single locus harboring the complementary sex determiner (*csd*). Honeybees heterozygous at *csd* are females, whereas homozygotes and hemizygotes (haploid individuals) are males. Little is known, however, about the regulation mechanism of *csd* on its downstream genes. To investigate other cofactors of *csd* in controlling sexual development of honeybees, we identified the receptor for activated the poly(A)-binding protein (*pabp2*), a protein harboring a RNA-recognition motif (RRM) and a Arg/glycine-rich-domain, as a novel factor interacting with *csd* by screening a yeast two-hybrid cDNA library. The interaction between *csd* and *pabp2* was further confirmed by GST pull-down assay. Knockdown the expression of *pabp2* using RNAi led to the female-specific splicing form of the *Amdsx* switch to male-specific form in female embryo, indicating that *pabp2* affects the sex-specific alternative splicing of *Amdsx* in honeybees. Our findings reveal that *pabp2* is a new component of the sex-determining pathway in honeybees.

[Abstract:0191]

Characteristic Analysis of the Queen Retinue Workers

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Honeybee queen retinue workers feed or groom the queen with their antennae or proboscis, and then transmit the queen pheromone messages to other nest-mates throughout the colony. It is note that the circle consisted of queen retinue workers will be formed when the queen is laying eggs, or taking a rest, or being fed. In this passage, we have studied four characteristics of queen retinue workers: 1) we found that the general rules of the number of queen retinue workers is like that: feeding>resting>laying. Thus, we speculate that the hunger information released by the queen is an important information for the queen bee to attract queen retinue workers by using a DVD to record the forming process of the queen retinue workers' circle. 2) we found that the age-bracket of queen retinue workers is 2-23d, but mainly 6-18d by marking newly hatched workers and using a DVD to record the forming process of the queen retinue workers' circle. 3) we found that the queen nurses are not represented in a significantly different proportion in honey bee colonies by Microsatellite DNA analyses. 4) we indicate that there is a genotypical component for the performance of queen retinue.

[Abstract:0220]

Genotyping-By-Sequencing to Support a Commercial Honeybee Crossbreeding Scheme

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Crossbreeding schemes have been used successfully in a wide range of domesticated species, both to produce new composite breeds and to maximise the positive effects of hybrid vigour in a terminal crossing. These structured approaches are so far absent in honeybee breeding, despite the establishment of specialised queen breeders, who have been making some progress with regards to specific characteristics. With the global development towards commercial beekeeping operations running larger numbers of hives, structured approaches to breeding that focus on improvement of a population as a whole instead of improvement of the individual are becoming more feasible. These breeding programs generally call for the establishment and maintenance of separate populations or lines and a targeted mating scheme, which, in honeybees, is complicated by multiple queen matings and the fact that matings take place on the wing, making them harder to control. The use of artificial insemination is possible, but severely restricts the number of mated queens that can be produced and is only feasible within a specialised queen breeding scheme. A bigger number of matings can be managed by running isolated mating stations or restricting flight times for drones and virgin queens. This makes it possible for commercial operators without a queen breeding program of their own to maximise the impact of improved queen genetics flowing into the population. Additionally, with the advent of affordable genotyping methods, fully segregated subpopulations are no longer the only options for the production of commercial crossbreds. We have developed a protocol for Genotyping-by-Sequencing which can be performed on drone brood to reconstruct their mother's genotype and create a dynamic understanding of genetic population structure. Based on the variation present in the population at the time, both the introduction of elite queen genetics and optimal mating decisions for each generation can be targeted to maximise genetic improvement without compromising genetic variation.

[Abstract:0223]

An Assay of PCR Amplicons of 2008 Simple Sequence Repeats (SSRs) Loci in 16 Genomic Linkage Group of *Apis mellifera anatoliaca* Using Microfluidic DNA Chip in High Through-put Screen

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Apis mellifera anatoliaca, also known commonly as Tuekey honeybee, was introduced to China for apiculture approximately in the 70s of the last century, and science then it has become naturalized in the region on earth after introduction. To detect its genetic polymorphism on a genomic scale, we carried out an assay of PCR amplicons of 2008 simple sequence repeats (SSRs) loci in 16 linkage groups of 100 drone samples at genome level using microfluidic DNA chip in high through-put screen. First of all, a portion of informative sites was chosen from these SSRs dispersed throughout the genome after these selective amplicons were with their specific patterns of SSR electrophorogram or electro-chromatogram in microfluid matrix. Furthermore, a significant change of SSRs allele frequency for haplogroup across the samples was recognized from distribution of the SSR allele frequency. Finally, two SSR allele frequencies for the most common haplogroups were compared between *Apis mellifera anatoliaca* and its closely relative, *Apis mellifera carnica*.

[Abstract:0270]

The System Organization of Practical Activities in Biotechnology of Honeybees (*Apis mellifera*)

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Biotechnological methods enable the preservation of genetic diversity. The systematic organization of practical activities (SOPA) is required for this. SOPA is conducted in three interrelated directions. The first is the biotechnology of reproduction and preservation of honey bees: 1. the output technology of the drones and Queen bees; 2. cryopreservation of reproductive and somatic cells of honey bees, creating a genomic Cryobank; 3. artificial insemination of Queen bees. The second area is cell biotechnology: 1. obtaining cell cultures from various organs of the bee species and other invertebrates; 2. improvement, optimization and development of new culture media and feeds; 3. create cellular test systems for detecting the quality of biologically active substances of bee products and medicinal products. The third area is environmental biotechnology: 1. the development of methods for the integrated analysis of cytogenetical, morpho-metric, physiological, and behavioral traits, as well as to analyze the stability of bees to the disease; 2. development of environmental monitoring with the use of honey bees; 3. creating an eco-biotechnological systems using bee colonies. Studies are underway in all three areas. The output technology of drones and Queens is improved. Sperm of drones from the five regions of Central Russia: Ryazan oblast, Tatarstan and Moscow oblast, Bashkortostan, Tver region is incorporated in the Cryobank. The survival rate of sperm of the drones (five and ten years of storage) was checked: it was 87% -95%. The embryos of honeybees is stored in the Cryobank. Techniques of artificial insemination of Queen bees was improved. 90-day cell culture derived from ovarian Queen bees. The method was developed for obtaining primary cultures of cells of honey bees. Forage for bees is established for the purpose of artificial cultivation of larvae and increase egg production of Queen bees (Patent RF №2520666 from 28.04.2014). Cellular test-systems are developed to identify the quality of biologically active substances, bee products, medicines. A comprehensive analysis designed to determine the resistance of bees to the most common diseases and to test morpho-metric, physiological, and behavioral traits. The test system established for environmental monitoring and model eco-biotechnological system using honey bee colonies.

[Abstract:0299]

Determination of Lifespan of Different Honeybee (*Apis Mellifera* L.) Genotypes (Nigde Ecotype, Caucasian, Mugla And Italian) in Nigde Province Condition by Survival Analysis

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This study was aimed to determine lifespan of four different honeybee genotypes (Nigde ecotype, Caucasians, Mugla and Italian) kept in the same time and condition in Nigde province of Turkey in 2015. Total twenty honeybee colonies (five colonies for each genotype) were used in the present study. One hundred one day old worker honeybees were taken from each genotype and marked with different colors and numbered on their thoraxes. Then all marked worker honeybees were replaced into the observation hive and then the numbers of returning and non-returning worker bees to the observation hive were counted daily (24 hours) during the control period (from 0th day to the all marked workers were dead or lost). Survival analysis using life tables was performed for statistical analysis of data. Analysis showed that workers losses in the investigated genotypes were not observed during the first 35 days. The workers losses for the Nigde, Caucasian, Mugla and Italian genotypes were firstly observed in the end of the 38th, 36th, 37th and 36th days, respectively. The cumulative survival rates (CSR) of the Nigde, Caucasian, Mugla and Italian worker honeybees genotypes reached to 0% at the end of the 61th, 60th, 60th and 53th days, respectively. Survival analysis also showed that the mean rate differences among the genotypes were statistically significant (P<0.01). Additionally, pairwise comparison also showed that Nigde ecotype had the best lifespan, however Italian genotype had the worst lifespan in the conditions of Nigde province in Turkey. These results could be interpreted that local honeybee genotypes like Nigde ecotype should be used in a manner suitable to local conditions instead of exotic honeybee genotypes.

[Abstract:0314]

The Importance and Effects of Industrial Sugars on Honeybee (*Apis mellifera*, Hymenoptera: Apidae) Colony Feeding

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In the present study, 130 honey bee colonies fed with different levels (5, 20 and 100 L/colony) of various industrial commercial sugars, including High-Fructose Corn 85 (HFCS-85), High-Fructose Corn 55 (HFCS-55), Glucose Monohydrate (GMS), Bee Feeding (BFS) and Sucrose (SS) syrups, with colonies fed with no sugar (control, CG) in terms of their colony loss, worker bee population, brood rearing, hive weight, wax production, foraging behaviour and lifespan of worker bee. Utilisation of industrial sugars by honey bee colonies showed differences in terms of colony performance parameters. Honey bees did not use GMS eagerly, resulting in increased worker bee loss occurred in winter and decreased worker bee numbers over time. SS and BFS had a positive effect on wintering ability, wax production and hive weight. The highest foraging was observed with BFS. Sugars containing high levels of monosaccharide (such as GMS) and fructose (such as HFCS-85) were not used efficiently or adequately by honey bee colonies, whereas the sugars containing fructose and glucose at rates of 40% and 30% (BFS and HFCS-55), were utilised efficiently. It has been found that the honey bees cannot produce enough essential enzymes to isomerize industrial sugars in the monosaccharide structure. The lifespan of worker bees decreased over time in the 100 L/colony of all sugars, and therefore, winter loss was high in those colonies.

[Abstract:0334]

Simulation Studies for Long-term Preservation of Endangered Honeybee Subspecies

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The SMARTBEES project (<http://www.smartbees-fp7.eu/>) aims to improve the resilience of the various native subspecies of the Western honeybee (*Apis mellifera*) in Europe. In order to do so, breeding programs shall be implemented for the local races, strengthening their attractiveness for the beekeepers. The respective breeding schemes are supposed to be based on the BLUP animal model which had to be adapted to the biological properties of honeybees such as their haplo-diploid genetics, the uncertainty of paternal descent, and the interplay between queens and workers.

To ensure sustainable breeding success, the breeding parameters such as sizes of tested groups of full siblings and the sharpness of selection need to be chosen in a right way. On the one hand, one aims for genetic progress in the relevant traits such as honey production, gentleness and Varroa tolerance. On the other hand, the genetic variability within the distinct races should not be diminished too much and inbreeding rates should not rise excessively.

Especially for small populations like the Maltese honeybee (*A. m. ruttneri*) or the Sicilian honeybee (*A. m. siciliana*) the right choice of parameters is crucial as they are in great danger of being replaced by economically more attractive subspecies, or dying out due to inbreeding depression.

Computer simulations have been run to get ideas about the right selection decisions and needed infrastructure and to oversee the expected long-term effects of bee breeding over the course of 100 years and more.

In the simulations all queens, workers and drones involved in the breeding process were simulated with their own datasets and genetic information was inherited due to the Mendelian rules. The breeding value estimation was implemented as it is done in the European breeding program based on www.beebreed.eu.

The results show the great importance of mating control and forecast significant breeding success even if (to minimize the loss of genetic diversity) the number of mother queens needs to be increased and consequently the size of tested fullsib groups decreases. Furthermore our results shed light into the advantages and shortcomings of genetic models with respect to their abilities to provide long-term prediction results.

[Abstract:0340]

Integrating Species Delimitation Methods and Landmark Based Geometric Morphometrics on the Genus *Halictus* s. str. Latreille, 1804 (Hymenoptera: Apoidea: Halictidae)

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Halictidae (Apiformes: Apoidea: Hymenoptera) is one of the most diverse family with nearly 3.500 species worldwide. Genus *Halictus* s.str. Latreille, 1804 is one of the most common genera, which contains almost 90 species in the Palaearctic Region and 35 species are distributed in Turkey. Because of its great abundance, it was regarded as an ecologically important genus in terms of their role in the pollination services among natural vegetation and in monitoring the habitat degradation. The group members are considered to be controversial and morphology-based characters were not providing solutions to the existing problems in their taxonomy. For these reasons additional taxonomical approaches need to be integrated in their taxonomy. "DNA barcoding" was originally developed to find a fast, objective and reliable method for identification of species. Some additional analytical methods have been developed to evaluate species boundaries by using the same molecular dataset created by DNA barcoding. On the other hand "landmark based geometric morphometrics" were found to be another powerful tool for taxonomic studies. In this study, it was aimed to integrate these methods to compare the results and clarify the taxonomic problems within group. Study was carried on 25 species which had been previously identified by classical taxonomy. For DNA based species delimitation methods, three analytical approaches (Statistical Parsimony Networks-TCS, Automatic Barcode Gap Discovery-ABGD, General Mixed Yule Coalescent-GMYC) were used by COI dataset. Landmark based geometric morphometrics analyses were carried on the same specimens' (96 female and 57 male) right forewings. The superimposed dataset was subjected to Linear Discriminant Analysis (LDA) for assessment of classification and each specimen was classified by morphology and species delimitation results separately. Integrating these methods resulted in 31 OTUs. DNA based species delimitation results also improve the landmark based geometric morphometrics analysis. As a result classical taxonomy, DNA based species delimitation methods, and landmark based geometric morphometrics are found to be more explanatory and giving more solutions when analyzed together.

[Abstract:0350]

Smartbees: The European Project for the Conservation of Endangered Honeybee Subspecies

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The diversity of the world's bee subspecies is the result of natural selection in which each bee has adapted to the climate and diseases of its unique environment. This has naturally led to a vast number of different bee subspecies occurring across the continent. Today, the situation has changed drastically. One reason is Varroa destructor, which has led to catastrophic losses of European honeybee colonies. In addition, we are observing a systematic replacement of many native European populations with two races that have been bred for productivity, gentle behaviour, and disease resistance. Both of these factors drastically reduce the genetic diversity of honeybees in Europe and endanger sustainable, regionally-acclimated beekeeping. In the EU-sponsored "SMARTBEES" project (<http://www.smartbees-fp7.eu/>), 16 Institutes from eleven countries are cooperating to address this problem. The aim is to analyse the current state of genetic diversity among Europe's bees and to improve it using appropriate methods. Beyond that, the participating scientists will take on the dangerous interrelationship between bees, mites, and viruses to identify which mechanisms allow otherwise innocuous viruses to become so dangerous in combination with Varroa mites. The reasons for differences in bees' resistance capabilities will also be investigated using the most modern molecular-genetic methods available. Beekeepers' dissatisfaction with the performance of native bees has been the fundamental reason for their replacement. Therefore the SmartBees approach, to be described as "Conservation through use", promotes local breeding activities by providing the breeders with modern methods of performance testing and selection and the respective training, and by providing access to modern methods of quantitative genetics and molecular breeding tools. The first data on Varroa resistance of different *A. mellifera* subspecies are presented.

[Abstract:0353]

Honey Bee Conservation Areas in Europe

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Local European honey bee subspecies have been largely replaced, over all Europe, reducing, and even removing, original subspecies diversity and adaptive potential either by introduced subspecies or by hybrid bees. In the last decades, numerous conservation efforts have been initiated in Europe, in order to preserve the diversity of local populations. The aim of this study is to collect and summarize management data on existing conservation areas and information on conservation efforts, in order to support and to motivate future conservation activities. The SMARTBEES FP7 project (KBBE 613960) is a European project for the sustainable management of resilient bee populations. In the frame of this project we established a conservation network available on the SMARTBEES webpage (<http://www.smartbees.eu/Extension/cons-network/>). We created this network in order to link with individuals and groups working for the conservation of the different subspecies of European honey bees. We have also approached known conservation groups/organisations and collaborators of the SMARTBEES project directly by e-mail and/or by access to the related web pages. Based on all resources, we have collected fundamental information on the existing efforts focusing on honey bee conservation in Europe. Some of the information that we collected are as follows: the date of the establishment of the conservation area, the size and the structure of the area, the number of beekeepers and the number of colonies involved, the type of organisation in charge of the conservation program, the monitoring of the hives and the rules for moving bees in and out of the area. A total of around 15 European countries with conservation activities for their local honey bees have been counted. Some countries count with one or more conservation areas delimited inside the territory, whereas in others the whole country is considered as a protection area of the local population. The subspecies concerned by these conservation efforts are: *A.m. mellifera*, *A.m. iberiensis*, *A.m. carnica*, *A.m. ligustica*, *A.m. siciliana*, *A.m. caucasica*, *A.m. anatoliaca* and *A. m. ruttneri*. Current situation on honey bee conservation in Europe demonstrates a high level of different approaches to conservation.

[Abstract:0367]

Profiling Cytochrome P450 Expression in Honeybee Workers and Queens: Identification of the Cytochrome P450s Responsible for the Phenome Hydroxylation in Mandibular Glands

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In honeybees, cytochrome P450s (CYP450s) are considered to catalyze a key step of the biosynthesis of mandibular gland (MG) secretions, the hydroxylation of stearic acid in ω - or (ω 1)- positions, leading to a striking caste difference between queen and worker MG products. In a previous study, by high-throughput RNA sequencing, we identified 26 CYP450 genes differentially expressed between queen and queen-right worker MGs. In order to identify the CYP450s involved in the biosynthesis of MG secretions in the honeybee, we further analyzed the expression profile of six abundantly expressed CYP450 genes, namely CYP6AS5, CYP6AS8, CYP6AS11, CYP6BD1, CYP9R1 and CYP305D1, across different castes, ages, tasks and tissues. Our analysis revealed that CYP6AS8 and CYP6AS11, the most abundantly expressed CYP450 genes in worker and queen MGs, respectively, are selectively expressed in the MGs of workers and queens compared to other tissues. These results suggest that these genes might be responsible for the critical bifurcated hydroxylation process in the biosynthesis pathway of honeybee MG. In addition, CYP6AS5 and CYP9R1 are mainly expressed in antennae and legs, suggesting a role in processing environmental signals

[Abstract:0395]

The Impact of the Honey Bee Queen Age on her Offspring

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Several studies showed that queen age impacts colony performance. Lower egg production and/or reduced queen's pheromone output are assumed to be causing the lower productivity. This study aims at analysing the influence of the maternal age on individual offspring. The queen honey bee mate once and stores sperm in the spermatheca for several years. Consequently, also the simultaneously aged semen may possibly have an influence. Semen collected from the spermatheca of old queen bees show different sperm movement patterns, slower speed and a different metabolism than sperm from the spermathecae of young queens. The embryonic development and larval growth rate have been examined with regard to queen honey bees of different ages (2-year-old to freshly mated queens). Early embryonic mortality has been found to be higher within the eggs from old queens than in those from younger queens. Egg volume, consequently embryo size, reduces as queen's age. A further study investigates embryonic mortality in offspring originating from older semen. This has been carried out by extracting the semen from the spermatheca of an old or/and young mated queen and re-inseminating it into a virgin queen, in order to adjust for queen age. The investigation shows significant higher embryonic mortality in the offspring from virgin queens inseminated with semen extracted from older queens than with semen from younger queens. In addition, we observed significant different honey production of colonies of identical aged (1 year) queens but reared at different ages of her mother. This indicates a transmission of a maternal age effects on subsequent generations. The results of the present study lead to the recommendation of using young queens for efficient production.

Abstract:0437]

Progress in Marker-assisted Selection for Honey Bee Breeding

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Most economically desirable traits in honey bees show considerable levels of heritability and thus can be improved via artificial selection. Indeed, cross-based genetic analyses have identified broad regions of the honey bee genome (quantitative trait loci or QTLs) that causally affect aggression, hygienic behaviour, and several aspects of worker foraging behaviour. Although previous honey bee QTL studies have demonstrated the strong genetic basis of many economically desirable traits, they have not been successful at providing stable and robust markers for assisted selection. The honey bee's high recombination rate necessitates new approaches for identifying markers for selective breeding.

Our team developed a novel approach to marker identification, notably the discovery of protein expression patterns that were highly correlated with the specific behavioural traits. We identified 9 putative biomarkers for hygienic behaviour (HB), isolated from the antennae of nurse bees, that survived stringent control for multiple hypothesis testing. These proteins were further determined to be involved in semiochemical sensing, nerve signal transmission or signal decay. Our data suggested that protein expression patterns were heritable and could be used to selectively breed bees to enrich HB. We then used a panel of protein expression biomarkers to successively test, select and breed several hundred colonies over three generations across western Canada, in a direct comparison of proteomic-based marker-assisted selection versus traditional behaviorally-based phenotypic selection on HB. Selected stock was shown to have improved resistance to American foulbrood disease, improved overwintering survival with *Varroa destructor* infestations as well as favourable economic performance.

Based on the success of HB trait enrichment using protein expression biomarkers, we are currently embarking on a large-scale study to combine proteomics and genome-wide association as these have the greatest potential for identifying highly discriminant markers for bee breeding. Full genome sequencing has the ability to leverage the bee's high recombination rate for identifying single nucleotide polymorphisms (SNP's) that are causally linked to a trait of interest. Progress in identifying proteomic and SNP markers for twelve economically desirable traits, measured in 1,000 colonies across Canada, will be reviewed along with implications for improved methods for trait selection in honey bees.

[Abstract:0465]

Effects of Glucose, Fructose and High Fructose Corn Syrup on the Development, Memory and Learning Behavior of Honey Bees

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Effects of glucose, fructose and high fructose corn syrup on the development, memory and learning behavior of honey bees.

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Honey bees utilize nectar and honey as an energy source for the development of larvae and the survival of colonies. Colonies starve to death without carbohydrates, therefore beekeepers feed their colonies with honey, sucrose syrup and/or high fructose corn syrup (HFCS). HFCS is a sweetener made from corn starch by enzymatic conversion of glucose into fructose. It has been used as a sweetener and additive for many foods and beverages. Even though the US Food and Drug Administration declared that HFCS is safe as a sweetener on beverages but there is a debate on the side effects causing obesity in human. HFCS is also widely used to feed the colonies in the fall and spring by the beekeepers. There are some reports indicating the side effects of HFCS on the development behavior and the survival of honey bee colonies.

We studied the effects of glucose, fructose and HFCS on the development of larvae in vitro, and compared the number of ovarioles in the ovaries. We also reared bees from colonies headed by SDI sister queens fed glucose, fructose, HFCS in the tents and compared the mass wet, ovariole numbers, longevity, learning and memory of these bees. Keywords: honey bees, carbohydrates, ovariole numbers, learning and memory of the bees.

Abstract:0471]

Deciphering the Characteristics of microRNA in Hypopharyngeal Gland in Honey Bee

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The orchestration of hypopharyngeal glands (HGs, the principal site of royal jelly synthesis and secretion) function requires complex gene regulatory networks and nutritional metabolism regulation that modulated, in part, by microRNAs (miRNAs). The miRNAs have been functionally known in translational repression, however, their repertoire in HGs is poorly characterized. Here, two set of miRNA isolated from the bees that generated from reciprocal crosses using high (*A. m. ligustica*, female parent) and low (*A. m. carnica*, male parent) with contrast performance of royal jelly are using to uncover the contribution of miRNAs (data was not yet published). Total of 27,310,263 and 21,268,854 clean reads were obtained in the two set, representing 154 know and 171 novel miRNAs, among which 34 and 27 were differentially expressed. miRNA-mRNA network predictions together with PCR validation suggest miRNAs including upregulated miR-9869, miR-9881, miR-210, miR-9872 target with EGF and pentraxin domain-containing protein (gene5125), mucin-19-like (gene10502), nose resistant to fluoxetine protein 6-like (gene2581) and CP450 (gene12399), downregulated miR-6057, miR-12, miR-3756 target with take-out-like carrier protein precursor (gene5777), clavesin-1 (gene1222). Functional analyses providing evidence for direct regulation of target gene expression by miRNAs. Overall, our study expects to illustrate the expression profile and pathway network implicated in the regulation of miRNAs, therefore the results may have contributed to the miRNAs research, as well as the molecular mark assisted breeding on honeybee.

[Abstract:0493]

Assessing the Diversity of Honey Bees in Europe

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Within the SMARTBEES project, the objective of this study is to assess the diversity of *Apis mellifera* subspecies in Europe. To achieve this, we designed a sampling strategy to cover as much of the species' range in Europe as possible, and also some regions in Asia and Africa. Each population is represented by up to 96 samples of bees, each one from a different apiary. Samples consist of several worker bees for morphometric analysis, and one individual for whole genome sequencing. The sampling scheme has been adapted to account for smaller and/or isolated populations, for instance on islands. More than 2000 samples representing 15 *Apis mellifera* subspecies have been registered to date, including includes samples from several areas where genetic and morphometric characterization will be done for the first time. Based on prior information (published data, microsatellite analysis or morphometric data), samples are assigned to groups, for which complete genomic data are obtained using the pool sequencing technique. The sequence data are subject to further bioinformatic analysis to evaluate genetic variation within and between pools and populations.

At the same time, representative subsets of samples from each population are subjected to morphometric analysis and statistically compared to published reference data. Thus, the genetic data obtained from the newly collected samples can be linked with historical subspecies descriptions based on morphometric data, and subspecies-specific SNPs can be determined. These can be used to create a honey bee genotyping kit for fast and cost-effective subspecies identification of unknown bee samples.

[Abstract:0500]

Design and Evaluation of a High-density SNP array for the Honeybee

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Genomic selection using high-density single nucleotide polymorphism (HD-SNP)-arrays is already a routine praxis in several agricultural species. We developed the first honeybee HD-SNP chip aiming to initiate genomic selection towards varroa resistance, behavior and productivity. The newly developed HD-SNP chip combines up to date research data including expression-, quantitative trait loci and bioinformatic prediction studies as well as breeding trait data and keyword searches to identify highly effective genetic SNP-markers. Out of nearly five million newly sequenced SNPs of 60 drones (*A. m. carnica* and *A.m.mellifera*), 120.000 markers were selected across the entire bee genome by applying three spacing criteria. The density was increased in areas which were predicted to be highly effective for certain breeding traits or gene locations. The final array will be validated using approximately 3,000 *A. m. carnica* queen samples with breeding value information.

First genotyping results of nearly 1000 samples of queen, drone egg and queen's exuvia samples yield promising results for successful future application. The average call rate (queen and drone egg samples) is over 92 % and is still in the process of technical improvement. The final SNP effect estimation and expression studies of promising candidate genes for important breeding traits and disease resistance are still in progress. Chalkbrood resistance is likely linked to Varroa hygienic behavior. These two diseases are in focus of our studies and planned to be validated on individual and colony level via digital PCR-technique. In future maximum breeding progress will be gained by the post-selection of the most effective SNP-markers out of the 120.000 on a low density SNP chip which should facilitate highly accurate low-cost genomic selection. Especially for the honeybee we expect genomic selection as an utmost promising application to be not only advantageous by improving the traits of interest but also empowers to objectively estimate genetic variability within populations and estimate precisely the genetic relationship between colonies and the reliability of paternal descent on mating stations.

[Abstract:0511]

Direct Comparison of two Honey Bee Semen Cryopreservation Methods

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The objective of this study was to determine an effective cryopreservation protocol to maximize the number of live sperm cells in spermatheca and the proportion of worker bee brood following the freezing process. Semen was collected from honey bee drones and frozen by two different methods of regular freezing protocol and dialysis protocol. The percentage of the live spermatozoa found in protocol I and protocol II as 53.74±9.01% (31.25-76.65) % and 57.62±3.89 % (38.36-69.74), respectively. The proportion of worker brood from the protocol I averaged 56.19±7.09 % (range 24.64-89.58); the proportion of worker brood from protocol II averaged 47.81±7.27 % (range 15.30- 81.03). The estimated total number of live spermatozoa in protocol I queens were determined as 673222.20±23973.15 (range 517000 - 1093000), in protocol II as 504200 ± 22285.94 (range 190000-841000). There was a positive correlation between spermatozoa number in spermatheca and fertile offspring after artificial insemination for both protocol I and protocol II as $r = 0.7$ and $r = 0.6$, respectively. The differences, in live sperm cells, brood pattern, and sperm count in spermatheca, between both protocol I and protocol II were not statistically significant ($P > 0.05$). The results of the experiment have shown that both protocol I and II has similar results. However, the protocol I is better than protocol II to obtain highest fertility rate and sperm number in the spermatheca.

[Abstract:0512]

The Effect of Pollen and Honey Substitution Feeding on Consumption, Weight and Lifespan in Workers Honey Bees *Apis mellifera* L.

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Climate changes, diseases, agricultural chemicals effect the honey bees in negative ways. Therefore, honey bees have difficulty in get clean, enough nectar and pollen that is crucial for their survival. Under these conditions, beekeepers feed their colonies with pollen and honey substitutes. In this study, we aimed to develop new products by comparing pollen and honey substitutes used in beekeeping sector. We measured the effects of diet on consumption, weight and lifespan in worker honey bees fed either pollen (P), honey (H), pollen substitute with %0,4 (PSL) and %10 (PSH) protein content, inverted sugar syrup produced by processing with invertase enzyme and caffeine (ISSEC), inverted sugar syrup produced by processing with invertase enzyme (ISSE) and without invertase enzyme (ISS). Workers consumed more ISSE than ISS. Workers from groups that had P and PSH with lived longer than bees fed with ISSE and ISS. Bees fed with ISSEC lived longer than ISSE and ISS groups. Bees fed inverted sugar syrup alone had lower weight comparing with the other feeding groups particularly as the bees aged. This study to gives beekeepers an overview of honey bee nutritional requirements and the role of natural substance, various carbohydrate and protein supplements in the management of honey bee colonies.

[Abstract:0529]

A Breeding Study Against Varroa in Mugla Honey Bee (*Apis mellifera anatoliaca*) Population

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This project is being carried out at Breeding Center in Fethiye, İncirköy. 100 colonies, which has not received queen bee from outside of Mugla, were obtained from different beekeepers who has not been practicing migratory bee-keeping for the last 10 years. Instrumental insemination techniques were used for mating control. The breeding values (colony fitness and Varroa tolerance) of the colonies were evaluated by means of the Best Linear Unbiased Prediction (BLUP) - Animal Model. Three different methods were used to estimate the mite loads of the colonies. Powdered sugar methods were applied to determine the number of Varroa on the adult bees and brood cells were opened to determine the number of Varroa. Additionally, number of Varroa fallen from nest to bottom board were counted and recorded. First measurements for the initial populations were carried out in April 2016 and the average numbers of the Varroa determined by powdered sugar method, bottom board method and opened brood cells were 15.48, 61.52 and 16.40 respectively. Second measurements were done for the F1 generations in April 2017 and the average numbers of Varroa determined by three methods were 9.28, 45.02 and 3.42 respectively. Results obtained from F1 generations indicate a decrease in the Varroa densities. Winter loss rate were calculated as 3.7%. Our findings related to high overwintering success of the colonies and good suppression of Varroa populations are promising in terms of breeding studies against Varroa. This Project (TAGEM-15/ARGE/19) is supported by TAGEM (Republic of Turkey Ministry of Food, Agriculture and Livestock) and Mugla Beekeeping Association.

[Abstract:0557]

Honey Bee Breeding Program for Increasing Disease Resistance and Productivity

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Our main objective is to establish a permanent honey bee breeding program based on stock performance assessments and controlled crosses of selected lines to improve desirable traits. Breeding colonies are selected on the basis of multiple criteria and independent rejections using a performance rank and a character priority level. Our main criterion is spring colony strength of overwintered colonies. Other criteria are, in order of priority, population build up from May to July, hygienic behavior, honey production, Varroa tolerance, aggressive behavior and wintering weight loss. The initial F0 genetic selection pool (2010) comprised 135 *Apis mellifera* colonies (14 lines) with queens obtained from local breeders and 5 inbred Buckfast lines from Denmark (Keld Branstrup, Buckfast breeder). Selective crosses are accomplished by rearing queens and drones from top ranking colonies. Young queens are open mated in isolated apiaries with drone flooding or fertilized using instrumental insemination. Between 10 and 14 lines are produced each year. After 4 years, selected colonies have improved results in the most important performance criteria: 7% reduction in winter colony mortality, 20% increase of spring population build up, 33% increase in hygienic behaviour, 30% increase of honey production, and colonies are gentle and easy to work. Improved honeybee stock is distributed every year to participating queen breeders who perform a second evaluation and commercial distribution of young queens to beekeepers.

[Abstract:0570]

The analysis of Sperm Competition During Sperm Storage Process in Honeybee (*Apis mellifera* L.) Queens by Pyrosequencing Technique

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Sperm competition is the competition between the sperm of two or more males for insemination of a female and/or for fertilization of an egg(s) laid by the female. Sperm competition likely occurs in honeybees during insemination of the queen by several drones shortly after mating and/or during sperm use by the queen for fertilizing the eggs with stored sperm in the spermatheca. Sperm competition has to be inferred from patriline distribution within the colony. However, present techniques do not allow recognizing whether the patriline distribution is the result of competition during storage or during fertilization process. Our aim in this study was to develop a pyrosequencing-based method enabling the genotypic identity of the heterospermic contents in the spermathecae of instrumentally inseminated queens (IQs) to detect sperm competition during sperm storage process. We also aimed to discover whether injection order of semen and queen genotype (cryptic female choice) affect the proportions of two drone genotypes in stored sperm contents of spermathecae of these IQs or not.

The Caucasian (*A. m. caucasica*) and Italian (*A. m. ligustica*) queens that were reared from one breeder colony of each race were allocated into 2 insemination batches. The first batch of the virgin Caucasian and Italian queens were instrumentally inseminated with equal volumes of semen (8 µl) collected first from Caucasian (4 µl) and then from Italian drones (4 µl), while the second batch of queens were inseminated with the same amount of semen collected first from Italian and then from Caucasian drones. The extracts of DNA isolated from spermathecal contents of IQs were pyrosequenced in order to determine two genotypic proportions in each spermathecal content by using single SNP discriminating Caucasian drones from Italian drones.

Pyrosequencing analysis data showed that the mean proportion of Caucasian sperm (69%) was significantly more than that of Italian sperm (31%) in spermathecae of IQs at all events ($P < 0.05$). Neither queen genotype nor injection order of semen affected the proportions of Caucasian and Italian sperm ($P > 0.05$). The results clearly proved that sperm competition during migration process occurred in favour of one genotype.

[Abstract:0592]

A Brazilian Social Bee Must Cultivate Fungus to Survive

Cristiano Menezes

Embrapa

The nests of social insects provide suitable micro-environments for many microorganisms as they offer stable environmental conditions and a rich source of food. Microorganisms in turn may provide several benefits to their hosts, such as nutrients and protection against pathogens. Several examples of symbiosis between social insects and microorganisms have been found in ants and termites. These symbioses have driven the evolution of complex behaviors and nest structures associated with the culturing of the symbiotic microorganisms. However, while much is known about these relationships in many species of ants and termites, symbiotic relationships between microorganisms and social bees have been poorly explored. Here we report the first case of an obligatory relationship between the Brazilian stingless bee *Scaptotrigona depilis* and a filamentous fungus. Fungal mycelia growing on the provisioned food inside the brood cell are eaten by the larva. Larvae reared in vitro on sterilized larval food supplemented with fungal mycelia had a much higher survival rate (76%) compared to larvae reared under identical conditions but without fungal mycelia (8% survival). The fungus was found to originate from the material from which the brood cells are made. Since the bees recycle and transport this material between nests, fungus would be transferred to newly built cells, and also to newly founded nests. This is the first report of a fungus cultivation mutualism in a social bee. We discuss the role of useful microorganisms to stingless bees and meliponiculture.

[Abstract:0597]

Initiating Breeding Programs for Genetic Improvement and Preservation of European Honey Bee Populations

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The fundamental idea of the EU funded SMARTBEES project (2014-2018) is preservation of European native and locally adapted honey bee populations through systematic breeding for improvement of colony performance and vitality. That leads to an enhancement of the attractiveness of local bees among the beekeepers and counteracts the trend to increased importation and use of queens from non-local origin. To initiate breeding activities around Europe a tailor-made extension program was implemented to enhance the beekeepers' understanding for systematic and standardized breeding principles, based on the requirements of the platform for genetic evaluation BeeBreed.eu. A network of 130 test apiaries with 1400 test colonies from 9 subspecies was established across Europe, and more than 350 European beekeepers were trained to date. After a period of almost 2 years, performance data were collected from the first testing generation of colonies, and breeding values for the queens were estimated with the BLUP animal model. Subsequently, the best available queens were selected for further propagation and for the next breeding cycle. For some of the subspecies these are the first systematic breeding activities ever. In addition to the estimation of the breeding values, the data were further analysed regarding the subspecies-specific features. These findings as well as the experience gained from the test of the first generation facilitate the process of improvement and adjustment of the testing methodology under various environmental conditions. Besides the subspecies-specific features and environmental conditions, the cultural differences, the particular management of the testing colonies and the mating control are recognized as main challenges for initiation and establishment of breeding activities in many regions. Finally, in synergistic efforts with other work packages of the project, devoted to assessment and promotion of European honey bee diversity, a series of actions were undertaken for strengthening and expanding the current SMARTBEES breeding structure.

[Abstract:0612]

Adaptive Traits of Turkish Honeybee Subspecies in Response to Climate: A Survey and a Test of Niche Overlap

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Subspecies or “geographic races” of honeybees (*Apis mellifera*) differ in morphology, biogeography and behavior and appear to have diversified following reproductive isolation during the Pleistocene glaciation. Research on their genetics suggest a model where Turkish races belong to two different lineages, but evolved in extremely different habitats. Habitat-specific features such as daily temperature, abundance and phenology of nectar flow, length and severity of winter, or predator pressure are expected to influence morphology, foraging strategy, honey storage, production of young, overwintering success, swarming behavior or aggression in different races. We surveyed potentially adaptive behavioral traits for each genetic component identified by microsatellite-based STRUCTURE analysis, and explored relations with climatic conditions prevalent where those components are geographically concentrated. We used ecological niche modeling by MAXENT to estimate distributional ranges and identify possible climatic drivers of adaptation for four subspecies and one ecotype. This is the first time, to our knowledge, that ecological niches for honeybee subspecies are modeled.

Our survey revealed a number of life history traits that were shown or hypothesized to be related to certain climatic features, and that most honeybee forms have morphologies or behave as predicted. Niche modeling produced ranges for each subspecies/ecotype that roughly correspond with particular ecoregions in Turkey. Precipitation in warmest or coldest quarter, precipitation and temperature seasonality, mean temperature of wettest quarter and annual mean temperature explained more than other variables in the best models. A comparison of niches, predicted ecological divergence between honeybee subspecies. Hybridization between C and O lineages where niche models overlapped was confirmed with genetic evidence. No models produced were found to be covering the range of another O-lineage subspecies in Eastern Anatolia not included in this study. Relationship between an ecotype in Aegean coast and a scale insect (*Marchalina hellenica*) of East Mediterranean Pine (*Pinus brutia*) that provides an annual cycle of resource availability impact on life history of that ecotype was also concordant with its distribution models and observed distribution of both the pine and the scale insect. We discuss adaptive values of the traits of honeybees and suggest hypotheses to test these associations at the genome level.

[Abstract:0642]

Genetic Variation in Western Anatolian Honey Bees Based on mtDNA COI-COII Intergenic Region

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Anatolia is an important gene center for honey bee (*Apis mellifera* L.) subspecies and ecotypes because of its geographical position, climatic conditions, and ecological diversity. According to researchs carried out using different methods, *Apis mellifera anatoliaca*, *A. m. meda*, *A. m. caucasica*, *A. m. syriaca*, and *A. m. carnica* are known to be distributed in Turkey. Among these, *A. m. anatoliaca* predominantly distributed all over the Turkey geography. Although extensive researchs have been done to reveal the evolutionary relationships of subspecies in Turkey, there are not detailed studies about the genetic origin and difference of Western Anatolian honey bees. In this study, our aim was i) to determine the genetic diversity of honey bees distributed in western Turkey based on mtDNA COI-COII intergenic region sequence data, that is widely used for the discrimination of honey bee species and subspecies, ii) to evaluate this diversity with findings obtained from previous studies and also test whether there are any genetically distinct honey bee populations. We analyzed sequences of 524 base pairs of the COI-COII intergenic gene region of worker honey bees belonging to different colonies collected from Mugla, Bozcaada, Gökçeada, Skinos, Crete, Greece and also included published sequences from Turkey that are available in NCBI Genbank. According to the sequencing results, different haplotypes were found among the 100 sequences including the published sequences of Anatolian honey bee haplotypes. New haplotypes were found specific to honey bees in Mugla region, Greece and Islands. The phylogenetic construction based on neighbour-joining algorithm and network analysis were carried out. The network analysis showed that Western Anatolian honey bees separated from other Anatolian honey bees and mainly clustered together with honey bees in Greece and Islands by forming a separate cluster. The results of phylogenetic construction and network analysis were indicated that honey bees distributed in western part of Turkey were found genetically different from honey bees distributed in the rest of Turkey.

[Abstract:0676]

Forest Cover Influences Stingless Bee Diversity in Brazilian Atlantic Forest

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Human-altered landscapes, such as deforestation and agricultural intensification, have contributed to the decline of many native bee populations and the pollination services provided by them, with severe negative impacts for both natural ecosystems and agriculture. Despite the great importance of stingless bees in Brazil, because of their utmost importance among native bees that play a crucial role as pollinators of the Neotropical flowering plants, only few studies have been undertaken using landscape ecology approach. Investigations to quantify the impacts of land use on this group of bees are scant. In order to fill this gap, our main goal was to evaluate the influence of a gradient of forest cover on stingless bee communities in the Atlantic Rainforest, São Paulo State, Brazil. We carried out the survey in 10 areas (landscapes at 5km scale) and within each one the following methods were combined: i) we installed 80 trap-nests on tree trunks; ii) we actively searched for hollow tree nests. The percentage of forest cover ranged from 16 to 69%. Non-linear regression was used for fit the models, and R² are reported. We sampled 131 stingless bee nests, representing 18 species. We observed a bell-shaped response of stingless bee richness and diversity as a function of forest amount (R²=0.67 and 0.81, respectively). In addition, we also observed a peak of bee diversity between 30 and 42% of forest cover. Overall, our results show that stingless bee diversity and richness are affected by proportion of forest cover at 5km scale in this Brazilian Rainforest that has undergone a large forest loss.

[Abstract:0704]

Genetic Mitochondrial DNA Variability of Honeybees (*Apis mellifera adansonii*) in Benin

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The aim of our study was to evaluate the genetic variability of mitochondrial DNA endemic bees *Apis mellifera adansonii* in Benin. A total of 304 bee colonies were sampled in 27 municipalities of the cashew growing area of Benin. The intergenic region IOC-COII mitochondrial DNA of a bee (worker) per colony was analyzed by PCR. The Dral test (RFLP) was used for the determination of subspecies of bees present in the population. Our results indicated that eight (08) PCR-RFLP profiles were identified in the 304 bee samples studied. Forty-nine (49) percent of the samples had presented the haplotype A1 profile, 40% that of the A4 haplotype, 3% that of haplotype A19, 2% that of haplotype A12, 2% of the haplotype A7', 1% had presented the profile of the haplotype A9 and finally 3% of the samples had presented the profiles of two new haplotypes (New1 and New2) obtained in the study. This study confirmed that the haplotypes A1 and A4 are haplotypes characteristic of African lineage A. The presence of haplotypes A4, A1, A19, A12 (Group IA) and haplotype A9 (IIA group) obtained in the study shows that the two sub-lines AI and AII of the African lineage are present in the population. This study will contribute to the development of coherent policies for the conservation of local bees in Benin.

[Abstract:0746]

Global Survey on Diversity and Data Availability for Monitoring Honey Bees and Other Pollinators

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Food and Agriculture Organization of the United Nations (FAO)

At the recently completed 16th session of The Commission on Genetic Resources for Food and Agriculture, FAO was requested to consider including domesticated honey bees and potentially other pollinators into DAD-IS (<http://dad.fao.org>), the Domestic Animal Diversity Information System for monitoring the status of animal genetic resources for food and agriculture. So far DAD-IS contains information only domesticated mammalian and avian species (N = 38). The first step in this process was the creation and distribution of a survey to amass data on the status of world-wide honey bee and pollinator populations to better understand regional concerns and management. The survey was sent out on February 28th 2017 to several global networks. To date 131 responses from 58 different countries have been collected. Four species of honey bee have been reported to be managed in some form (*Apis mellifera*, *Apis cerana*, *Apis florea* and *Apis dorsata*). *Apis mellifera* is present in all responding countries and managed in 97 % of them. *Apis cerana* is managed in four out of five of the countries where it was reported. Furthermore among the around 30 recognized subspecies of honey bee, respondents reported 24. 79 % of respondent countries collect population data on at least some honey bees present in their country. The government is most often the responsible party for the collection of honey bee population data. The countries that do not collect population data on honey bees cite a lack of political will as the primary reason. 48 % of countries reported that their honey bee populations were steady to increasing. Only 30 % of responding countries routinely monitor honey bee genetic diversity. Regarding other pollinators, 32 countries do not monitor the population or status of any other species, and the respondents from 9 additional countries did not know. Where monitoring of general pollinators takes place, bumble bees (sp. *Bombus*) and butterflies (e.g. *Danaus plexippus*) were the most commonly monitored species. 29 % of countries reported that some pollinator species had gone extinct in their country in the last half century.

[Abstract:0787]

What's New in Honeybee Science?

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Since many years we can observe that the number of publications about honeybees in scientific journals is increasing drastically. In the two most cited journals for such topics, Science and Nature, there was a new publication almost every month. This reflects the enormous scientific and public interest in this animal. As an introduction to the Biology Session I give an overview (last 2 years) about most interesting papers regarding winter losses, nutrition, behavior and strategies of honeybees, beekeepers and scientists to fight diseases and parasites of the honeybee.

[Abstract:0788] / PLENARY TALK

Ambrosia and Royal Jelly: How Bees Meet Their Nutritional Needs

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Bees feed on floral pollen as a source of protein, fat, and micronutrients like vitamins, minerals, and sterols. In this talk, I will describe the chemical nature of pollen collected from across the UK. I will also show how bees refine the chemical nature of their food starting with pollen, then bee bread, and finally how bee bread is converted to royal jelly. I will also report data from experiments designed to test how honeybees regulate their intake of carbohydrates, proteins, and fats to show how bees optimize their intake of essential macronutrients. In addition, I will discuss the nutritional value of commercially-available pollen substitutes and how they compare to the nutrition rendered by feeding bees with pollen. The implications of our work for bee husbandry and land management to optimize bee nutrition will also be discussed.

BEE HEALTH

[Abstract:0018]

Use of Thymus Volgaris Ethanolic Extract for Nosema Apis Control in Honey Bee

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The aim of this study was to evaluate the effect of thymus volgaris ethanolic extract on the development of Nosema apis spores in honeybee. Emerging bees from a nosema-free colony were infected with sucrose syrup containing 20000 spores/ml of Nosema apis. contaminated bee placed in wooden cages, and kept in an incubator at 33°C and 60-70% RH. 8 groupes formed and each group was formed of 30 adult bee. For each group three replications were considered. The experimental groups were fed by sugar syrup that was prepared with thymus volgaris ethanolic extract in different concentrations (0.50, 0.75, 1, 1.50 and 2 mg/ml). Infection levels were monitored over 6 weeks by removal death bees and dissection of them. After 6 weeks bees fed with different concentration of thymus extracts had significantly lower levels of infection (2- 7 million spores/bee) compared to control bees (20- 70 million spores/bee). Thymus volgaris extract appears to be promising in the treatment or control of nosema infection in honeybee colonies.

[Abstract:0032]

Identifying the Infectious Etiologies of Honeybee Colony Losses Between 2012 - 2016 in TURKEY

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Honeybees are the driving forces that sustain the fecundity of mother nature in global ecosystems. Since the beginning of 2006 increased global honey bee colony losses cost too much for the beekeepers in the Turkey. For this reason it was aimed to identify the medical etiology of honeybee colony losses. The honeybee samples were collected from 133 migratory and 57 stationary apiaries which were suffering of colony losses between 2012 to 2016. The results showed that parasites and pathogens including Varroa destructor, Nosema ceranae, Nosema apis, Crithidia sp, Lotmaria sp, Spiroplasma sp, Paenibacillus larvae, Melissococcus pluton, Ascosphaera apis and nine different viruses were found to be more prevalent in the migratory beekeeping operations in the Turkey. This is the first long-term scientific report about nationwide colony losses. Prevention is the major control point against to honeybee diseases so annual secreening for pathogen profile is important for key role of early diagnosis and effective treatment.

[Abstract:0033]

Survey and Distribution Patterns of Different Honeybee Viruses in Healthy Colonies: a Case Study from Saudi Arabia

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The Survey and regional distribution patterns of seven different honeybee viruses, i.e. Acute bee paralysis virus (ABPV), Sacbrood virus (SBV), Black queen cell virus (BQCV), Deformed wing virus (DWV), Kashmir bee virus (KBV), Chronic bee paralysis virus (CBPV), and Israeli acute paralysis virus (IAPV) were investigated using reverse transcription PCR (RT-PCR) analyses. Indigenous honeybee (Apis mellifera jemenitica) samples were collected in 50 apiaries located in eight different geographical regions of Saudi Arabia, mainly from healthy bee colonies. 6.78 % of investigated samples (apiaries) proved to be infected with ABPV, while KBV, BQCV, SBV, CBPV and DWV were found in 14.82 %, 18.92 %, 24.54 %, and 98.32 % of apiaries, respectively. Thus, the prevalence of ABPV, KBV, BQCV, SBV, and CBPV were generally lower in Saudi Arabia compared to other European and Middle east countries, whereas the prevalence of DWV was similarly high. Varroa destructor mite infestation found in all apiaries. Nosema cerana, European foulbrood, and Chalkbrood diseases were found in some apiaries. This study provides the first molecular evidence for the presence of honeybee viruses in Indigenous honeybees race of Saudi Arabia.

[Abstract:0077]

Landscapes, Forage Sustainability and Pesticides: All Affect Honeybee Health and Survival

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Honeybee *Apis mellifera* L. colonies were placed in four different agricultural landscapes to study the effects of agricultural crops, forages and exposure to pesticides on honeybee health. Those four different landscapes were: high (HighAG), moderate agricultural (ModAG) areas, low agricultural (LowAG) area with high urban activity, and a non-agricultural (NonAG) location in a forested area. Colonies were monitored for their performance and productivity by measuring colony weight, thermoregulation and brood production. Varroa mites, *Varroa destructor*, were extensively monitored for all colonies. Prevalence of seven different honeybee viruses as well as *Nosema apis* were studied by RT-qPCR. Comprehensive MS-LC pesticide residue analyses were performed on samples of wax, honey, foragers, winter bees, dead bees, trapped pollen and crop flowers for each apiary and location. Palynological analyses were conducted on trapped pollen collected from each location.

Not surprisingly, our results indicate that the landscape's composition significantly affected honeybee colony performance and development. There was better thermoregulation, heavier colonies, and greater brood production in agricultural areas compared to the NonAG area. Varroa loads were significantly higher in colonies of the agricultural areas, and partially correlated with the increase of colony size. Infections of two viruses (DWVa, ABPV) and *Nosema apis* varied among the four locations. Although colonies in agricultural areas grew larger, random samples of crop flowers sometimes contained high concentrations of pesticides including neonicotinoids, and we observed some insecticide related mortality of bees. However, pesticide concentrations in foraging bees, pollen, wax, and honey indicated generally sublethal exposure. The most pollen diversity and greatest brood production was found in the LowAG landscape where agricultural, urban, and native forages were available for bees. In contrast, starvation losses were observed in NonAG area where there was little access to agricultural, urban or diversified native habitats. Agricultural crops provide a valuable resource for honeybee colonies but increase the risk of pesticide exposure and may present bottlenecks in pollen availability and diversity. Promoting bee habitats with sustainable diversified forages seems to be the best-balanced strategy to enhance bee health.

[Abstract:0133]

Control of Honeybee Intracellular Gut Parasites, Nosemosis

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Nosemosis (*Nosemosis apium*) caused by the microsporidia *Nosema apis* and *Nosema ceranae* are a honey bee pathogen parasitizing. Nosemosis symptoms include digestive and absorption disorders because the spores damage epithelial tissue and potentially causing colony death. Recently, *N. ceranae* has been reported as an important threat to honey bee health. The aim of this study was to evaluate the potential of *Curcuma longa* and *cordyceps militaris* for the control of *N. ceranae* in honeybees. For the study, we infected with *N. ceranae* spore through dosed and fed with the turmeric and *cordyceps militaris* extraction at difference concentration. The data show that *cordyceps militaris* reduced spore production of *Nosema ceranae* to 97.82% compare with control, but toxic for bee. However, the *Curcuma longa* extraction was not toxic for bee at least at 1% and the bees fed with 0.5 % *Curcuma longa* extraction had significantly reduced spore production to 92.5% compare with control. This data suggest that *Curcuma longa* could be useful in alternative strategies for the control of *N. ceranae*.

[Abstract:0137]

Hive Protection Against Environmental and Toxic Chemicals, the Impact on Bee Health and Food Safety

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Distribution and accumulation pattern of toxic substances within the hive was demonstrated for various contaminants such as acaricides for apicultural treatments e.g coumaphos, synthetic industrial contaminants e.g dioxins or toxic metals and natural toxic contaminants e.g pyrrolizidine alkaloids. It has been estimated that 3% of the world's flowering plants contain pyrrolizidine alkaloids. Honey products were shown by numerous studies to contain various levels of pyrrolizidine alkaloids.

The beeswax, a composite material excreted from the honeybee glands and implemented in combs construction, plays a major role in the protection against intoxication of honey bee colonies, by decreasing bioavailability of most toxic substances into the hive and the colony. The physico-chemical properties i.e. lipophilicity and octanol/water partition coefficient (Kow), polarity, density, fluidity and solubility of bee products such as beeswax, honey, pollen and propolis, are key parameters for their underlying detoxifying process and colony defense system. The natural protection mechanisms eventually leading to enhanced food safety can be explained and demonstrate by the physio-chemical properties of the beeswax. We have noticed a unique mechanism in hive, functioning as the "liver" of honey bee colony, efficiently reducing the exposure of the colony to a broad spectrum of toxic chemicals. This mechanism enables honeybees to protect colony health and to maintain the bee product as a safe inhabitant for bees as well as a safe food source. We have found strong correlation between contaminants levels in beeswax and the toxic effects in brood, worker bees and Queen rearing.

The ability of beeswax to efficiently absorb a variety of toxic substances, diffuse and dilute the contaminants, on a large surface area of the combs, constitutes the main protection mechanism. Efficient beeswax recycling is crucial and enables to eliminate the negative effect and potential risks associated with toxic contaminants.

Abstract:0169]

Global Profiling of Metabolites in Seminal Fluid of Honeybee

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The societies of honeybees consist of related individuals that live in close proximity within their colonies offering favorable conditions for parasites and pathogens to establish infections to spread among genetically similar hosts. Parasites that can contaminate semen can also hitchhike on the mating process and be transmitted to the queen. Honeybee drones (males) are highly susceptible to infections with the sexually transmitted fungal pathogen *Nosema apis*, however, small molecules present in seminal fluid are remarkably efficient in significantly reducing spore viability and this antimicrobial effect was also detected in the non-protein fraction of seminal fluid. Consequently, the metabolome of seminal fluid is likely to contain antimicrobial metabolites and we here conducted a series of experiments to start their identification. We collected seminal fluid samples and centrifuge them using ultra-filter centrifugation to obtain their non-protein fraction, which contain the metabolites. After sample derivatization, we then used gas chromatography mass spectrometry analysis and processed the data via automated mass spectral deconvolution. Metabolites were identified by mass spectral patterns and retention times on the basis of the NIST and Fiehn libraries.

We were able to identify a total of 163 metabolites including alkanes, organic acids, amino acids, alcohol compounds, benzenes, amines, indolyl, inorganic acids, aldehydes, esters, carbohydrates, oximes, ketones, alkenes, adenosine, inosine, guanosine, phosphonomycin, bupivacaine and pyridine. Several of these metabolites are indeed known to be active in the immune defenses of insects other than honeybees, showing antimicrobial, anti-fungal, anti-viral and mite-killing properties. Others support energy metabolism, respiration and pheromone communication, as well as insect sperm viability and motility. Our research presents a number of compounds in honey bee seminal fluid, that can now be used for further screening to confirm their direct involvement in killing *Nosema apis* spores and other potential biological functions.

[Abstract:0192]

Pesticides Residues Pattern in Honey and Bee Wax for Determining Appropriate Zones for Better Beekeeping Development

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In Chile, honey may be produced from several native species with interesting biological properties owing to the presence of phenolic compounds inherited from specific floral sources. Despite this biological value, some beehives are placed nearby agricultural crops and thus, there is a potential pollution with pesticides residues used for control pest affecting those plants. These undesirable molecules may damage bee health and be responsible of modifications of the original composition of honeys. In the same way, there is no further information about residues presence in other products from beehives such as bee wax or bee pollen.

Honeys and bee wax produced in the Southern Chile were analyzed by UPLC-MS/MS and GC-MS/MS for detecting and quantifying pesticides residues. Likewise, the concentration of total phenolic compounds and the antioxidant activity in honeys was determined by Folin - Ciocalteu and FRAP assays, respectively. The chemical profile of the phenolic compounds composition was obtained from mass spectrum by DSA-TOF-MS. In this work we discuss the construction of geographic map for each studied zone where beekeeping is better allowed and prospected by considering the obtained values for pesticides residues in honeys and bee wax, biological activities and chemical profiles of phenolic compounds in honeys related to its antioxidant activity.

This study describes the results obtained in relation to the presence of pesticide residues in honey and bee wax, as well as the biological activities and chemical profiles of phenolic compounds in honeys, parameters related to their antioxidant activity. These results will allow to make a geographic map of each studied area, with the objective of establishing the places with lower risk for the development of beekeeping.

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[Abstract:0195]

Toxicity of Acaricides on *Apis mellifera* Larvae Reared In-vitro

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The reported high loss rates of managed honey bee colonies have been attributed to diverse stressors including pesticides. Honey bee larvae can be exposed to pesticides in contaminated nectar, pollen and wax. Herein, we aimed to assess the acute and chronic toxicity of three acaricides to honey bee larvae in vitro rearing method. The LC50 and LD50 were calculated for larvae at 72 hours following a single diet exposure administered when the larvae were 84 ± 12 h old. Solvent control larval mortalities were less than 15% at 72 h. The LC50 values for each tested pesticide were as follows: amitraz - 494.27 mg/L, coumaphos - 90.01 mg/L and fluvalinate - 27.69 mg/L. The LD50 values were 14.83 (amitraz), 2.70 (coumaphos) and 0.83 (fluvalinate) µg/larva. Chronic toxicity effects of acaricides amitraz, coumaphos and fluvalinate were also tested in the laboratory. Oral trial was carried out on honey bee larvae reared in vitro for amitraz at different concentrations in the food: 1.5, 11, 25 and 46 mg/L, coumaphos: 1.8, 6, 8 and 25 mg/L, and fluvalinate: 0.1, 1, 2.4 and 6 mg/L. Larvae were fed with dimethoate contaminated food (45 mg/L) as a positive control, acetone or methanol contaminated diet as solvent control and no contaminated diet as negative control. Negative control and solvent control survivorship was more than 80% at D19. Positive control mortality was more than 50% at D7. A significant decrease of larval survival occurred from 46 mg/L amitraz and 25 mg/L coumaphos food. 46 mg/L amitraz decreased the successful rate of development and increased the larva-adult stage. Based on the level of acaricides residue found in pollen, the contamination of food by amitraz, coumaphos and fluvalinate at concentrations similar with 10 times mean residue or maximum residue in pollen didn't affect survival and development of honey bees.

[Abstract:0204]

Investigation of Neonicotinoid Insecticide Toxicologies in Honeybees

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Neonicotinoid group of insecticides are used to fight against pests in agricultural production as licensed in Turkey. Also, they are used to indicate as off-label to pest control for some products such as sunflower, cotton, corn that honey bees provide to pollination and much benefit from them. Effects of imidocloprid which in member of neonicotinoid class pesticide are required to investigate thoroughly on the bee deaths and colony losses in these areas. Neonicotinoids are a class of insecticides which effect on the central nervous system of insects with lower toxicity to mammals. Neonicotinoids are among the most widely used insecticides worldwide, but recently the uses of some members of this class have been restricted in some countries due to a possible connection to honeybee colony collapse disorder. This research was carried out to determine the toxic effects of neonicotinoid on the bee health especially sunflower, corn and cotton as illegally used in the field

Imidocloprid residues were dedected as positive results more than other neonicotinoid group pesticides in sunflower in Thrace Region in Turkey. Positive results were obtained on average 35% in which were found 40% on the level of limit of quantitation (LOQ) that cause poisoning of the bees. Imidocloprid residues positive results were obtained in soil samples taken from sunflower cultivation areas on the level of 25%. The most positive results are imidocloprid, thiomethoxam, acetamprite compounds, respectively. Dinotefuran, Nitenpyram, Clothianidin, Thiachloprid could not be detected positively.

[Abstract:0214]

First record of *Megaselia scalaris* (Diptera: Phoridae) Parasitizing *Apis mellifera* (Hymenoptera: Apidae)

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The honey bee *Apis mellifera* was so far the host of two Phorid fly species; *Apocephalus borealis* and *Megaselia rufipes*. During laboratory experiments on the local honeybee *Apis mellifera intermissa*, in Annaba (Algeria), we noticed a parasitism of honeybees by a fly, leaving the former ones as empty exoskeletons. DNA and RNA extraction was done on samples of adult flies and larvae. The infested honey bees came from hives infected by Deformed Wing Virus (DWV). A detection of DWV was performed on adults and larvae phorid fly RNA, followed by a negative strand detection of the virus as proof of a true infection which was done by a multiplex ligation-dependent probe amplification technique (MLPA). Morphometric and molecular analyzes revealed that the Phorid flies belong to *Megaselia scalaris* species (Diptera: Phoridae). Both fly stages were positive for DWV but the negative strand of the virus was detected only in the larvae. This study showed the first record of *Megaselia scalaris* parasitizing *Apis mellifera* and also the detection of DWV in *M. scalaris*. These results shed light on the new threat *M. scalaris* and on its possible role as a new vector of DWV.

[Abstract:0229]

Attraction of *Vespa velutina* Nigrithorax Buysson (Hymenoptera: Vespidae) to Honeybee Extraction and Synthetic Honeybee Pheromone Chemicals

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Invasive species is well known for major importance frequently disturb biodiversity by competing with indigenous species. Due to the ecological and economical problems that ensue from biological invasions, they have become a major concern worldwide. The yellow-legged hornet *Vespa velutina nigrithorax* is an Asian native species. Since its detection in Korea in 2003 it has spread across the country. Like other wasp, *Vespa velutina* is an aggressive predator of domestic honeybees, such as *Apis mellifera* and other beneficial insects. In the present study, the aim was to screen samples of baits (i.e., Honeybee comb extract, Honeybee extraction, Honeybee Pheromone) for their attractant wasps in trap. We first tested combined attractant such as honeybee comb extraction, honeybee extraction, pollen, rice wine and sugar syrup for attraction efficacy. Then, Nine honeybee pheromone traps were tested and compared in order to find the best attractant. When testing specific compounds, the honeybee queen pheromone, homovanillyl alcohol, proved highly attractive.

[Abstract:0294]

De Novo Transcriptome Assembly of *Apis cerana cerana* Larval Gut and Identification of Immune Responses to *Ascosphaera* Apis Infection

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The Chalkbrood is a kind of fungal disease of the honeybee and leads serious threat to apiculture industries worldwide. Through morphological and molecular methods, *Ascosphaera apis* was identified in *Apis cerana cerana* drone mummies. By adopting RNA sequencing technology, a transcriptome of the *A. c. cerana* larval gut was assembled, and the host immune responses to *A. apis* invasion were investigated. More than 367.01 millions high quality sequenced reads were generated from *A. c. cerana* larval guts. In total, we assembled 43557 unigenes with a mean length of 898 bp, with over 41.84% of unigenes exhibited significant similarities with known proteins families. Moreover, 13448 SSRs were observed in all unigenes, and among twenty, six SSR loci were successfully amplified by PCR in *A. c. cerana* larval gut samples from three different regions in China. Based on the trend analysis, 5155 differentially expressed genes (DEGs) were clustered into nine profiles ($p \leq 0.05$). The GO term analysis suggested that DEGs within significant up- and down-regulated clusters were enriched in 45 and 33 functional groups, respectively. Moreover, KEGG pathway enrichment analysis was performed and further investigation of DEGs engaged in immunity-related pathways showed that DEGs up-regulated in cellular immune pathways outnumbered those down-regulated, and all DEGs within humoral immune pathways displayed up-regulated profiles. Taken together, these results demonstrated that an overwhelming number of genes involved in the immunity-related pathways were activated by *A. apis* infection. This is the first documentation of morphological and molecular identifications of *A. apis* in *A. c. cerana*. Our findings provided the valuable information for further investigation of not only the molecular mechanisms underlying immune responses of *A. c. cerana* larvae to *A. apis* infection but also the pathogen-host interactions during the Chalkbrood disease.

[Abstract:0315]

Impact of Reclaimed Water on Bee Colonies Under Field and Lab Conditions

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Three-year field experiment and one lab experiment were conducted to investigate the effect of reclaimed water on brood and worker bees' build-up in the field and to assess the death rate and histopathological changes in the midgut of honey worker bees. Twelve colonies of "*Apis mellifera*" headed by sister queens were used. Half of these colonies were placed near the reclaimed water, whereas the other half were placed 4 km away where fresh water was available. In the lab experiment, two feeding solutions sugar solution dissolved in fresh water or sugar solution dissolved in reclaimed water were given for two separate groups of bees for twelve days. At the end of the experiments, midguts of bees were removed and processed routinely for histopathological examinations. The bee's colonies that were kept 4 km away from wastewater treatment plant produced significantly more brood cells and worker bees over three years compared to colonies kept near the reclaimed wastewater plant. In both treatments, seasonal brood rearing activity and population of adult bees showed the same general trend in each year. The number of dead bees was significantly higher in the reclaimed water group than the fresh water group. The examined midguts of worker bees fed with the reclaimed water exhibited variable degrees of vacuolar changes of epithelial linings and a few necrotic cells in comparison with those fed with fresh water.

[Abstract:0326]

Outbreak of Honey Bee Loses and Reasons in Early Spring 2017 in Çukurova Region, Turkey

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Outbreak of honey bee loses were seen in Çukurova region including Adana, Mersin and Osmaniye cities section, this case was started in 2013 beginning of February and was continued until 2017 beginning of February and honey bee loses was the highest in 2017. Conspicuous findings were 1. Honey bee loses was been started beginning of February and continued until middle of March, 2. Loses were seen very quick, 3. Some of foragers could not come back to hive, some of forager which come back to hive cannot enter the hive because of unbalanced flying and walking, and death front of the hive, 4. Deaths were generally seen apiaries where localized in plain or near plain, 5. Strong and health hives were more affected than others, 6. In windy weather, when wind was came from plain direction to hives honey bee loses were increased, 7. When the weather was rainy, honey bee loses was been decreased or stop, 8. In this period is beginning of sowing of corn seeds in the plain, 9. Honey bee loses were between %30-%80 and 10. Due to migratory beekeeping is prevalent in the region honey bee populations are high and it lead to increase of honey bee loses in this plain area. Investigation was made related with honey bee loses in Adana, Mersin and Osmaniye cities with field studies in apiaries, visual and laboratory findings. Although different pesticides were determined in death honey bees, new pollens and bee larva, herbicides used before and later of sowing of corn seeds in the plain and neonicotinoid insecticides which coated corn seeds were mainly suspected pesticides. As a result, to decrease of honey bee loses related with pesticides uses in agriculture, assignor stuffs of government agencies, agricultural producers and their local and general union, beekeepers and their local and general union and academic persons related with honey bee loses were should work all together.

[Abstract:0341]

Aluen Cap: Efficacy Using the Brand New Varroa Treatment

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The appearance of resistance from varroa mites to the current synthetics treatment has pushed to develop a new way of treating mites using organic compounds to do it. Resistance to amitraz and coumaphos has already been detected in severus regions in Argentina. To evaluate a new formulation with oxalic acid (Aluen CAP) made by Cooperativa de Trabajo Apícola Pampero Ltda efficacy trials have been made all along the Argentinian territory, during the summer season, autumn and spring. All colonies used during trials were previously equalized for bee population, brood area, and honey and pollen stores. Hive bottoms specially adapted for the collection of dead mites were placed in each colony. At the beginning of the experiment, the new formulation was applied to the treatment group. Aluen Cap treatment consists of four strips U-shaped. The matrix of these strips is composed of cellulose (45 cm×3 cm×1.5 mm); each one contains 10 g of OA. Each strip was placed astride on frames 2, 4, 6, and 8 of the brood chamber. Falling mites were counted after 7, 14, 21, 28, 35, and 42 days using the hive bottoms specially adapted for the collection of dead mites. After the last count, the strips were removed and at the same day, colonies received a chemical shock using Amitraz or Flumetrin. The efficacy of oxalic acid treatment was calculated as a percentage: ((number of dead mites during oxalic acid treatment)/(number of dead mites collected during the treatment with OA and synthetic treatment))×100. The acumulative mite fall after oxalic acid and syntethic treatment was assumed to be 100 %. The average efficacy obtained through the trials was 95,89 %, with a SD of 5,5%. No differences between hives with sealed brood and no brood were found. Aluen CAP brings a new way to treat varroa mite using an organic compound on the beehive, and therefore allows not to generate contamination of honey, wax or bees, since it was found in other studies on hives treated with Aluen CAP.

[Abstract:0349]

ApisRAM – a Regulatory Assessment Model for Honey Bees

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The development of ApisRAM model has been initiated by the European Food Safety Authority to support the risk assessment of multiple stressors on honey bee colony health. ApisRAM uses the agent based simulation system ALMaSS. Taking advantage of the existing detailed dynamic landscape simulation, it integrates agriculture management, topography, weather and vegetation growth to provide a highly realistic simulated environment for bees. Combined with a highly detailed colony model, the simulation will be used to evaluate potential impacts of stressors and beekeeping practices on bee colony health. ApisRAM differs from previous models of bee colonies as it integrates multiple factors affecting bees and the high level of resolution at which these factors are represented. The model simulates individual bee biology and behaviour according to their stage-specific characteristics. Factors affecting the individual bee, biology and behaviour are integrated mechanistically using the current state of knowledge on honey bees. Representation of pollen and nectar resources is highly detailed in time and space. Bees will scout this resource landscape and pass information to foragers that then forage for resources for the colony. The model takes into account environmental drivers and their effects on bees. Furthermore, it considers the effects of pesticides describing their fate from the landscape to the hive. Contaminated material may be stored or consumed and the toxicological effects will be considered on the individual bees in all life-stages. In addition, the interaction with biological agents (viruses, Nosema and Varroa) and beekeeping practices are also considered. The main model outputs will be colony size and demographic structure, mass of in-hive products and patterns of resource use in time and space. The model is written using object-oriented programming (C++) using good software development practices to ensure longevity, ease of maintenance and extensibility. ApisRAM model is expected to be completed by 2021. A comprehensive data set on colony health, environmental conditions, landscape characteristics, management, pesticide contamination and biological agents will be collected from real landscapes to test and further calibrate ApisRAM model in a project starting in 2018.

[Abstract:0418]

Therapeutic Potentials of Herbal Extracts in Controlling Nosemosis in Honey Bees (*Apis mellifera* L.)

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Nosema ceranae, a newly emerging parasite, is suggested to pose a threat to Western honey bees (*Apis mellifera* L.). However, efficient and environmentally friendly drugs are currently lacking. Though Fumagilin can effectively reduce *Nosema* spore numbers in colonies, its residual effects on honey bees and bee products raise high safety concern. Thus, efficient and environmentally friendly drugs to control *Nosema* diseases are urgently needed. Our previous investigations revealed that decoctions of *Andrographis paniculata* (Burm. F.) Nees. (*A. paniculata*), *Phellodendron chinense* Schneid. (*P. chinense*) and ethanolic extract of *Vitis vinifera* L. (*V. vinifera*) skin respectively displayed efficient potentials to control *N. ceranae* infection. In this study, we examined effect of the combinations of these three herbal extracts on inhibiting *N. ceranae* spore proliferation in laboratory condition. Our results showed that all the tested combinations presented similarly significant effect to reduce *N. ceranae* spore numbers as what crude single herbal extracts have done at 13 d.p.i. We also tested spore-reducing efficiencies of the major monomers in *A. paniculata* extract, including andrographolide and dehydroandrographolide. Our analysis showed that the two monomers, when used alone, failed to inhibit *N. ceranae* proliferation. Instead, combination of the two monomers displayed a significant effect on decreasing *Nosema* spore numbers. These results provided alternative strategies for controlling *Nosema* diseases in honey bees.

[Abstract:0426]

Biotechnical Approaches for Varroa Control - Different Applications of Brood Interruption, Brood Removal and Trapping Combs in Colony Management

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The natural segregation of brood and bees by means of swarming and absconding as well as a temporary brood break seems to play a key role in survival of feral honey bee colonies. Since the late 1980s the Bee Institute Kirchhain has investigated these mechanisms and their use as biotechnical management methods. In the current light of expanding brood periods, changing environmental conditions, rising residues and resistances, the improvement of these methods becomes a major challenge to modern apiculture around the world. In 2015 and 2016 we studied seven biotechnical treatment methods against *V. destructor* in 80 colonies concerning their efficiency, practicability and effects on the development, fitness and colonies' overwintering ability. We caged queens for 25 days to treat the broodless colonies with different dosages and application forms of oxalic acid afterwards. In 2015 we trickled a solution of 3.5% oxalic acid in three groups after caging the queens in July, August or September (CJ, CA, CS) and treated another group via complete brood removal (BR). In July 2016, we caged the queens in three groups to either trickle a solution of 3.5% or 4.2% respectively (T3.5, T4.2) or sublimate 1.5 g of oxalic acid (S1.5) afterwards. Simultaneously we performed the trapping comb technique in another group (TC). The amount of brood and bees were estimated following the "Liebefeld method" and *Varroa* infestation was monitored over the entire period. Additional samples were taken to detect *Nosema* sp. and virus infections in 2015. With few exceptions, we found no difference between the treatments in terms of overwintering ability or colony strength. Before wintering in 2015 CA showed a sig. larger amount of brood than all other groups ($p=0.001$). The Group CS showed a sig. higher *Varroa* infestation in October 2015 ($p=0.018$) than CA. In 2016 the efficacy in the groups T4.2 and S1.5 was sig. higher compared to the groups T3.5 and TC ($p < 0.05$). Overall the results indicate that biotechnical methods, especially brood interruption by caging the queen or removing entire brood can be effective management techniques. We will further discuss the results and implications for the beekeeping practice.

[Abstract:0430]

Social Apoptosis Governs Resistance of Eastern Honey Bees, *Apis cerana*, to Mite Infestations, *Varroa destructor*

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The Korean haplotype of the mite *Varroa destructor* (Vd), shifted host from the Eastern honey bee, *Apis cerana* (Ac), to the Western honey bee, *A. mellifera* (Am), and has become the most severe threat to apiculture with *A. mellifera* in the last decades. The absence of mite reproduction in worker brood is an obvious key factor for the resistance of the original host to this parasite, and can be explained by a higher susceptibility of brood to infestations (= social apoptosis). Determining whether this haplotype is attracted to worker brood and can initiate reproduction on this host before brood death is important to choose appropriate selection traits for resistance breeding programs in Am. Here, we investigated these traits in a Chinese population of the original Ac host of the Korean haplotype of Vd to better understand the absence of reproduction in worker brood. The data show that worker brood is attractive to this haplotype and that it initiates reproduction on this host type. However, successful mite reproduction was prevented in the great majority of cases by abnormal host development, because adult Ac workers recognized this state and removed both host and parasite. Our results show that social apoptosis also occurs in the original Ac host population of the Vd Korean lineage and that it is a widespread phenomenon in *A. cerana*. Since other factors had no significant effect on the ability of the invasive Vd haplotype to use the worker brood for reproduction, our results support the idea that this social immunity mechanism is key to *A. cerana* resistance to Vd and that it should be considered to improve selection programs for *Varroa* resistance in Am.

[Abstract:0461]

Identifying Risk Factors of Productive Season Colony Loss in Ontario, Canada - A Multifactorial Epidemiologic Approach

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Concerns and reports of acute colony death, identification of weakened colonies, and widely fluctuating overwintering losses amongst honey bees continue to be reported by beekeepers in Ontario, and across Canada. Symptoms of weakened colonies have been described to include queen health issues, reduced productivity, increased susceptibility to pests and diseases, and reduced ability to overwinter. Declining pollinator health is multifactorial and complex. Epidemiological approaches to investigating diseases in other contexts (e.g., human health, or health of production animal species) have been powerful for investigating multiple risk factors using a variety of data types, including field data. Epidemiological studies investigating honey bee health issues are limited in Canada, but could prove useful in better understanding the complexities of health and disease in this population. A cross-sectional study was performed in Ontario, Canada, from March to May, 2015 to identify risk factors for colony losses during the productive season (i.e., spring to autumn). Management data from beekeeper questionnaires, geospatial bee-yard coordinates, and crop (corn, soybean) locations as an indicator of neonicotinoid use, were integrated and analyzed using multilevel multivariable logistic regression and spatial analysis. Respondents (n=309) represented 9.5% of the registered beekeepers in Ontario. The prevalence of colony mortality during the 2014 productive season was 23.4% (Confidence Interval: 19.4-27.3%). Further key results will be presented, including: differences in beekeeping outcomes between hobbyist and commercial operations; associations between beekeeper experience, management factors and colony mortality during the productive season; as well as associations between geographic proximity to corn and soy and honey bee health. These associations highlight the management and environmental factors of most impact to colony survival, and can inform future areas of research.

[Abstract:0462]

Effect of Pesticides Used in Regions Where Bee Mortality is Common on Bee-body Motor Movements

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Although the bee deaths that started in 2006 and a long time has passed, no solution has been found and even bee deaths have started to increase again in recent years. The end of winter and spring are months when bee deaths are seen intensely. When this period is examined, many factors (disease, pests, hunger, cold, etc.) cause bee deaths. One of these factors is the pesticides used in the wintering region. In this study, agricultural products grown in the regions where bee mortality is intense (citrus fruit, corn, apple, cherry, etc) and the pesticides used against the factors harming these products (Abamectin, Acetamiprid, Chlorpyrifos-Ethyl, Cypermethrin, Deltamethrin, Glyphosate Potassium Salt, %80 Sulphur, Imidacloprid, Penconazole, Spirodiclofen, Tau-fluvalinate, Thiacloprid, Thiamethoxam) were identified.

Starting from 2 times the dose of pesticides used for agricultural purposes, it was diluted by 50% and 6 different doses were prepared. These doses were given to bees in 2 molar syrups and 10 microliter were given. In the control group, 10 microliters of drug-free syrup were given. Drugs given bees were scored according to the movement of some body functions (antenna, leg, abdomen and mouth parts) after 4 hours of waiting. In this scoring, the ones with complete body function loss and that were motionless got "0", the ones whose antenna, mouth pieces, legs and abdomen move slow and irregular got "1" and the ones whose aforesaid organs function normally got "2". According to this scoring system, the bees that lost their body function got 0 point; the bees that used all their body functions, the healthy ones, got 8 points. Anatolian bee *Apis mellifera anatoliaca* was used in the trials. For each pesticide 5 trials were formed and 35 bees were used in all trials. 175 bees were used for each pesticide and in total 2275 bees were used.

At the end of the study, it was seen that the relationship between dose and body functions depending the used doses belonging to the pesticides and control group were as follows respectively: Chlorpyrifos-Ethyl ($R^2=0.9886$), Deltamethrin ($R^2=0.9714$), Thiamethoxam ($R^2=0.9706$), Imidacloprid ($R^2=0.9618$), Thiacloprid ($R^2=0.9591$), Cypermethrin ($R^2=0.8104$), Acetamiprid ($R^2=0.8055$), Abamectin ($R^2=0.7242$), %80 Sulphur ($R^2=0.5526$), Tau-fluvalinate ($R^2=0.4519$), Penconazole ($R^2=0.000$), Spirodiclofen ($R^2=0.000$), Glyphosate Potassium Salt ($R^2=0.000$)

[Abstract:0467]

The Effect of Thiacloprid on Honeybee

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As the harm caused by pesticides in recent years has come up, conscious people prefer to use medicines that do not harm the pest. Thiacloprid active agricultural warfare agent from the Neonicotinoid group, which is one of the preferred pesticides for this purpose and has an increasing market size, was examined in this study, and its effect on the length of life of Anatolian honeybee (*Apis mellifera anatoliaca*) and Caucasian bee (*Apis mellifera caucasica*) was examined.

In the study, the label dose of the pesticide (40 ml/100-L-water) and 6 separate dose prepared by diluting 50 % of the label dose were sprayed on the bees and their life span was monitored. For the study 2 molars of sugared water was put ahead beehives and the field bees came here were randomly gathered in small plastic boxes. These bees were brought to study place and were separated as groups of 5 and put in small boxes; and they were fed with 2M syrup until they were full. After waiting for 4 hours, thiacloprid was sprayed on them with 6 separate doses. Only water is sprayed onto the control bees. Spray results were monitored every 12 hours and followed up to the day of death. The bees were fed with 2M sugared water and normal water during the time they lived. The change of the length of life of the control bees compared to the bees that were exposed to drugs with this method was identified. At the end of the study, all bees that received the highest dose dies within 12 hours while in the control group, the average was 16 days in Anatolian bees and 15 days in Caucasian bees. The average life span of bees sprayed with pesticide is 6 days in average Anatolia and 5 days in Caucasus. The relationship between dose and the length of life was pretty high (In Anatolian Bee $R^2=0.9745$, In Caucasian Bee $R^2=0.9439$). The decay rate in the length of bees that received all pesticide doses were found %62,70 in Anatolian bees and %64,10 in Caucasian bee compared to control group.

[Abstract:0496]

Comparative Analysis of Winter Losses of Honey Bee Colonies in Turkey 2016-2017 period with COLOSS Monitoring Data

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Honey bee colony losses have been threatened the bee sector since 2006. Many investigations revealed that there are several possible causes of the losses. The COLOSS Association which has 858 members from 96 countries aims to search on colony losses rates and causes in the World. Turkey has been included these investigations both by applying COLOSS questionnaires and sampling from apiaries and laboratory analyses. In 2016-2017 winter period, Turkey has big problem about winter losses. Between the 1st-3rd months of 2017, 2431 bee samples from 82 apiaries were sent to the Hacettepe University Bee Health Laboratory for analyses. 1676 samples from the 63 apiaries were also collected in the field studies collaboration with Turkish Beekeepers' Association. All samples were analysed for possible causes of colony losses and the questionnaires' data entered the COLOSS monitoring system. The preliminary results show that 41.2% of Turkish bees are lost and/or dead at the end of the winter in 2016-2017. The possible causes can be listed as lack of feeding in autumn, cold and long-term winter, Nosema spp. infection and no treatment before winter, pesticides, the co-infection of Varroa and Nosema, overdose anti-Varroa products without licence, the fault beekeeping techniques. COLOSS data has still been collected from different countries. The comparison of COLOSS data will be completed before the 45th. Apimondia Congress and discuss in the last part of the study.

[Abstract:0509]

Study on the Effect of Veterinary Medicines Used against Varroa Mite Upon the GST Isoenzyme Profile in the Whole Body of Worker Bees

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Glutathione S transferase is a family of isoenzymes which belongs to the phase II of detoxification. It consists of a number of isoenzymes each one of them expressing specificity towards a number of different xenobiotic substances. The specificity is partially overlapping offering protection of the organism against various toxic compounds. Exposure of an organism to pharmaceutical substances often leads to significant changes in isoenzyme profile which serves as a biological marker of stress. In the present work we investigated the effect of exposure of worker honey bees to various veterinary medicines used against Varroa mite. We screened the effect of a broad range of substances and application methods upon the isoenzyme profile of the GST family from the whole body of bees, collected after an exposure period of 20 days in broodless colonies. They were first anesthetized by exposure to low temperature (-10°C) in order for the head and the sting to be removed and subsequently they were stored at deep freeze (-70°C). For each one of the compounds the isoenzyme profile was analyzed at least three times. The results showed significant differences between the groups of the substances as well as among the application methods. The safety of each of these applications for the honey bees is discussed. This is a pilot study for almost all substances used, conventional or biological. However, there is a need to extend the study on the conventional substances as well as to investigate their effect on bees in shorter and longer duration than 20 days.

[Abstract:0530]

Epidemiology of Nosema Apis and Nosema Ceranae in Eastern Black Sea Region

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Honey bee samples were taken in spring and autumn periods from 209 bee culture enterprises which are involved in bee culture Register system of the cities composing East Black sea Region and which have more than 50 colonies. The samples taken were subjected to the microscopic analysis and those which were positive in terms of spore were subjected to spore count, Giemsa coloring and PCR. In the analyses performed on the samples of the region, positiveness was determined for 185 enterprises in spring and for 81 enterprises in autumn. While nosema infection was not seen only for 11% of the enterprises in spring period, 10 million and more nosema spores were determined for 36% of the enterprises. While nosema infection was not seen for 61% of the enterprises in autumn period, 10 million and more nosema spores were determined for 4% of the enterprises. While number of the bee culture enterprises in East Black sea Region where varroa and nosema are seen together is 29 (14%) in spring period and 51 (24%) in autumn period, number of the enterprises where varroa is not seen but nosema is determined is 156 (75%) in spring period and 32 (15%) in autumn period. While nosema ceranae was determined in all the positive ones of 1256 samples taken in spring and autumn periods, nosema apis was not encountered. It is an important point to consider that nosema spores were determined in spring and autumn periods for a great majority of Bee culture Enterprises involved in East Black sea Region and that they were nosema ceranae.

[Abstract:0533]

Evaluation of American Foulbrood Disease in Honeybees in Marmara Region of Turkey Between 2012-2016

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American foulbrood is the most widespread and destructive bacterial disease of the honeybees in Turkey as in the world. American Foul Brood (AFB) is caused by a spore forming bacterium called *Paenibacillus larvae*. Spores effects honeybee larvae and leads to extinction of the hives. American foulbrood is a notifiable disease in Turkey as in other countries and officially reported to OIE. The aim of this study is to evaluate the cases of American foulbrood disease of honeybees in Marmara region of Turkey between 2012-2016. The suspicious bee, honeycomb and honey samples that sent between 2012-2016 to American Foulbrood Reference Laboratory in Pendik Veterinary Control Institute, were tested with both cultural and PCR method. Nigrosin and gram staining, brain heart infusion agar, nutrient broth, columbia sheep blood agar and biochemical tests were used for cultural method. DNA extraction kit and appropriate primers were used for PCR. A total of 18 positives were found from the suspect samples examined between 2012 and 2016.

Finding of this study would help for future studies of honeybee health and may be useful for developing new fight strategies for American foulbrood of honeybees.

[Abstract:0541]

A Method for Detection of Nosema sp. spores in Beeswax

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Nosemosis is one of the most dangerous and contagious global honeybee disease. Its economic impact is not limited only to its etiologic role in CCD outbreaks but also due to the possible contamination of beeswax which is used in medical and cosmetic industry. The success of treatment at colony level is directly related to early diagnosis and quality of treatments performed. There are two major components of early detection of nosemosis: beekeeper's education about disease symptoms to guarantee early diagnosis and annual screening. The early diagnosis is the major element of prevention in any case. One of the most effective way of disease prevention is directly related with microbial quality of beeswax. Accordingly, nosema spore free beeswax should be preferred. However, there is no official method to check spore in beeswax. We developed a new method for easy detection of nosema spores in beeswax. This study presents protocols for spore separation by water and by solvents respectively, followed by purification if required, for successful detection of nosema spore in beeswax.

[Abstract:0549]

The Comparison of Ochalyptus Bark and leaves with Chemical Application Methods on Varroa destructor Control in Honey Bee Colonies (Apis mellifera L.,)

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The aim of this research, which is one of the most important problem of beekeeping, honey bee (*Apis mellifera* L.) colonies, parasites used against *Varroa destructor* alternative to chemicals in order to determine the effectiveness of new control methods. This research was carried out on 40 *A. mellifera* colonies in Çukurova University Agriculture Faculty Animal Science of Apiary in 2003. Eucalyptus with more than a hundred varieties is the most known and widespread Species: *Eucalyptus alpina*, *Eucalyptus amplifolia*, *Eucalyptus amygdalina*, *Eucalyptus Andrean*, *Eucalyptus calophylla*, *Eucalyptus citriodora*, *Eucalyptus coccifera*, *Eucalyptus cordata*, *Eucalyptus cornuta*, *Eucalyptus cosmophylla*, *Eucalyptus Diversicolor* (Collossea), *Eucalyptus globulus*, *Eucalyptus gomphocolea*, *Eucalyptus leucoxylon*, *Eucalyptus robusta*, *Eucalyptus rostrata*, *Eucalyptus viminalis*, *Eucalyptus longifolia*. Application methods used in this research results on the effects of the varroa; in the spring season was determined Perizin® group 96.96%; Eucalyptus and leaves Bark 97.58% in the group. The application groups were significant that the difference between $P < 0.01$. Eucalyptus leaves contain essential oils (1-8 cineole = eucalyptol, 70-85% Terpeneol, alpha-piène, p-cymene, sesquiterpene-leadol, aromadendrene, viridoflorol; Aldehydes, ketones, alcohols), polyphenolic acids and flavonoids Chemical compounds. (Anonymous, 2003). Eucalyptus is an aromatic Substances that have plant and biologic and physiological effects on structure For the purpose of controlling varroa In the study Eucalyptus crust and leaf (*Eucalyptus alpina*) used as material Cukurova University of Agriculture Faculty of Eucalyptus trees It was collected. Plant and smoke to be given before application of Eucalyptus crust and leaf. Preliminary work has been done. It was tried from the entrance and the hive cover. According to the results obtained eucalyptus crust And its smoke is burned in the bellows in 5 smoke shaped, And its smoke is burned in the bellows in 50 g + 50 g quantity and 5 smoke shaped hives It is appropriate to give it from the door. Kept closed for minutes. 15 hours after application of eucalyptus The number of items per day is counted on a daily basis on. As a result, honey and wax residue, left on the varroa drug as an alternative; eucalyptus bark and leaves application methods varroa struggle to be effective and beekeeper can be recommended for applications that have been put forward.

[Abstract:0666]

Healthy living of Honey Bees

Karen Lally, Hossein Yeganehrad

Caspian Apiaries

The purpose of this study is to identify the movement of healthy living of honey bees for beekeeping. There are multiple causes of declining honey bee populations from around 20-90%. The losses and expenses to recover is very pricey. Monoculture is destroying natural habitats of species whereas in the case of bees, pesticides have been named as the number one cause of the bee colony collapse, also known as the colony collapse disorder (CCD). The movement for beekeeping towards pollination and the health of honey bees is to move the bees to California where almond pollination takes place and longer fruit season for food productions. The food production period is from January to end of November which is when brood production takes place and other conditions are exposed such as Varro mites, tranquil mites, nosema-apis, nosema-ceranae, bacterial diseases, and nutrient deficiencies, epidemic diseases, and parasites. Commercial honey producers are changing their bee keeping practice from a honey producer and a pollinator to creating more demands for pollination. This information will impact beekeeping agriculture for more improvement.

[Abstract:0686]

Determination of Secondary Contamination Sources and Critical Control Points of Honey Production Procedures, Specifying the Risk Factors And Correlations

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In spite of honey includes a plenty of bioactive antimicrobial components, hydrogen peroxide for antimicrobial activity can not be sufficiently produced because of low water activity and this situation revives the existence risks of food and/or bee originated pathogens, viruses, parasites and fungal agents in honey. There are a lot of studies about antimicrobial and bacteriostatic effects of honey. However the studies about critical control points which could be identified as secondary contamination sources in honey production procedures are very limited. In this study it was aimed to explore the microbiological loads the 7 critical control points that could be identified as secondary contamination sources (bee gloves, staff hands, hive tools, hive brushes, hive frames, hive base woods and environmental water sources) for 10 foodborne pathogens (Klebsiella, Escherichia coli, Listeria monocytogenes, Staphylococcus aureus, Clostridium botulinum, Bacillus cereus, Salmonella spp., Salmonella typhimurium, Salmonella enteritidis and Yersinia enterocolitica) in Bolu and its districts. Besides, a risk alignment was determined. Furthermore, binary and multiple correlations among the critical control points / potential secondary contamination sources and microorganisms were exposed by using statistical methods. According to the results of the study, all the critical control points in the honey production process which was explored in our study were determined to contaminate all the chosen microbiological parameters except Bacillus cereus and Yersinia enterocolitica. Besides, it was decided that to apply the "Good Manufacturing Processes" is obligatory in the honey production process to maximize the consumers' health. Furthermore it would be very useful to increase the detailed and related researches about honey production to understand the epidemiology and pathogenicity of the various pathogens because the lack of scientific studies related to the explored topic in our study.

[Abstract:0696]

Four Year Cooperation between Austria and Czech Republic on Investigating Colony Losses

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Austria and the Czech Republic have historically shared beekeeping thanks to geographical as well as cultural proximity. Although the number of beekeepers (59760) and colonies (637087) is higher in the Czech Republic than in Austria (26609 beekeepers and 354080 colonies in 2016, respectively) the structure of apiculture is similar. For example, the average number of colonies per beekeeping operation is about 11 and 13 in Czech Republic and Austria, and the vast majority of beekeepers in both countries can be considered being hobbyists. The density of honey bee colonies in the Czech Republic (8.1 colonies / km²) is almost double than in Austria (4.2 colonies / km²). In Austria, winter losses of honey bee colonies are being investigated by surveying beekeepers since 2008, in the Czech Republic since 2014. The close cooperation was supported by AKTION (Austrian-Czech scientific collaboration projects 69p11, 71p6, 74p4, 78p8). During this cooperation several bilateral visits have been accomplished and several common conference contributions and scientific publications as well as articles for the public have been written. We found differences in colony loss rates between Austria and the Czech Republic, but both countries share trends for high or low losses in a particular winter. In both countries Varroa mites are the biggest issue in beekeeping management. Treatments against mites drastically differ between the two countries. Lower losses in Czech Republic could be caused by different Varroa treatment strategy: whereas Austria is mainly focused on organic treatment compared to the Czech Republic, where synthetic acaricides are very popular during summer time. In addition to the common factors identified as detrimental for colony mortality, we found that robbing in Czech Republic and altitude in Austria affects winter mortality. These two factors deserve further attention in a comprehensive investigation of colony losses. We will further investigate the interplay of other factors which influence colony health.

[Abstract:0708]

Antifungal Activity Of Turpentine Oil Against *Ascosphaera apis* a Causal Agent Of Chalkbrood Disease On Honey Bee *Aphis mellifera* L.

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Turpentine is a fluid obtained by the distillation of resin obtained from live trees. This oil is antiparasitic, analgesic, revulsive, disinfectant (external use), balsamic, antispasmodic, antirheumatic. Alternative names are wood turpentine, spirit of turpentine, oil of turpentine, pine resin, terebenthine oil and gum turpentine. In this study, antifungal activities of different doses (5, 10, 20, 30, 50, 100, 200 µg/ml) of turpentine oil were investigated against *Ascosphaera apis*. The volatile effect of different doses of turpentine oil was determined against *A. apis* *in vitro*. Sterile distilled water was used as a control. The antifungal effect of turpentine oil was compared with that of *Thymbra spicata* var. *spicata* essential oil (50 µg/ml) which is known as a very strong antifungal essential oil. Antifungal effects of turpentine oil had different antifungal effect against *A. apis*. The highest dose, 200 µg/ml, of turpentine oil had a maximum antifungal effect on *A. apis*. The results showed that the turpentine oil had a strong antifungal activity against *A. apis*. It was thought that this antifungal effect can be result from the presence of some main components as α-pinene, camphene, β-pinene, β-myrcene and limonene. This study is the first report on antifungal effect of turpentine oil against the fungal pathogen, *A. apis* causing chalkbrood diseases on *Aphis mellifera*.

[Abstract:0733]

New Invasion of the Small Hive Beetle, *Aethina Tumida* (Coleoptera; Nitidulidae) into Korea

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The most destructive beetle in apiary, the small hive beetle (SHB), *Aethina tumida* Murray, 1867 (Coleoptera: Nitidulidae), is identified for the first time in Korea. The SHB is originated from the southern Sahara and has been spreading to world wide; USA (first in Florida, 1998), Australia, Egypt, Central and Southern America, Europe and South East Asia etc. This is the first report from the Far Eastern Asia. In Korea, it was first recognized last year (September, 2016) in one farmer's apiary, Milryang District, the southeastern part of the Korean Peninsula, with very high infestation and serious damage. According to the Beekeeper's experience, the damage of SHB has been seen in their apiries, already 3-5 years before our recognition. The result of urgent survey of distribution in Korea will be presented, with the morphological comparison of adult and immature stages with relative beetles for the beekeeper's diagnosis. As SHB is world wide serious economic pest, the nationwide surveillance and control is urgently required against wide spreading in Korea.

[Abstract:0743]

Keeping the Buzz Moving on: FAO's Support to Sustainable Apiculture Production and Health

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The Food and Agriculture Organization of the United Nations (FAO-UN) is mandated to eradicate hunger and reduce poverty in the world by ensuring food security and improving livelihoods, particularly in rural areas. Through its five strategic objectives, FAO builds capacity in member countries to make agriculture, including apiculture, more productive and sustainable; enable inclusive and efficient agriculture and food systems; and increase the resilience of livelihoods to threats and crises. The FAO Animal Health Service directs its resources toward improving animal health in all production systems by enhancing the national and regional capacity to address high impact animal diseases. Global trade from honey exports was USD 2.2 billion in 2016 and FAO recognizes the important role that apiculture plays in sustainable and environmentally friendly agriculture, pollination and people's livelihoods. To improve apiculture health and contribute to its sustainable production, the Animal Health Service partners with countries, producer associations and other stakeholders by working together to improve prevention and management, emergency preparedness, early detection and rapid response to animal disease incursions. The FAO Animal Health Service maintains many tools and resources to support apiculture.

- a) The Global Surveillance and Early Warning System, and Emergency Prevention System for Animal Health to conduct risk analysis, sustain disease surveillance systems for early detection and distribute early warnings to at-risk countries or regions.
- b) The partnership with the International Atomic Energy Agency to deploy emergency supplies to improve laboratory quality and diagnostic capacity and provide training for personnel. The FAO also supports countries to safely dispatch biological samples to international reference laboratories to confirm or characterize pathogenic organisms.
- c) The Crisis Management Centre for Animal Health, in partnership with the World Organisation for Animal Health (OIE), to field rapid response missions that help countries assess epidemiologic situations, support diagnosis of possible causative agents, and recommend actions to prevent or stop disease spread.
- d) Publications and technical documents to raise awareness and alert about high impact bee disease outbreaks and encourage emergency preparedness and early action.
- e) Various training modalities to improve national and regional capacity to address endemic and emerging bee health issues.

[Abstract:0764]

Labelling of Deformed Wing Virus (DWV) uncovers Epithelial Cell Tropism

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The western honeybee *Apis mellifera ssp.* is crucial for global crop pollination. In the recent past, beekeepers in most developed countries observed an elevated mortality rate of managed and feral honeybee colonies. Epidemiological studies indicated that the Varroa mite *Varroa destructor* is a major factor involved in bee colony mortality. It was further shown that the mite acts as a vector for Deformed wing virus (DWV), which is directly injected into the hemolymph of honeybees during feeding. Varroa mite infestation together with DWV infection results in the appearance of crippled honeybees and ultimately causes colony mortality. In order to sustain the bee population, we need to understand the factors contributing to Varroa mite and DWV pathogenicity. In this work, we investigated the pathogenicity of DWV under controlled in vitro conditions using labelled virus clones and bee cell cultures. Different genetically labelled DWV strains were generated using a recently established molecular clone for DWV and integration of fluorescent proteins (AcGFP, GFP, and mCherry). In vitro transcription of viral cDNA into synthetic infectious RNA followed by RNA transfection into primary bee cell cultures resulted in DWV replication and fluorescence of cells. Injection of the RNA into bee larvae lead to the appearance of typical clinical signs, expression of DWV proteins and strong fluorescence of the developing bees. Passages of the rescued viruses proved the genetic stability of the introduced marker genes. Using this system, it was obvious that DWV preferentially replicates in neuronal and epithelial cells including developing wing tissues. End point dilution of rescued viruses demonstrated that tissue tropism and onset of infection were similar between high and low titer infections. Taken together, the fluorescent labelled DWV genomes enable an in-depth study of DWV infections, allowing an observation of virus spread by the direct visualization of viral protein expression within the host.

BEEKEEPING ECONOMY

[Abstract:0024]

Measurement of Consumer Perception with Regard to the Relationship between Bee Products-Healthy Life: A Case Study of Canakkale Province

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Beekeeping activity is an important branch of manufacturing that provides both an advantageous source of income for farmers with low input amount and capital requirement as well as important food products that are required by consumers for healthy living. The best known bee products can be listed as honey, pollen, propolis and royal jelly. Bee products have been known and consumed for a long time with their properties of preventing or treating diseases. Honey is a product that is known mostly with its positive effects on health among bee products. Many scientific publications have been made on the positive contributions of other bee products of pollen, propolis and royal jelly on the immune system. The fact that the media has taken up interest in the relationship between bee products-health has increased the demand for and the consumption of these products. In addition, it is expected that the perception of consumers regarding bee products will change as a result of the recent issues of artificial honey.

The objective of this study is to measure the perceptions of consumers living at the Canakkale city center with regard to the relationship between bee products and healthy life. Face to face surveys carried out with consumers comprise the main material of this study. The number of surveys was determined as 175 via proportional sampling method. A 7-point Likert type scale was used in the study to measure perceptions. Primary data obtained from the surveys were analyzed via multi-variate statistical analysis methods in addition to basic statistical methods. The results were evaluated with regard to issues such as whether consumers establish a relationship between bee products and health, on which bee products this relationship focuses, socio-economic factors that affect the perception related with the relationship between bee products and health and the problems of the consumer related with this issue.

[Abstract:0030]

The Economic and Social Dimensions of Apiculture in Gümüşhane Province

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With its territory of 6437 square kilometers, 50,7 % of the total population lives in rural areas in Gümüşhane Province. Agricultural activities are mainly performed by small family businesses in the province. Considering land structure, climate, vegetation, diversity of flora and the life styles, apiculture comes forward as one of the most convenient sectors for economic activity. In Gümüşhane, the number local residents engaged in apiculture is rather low. Capital accumulations of domestic farmer families are insufficient; yet their ability for taking advantage of state subsidies efficiently are complicated by bureaucratic mechanisms. With harsh conditions during winters, the places suitable for wintering the bee colonies are very rare. Relatively convenient areas for wintering have been recently included in urban residential areas. In this context, the migratory beekeepers from Ordu, Trabzon, Giresun and Rize, who comes to the province after spring, obtain the main income from the beekeeping in Gümüşhane. Therefore, in face of the province's problems such as depleting of the population and poverty, the potential of the beekeeping to bring solutions has not been utilized. The number of producers engaged in beekeeping is slightly over 500 in Gumushane. 480 of them are registered in the province's beekeepers association and produce 1360 tons of honey per year with 60000 bee colonies. Other producers keeping hives, continue the activities to operate at a level that meets the family needs. In this context, beekeeping does not reach beyond to be a supporting factor after the other economic activities for the subsistence of households.

[Abstract:0073]

The Economic Evaluation Queen Bee Enterprises

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The main subject of this study is the economic evaluation of queen bee enterprises that one of the biggest problems of beekeeping in our country. Questionnaire study was carried out in total 28 enterprises in 10 provinces and current situation of 101 breeder queen bee and 4 queen bee production enterprises were examined. Despite the need for 3.5-4 million queen bees per year in our country, enterprises can meet 10% of their needs. Queen bee production is a busy activity of beekeeping and is a very important field that requires knowledge and skill. Because of the colonies are below 200 of queen bee enterprises in our country, production capacity is low. Queen bee enterprises must have at least 10,000 to 15,000 queen bee production capacities. When the education status of queen bee producers are examined, it is determined that 28% is primary school graduate, 14% is middle school graduate, 39% is high school and 5% is university graduate. Queen bee producers are more educated than beekeepers. Queen bee enterprises do not only produce queen bees, but also they are producing bee and honey to maximize their income. It is very important that a profitable queen bee enterprises are not only sell queen bees but also sell live bees in the early spring, and they are producing honey to increase the efficiency of their enterprises. When we look at total income, income from live bee and honey production is equal to income from queen bee production. It can not make too much income by only producing queen bee.

[Abstract:0084]

China's Apiculture Situation and Development Strategy

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This article comprehensively describes the present apicultural situation of China and development strategy in future. 1. China apiculture, including colony number, bee products production, beekeepers number, major apicultural scientific research institutes, universities involving in apiculture, apicultural management organizations, apicultural social groups, main bee products inspection agencies, apicultural technology innovation platforms of science and technology, introduction of China apicultural research system; 2. Major achievements of China apiculture from 2011-2015. (1) The scale and benefit of apiculture significantly increased; (2) The technique of bee pollination has been promoted; (3) The local government pay more attention to apiculture, bee species resources protection is strengthened; (4) Emergency response, Services for government and apiculture; 3. Development goals of apiculture from 2016-2020. (1) The moderate expansion of bee colonies in China, the moderate increase of bee products production capacity. (2) Remarkable progress was made in apicultural production mode transformation. (3) Improve the quality of bee products, bee products production increased steadily. (4) Bee pollination technology to get promoted. (5) The bee resources protection and bee production capacity improved. (6) Organizational degree of apiculture get further improved. 4. The research and focus of China Apiculture Research System. (1) Bee health and efficient breeding technology integration and demonstration; (2) Quality of bee products safety monitoring and early warning and control key technology and new product development and evaluation; (3) Bee pollination key technology research and demonstration; (4) Stress resistance germplasm resources and genetic evaluation system research; (5) Basic data platform construction, (6) Emergency technical services.

Abstract:0153]

Technical and Economic Analysis of the Beekeeping Enterprises; Aegean Region Sample

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The technical and economic analysis of the beekeeping enterprises, located in the provinces of Muğla, Denizli and Aydın was performed within the scope of the research. The research tool was composed of the data belonging to 2013-2014 through the questionnaire conducted by meeting face to face with 73 beekeeping enterprises. The production cost of 1 kg honey in the beekeeping enterprises were found as; 8,53 TL in small-sized enterprises, 5,48 TL in medium-sized enterprises and 4,96 TL in large-sized enterprises. As per the provinces, the production cost of 1 kg honey was calculated as 4,45 TL in Aydın, 10,3 TL in Denizli, 6,37 TL in Muğla and the production cost of 1 kg honey was calculated as 6,76 TL throughout the companies. While there is not any statistically significant difference between the unit costs as per scales, a statistically significant difference was determined between the unit costs as per provinces ($p < 0,05$). According to the model, formed for determining the total profit in the beekeeping enterprises; one-unit spending to be made for the marketing activities and tools-equipment respectively leads to 24,711-unit and 2,635 unit increase in total profit, one-unit cost increase in other expenditures leads to 2,635-unit decrease in total profit. It is estimated that one-unit increase in sale price, being one of the other independent variables in equation leads to 1 207,763-unit increase in total profit and one-unit increase in unit production cost leads to 1 463,276-unit decrease in total profit. Finally, the most important factor affecting the level of profitability in beekeeping enterprises is determined as marketing and the cooperative structures are required to have an activated structure in solving marketing problems and then play a determinative role in price formation through these activated organization structures. It was determined that an effective Honeybee Diseases and Pests control and strategies should be determined and also considering the increasing domestic demand and exportation level of the supports granted for the sector, a new type support, which will promote the production of honey and other beekeeping products and also reduce the production cost, should be adopted.

[Abstract:0193]

“My Bee, My Honey, My Honeycomb” Project

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An accredited laboratory is needed to ensure the reliability on apiculture products, to procure hygienic processing and packaging of honey; and for capital, technology, equipment and analyses. Standard brand product can't be developed due to inadequacy of institutional capacities of businesses, research and development studies are needed in terms of access to market, production of pollen, propolis and royal jelly and evaluation issues. The Project “My Bee, My Honey, My Honeycomb” is developed to constitute reliable and brand products, to provide for new research and development opportunities for apiculture products, to enrich the product diversity, to find a market and to create new employment areas. The Project “My Bee, My Honey, My Honeycomb” whose budget is around 10 million Euros is a Project supported by the Republic of Turkey and the European Union and conducted by the Ministry of Science, Industry and Technology under the umbrella of “Competitive Sectors Programme”. The beneficiary of the Project is the Ordu Apiculture Research Institute. The capacity (analysis, packaging, education and consultancy) which will be created within the Project “My Bee, My Honey, My Honeycomb” which is the first in Turkey and the biggest in the sector conducted with the aim of increasing the competitiveness of SMEs (SME: Small and Medium Enterprises) operating in the sector, will not only increase the competitiveness in the manufacturing sector but also provide for the strengthening and increase of apiculture business capacities which will enter SMEs and SME groups. The project operation center is the Ordu province, the implementation provinces are Ordu, Giresun, Rize, Trabzon, Sinop and Samsun. The construction of 5.000 m2 including Quality Department, Packaging Facility and Main Comb Production Unit in the scope of the projects' construction works has been completed. Additionally, a “Quality Development and Documentation Center” under the “Quality Department” and a “Consultancy Contact Point” will operate in the Apiculture Research Institute. Together with the Marketing and Promotion Unit, the access of producers to the market will be increased.

[Abstract:0287]

General Characteristics of Bee Products Consumers in Turkey

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Bee products are products that have been consumed to maintain a healthy life for many years. The aim of this study is to reveal the general characteristics of bee products consumers. For this purpose, face-to-face surveys were conducted with 175 consumers in Canakkale, an important center for bee production and consumption. According to the study results, more than half of the consumers are women. Bee products consumers are middle-aged and the most of them are graduated from high school. Monthly kitchen expenses are over 150 Euro and monthly income is slightly above the minimum wage. The surveyed consumers have the most information respectively about honey, pollen, beeswax and royal jelly. The least known bee products are bee venom and propolis. The most frequently purchased bee product is honey. Accordingly, the proposals can be developed, such as training at the schools, organizing of publicity campaigns and preparing of public spots for other bee products and their benefits on health.

[Abstract:0290]

Possible Risk and Hazard Factors for Beekeeper Health

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Beekeeping is an agricultural activity with a lot of potential hazards and risks. Beekeepers are exposed to many effects; equipments used in production activities; mechanical and physical difficulties such as height of hive from the ground and weight of hive, environmental conditions in the place where the activity is carried out, climatic conditions such as high temperature, time stress, colony transfer stress, sleeplessness, bee venom and smoke. Production made in outdoor areas can cause breakdown in health of beekeepers, injuries, psychological disturbances and / or job accidents. Taking protective measures is very important. Beekeeping risk factors and beekeeping health studies in the world are limited, and it is not yet a subject in Turkey. Bee products from the hive to table have a difficult process, so these effect beekeepers health. In this production process, the beekeepers must also take care to his/her own health. In developed countries, modern tool-equipment support reduces work load and risks, but there are risks at every stage because of the natural conditions. In this study, it was aimed to indicate risk factors and effect on the health of beekeepers at beekeeping activity and aimed to make suggestions. It is also aimed to create awareness on the subject and aimed to be a preliminary work on occupational health and safety in beekeeping activity in Turkey.

[Abstract:0293]

REDLAC: Platform for the Sustainable Development of Beekeeping in Latin America and the Caribbean

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The experience of cooperation between INTA - PROAPI Argentina and CEDAF, Dominican Republic began in 1996. It was recognized as the best strategy for the Family Agriculture of the Southern Cone in 2014, and it took shape as REDLAC with the support of FONTAGRO and the participation of the Dominican Republic, Costa Rica, Uruguay, Argentina and Haiti in 2015. Nicaragua, Bolivia and Paraguay will join to the Platform in 2017. El Salvador, Colombia and Ecuador are interested in integrating to REDLAC. The proposed strategy is based on the "collective way of innovating" which promotes territorial development by articulating the work of more than 17,000 organized beekeepers, 250 territorial technicians and 70 researchers based on territorial participative planning and the "country strategy". Among the main technological RESULTS: the development and implementation of more than 50 technological paths adapted to the conditions of different environments, which allowed to reduce the mortality of hives in an average 30%, to improve the production and to guarantee the quality; the integration of value chains with traceability from the apiary to the gondola, the development of products with added value and the improvement of the pollination service with *Apis mellifera*, *Bombus* sp. and native stingless bees. Among the results achieved in relation to organization: the articulation at territorial level, the strategic integration within each country and the formation of a working team with representatives of the involved Latin America and the Caribbean's institutions; a platform for communication and collaborative work, web page (www.redlac-af.org) and social networks which allowed to start work on knowledge management at regional level. In this sense, three years of work have allowed the construction of a community of practices sustained by strong institutional and personal links, shared objectives and a way of doing apiculture adapted and adopted in the region.

[Abstract:0311]

Beekeeper and Citizen Education in the Digital Age

Sandra Evans, Jilly Haliday

Arnia Ltd

Education and dissemination of valid and useful information forms a basis of any activity, beekeeping not being an exception. A recent Pan-European study identified beekeeper's background and practices are one of the main factors affecting honey bee colony mortality. Over the past 7 years our remote hive monitoring technology has been adopted in over 25 countries around the world. In this presentation we will show how the use of this technology not only contributes to the education of its users but also how the resulting and growing knowledge base can be adopted as a tool by wider audiences. Even if there is only a limited number of technology users in a particular geographical area, the data produced can be still be valuable to other members of that local beekeeping community. The start of the nectar flow, appearance of diseases/pests and the need to supplement feeding can all be registered by 'sentinel hives' and relevant information communicated. Exchange of this information via internet and social media is rapidly becoming the mainstay of education for many novice beekeepers. The potential value of this is enhanced by the wisdom of the crowd.

For educators, such as local beekeeping organisations and mentors, remote monitoring offers an additional educational tool that can be used in distance learning and guidance. New beekeepers can share their data with mentors for remote assessment, possible explanation and practical advice. With increasing focus on STEM education in primary and secondary education, a programme has been developed and implemented to teach children science, mathematics and technology using data from the bee hive monitors. In our age of data (digital, big, economy) the need to learn to handle and interpret data is a very relevant skill. By bringing real life examples of honey bee colony statistics into the classroom, cross curricular material is tackled in an engaging, thought stimulating and easy to absorb way. Furthermore, the teaching material data is generated by the local beekeepers, users of the technology and active participants of this community based project, which in turn contribute to the invaluable knowledge base.

[Abstract:0319]

Royal Jelly in Turkey: Production, Cost and Marketing

Murat Emir

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The study examined the production, cost and marketing of royal jelly (RJ) in Turkey. The research data were collected from 11 royal jelly producers (RJP) by using questionnaires and workshop programme. Research results showed that beekeeping was the main income for 82% of RJP. Beekeepers, who were 54 years old, had 23 years of beekeeping experience, 16 years of RJ producing experience and 13 years of education. Research results also showed that RJ yield in Turkey was 228.43 ± 33.22 g/colony. The most affecting factors on yields RJ of colonies, which are ecological factors, the supplementary feeding and bee races. Labor cost was the most magnificence cost component of RJ production, and it was followed by the costs of feed, depreciation and transportation. The production cost of RJ excluding unpaid labor expenses was \$ 0.34/g. In Turkey the average wholesale and retail price of RJ were \$ 0.74/g, \$ 0.97/g, respectively. Return to family labor and management was \$ 98/colony. To decrease the cost of RJ, the production amount needs to be increased by solving the problem of qualified workforce. Beekeepers can be given applied education on RJ production, and the state can develop policies encouraging RJ production aimed at young beekeepers and female beekeepers.

[Abstract:0320]

Evaluation of the Socio-Economic Structure and Vocational Training of the Beekeeping Program Graduates

Murat Emir

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The study was examined an evaluation socio-economic structure and vocational training of the graduates of beekeeping program. The research data has been obtained from 20 graduate students through survey forms based on the purposive sampling method. The ranking of the order of importance and the degree of effect of the lessons within vocational training were analyzed statistically by using Kruskal-Wallis H and Mann-Whitney U tests. According to the research results, the average age of the participants is 31 and the participants consist of 90% male. 50% of the graduates are engaged in agricultural extension and consultancy, while the remaining graduates work as cashier, marketing personnel, logistics and store manager, and front desk staff. Besides, 10% of the graduates have been unemployed for two years and the average length of unemployment after graduation have been determined as 18 months. The monthly net salary of those who work is 1611,89 ±192,86 TL. It has also been found that the number of colonies of the beekeepers has increased 15% after the vocational training and the average yield of honey per colony has been calculated as 19,29±7,29 kg. All the participants have stated that the training has contributed to their professional life. There is a statistically significant difference between the scores of importance and competence levels of the lessons learned ($p<0.05$). The graduates feel themselves ready for the sector in terms of the bee behaviors, honey bee diseases, seasonal studies in beekeeping, agricultural combat and beekeeping, the environment and bee genetics lessons; on the contrary, they are of the opinion that they did not graduate with necessary equipment in terms of queen bee production, artificial insemination in beekeeping, bee breeding, production processing and storage of bee products, foreign language, wasps, bumble bees and breeding, arthropod, statistics and biochemistry lessons. Considering the sector needs, the queen bee breeding should be included as practical training in the curriculum of the beekeeping program. Besides, the beekeeping program students should be responsible for at least a hive during their training and they should be provided with the opportunity to apply the theoretical education they received.

[Abstract:0330]

Determinants of Technical Efficiency in Bee-Keeping Farms in Nigde Province, Turkey: An Analysis of Efficiency Using Data Envelopment Analysis

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Beekeeping has been used for feeding and curative health care for centuries by using vegetable sources, bees and labor together. Turkey has a great potential for beekeeping in terms of its geographical structure, diversity of plants and nectar sources which are well suited for the production of honey. According to FAO data, 7.7 million colony of 83 million and 107 thousand tonnes honey of 1.5 million tonnes are produced in Turkey in 2016 year. Turkey is the 2nd for honey production after China and 3rd for beehives after India and China in the World. In Nigde province, farmers have a long tradition of beekeeping and the province has huge potential for multi-floral honey production. However traditional mode of production still dominates the sub sector which negatively affects the total production and productivity. A number of studies have been conducted to better understand the working honey production in Turkey; however, there are not any studies which systematically investigate the extent of technical efficiency in Nigde province. For this reason, this paper aims to investigate to the extent of technical efficiency and identify exogenous determinant of inefficiency in Nigde. Improving efficiency can have a twofold positive effect. First, efficiency gains will enhance the viability of individual farms and the industry as a whole, leading to an improved socio-economic status of rural people in the Nigde. Second, improved efficiency can lead to the conservation of resources, as well as reductions in the use of inputs leading to positive impacts on environmental health. Determining the efficiency of bee-keeping farms in Nigde province is important for exposing potential opportunities for reducing costs and conserving resources. Therefore, the objective of this study is to measure technical efficiencies in order to identify opportunities for improving the efficiency of resource use in honey production with DEA (Data Envelopment Analysis) method. Ultimately, improving efficiency will be ensured the increasing of honey production in the Turkey. The data will be used by obtaining through face to face interviews with producers selected through stratified sampling method in Nigde.

[Abstract:0434]

Apiculture and Agriculture Relationship: the Need to Explain Benefits and Harmful Effects

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Since 2006 a high number of honey bee colonies are annually dying. The dimension of the problem has favored international research cooperation which reports that factors involved are very diverse. Broadcast media alarms repetitively and agriculture practices or pesticide use are often presented as the main responsible. Agriculture and apiculture relationship is diverse and complex, and often misunderstood. Some analytic tools to explain better this relation could favor its study and Life Science student's education. Honey bees and most of the agricultural crops are known to be essential to each other. Bees need flower nectar and pollen for their feeding. Pollen need to be transported from anthers to ovules of the flowers and bees are good carriers. Then, ovules have to be fertilized to produce fruits or seeds. Hormonal influence in this process has to be correctly explained for a good comprehension of fruit production.

The analysis suggested wants to illustrate examples where bees are beneficial for crops but also where they can be a problem. A large number of agricultural crops need pollinators for improving their yield (fruits trees) but also their quality (strawberry) or to facilitate the harvest (colza). On the opposite, bees can difficult seedless productions (citrus fruit) or can be vectors of vegetable pathologies. Then, it is suggested to analyze agricultural practices harmful for beekeeping. Insecticides use is dangerous for bees. In addition OGM crops, new varieties producing less nectar quantity (sunflower) or flowering latter (almond) loose the interest for bees feeding. Field boundaries elimination related with new irrigation areas reduces flora diversity but increases nectar production quantity and period. This benefit of agriculture advances for apiculture could end this analysis with other examples as biological productions, reduction of herbicides use and consequent flowering weeds as bees pastures or crop rotations introducing plants with an apicultural value.

A debate following these different points of view complements Life Sciences students' education at university, schools or during beekeeping lifelong learning courses. In their apicultural or agricultural activity they are able to support better their decisions as well as to argument better agricultural and apicultural practices in beekeeping broadcast.

[Abstract:0436]

Marketing and Branding of Bee Products in Uganda

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The production of bee products in Ugandaare still very low, most of the output actually ends up in market. Generally, there is local market within the communities and local traders. Northern Uganda region takes the highest percentage of producing honey, followed by Central region and the western region. Some developed companies like Golden bees ltd, Native honey, pack and brand their honey depending on its derivation. Western region mainly produces amber and dark honey, such honey is branded with different label including its origin. Central and northern Uganda produce acacia honey, they normally brand it with yellow label, it has the highest demand and most expensive in Uganda. Buyers of honey in Uganda include: processors, packers, traders, pharmaceutical companies and domestic users. Honey Traders purchase from individual beekeepers and weekly markets to sell to consumers and processors/packers in order to make a profit. They face difficult in collecting honey in large volumes due to low productivity from the beekeepers. The main actors within the honey value chain are beekeepers, middlemen, processors, wholesalers, retailers and consumers.

Most producers sell their honey locally to supermarkets, hotels and groceries. Sales to international market are very low, due lack of documentations for exporting, stringent quality requirements, quantities required and price offered in the international markets. According to processors, local market offers them higher prices and is less demanding in terms of documentations and quality requirements. Uganda has got both local and international honey brands. Local brands are suffering from inconsistent supplies, poor packaging and UNBS quality mark. Local brands take 80% market share in terms of brand and the rest being shared by the international honey brands. (Majorly from U.S.A, followed by United Arab Emirates and Kenya)

Other bee products include Bees wax, Bee propolis and bee venom. Uganda exports more than 30 tons of bees wax per year, to European countries according to sellers of beeswax. They are mainly two companies which export beeswax (Golden bees ltd followed by Bee natural Ltd) In conclusion the quality honey produced and packaging has been improved compared to 3 years back.

[Abstract:0445]

Beekeeping Activities, the Demographic Characteristics of Beekeepers, the Problems of Beekeeping and the Determination of the views of Beekeepers related to Current Administrative and Economic Applications

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This research was conducted to determine the situation of beekeeping in respect to socio-economic and demographic characteristics of breeders, supporting, organization and controlling of beekeeping, trade and marketing of bee products in the scope of breeder's perception and ideas in Malatya. For this reason, face to face interviews with 149 beekeepers were applied by using in selected randomly registered beekeepers to Beekeeping Registration System (BRS) and Beekeepers Association. In this study, it is found out that 95.3% of beekeepers are men and 21.5% are high school graduates, the ratio of beekeepers having 1-10 hives at the beginning is 38.3% and having 51-100 hive snow is 38.5%. In this study, it is calculated that the breeders who are discontent with the supporting of percolony is 58.9%, with the services of the Beekeepers Association is 61.5% and with the application of Ministry of Food, Agriculture and Livestock in the last five year about encouaring, supporting, research, legislation, and application is 87.8%. The deficiency of qualified studs as 68.45%, lack of bee product marketing except honey as 42.95%, high in put prices as 41.61% are stated as the most significant and primary problems. The most important cost in bee feeding and fodder (56%), the most popular marketing in retail method of breeders in marketing (90.6%), the most important expectation of beekeepers in increasing current suppoting from the Ministry (80.54%) are stated. In order to have a profitable and efficient beekeeping in Malatya, establishing right and proper strategies of social, administrative and economic and shaping fundamental structure and application in terms of the stated issues in beekeepings are necessary.

[Abstract:0446]

A Model Suggestion for Establishment of Honey Exchange Market

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Honey production is one of the potential locomotive sectors of Bingöl's economy. However, in terms of inspections, production quality and marketing, the necessary steps towards professionalization have not yet been taken. For this reason, although the product's value added is very high, it has not yet been utilized sufficiently. The fact that Bingöl University is chosen among the pilot universities under the new YOK perspective and framework of 'Regional Development-Focused Mission Differentiation and Specialization' program and the scope of this research, honeybee, has been selected as the University's primary product to focus on, it should be expected that this fate can be reversed. In addition to regulation of honey production standards, producer and consumer relations and increasing production quantity and quality; the establishment of a trade exchange in which the trade of honey can be made, the producers, the intermediaries and the consumers can come together, is essential at the point of being able to benefit from this sector effectively. One of the best places to establish such a Honey Exchange Market is Bingöl, with its honey being selected as the world's best, in an international test in 2015. In this context, it is also important that the analysis of honey is in safe hands. Standardization and stabilization of the quality and prices, and thus the protection of both producers and consumers, could potentially make honey production and trade one of the locomotive sectors of the provincial economy.

[Abstract:0539]

Kenyan Honey Production in the Context of Global Beekeeping

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Kenyan Beekeeping has been at the fore for a long time, since several rural communities had embraced it, though at the subsistence level, using traditional technologies. Currently, the change in technology is nominal, even with the availability of modern technologies. Resistance to technology change has been attributed to strong cultural practices, low purchasing power and insufficient training. With the race for middle income economy, Beekeepers are awakening to the call for increased honey productivity. This is enhanced by commercialization of the Beekeeping Project. To some extent, modern technologies are now accepted as a vehicle to increased productivity. Albeit the contribution of Beekeeping sector to the Kenyan economy, 4.4 b Kenya shillings, a ten percent increase is stipulated. There has been intensive training along the value chain. Besides, young people are now venturing in the art of Beekeeping, not as a hobby but as a business enterprise for profit. Students at training and research institutions are endeared to Beekeeping research. Slowly, the industry is picking up to its glory of the 1990s, where over 30,000 metric tonnes of honey production was attained, linked to a strong Beekeeping cooperative movement, the best in Africa and second in the world. The honey residue testing equipment is installed, with Iso lec 17025: 2005 processes in place. Many players and partners are on board to ensure a viable and sustainable Beekeeping industry. The challenge, however, is the declining trends in global honey production as a result of climate change, aggravated by human activities and Varroa mite invasion on the African continent

[Abstract:0555]

Organic Beekeeping in Turkey

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Organic apiculture, is the activity of beekeeping that is supervised and certified by a control agency or a certification body in accordance with the regulation on organic farming at every stage such as nectar, pollen, water and bee resin found in the nature being collected by the bees and transformed into various apicultural products by fully complying with the hygienic rules from production to consumption without conducting artificial recharge and chemical disinfection. According to the Organic Agriculture Information System of The Ministry of Food, Agriculture and Livestock; in 2015, 322 manufacturers engaged with organic apiculture with 38.296 colonies in total, and produced 421,49 tons of honey products across Turkey. In the last 6 years in Turkey, the number of organic beekeepers has shown an increase of 68,5%, the number of colonies has shown an increase of 160,5%, and the total production has shown an increase at the rate of 102,49%. Data about organic beekeeping activities were compiled from Republic of Turkey Ministry of Food, Agriculture and Livestock, General Directorate of Plant Production's organic agriculture information system.

In this study, aimed to organic beekeeping regulations and give information about structure of activite organic beekeeping businessesv in Turkey.

[Abstract:0645]

A Research in the Awareness of Bee Products in Turkey

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With this study, it is aimed to determine the awareness and consumption behaviors of the products. In the survey, firstly, the cities representing 7 geographical regions of Turkey were identified by considering their population. Accordingly, İstanbul, Bursa, İzmir, Manisa, Ankara, Konya, Van, Erzurum, Gaziantep, Sanliurfa, Adana, Antalya, Samsun and Trabzon cities were selected. A total of 1,834 consumers surveyed in these cities. 93.3% of the consumers stated that they consume honey in their daily life and 6.27% stated that they do not. 55.44% of the survey participants consume extracted honey, 16.56% consume comb honey, 27.97% have both extracted honey and comb honey. 49.78% of the consumers buy honey from beekeepers, 37.66% from markets and 12.56% from different places (neighborhood markets, friends). It is stated by the consumers that the awareness of pollen is of 34.18%, royal jelly is of 24.75%, propolis is of 11.67%, beeswax is of 11.19% and bee venom is of 4.72%. 13.31% of the consumers stated that they consume a few of the other bee products other than honey and 86.69% stated that they do not consume any bee product other than honey. It is seen that the highest consumption rate among the regions is in Central Anatolia Region (16.35%) and the lowest consumption rate is in South Eastern Anatolia Region (7.92%). It was found that 45.99% of the consumers did not know about the benefits of other bee products and consumption habits, 17.90% thought the products were expensive, 15.91% did not find the products safe, 10.63% did not like the products and 9.20% could not find/reach the products other than honey, thus they do not consume them.

In the light of the findings, it became clear that the awareness and consumption of bee products other than honey is very low throughout the country. Preparatory programs should be prepared and applied by all sector stakeholders including beekeeper associations and our Ministry, including advertising, public relations, participation in fairs, corporate identity and brand image creation, use of internet and other electronic methods, preparation of sales literature, customer referral and marketing communication tools.

[Abstract:0692]

Improving the Economics of Beekeeping and Farming by Promoting Bee-friendly Farming Methods

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European Professional Beekeepers Association, Oppenau, Germany

Beekeeping is probably the most open production system in the food sector. Bees have a foraging area of at least 30 square kilometers. Many different land uses and farming activities fall within the area visited by a single hive. Therefore the health of our bees and the healthiness and marketability of our bee products depend to a large extent on the methods used by farmers to profitably grow their crops and feed their livestock. It is common wisdom, that the interests of beekeepers in a healthy environment for their bees are in conflict with intensive agricultural practices.

But there is a growing number of projects showing, that developing bee-friendly farming methods also makes economic sense for farmers. While highly intensive practices are highly profitable for those who sell seed, fertilizer and pesticides to farmers, it is not necessarily the most profitable approach from the perspective of the farmers themselves.

In addition, new technologies are making it easier for farmers to protect bees and pollinators in their production system. A cooperation between the European Professional Beekeeping Association, the European Farm Equipment Manufacturers Association and the European Land Owners Organization is actively looking to develop new tools to enable farmers to work in a more bee-friendly way.

This talk will review a number of exemplary projects as an inspiration to find additional common ground with farmers resulting in economically sustainable beekeeping operations as well as successful family farms.

[Abstract:0726]

“Hand in Hand with Beekeepers, Towards to Active Training”: A Case of Izmir Province

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In recent years beekeeping training course is given on all sides of Turkey, but a large part of this training is offered in different standards without practice and depending on the approach of trainer's. A training work was conducted to resolve this discrepancy within the project on “Hand in Hand with Beekeepers, Towards to Active Training” in Izmir Province. The improvement of professional and technical training's context in beekeeping, implementation of an innovative approach to this training process and providing the necessary environment for the achievability of one-to-one practice; has been aimed by this way. Videos on the subjects of beekeeping technical training for this purpose have been made and animations and large-scale visual presentations have been prepared according to the curriculum. A Beekeeping Training Car in this project has been designed by making a protocol with Izmir Metropolitan Municipality for the purpose of being an example to this kind of training programs. During the training process; beekeepers have observed every stage of the administrative systems in different colonies and production of bee products in a practical way. This model has also been an important opportunity especially for the women participants who were doing or wanted to do beekeeping but missed the opportunity of having a training. An exemplary work has been displayed especially in ensuring women's employment in rural development and it has been constituted that most of the women trainees have began their active beekeeping during the two-years project. As a result of the applied training model; the opportunity of high income for the producers and healthy and qualified food production for the consumers has been provided and healthy bee products have been produced. Within the scope of this project; training program have been given in 9 districts in 2016 and 2017. With the purpose of seeing the absence of materials and the situation assessment; a survey is conducted with 35 trainees without any prior information about beekeeping at the end of the training program and with 35 trainees with prior beekeeping training, both at the beginning and at the end of the training.

[Abstract:0727] / PLENARY TALK

An Evaluation on Different Beekeeping Investment Models from Young Beekeeper Point of View

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Since thousands of years human beings have used honey and propolis as food and cure. It is stated in recent years that the awareness of bee products isn't just related with honey by the producers and consumers in Turkey and other countries. With people turning to natural solutions for healthy living, interest in apitherapy, which means healthy life with bee products, has increased and bee products that have been produced for thousands of years for healthy colonies have been researched and diversified. When calculated according to TUIK 2016 data, the number of hives per establishment in Turkey is 93,99 and the production of honey per hive is 13,57 kg. In this study, in order to create a sustainable profitable production model by diversifying the bee products produced by the beekeeping enterprises in Turkey, the aim is to encourage the production of bee products such as honey, pollen, bee bread, propolis, royal jelly, apilarnil and bee venom and calculate their production costs in order to direct beekeeping enterprises to high value added products. In order to enable young people and investors to make a sustainable investment without trial and error method of beekeeping activity in beekeeping enterprises, a beekeeping model has been tried to be based on the feasibility report so that not only honey but other bee products can be produced. For this purpose, 10 companies which are active in migratory and non-migratory beekeeping in different regions in Turkey, healthy, reliable and which perform diversified production in bee products, were selected from small, medium and large scale enterprises. The costs of bee products were calculated and the income levels of enterprises producing honey were compared with the income levels of enterprises which diversified their products. In the feasibility study, the number of hives (containing bees) per enterprise was taken as 100 and the whole production was modeled according to this enterprise size. Beekeeping enterprises need to increase honey production which is the primary bee product by maintaining colony welfare and health for sustainable production and to create different markets by increasing product variety and quality.

[Abstract:0728]

An Analysis on Economical Aspect of the Beekeeping Enterprise: A Case of Kemalpaşa District–Izmir/Turkey

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This research aims to analyse economical aspect of the beekeeping in the villages of Yenikurudere and Dereköy of Kemalpaşa district –Izmir. The main reason for the selection of these villages is beekeeping's widespread. The data was collected by face to face survey from 53 beekeepers in the selected villages for 2014-2015 period. The socio-economic characteristics of beekeeping farms, and technical and economic results of beekeeping enterprises were given in detail. Analysis on technical and economical aspects of beekeeping farms were given by three sub-groups (less than 51 hives, 51-150 hives, more than 150 hive) and by villages. It is tested there is or not any statistically significant difference between the characteristics of beekeeping farms by villages and by the groups of number of hives. While Suitability of variables to normal distribution is tested by the Kolmogorov - Smirnov test. The data showing normal distribution were tested with "One-Way Analysis of Variance, the data not showing normal distribution were analyzed by the Kruskal Wallis test to compare two groups and by Mann-Whitney U test to compare more than two groups. Average beekeeper age was found as 47 and education period was found as 5.68 years in these investigated farms. While the average yield of honey per hive is calculated as 19.27 kg, the yield is 23.80 kg in Yenikurudere Village and 12.65 kg in Dereköy village. Honey, comb honey, propolis, royal jelly and pollen are produced in these farms. Average gross profit per hive was determined as 133.72 TL. Gross profits per hive by groups were 151,53 TL, 138,17 TL and 128.33 TL respectively. While 49.06% of beekeeping farms has sold the beekeeping products to local wholesalers, 33.96% of them to large wholesalers and 16.98% of them to retailers. 83.02% of the beekeepers were benefited from the supports given per hive. The most important problem in beekeeping farms was determined as marketing of bee products.

[Abstract:0734]

Economic Evaluation of Ecosystem Service of Insect Pollination on Crop Production and its Susceptibility in Korea

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Pollination is an important regulatory ecosystem process transferring male gamete of pollen to the female reproductive organ for reproduction. Two third of global crop species are at least partially dependent on animal pollination for proper production. Monetary valuation is critical step for accounting the importance of ecosystem process and planning for enhancement or conservation of the components involved in the process. Even though the larger part of agricultural land is occupied by pollination independent crops such as rice, growth rate of pollination dependent crop area was higher than that of independent crops. Total market value of dependent crop was higher than that of independent crops. Economic valuation of pollination service to crop production was attempted with the data of crop area, productivity, market value and pollination dependency. Pollination service values were estimated over 6 billion USD on selected fruit and horticultural crops. Pollination service values were highly aggregated in terms of county-level spatial distribution. From accounting the hive density of honeybee, *Apis mellifera*, there are some focal points with high discrepancy of demand and supply, indicating the need of active movement of honeybee hives from area of surplus to the area in need, and encouragement of local wild pollinator abundance.

[Abstract:0737]

Branding of Bee Products in Turkey

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Along with the changes in consumer expectations and preferences in the world and in Turkey, good agricultural practices and organic agricultural production of bee products have increased as well as the production of conventional bee products. Transforming bee products into high value-added products via branding and popularizing utilization of these products by promoting them to consumers are extremely important in terms of the development of the relevant sector.

Providing awareness of nutrients and natural features of bee products, particularly honey, has increased the demand however brought up the subject of counterfeit production. In this context, branding of bee products for providing information to consumers about products and services is extremely important in terms of consumer protection, satisfaction and loyalty. The creation of a strong brand; within the frame of the concepts of health and safety, which are generated in the process of production and labeling of bee products; depends on the implementation of a proper marketing strategies. In Turkey, where the consumption preferences are changing towards branded and packaged bee products, branding of honey and other bee products have gained importance therefore branding should be considered for the accurate positioning of Turkey in the world bee products industry.

In this study, practices and studies on brand development in bee products in Turkey will mainly be discussed. In addition, the activities intended to the creation of brand equity in bee products around the world will be explained in terms of brand awareness, perceived quality, brand loyalty, brand associations and legal values (patents, registrations, etc.) and an evaluation for Turkey will be carried out.

[Abstract:0751]

Innovative Approaches in Bee Products Marketing

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In recent years, beekeeping and honey production have become one of the most important production activities in Turkey. Increasing competition in the international arena has led Turkish beekeepers into this competition. Although Turkey has been ranked 2nd in honey production and obtained more than 90% of pine honey production in the world, it has not been able to use this opportunity effectively in the matters of product diversification and marketing activities. In terms of keeping pace with the new developments in the area of beekeeping, it is important to seek for possibilities in product diversification as well as marketing. At this stage, while launching new bee products to consumers; diversification of honey and other bee products will tend beekeepers towards high value-added products. The main purposes of this study are explaining the product diversification and innovative approaches starting with the countries that have important role in honey production and marketing and examining the marketing strategies of Turkish beekeepers for honey and other bee products. From this point of view, first, the current situation of beekeeping and product diversification in the world and Turkey will be examined, then the current and innovative approaches (neuro-marketing, experimental marketing, niche marketing etc.) in bee products marketing will be stated and Turkey's situation will be evaluated.

[Abstract:0757]

Potentials and Prospects of Stingless Bee-keeping in the Philippines

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This study aimed to promote the conservation and utilization of stingless bees for pollination and production of bee products for additional family income. Stingless bee *Tetragonula biroi*, is currently used in the Philippines for pollination of high value crops like mango, avocado and other vegetable crops. It is also used for ecosystem restoration in disaster-hit areas. Apart from the impact of stingless bees in pollination, its products are popular and command high market value. In this study, we analyzed the economics of raising stingless bees for production of honey, pollen and propolis. We conducted survey of stingless bee-keepers and their colony holdings and production. There are 80 stingless bee-keepers spread in Luzon (56), Visayas (20) and Mindanao (4). Among the beekeepers, only eight are keeping more than 1,000 *Tetragonula biroi* colonies where our economic analysis was based. All the colonies are located in Luzon, which could be explained by the abundance of feral colonies and nesting sites. In Visayas and Mindanao, the predominant species are *T. laeviceps*, a species which do not produce surplus honey. As shown in the Benefit-Cost Ratio, propagation of stingless bees on a commercial scale is feasible in the Philippines. Being native to the country, the species has wide genetic pool and resistant to pest and diseases. Moreover, it can exploit diverse floral resources, making their production sustainable. In our mango pollination trial, introduction of stingless bee colonies in the farm during blooming period significantly increased fruit setting. However, there was no valuation yet on the impact of bees as pollinators of mango.

[Abstract:0758]

Direct Marketing in Bee Products

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Today, the number of farmers that distributed their products through direct marketing channels has been continuously increasing. Marketing products directly to consumers provides opportunities for producers to obtain higher margins in the marketplace since there are no intermediaries between producers and consumers. Selling to direct consumers is only opportunity for farmers to increase their share of consumer prices and to cut some intermediaries from the distribution chain for these products. For many small farmers, direct farm marketing is a preferred business option because of the flexibility and the economic returns it provides. Prices for produce sold directly to consumers can be substantially higher than typical wholesale prices. Another reason of the increased interest in farm direct marketing that is producers value the relationships they form with the consumers, as well as the opportunity to receive immediate feedback on their products. Consumers value the fresh, quality products along with the opportunity to support local producers. Also, honey producers increasingly use direct marketing to avoid the intervention of middlemen in recent years. As an example, 24% of honey produced in Bulgaria in 2013 was sold to final consumers through direct marketing channels. The aim of the study is to examine and discuss the direct marketing strategies practiced in bee products, and to put some suggestions oriented to the direct marketing initiatives in Turkey.

[Abstract:0759]

Perceptions and Expectations of Turkish Beekeepers Associations' Towards the Beekeeping Sector

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Beekeeping is a traditional agricultural activity in every region of Turkey. According to the Turkish Statistics Institute, there are 84.047 registered farms dealing with beekeeping and 7.9 million registered bee hives in Turkey in 2016. Turkey is one of the biggest honey and beeswax producers of the world. Turkish beekeeping sector produced 105.727 tons of honey in 2016. Turkey produces 92% of the world's pine honey, specifically in its West Mediterranean and South Aegean regions. Despite of great potential in honey production, it is emphasized that farms dealing with beekeeping in Turkey are not consistent and effective with quality, standards and marketing issues. In this context, it is important to learn the opinions of stakeholders in order to develop the beekeeping sector in Turkey.

In this study, the perceptions of the Unions of Turkish Beekeepers, which is one of the important stakeholders of the sector, towards the beekeeping sector in terms of product characteristics, quality, standards, product development, pricing, branding and promotion in bee products and their future expectations development of the beekeeping sector will be presented. Data of this study will be obtained using electronic questionnaire as online from managers of Associations of Beekeepers in 81 provinces of Turkey.

[Abstract:0760]

Honey Festivals: How to Reach 1000s in One Day & Educate Them on the Importance of the Honeybee

Steve Rogenstein

theBEEcorps

Like many other scientific and grassroots sectors, apiculture can be very insular. Often we talk about insects that others fear in a vocabulary that may not be understood, while attending meetings and reading publications that esoterically don't speak to or include the public at large. While this ordinarily wouldn't be problematic - after all, apiculture, like other passions and hobbies, is niche-oriented, thus necessitating its own terminology and technical know - how - it is exactly at this juncture that we need to reach beyond our inner circles to welcome as many people as possible into the fascinating world of bees. Because we alone as beekeepers cannot save the bees, now is the time to look outward to build allies, invite new audiences to the conversation, and find devout advocates beyond our community to help in the global (and local) effort to protect them.

But how?

After having produced three honey festivals in two major cities, my co-producers and I directly exposed more than 10,000 people to the importance of *Apis mellifera*. Events like NYC Honey Week and BCN Honey Fest have the potential to effectively reach thousands of people through fun, interactive, and educational activities: honey tastings and contests, extraction demos, scientific and cultural talks, hands-on workshops for kids, apiary tours, a marketplace of hive products, and more.

In this presentation not only will I summarize my personal experience organizing and marketing these festivals (in two countries with very different work cultures and languages), but, more importantly, I will provide conference attendees step-by-step guidance on how they, too, can reach the masses by creating honey festivals in their regions. Topics covered will include (but not be limited to) how to get started, identifying potential collaborators, soliciting and involving sponsors, creating engaging programming, marketing to a wider audience, and producing the event itself. At its conclusion, attendees will better understand how even the most resource-challenged individual, nonprofit beekeeping association, or private enterprise can undertake producing a honey festival to educate the masses about bees, beekeeping, and honey, and in the process contribute to the increased awareness of and wellbeing of our beloved honeybee.

[Abstract:0783] / PLENARY TALK

The Basic Problems of Beekeepers in Turkey and the Future of Beekeeping

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Beekeeping and production of bee products in Turkey is one of the increasing production activities in recent years. In this paper, the main problems of Turkish beekeeping and beekeepers' will be explained and the solutions in economic terms will be emphasized. In terms of professional beekeeper, practical and healthy techniques for increasing the bee products' diversity and producing them will be discussed. The importance of bee products in apitherapy will also be mentioned.

BEEKEEPING FOR RURAL DEVELOPMENT

Abstract:0093]

Retaining Development Beekeepers in Projects Through Microfranchising www.africanhoneybee.co.za

Guy Stubbs

African Honey Bee

Although beekeeping projects have contributed to poverty alleviation in a lot of developing countries around the world, success in South Africa has been limited. Englebrecht (2014) states that over \$20 million was spent on beekeeping projects during the period of 2004 – 2014, with no sustainable projects. African Honey Bee, a Christian Social Enterprise, was established to identify the causes of failure in beekeeping projects, and develop a practical solution to assist poor rural people, to benefit from the natural resources on their doorstep. African Honey Bee presumed that if it could help poor rural families produce excellent quality, organic, gravity extracted, raw, traceable honey, it could market the honey for the beekeepers at a premium price, share profits, ensure loyalty, and encourage them to help each other through a microfranchising structure. Instead of training beekeepers, providing them with equipment and leaving them with no support, African Honey Bee partners with the beekeepers through microfranchising. This enabled African Honey Bee to overcome many of the obstacles experienced by the traditional “train, give and leave” project approaches. Changing relationships from a “donor – beneficiary” scenario to a “microfranchisor – microfranchisee” scenario, and treating producers as business partners, rather than beneficiaries. This approach has restored dignity, incentivise loyalty, increased overall stakeholder benefit, and enabled the projects to become self-sustainable. Out of the many failed approaches researched by African Honey Bee, one approach stood out in all the projects as a primary cause for failure: all the failed projects had given protective clothing, beekeeping equipment and commercial hives to the people they had trained. The result of this was - dependency. The people who were trained did not continue with beekeeping if they lacked specific equipment, or equipment broke, or if they did not understand how to use equipment. In response to this problem, African Honey Bee teaches beekeepers to make their own veil from a t-shirt and hat, gloves from old jeans, a smoker from a used paint tin and their hives from whatever materials they have lying about. Only committed beekeepers continue, and when they produce honey, their profit is 100%.

[Abstract:0103]

The Role of Honey Hunting in Supporting Subsistence Livelihoods and in Sumbawa, Indonesia

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Honey hunting has a strong social and cultural heritage value, playing a major role in the livelihoods of villagers in forested areas in Sumbawa, Indonesia. Although honey from the Giant Asian honey bee (*Apis dorsata*) is highly valued in local and national markets, honey hunters remain one of the poorest groups in Indonesian society. Honey hunters also continue to collect honey under dangerous and unsustainable conditions often involving climbing tall trees with burning branches at night and without any safety equipment. This presentation discusses the findings of a key informant case-study undertaken in 2015 examining the issues and opportunities facing honey hunters in Sumbawa. It examines the role of honey as a key non-timber forest product in supporting subsistence livelihoods as well as contributing to plant biodiversity. Key stakeholders involved in the study included members of the Sumbawa Forest Management Unit, honey hunting villages and honey cooperatives. Through structured interviews, participatory questionnaires and focus group discussions the study examined the social, cultural and institutional issues associated with forest honey production. Significantly 83% of participants reported that income from honey was essential, accounting for an average of 68% of income but this income is subject to unpredictable market prices and fluctuating yields. Honey hunters in Sumbawa also face numerous obstacles in finding markets for their honey related to poor roads, limited access to market information, poor linkages to other producers and buyers and a lack of training and extension services.

This presentation discusses opportunities for significant improvement to the welfare of honey hunters as well as achieving a higher value for forest biodiversity. It also identifies the potential for engagement of women in the process of quality control and value adding to honey and other bee products. Recommendations of the presentation include strategies that are focused on: village specific support and improved relations with cooperatives; better education on market price; the provision of basic safety equipment and training; and measures to improve villagers ability to produce higher quality products to achieve a greater return for honey collected.

[Abstract:0105]

The Five Pillars of Successful Beekeeping: Beekeeping for Sustainable Development

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Beekeeping, as a development strategy in developing countries, has many positive attractions, particularly for poor rural farmers. In addition to honey production, honey bees provide pollination services that support biodiversity and improve agricultural production through increased yield. Beekeeping fits in well with women's priority areas and the development of value added products which has significant potential for improving financial independence for women, youth and landless poor. Increasing interest in beekeeping for development programs can also be attributed to the low start up and maintenance costs, ability to scale up production, niche marketing, nutritional and medicinal benefits and its complementarity with other resource intensive farming. While there have been many successful projects there have also been many projects with high resource inputs that have resulted in few, if any, positive outcomes for communities, despite the best intentions of proponents. This variation in success highlights a need to improve the knowledge and ability of those engaged in apicultural development to sustainably implement and optimise the potential for success. This presentation seeks to synthesise the lessons obtained through a review of literature and drawing on the authors hands-on experiences reviewing and implementing beekeeping projects in Southeast Asia and the Pacific. It discusses the key determinates of the success or failure of beekeeping development projects and highlights that successful beekeeping programs require greater expertise than just a basic understanding of beekeeping practices. This presentation provides a framework for identifying the key considerations to be applied at the planning stage and for use in reviews through the life of beekeeping projects. The need to consider market systems and access, local knowledge and cost benefit of various beekeeping systems in regard to productivity, profitability and sustainability often remain in the periphery of beekeeping programs. We present the "Five Pillars of Successful Beekeeping", essential in establishing a successful beekeeping enterprise: pest and disease; honey bee nutrition; genetics; technology; and extension and education. The authors experience suggests that while there has been a focus on technology and modern beekeeping the five pillars for successful beekeeping development are often overlooked.

[Abstract:0201]

Bee Reserve: A Type of Protected Area for Bee Resources, Honey Production and Involvement of Communities

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National Beekeeping Policy of Tanzania encourages involvement of public and private sectors in conservation of bee species and foraging habitats through establishment and management of bee reserves. Bee reserves are categorized into four types namely Territorial, Local Government, Village and Private. It is the type of protected area only found in Tanzania. Ruaha Farm Private Bee Reserve is located in the Southern Highlands of Tanzania being 624km from Dar es Salaam International Airport; 95km from Iringa Municipality and 12km East of Ruaha National Park main gate. The Bee Reserve is managed by Ruaha Farm (T) Ltd that owns the land covering 451.94 ha which has been declared as private bee reserve based on sections of the Beekeeping Act. According to the floral diversity and richness survey, there are 123 plant species from 32 families observed in the area and a phenological data collection is underway. The Bee Reserve is natural with virtually distinct sub vegetation zones; namely, the Upper Vegetation of Commiphora, Combretum and Xeroderris Woodland Zone; the Middle (ecotone or transitional) Zone which is highly bushy and the Lower (Acacia spp. semi consociation) Zone. The variations in vegetation are ideally for beekeeping and conservation of feral bee colonies.

Inside the private bee reserve 500 hives have been sited into three categories of apiaries: extended apiaries comprising hives sited on trees; indoor apiaries in the form of bee cages and hives sited on stands in different layouts. In the process to manage a private bee reserve, the Ruaha Farm (T) Ltd has requested "a bee reserve dedication covenant" from the Authority as a legal note to declare the area. It has built office, staff and storage houses; procured facilities and circulated 1150 hives to communities on contract beekeeping basis. In addition, some hives have been harvested, honey processed, packed and sold including beeswax rendered for colony management. The plan for ten years is to implement activities for protection of bee species and foraging habitats, production of honey and other bee products, branding products, carry out authentication of honey origin, intensify contract beekeeping program and promoting beekeeping tourism.

[Abstract:0232]

Beekeeping History in Egypt

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Egypt, the land of Pharaohs, is the most fertile region, in our historical research field, for establishing the important and paramount roles that honey have played in the social, economic and spiritual life of ancient nations. The ancient Egyptian kept and maintained honeybees for producing the precious wax and honey on large scales. For the recognition of its importance, the bee became a symbol that was associated with all Egyptian kings. Egyptian honeybees *Apis mellifera lamarckii* is the native honeybees race that belongs to Egypt. Comparing the currently-existing species of honeybees to the ancient ones that used to be found in Egypt revealed that they are the same species. Both the bees and honey were then entered religious symbolism together with cattle and Milk, and hence, the expression “milk and honey” was then widely-spread amongst the ancients. Being closely connected with the cult of the dead, the bee was often being a symbol for the soul of the deceased. The hollow trunks of trees and the mud cylinders were the most primitive forms of hives. There are three reliefs showing how honey was collected in ancient Egypt and illustrated that the ancient Egyptian were good apiarists and collected wild honey. Also, they collected honey from their hives twice a year in Upper Egypt, and up to five times a year in the Delta. Moreover, They invented a method of beekeeping migratory, where some inscriptions were found at Luxor Temple. In order to get the utmost yield of honey, the hives were often moved to new spots, where there is abundant clover.

[Abstract:0264]

Livelihood Strategies and Beekeeping in Baringo County, Kenya

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In Kenya, beekeeping offers various benefits which could make it attractive to small and semi-subsistence farmers as a possible strategy for strengthening the sustainability of their livelihoods. However, beekeeping's potential remains largely unexploited and the lack of new entrants is thought to be one key reason for a decline in beekeeping. This study examines the factors affecting beekeeping adoption and strategies in Baringo County, Kenya with a focus on the rural communities in the agro-pastoral zone, in the mixed-farming zone and among the Njemps Community. The impacts of beekeeping adoption and strategies on livelihoods are also discussed. Semi-structured interviews were conducted with 93 informants in these communities, including 41 new beekeepers and 26 key stakeholders at national and local levels. The findings show that farmers taking up beekeeping follow one of two pathways: learning on-the-job from family members or skilled beekeepers in the community (apprenticeship pathway), or through formal training organisations (traineeship pathway). The main factors affecting the decision of farmers to take up beekeeping were: access to information, land and beehives, livelihood options available, perceptions of beekeeping outcomes and performance, feelings towards bees and cultural norms. Choice of beehives and harvesting methods depended mainly on access to equipment and knowledge and, on social restrictions. Value addition were influenced by membership to community based organisations, access to knowledge, tools and equipment and, market demand. Finally, marketing strategies depends on the quantity and quality of honey harvested, payment duration and market demand. This study suggests that to increase the uptake of beekeeping and improve rationality of beekeeping strategies the following should be considered: a) increasing awareness and knowledge, b) supporting local social networks and c) improving access to modern equipment, especially for young people and women.

[Abstract:0283]

Apitourism in Nepal

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Nepal is a one of the beautiful and the richest country in honeybee species diversity in the world. Bees and beekeeping in Nepal have historically been the focus of deep rooted sustainable livelihood and cultural heritage since long time ago. The biggest honeybee of the world *Apis laboriosa*, second largest honey bee *A. dorsata*, domesticated and wild honeybee *A. cerana*, little bee *A. florea* and various species of stingless honeybees are native to Nepal. Honey hunting from the native honeybees in Nepal is the world's famous tradition and culture “a unique and rear events in the world” done by the indigenous community people for thousands of years. This ancestral job of honey hunting in many remote villages of Nepal offers high tourism potential. It provides an opportunity to observe adventurous honey hunting of *A. laboriosa* and *A. dorsata*, carryout experiments on different species of honeybees and bee products and taste the honey of different species of honeybees. All these opportunities which is available within the shortest distance (150 km) in the world has become the core attraction point for tourists from every corner of the world.

[Abstract:0295]

Beekeeping in Ukraine

Gornich Mykola

Gornich Mykola, Ukrainian Beekeeper Journal, Kyiv, Ukraine

Beekeeping in Ukraine has big and long history. In recent years, Ukraine has become one of the main producers of honey in the world. There are 3 - 4 million bee colonies and 300 - 400 thousand beekeepers in Ukraine. Ukraine annually produces up to 100 thousand tons of honey, half of which is exported. The average size of the apiary - 10 bee colonies, the average honey crop - 25 - 30 kg/colony. Beekeeping in Ukraine is predominantly amateur nature. Apiary in 100 colonies is quite large in terms of Ukraine. There are not enough large farms in Ukraine. Amateur character beekeeping in Ukraine creates serious difficulties for statistics and regulation of beekeeping. Therefore, we have not exact statistics, statistics in Ukrainian beekeeping mostly estimated. The main honey plant in Ukraine is sunflower, crops which are 6 - 7 million hectares. Productive honey plants in Ukraine are also acacia, lime, rape, buckwheat. Sunflower honey is 80 – 90% of all production of honey in Ukraine. There are two races of bees, mainly, in Ukraine. It is Ukrainian bee and Carpathian bee. Diseases of bees in Ukraine are varroa, nozema disease, foulbrood. We have significant losses of bees from pesticide and chemicals poisoning in commercial agriculture. Each year, sold 300 - 400 thousand packages of bees, and 200 - 300 thousand queens. In western Ukraine honey is the third largest product after queens and packages. Public administration and regulation of beekeeping on the part of government is insignificant. The cooperative movement in beekeeping of Ukraine is almost absent. The main public organization that unites beekeepers is Beekeeping Union of Ukraine. Scientific support of beekeeping in Ukraine realizes by the Institute of beekeeping and apiculture department Agricultural University. The feature of beekeeping Ukraine is that Ukraine is the most northern country with large producers of honey. We have a fairly long and cold winter, short spring, hot and often dry summer, which creates problems in keeping bees. Honey crop season in Ukraine is very short, rarely more than a month. Therefore, large farms are not always profitable under such conditions.

[Abstract:0301]

Suitable Site Analysis for Beekeeping Activities Via Analytical Hierarchy Process (AHP) and Geographical Information Systems (GIS) Integration

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Nowadays, the importance of the beekeeping activities has been emphasized in the field of biodiversity, ecosystems, agriculture and human health all over the world. Although Turkey has considerable potential in beekeeping with her rich flora, proper ecological conditions and existence of colony; Turkish beekeeping sector has not utilized the rich natural resources sufficiently. According to the beekeeping statistics, while the colony and total honey production rates are increasing, honey production yield rate for per colony remains unchanged. Thus, management, monitoring and deciding correct beekeeping activities are being more important to provide efficient and sustainable productivity. Due to this importance, considering the economic contributions of beekeeping to the rural area, the need for suitability analysis concept has been revealed. At this point, Multi Criteria Decision Analysis (MCDA) and Geographical Information Systems (GIS) integration provides efficient solutions to the complex structure of decision-making process for beekeeping activities. Furthermore, determining suitable locations via this integration for beekeeping should be evaluated in the field of land use planning considering economical, ecological, environmental and social aspects.

In this study, site suitability analysis for beekeeping via AHP method was carried out with their comparisons for Konya city in Turkey. Slope, elevation, aspect, distance to water resources, roads and settlements, precipitation and flora criteria are included to determine suitability. The requirements, expectations and limitations of beekeeping activities are specified with the participation of experts and stakeholders. The final suitability map is validated with existing 96 beekeeping locations and Turkish Statistical Institute 2016 beekeeping statistics for Konya province

[Abstract:0339]

The Collective Way of Innovating: a Strategy for the Development of Beekeeping in Latin America and the Caribbean

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Beekeeping in Latin America and the Caribbean (LAC) is characterized by its Potential for development, practiced by small beekeepers with a strong environmental commitment and an increasing conscience of the need to organize and produce quality to reach the strictest markets. It faces, like all, the challenges of climate change, requiring adapted technologies and quick responses to sustain production. Since 1996, INTA-Argentina's National Apiculture Program (PROAPI) has successfully implemented a sustained strategy in which technology is not transferred as an inflexible package and in which innovation is a process generated in the territory instead than in the laboratory. Then, the technology is adapted to the conditions in each territory, obtaining local information, and only then it is adopted. This is how INNOVATION is generated. This innovation is a collective construction, that results of the joint work of the territorial technicians, researchers and beekeepers, generating what in Latin America was called: "A COLLECTIVE WAY OF INNOVATING". This way, seeks to jointly promote the process of innovation to develop competitive, sustainable and equitable beekeeping, by linking research groups with beekeepers through territorial technicians, to improve the quality of life of people and strengthen the development of communities, and position LAC as the supplying region of high quality bee products in the world market. Since 2013, this intervention strategy was adopted by the REDLAC (Platform for Apicultural Development of LAC) and is being applied in Argentina, Costa Rica and Dominican Republic, having generated innovations among which are: Protein supplement composition; Quality seal; Adaptations of management and multiplication of colonies (Apis and ANSA); Design of extraction rooms; Traceability; Evaluation, selection and multiplication of genetic material; Propolis production and small-scale processing plant design; Characterization of honey; Development of value-added products; Pollination service adjustment; Devices for measuring temperature and humidity in hives; Network of demonstrative apiaries and innovation apiaries.

[Abstract:0348]

Beekeeping: A Tool for Biodiversity Conservation, Livelihood Improvement and Climate Change Adaptation. A Case for Bwindi Forest Conservation Area (BFCA), South Western Uganda

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Uganda is one of the most bio diverse countries on the planet and ranks second among all African countries in term of its biodiversity. This natural richness provides the foundation for its economy basing on biodiversity related products and services in fisheries, forestry, tourism, agriculture and energy sectors. However, the rapid human population growth is exacerbating the loss of her natural resources. This situation is likely to make Uganda's biodiversity endowments (including Bwindi Forest Conservation Area (BFCA) in South West Uganda) highly unsecured. The paper highlights approaches that create linkages between key stakeholders working in partnership to promote beekeeping as an initiative for curtailing the rapid natural resource loss in (BFCA). BFCA besides being a UNESCO World Heritage Site due to its ecological importance, provides excellent resources for bees and beekeeping. Bees are vital part of nature and sustain ecosystems because they pollinate flowering plants, help in conserving biodiversity and produce the most cherished products (Honey, bee wax, royal jelly and bee venom) which are beneficial to man. Despite of the role played by bees, they are often not appreciated by key players in climate change adaptations. Inadequate knowledge about the role of bees in biodiversity conservation, livelihood improvement and climate change mitigation can be detrimental to natural resources.

This paper therefore gives highlights on projects initiated by NGOs and private sector where bees have been considered as crucial ecosystem-based link and pivot for sustainable resource management, Livelihood enhancement and climate change mitigation.

This paper finally attempts to show that beekeeping is a practical tool for raising awareness and an incentive that enhances local efforts in the conservation of BFCA which is important habitat for Mountain Gorilla tourist destination. Thus beekeeping can play a central role in using biodiversity and ecosystem services provided by BFCA to promote sustainable development hence helping in curtailing human activities that accelerate climate change effects.

[Abstract:0354]

Africa: Beekeeping as a Potential Tool for Sustainable Health & Economic Development

Hugo Fearnley

Apiceutical Research Centre

In partnership with the Apiceutical Research Centre and the Winston Churchill Memorial Trust, I conducted field research in several Sub-Saharan African countries in an attempt to understand the role of beekeeping in communities and assess its potential as a development tool. Travelling to Cameroon, Nigeria, Malawi, Zambia and Tanzania I met with beekeepers, academics, business people and development practitioners to try to tease out the pertinent challenges and opportunities for the industry. The research brought to light a number of key considerations worth looking at for any future work involving both healthcare provision and economic development projects. In the countries visited, beekeeping is not a popular activity and therefore not well developed as an industry. Beekeepers generally appear to be operating on a small scale with many challenges relating to equipment, hive health and unstable markets. Where there was apparent success, this was due to long term investment and coordination to tackle the challenges mentioned above.

Understanding and use of bee products is limited - with understanding of propolis very limited. Where propolis is understood for its medicinal qualities, it is generally understood to be useful for oral health, stomach complaints and wound healing, however this knowledge is rarely spread beyond experienced beekeepers and traditional healers. Whilst there are significant challenges with the wider macroeconomics and governance in the countries visited, there were instances where beekeeping could thrive as an economic activity. The beekeepers who were struggling generally had little support and found themselves totally isolated or within a small cooperative but with scarce resources to invest in training and equipment. Often the market for their products would be small, local and volatile, offering little encouragement to invest or attempt to increase production. However in the situations where these issues were successfully mitigated against, beekeeping was shown to be a highly beneficial activity for the individual and wider community.

[Abstract:0387]

Honey bee conservation areas in Turkey

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Turkey has a rich honey bee diversity. Of the 28 recognized honey bee subspecies in the world, four of them (Anatolian, Caucasian, Syrian and Persian honey bee subspecies) were naturally distributed in Turkey. Moreover Muğla, Thrace, Yığılca and many other ecotypes increase the beekeeping potential. During the course of evolution honeybees adapted to Turkey's climate and floral diversity, and survived from diseases and parasites for thousands of years. However recent migratory beekeeping practices are forcing them to admix and result in loss of genetic diversity. Breeding wrong races, marketing incompatible races and the migratory beekeeping being carried out for the last fifty years resulted in an uncontrolled and intense hybridization of natural honeybees. As a result of this admixture, colonies show slow spring development, extreme aggressiveness, high swarm tendency, low disease resistance and decreased honey production. Thus, for beekeepers it is very hard to sustain their businesses. The natural races are left in pure and unhybridized only in isolated and inaccessible locations. Starting from the late 1990s, honeybee research speeding to characterize and conserve this biological richness. Based on the valid techniques such as morphometry, geometric morphometry and also molecular studies (DNA sequencing of specific regions in the mtDNA and also microsatellite variation in nuclear genome) are continuing to characterize the honeybee diversity in Turkey. Currently two of those subspecies *A. m. caucasica* and *A. m. anatoliaca* characterized, in addition *A. m. caucasica* is registered and now they are under conservation in several apiaries in North east and central Anatolia. In addition to these conservation areas there are others established in Ardahan and also in Muğla region. In those apiaries along conserving the subspecies, researches are also underway to select for better characteristics of these conserved honeybees in order to produce quality queens and market them for the benefits of beekeepers. Pure stocks for the sake of queen producing companies or the quality hybrids for the sake of honey producers or all for amateur beekeeper who need them will be distributed in order to increase the honeybee industry as a whole in Turkey.

[Abstract:0421]

The Importance of Forming Artificial Pasture In Terms of Beekeeping From Bingöl (Turkey)

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In 1996, the crisis that arose with the appearance of Varroosis and approximately 60% of the colonies in hollowed logs (barrels) seemed to place Dominican Beekeeping in the face of a terminal crisis. From that moment, the sector began to seek help at the international level and a cooperation project was launched with the Argentine Ministry of Foreign Affairs, led by the Center for Agriculture and Forestry Development (CEDAF). In 1997 the Dominican Beekeeping Network (REDAPI) was formed with the objective of contributing to the technological development of the sector. In 20 years of working together with INTA's PROAPI, Argentina; REDAPI promoted the creation of an inter-institutional and interdisciplinary working team capable of carrying out research, technical assistance and strengthening beekeeping organizations through articulation with national and international public and private institutions in initiatives such as: establishment a bee genetic improvement program, integrated management of Varroosis, integration into the education system, technological innovations, market access, product development, formation of the first beekeeping cooperative that links Haitian beekeepers in the border area, among others. This Cooperative allowed the first honey exportation led by beekeepers organizations and to put their honey on shelves of one of the most demanding local supermarket chain. In 2012 the joint work between Argentina and the Dominican Republic won the First Price in the "Successful Cases Contest of Innovations for Family Agriculture in the Southern Cone", organized by FONTAGRO, IICA, and IDB. This led the foundations for the organization of the Network for Beekeeping Development in Latin America and the Caribbean (REDLAC), allowing DR to join a regional platform to optimize the development of beekeeping in LAC. The Dominican Beekeeping Cluster was formed in 2014 with representation of the entire value chain, and the Strategic Plan "Dominican Beekeeping 2030: Inclusive Development with Environmental Care" is prepared. This plan aims to transform Dominican beekeeping into a development tool for Family Agriculture, contributing to fight against poverty and preservation of the environment by linking five medium term plans of three years that allow to collectively build a future of equitable and sustainable development for the sector.

[Abstract:0454]

The Role of Beekeeping in Rural Development: Case of Kastamonu

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One of the most important problem in today is scarce food resources which can not meet the needs of increasing population. Agricultural lands, which we use for producing food are diminishing day by day in our country and in the world while population are growing rapidly. Because of these developments, necessity to use natural resources efficiently and requirements from the forests are increasing. Beekeeping which produces important products for human health while using limited kapital and produces decent income in a short time period can be described as an agricultural activity without depending on the soil, Therefore beekeeping is very important way of providing food safety for increasing population and income safety for villagers in rural development. Beekeeping is one of the oldest agricultural activities done by the villagers which goes back 9 000 years in Anatolia. Beekeeping does not harm environment and demolish the natural resources, it is also one of the important component of securing natural balance and continuity of life in the planet. It is determined that %85 of the pollination done by the bees in vegetable production. Beekeeping has an iportant role also in forestry by preserving and improving biological diversity. It is important that beekeeping should be supported because it provides food security, contributes to rural development, conserves biological diversity, prevents erosion and protects soil. Because of those reasons Ministry of Forestry decided to promote beekeeping by establishing "honey forests" all around the Turkey. In this study, we have studied the villagers which they have beekeeping certificate in Regional Forestry Directorate of Kastamonu within the scope of ORKÖY (General Directorate of Forest and Villagers Relationships) promotions. Villages in and around the forested areas, especially having more chestnut trees in the coastline of Kastamonu selected to give out beehives (years of 2014 and 2015). Villagers who are selected, have permissions to place their beehives in forested areas. We have performed surveys with those who selected to benefit from the ORKÖY promotions and analyzed the socio-economic effects occurred in this time period.

[Abstract:0470]

Dominican Beekeeping 2030: “Inclusive Development with Environmental Care”

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In 1996, the crisis that arose with the appearance of Varroosis and approximately 60% of the colonies in hollowed logs (barrels) seemed to place Dominican Beekeeping in the face of a terminal crisis. From that moment, the sector began to seek help at the international level and a cooperation project was launched with the Argentine Ministry of Foreign Affairs, led by the Center for Agriculture and Forestry Development (CEDAF). In 1997 the Dominican Beekeeping Network (REDAPI) was formed with the objective of contributing to the technological development of the sector. In 20 years of working together with INTA's PROAPI, Argentina; REDAPI promoted the creation of an inter-institutional and interdisciplinary working team capable of carrying out research, technical assistance and strengthening beekeeping organizations through articulation with national and international public and private institutions in initiatives such as: establishment a bee genetic improvement program, integrated management of Varroosis, integration into the education system, technological innovations, market access, product development, formation of the first beekeeping cooperative that links Haitian beekeepers in the border area, among others. This Cooperative allowed the first honey exportation led by beekeepers organizations and to put their honey on shelves of one of the most demanding local supermarket chain. In 2012 the joint work between Argentina and the Dominican Republic won the First Price in the “Successful Cases Contest of Innovations for Family Agriculture in the Southern Cone”, organized by FONTAGRO, IICA, and IDB. This led the foundations for the organization of the Network for Beekeeping Development in Latin America and the Caribbean (REDLAC), allowing DR to join a regional platform to optimize the development of beekeeping in LAC. The Dominican Beekeeping Cluster was formed in 2014 with representation of the entire value chain, and the Strategic Plan “Dominican Beekeeping 2030: Inclusive Development with Environmental Care” is prepared. This plan aims to transform Dominican beekeeping into a development tool for Family Agriculture, contributing to fight against poverty and preservation of the environment by linking five medium term plans of three years that allow to collectively build a future of equitable and sustainable development for the sector.

[Abstract:0519]

Improvise Hive Security to Curb Menace of High Risk of Honey Theft in Nigeria. A Case Study in Osun State

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Beekeeping still remains one of the lucrative businesses in Nigeria but has not been fully explore with sense of seriousness both from the government, private and public sector. There is no enacted law to help protect the average beekeepers who summoned courage to raise top bar hives with little capital he/she has but instead was made to be at the mercies of the thief at every honey flow season. For over 15 years now more than half of the beekeepers in Nigeria have quit the business simply because of the rate at which honey rubbers set ablaze hives and makes away with honey found in the hive. The aim of the study is to look into alternatives method by which this menace can be curb in other not to paralyze the activity of entire beekeeper in Nigeria. Major areas which are very prone to the honey theft are mapped out in Osun State and we placed those hives there with chain and padlock using iron stand to raise those hives from the ground. Fifteen apiary sites with ten top bar hives each were used for our studies across the state for two consecutive years. The result shows that the rate of theft and hive destruction reduced from 60% to 25% in the first year and in the second year it was further reduced to 12% which gave us hope to embrace the method.

[Abstract:0524]

The Current Status of Brazilian Beekeeping

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In the past decade, beekeeping in Brazil has experienced considerable increase, mainly due to honey market conditions. Although the country is among the largest honey producers in the world, no attempt has yet been made to value the situation of the Africanized honeybee industry in Brazil. In order to fill this gap, a large-scale effort was conducted using structured and semi-structured questionnaires to personally interview 3,169 beekeepers scattered across 15 Brazilian States. Survey data revealed that among interviewees: 71% kept honeybee colonies as a source of complementary income; 54% owned up to 50 colonies; 14% were professional beekeepers with more than 200 colonies; 42% had less than 10 years of beekeeping experience; 56% initiated in the activity learning by themselves; 59% were members of regional associations of beekeepers; 72% attended training(s) in order to improve their management practices; 63% assisted or were assisted by a fellow beekeeper; 69% were not the owner of the property where the bees were kept; 16% practised migratory beekeeping; 54% artificially fed their colonies; 28% and 94% did not inspect colonies for pests and diseases, respectively; 85% did not experience decrease in honey production between 2015 and 2016; 12% reported lower honey production in 2016, compared to previous year, and pointed that climatic conditions (85%) and/or management practices (69%) were the main causes of this depletion. Concerning the 9,452 apiaries: 95% had predominantly wild flowering plants as foraging resources; 68% were surrounded by pastures and/or maize crops; produced, in average, 21.6 kg honey per colony per year. These data provide useful baseline figures to optimise beekeeping and make informed management decisions in bee breeding and conservation efforts, since honeybees are a highly valued resource for Brazilian agriculture (improving crop pollination services) and a mean to increase household income streams (selling bee products, such as honey, wax, pollen, propolis and royal jelly). Also, these figures show that Brazilian beekeeping has excellent conditions to grow its potential production in a few years.

[Abstract:0545]

The Status of Beekeeping in Northern Cyprus and Development from Past to Present

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Cyprus is an island with many political and commercial problems. Turkish Republic of Northern Cyprus (TRNC) is a politically unrecognized state. Despite this, the honey bee activity in this region has begun to develop in recent years, as the honey has been allowed to pass through Europe under the regulation of the green line. Many innovations have been made with the support of the European Union to the Northern Cyprus Beekeeping Association under the grant scheme. In this context, the installation of cards with RFID microchips has been started for every hive which is called beekeeping registration system. Thus, all activities of the beekeepers can be checked by registering the beekeeping. Larvae and adult bees from all apiaries throughout the island were evaluated for honey bee diseases. In this study, honey bee diseases especially Varroa, Nosema and foulbrood were investigated. An epidemiological map covering the northern part of the island has been taken in the direction of disease detection. Regional beekeeping trainings for Cyprus beekeepers also provide technical information with specialists. These trainings are on the topics that beekeepers need to know about such issues as seasonal care and fighting honey bee diseases. In addition to presentations, practical trainings are given at the apiaries. In addition, the government has begun to provide financial support every year for each hive in the context of direct income support in the government program. Such innovations are continuing to work in the TRNC to achieve the European standards of the beekeeping sector

[Abstract:0583]

Haitian Beekeeping

Bo Sterk

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Paper: Haitian Beekeeping

Keeping bees is vital to the farmers and beekeepers of Haiti, the poorest nation in the Western Hemisphere. Beekeeping is part of the Haitian culture. Haitian farmers and beekeepers rely on ineffective traditions though. They continue to work with log hive colonies for crop pollination and honey production using information and techniques handed down through generations. Although they follow tradition, my project introduces more effective and efficient contemporary beekeeping strategies to assist the apiary practices of the Haitian farmers and beekeepers. The project I began 12 years ago in Western Haiti offered education and training in simple beekeeping methods. Building upon the skills already employed in beekeeping with traditional log hives, the curriculum includes basic bee biology, the use and management of top bar hives and the importance of bee space. The aim of this work is to provide knowledge and opportunity for families to develop a source of sustainable income through more effective and efficient beekeeping and farming in a crippled nation.

Haitians value education and know it is the only way out of poverty.

[Abstract:0598]

Traditional Beekeeping and Potential Development in Botswana

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Ministry of Agricultural Development and Food Security

Natural forests carry diverse resources available for human consumption and other related activities. Indigenous societies across Botswana have benefitted from forest products for millennia and some of these inter alia honey from bees which show high potential for beneficiation through beekeeping. This paper explores traditional beekeeping and potential contribution to the development of the sub-sector in Botswana given the conducive environment provided by the varied native natural vegetation. It also provides policy development options in view of the lack of the same in the country. In Botswana, honey consumption is part of a long tradition of honey hunters who gather honey from wild colonies of stingless and stinging bees as a preferred food. However, the practice of keeping bees in artificial hives in apiaries is a relatively recent development as it dates back to the 1970s when the Ministry of Agriculture established the Beekeeping Unit to promote honey production in the country. The major challenges in beekeeping include low adoption of technologies due to inadequate extension service, lack of research, farmers' inability to adhere to food safety standards, lack of legal framework to guide the development of the sub-sector and inadequate institutional support. It is evident that for the sub-sector to develop, these challenges must be addressed.

[Abstract:0599]

Development of Şırnak Province Beekeeping Activities within Rural Development Projects

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In this study, projects which are being carried out in order to develop beekeeping activities in the province of Şırnak within the scope of rural development projects, especially GAP-TEYAP project, are examined. There are nine provinces in the Southeastern Anatolia region that have quite different beekeeping potentials in terms of ecological, climate and topographical features. The grassland areas with rich and natural floral diversity have an important potential for both traditional and organic beekeeping in the region. As in the case of Şırnak province, analysis of the situation in beekeeping was prepared as a result of the studies conducted with village meetings, questionnaires and institutions-organizations within the scope of GAP-TEYAP Project. The results and outcomes of the projects will be presented in order to inform the agricultural consultants and beekeepers about honey and pollen production, beekeeping management and nutrition, disease and pests. Projects and studies will be introduced in order to develop of beekeeping activities and the increase of the economic income level of the local people.

Key words: Rural development, Beekeeping in GAP Region, Beekeeping project in Şırnak province

[Abstract:0606]

Socio-Economic Structure and Problems of Beekeepers in Muğla

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Beekeeping, which is crucial for agricultural production and sustainability of nature, is also one of the important income sources of agriculture sector in terms of profitability and productivity that it provides with regards to its production costs. Beekeeping is one of the livestock activities, which is most nature-dependent and most affected by climate due to the life cycle of honeybees and raw materials of its products being collected from the nature. The migratory beekeepers, who provide almost whole of the honey production in Turkey, aim to increase their production and income by utilising Turkey's rich flora resources and differing biodiversity across regions. Depending on the different flowering periods, geographical and climatic conditions, the migratory beekeepers maintain the same lifestyle as Yoruks, nomads. For this reason, socio-economic and cultural characteristics of the migratory beekeepers, social relations they have established in their activities and the problems they have experienced are the subject of the sociological research. Together with its districts, the city of Muğla is in the central position in the pine honey production and it makes approximately 85% of the country's production. According to data from the Turkish Statistical Institute (TUIK), in 2016, the city of Muğla produced 15,875 tons of honey in 982,601 hives with 4833 beekeeping enterprises. Muğla beekeepers, who have an important share in honey production in Turkey, migrate to the tablelands in almost every region of Anatolia in the beginnings of spring months (March-April) according to flowering periods and return to Muğla for pine honey towards the end of summer months. This research aims to identify the socio-economic and cultural characteristics of the Muğla beekeepers and the problems they experience, and to carry out a sociological analysis. The data of the research have been obtained through questionnaires applied to 450 beekeepers selected by taking account 10% of the beekeepers live in the each districts of Muğla in the year of 2017 and by simple random sampling technique. Furthermore, interviews with experienced beekeepers in the field of migratory beekeeping have been carried out. The obtained data have been analysed by using the SPSS program.

[Abstract:0613]

Apitourism - How Tradition and Innovation Open New Alleys for Beekeeping

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Apimondia, Rome, Italy

Apitourism is not new as a general concept *per se* since for centuries rural hospitality, including beekeeping farms, have hosted visitors on their premises to show how bees are kept and how their products are derived and processed. Concurrently such occasions of contact with the public offered the possibility to promote the properties of their bee products and sell them. However in the last decade there has been new strong emphasis on combining a structured rediscovery of beekeeping with the environment in which it is exercised. In this specific context, the environment is considered on an extensive basis to embrace also the tourist dimension.

in fact, several new itineraries, travel channels and tours have been developed and offered to various strata of tourists and general public to attract them to where beekeeping is conducted to show the details of the operations and also to educate the visitors on the close symbiosis between apiculture and the surrounding environment. It is the importance of preserving the environment for safeguarding the future of humankind and livelihoods that exerts significant attraction on customers who wish to understand the intrinsic dynamics of this relationship. This paper covers the main features of how apitourism is being implemented and offered to the public and addresses also the potential for future new developments.

In particular, special attention is being paid on how apitourism can integrate and support the normal beekeeping operations and enhance the sale of bee products taking advantage of hospitality services and the local tourist features and facilities. Moreover, apitourism is being considered here also as a means to diversify operations in the beekeeping farms to increase the robustness and resilience of the activities.

In this context, attention is devoted to the profiling of the customers, the range of services offered and the array of facilities that are typically set up in apitourism to attract visitors.

Examples of how apitourism is organised and marketed are considered with cases taken from Europe and South America to analyse how the offer package is developed and the related services are being rendered in different countries and cultures.

[Abstract:0629]

Opening of Foreign Markets to Small and Medium Producers of Bee Products of Ukraine

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Export of Ukrainian honey is increasing every year. During 2016 Ukraine exported 56.988 thousand tonnes of honey worth about 97.282 mln. USD. The price of Ukrainian honey on the world markets is very low, because a trader sells honey as a raw material. The ability to extend export for beekeepers – both small and medium business – will be the starting point for efficient development of beekeeping in Ukraine at a professional level. The Ukrainian market as regards to honey export is monopolized by traders - exporters. Beekeeper cannot export the products and remaining honey supplier for the trader, he becomes completely dependent on the trader. The traders buy out honey from the beekeepers at a very low price – 1 USD per kilogram. The beekeeper –producer does not receive the expected income, his work becomes unprofitable. This is the reason why the beekeeper –producer is not motivated to work better: register his apiary, receive veterinary care, acquire new knowledge, apply new technologies and develop in order to meet all requirements for safe production of beekeeping products.

Later, it would lead to reduction of the number of apiaries, total number of bee colonies, pollination crisis, and reduction of crop yields. This may be one of the challenges of the food crisis. The main objective of the NGO "Brotherhood of Ukrainian Beekeepers" is to protect the national market and domestic producer. The beekeeper as a producer, must have a solid legal framework to facilitate its profitable operation, implementation of innovative technologies in his practice, will contribute to his ability to become the operator of the national and international markets and sale the beekeeping products with higher added value. For beekeepers export practices will become an incentive for high-quality work. The report is devoted to the legislative initiatives of the beekeeping organisation and scientists of Ukraine based on the experience and practice of EU and world countries in order to provide the status of exporters to the beekeepers-producers of bee products. This will facilitate the development of small and medium business in beekeeping of Ukraine, rural development and improvement of the environment.

[Abstract:0670]

Modifying the Langstroth Honey Bee Queen Rearing Techniques to be Adoptable to the Top Bar Hives and African Bee Species

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INTRODUCTION

The world bee population is declining due to various reasons. Most of the principles of queen rearing were done with domesticated bred bees as against the wild African bees as well as the architecture of the Langstroth hive.

To enable us get over these challenges, various innovation are being adopted to modify the various Langstroth based queen rearing techniques to suite the top bar hive with respect to the African bees

MATERIALS AND METHODS.

Metal cutting edge fixed to a welding clamp to cut

15mm diameter circular or square cut combs

Zigzag edged combs slanted at 135° to the vertically to project zigzag combs as 'fingers'

A 12mm wide strip of comb which contains 2 or 3 cell on both side of the comb.

An inverted metal triangle of width 2.5cm, sides of 22cm and base 10cm with side slanting at an angle of 135°

A 3 inch paper clip, pieces of cardboard.

A T –shaped metal plate with metals protrusion attached to its'leg' at 90 and 135 degrees respectively

Plastic queen rearing cups

Method

Combs with a maximum age of 2 ½ days and turned upside down is taken as a queen cell and worked on by the worker bees.

The comb is then cut into square, circle, strips as stated above and attached to the various tools with molten bee wax for them to face downwards and are further placed in a queenless bee hive until near emergence of the queen

CONCLUSION AND RECOMMENDATION

The above system when adopted ensured that the queen bee is not handled as it is difficult to see them both during the day and night due to the harassment of the wild worker bees. This will enable all small scale bee keepers to produce their own queens and increase their colonization rate for more production of honey and other bee productions.

[Abstract:0672]

Modification or Innovation of Top Bae and Frames as an Efficient Propolis Collecting Mechanism for Top Bar and Langstroth Hives

Abraham Addo Ansah Allotey

Abraham addo- ansah allotey

Introduction

Africa propolis. has not adequately been commercially harvested and researched into due to impure propolis harvested by the scrapping at the top bars. This technical research is to develop a more or less a universal propolis collecting mechanism

MATERIALS-METHODS:

1.5 mm thickness metal plate of dimension

1. 2 pieces of 2.5 by 22cm – ‘A’
2. 2 pieces of U Shaped metal of base width 2cm and each ‘arm 4-5cm with plate width of either 3.2 or 3.5cm – B
3. 4 pieces of U shaped metal plate of base dimension 5mm and ‘arms’ of 10mm with length of 22cm – C
4. 2 pieces of L shaped metal plate of width dimension of either 3.2 or 3.5cm and lengths of 2cm for each side of the L – D
5. 6 pipes of 5mm rods at lengths 48cm but threaded at 15cm at both ends – E

METHODS

6. 6 pieces of metal plate of length 6cm and width 3.2 or 3.5cm with two sets of drilled holes parallel to each other with mid distance of 1.5cm and evenly spaced distances of 4mm – F
7. Propolis mesh of dimension 22 by 40cm – G

METHODS:

A frame system is formed by the materials above. Plate ‘A’ is welded at its top with plate B and sandwiched by E with F protruding upwards and the open end of B facing outwards when placed in the hive. Plate C is fixed internally of A’s edges

At the base of A, two plates of D is sandwiched between A and F with part of D facing inwardly of the hive with F protruding downwards.. The rods are passed through the F plates to hold the two sides. The mesh is slotted in from the top to collect the propolis to till up the mesh.

CONCLUSION & RECOMMENDATION

The set up can be varied to fit any type of standard hive for efficient propolis collection In the Langstroth, all the frames are covered except where the Propolis Collector is placed for effective light incidence.

[Abstract:0690]

Implementing the Apimondia Open Source Breeding Material (OSB) License to Protect Beekeepers Rights Under the Nagoya Protocol

Walter Haefeker

European Professional Beekeepers Association, Oppenau, Germany

The Apimondia Open Source License was adopted to maintain honey bees as a common good in the hands of the beekeeping community. It protects the traditional breeding activities with an open-source licence. This is the most efficient way to legally protect our bees from patenting and privatization. On the basis of this license concrete steps can be taken by each beekeeping association to maintain the genetic diversity in the hands of the beekeepers. The license is based on the concepts of the International Treaty on Plant Genetic Resources for Food and Agriculture, which was ratified in Brazil in 2008 and Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity.

Because honey bees fall with the scope of these international agreements, the Commission on Genetic Resources for Food and Agriculture, at its recently completed 16th session, requested FAO to consider including domesticated honeybees and potentially other pollinators in the Domestic Animal Diversity Information System hosted by FAO, which is the official tool recognized by the Convention on Biological Diversity for monitoring the status of genetic diversity in global livestock breeds. During the 44th International Apimondia Congress Apimondia in Daejeon, Korea 2015 the Working Group 10 was tasked with drafting a public license intended to be used by the beekeeping community when exchanging honey bee genetic resources, which does reserve the rights of the beekeeping community to protect this common good from undue commercial exploitation or bio-piracy.

Any use of the honey bee genetic resources of commercial purposes outside of the traditional scope of the beekeeping community has to ensure the beekeeping communities’ prior informed consent, and fair and equitable benefit-sharing, keeping in mind established procedures as well as customary use and exchange. The recognition of beekeepers’ rights is a form of promoting the conservation of pollinator genetic resources and of traditional knowledge and of ensuring current and future food security. Beekeepers are joining forces with breeders of live stock and crops to protect the rural biodiversity and economy.

[Abstract:0694]

Impact and Current Situation of Varroa Mites to Beekeeping in Zimbabwe

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National apiculture association of zimbabwe

In 2011 varroa mites crossed the border between South Africa and Zimbabwe. The spread was monitored and varroa quickly spread in hives across Zimbabwe. Researchers used sticky board under screens between floors and brood chambers of frame hives to trap the mites which came off the bees. The mites were counted and then examined under a microscope. It was found that a number of the mites were missing legs from one to six. Researchers also found that the percentage of mites harmed or mutilated varied from hive to hive e.g. one colony mutilated 5% while another over 45%.

The full paper will therefore aim to determine the impact the percentage of mites harmed by different colonies have of the beekeeping and honey production and whether it is significantly increasing or decreasing. (If there are differences then may it be possible to selectively breed strains of *Apis mellifera scutellata* or *Apis mellifera litorea* able to control the proliferation of the mites in such colonies. Six randomly selected colonies in frame hives will be placed over sticky boards. The colonies will be roughly equal in numbers and in the amount of brood they contain. They will be placed in the same apiary with enough space between them so that drifting is unlikely to occur.

The sticky boards will be examined daily and the numbers of mites on each will be recorded. The numbers of mites with damage to the legs will be recorded. The production of honey will also be monitored. The results will be analyzed to determine if there are any significant differences in how the different colonies deal with varroa mites and its impact on honey production.

[Abstract:0713]

The Pathway to Develop Emirati Bred Honeybees

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Abu Dhabi Food Control Authority

Honeybees in the UAE have long been prone to large annual die-offs, with almost 90% unable to survive from year-to-year. Beekeepers dealt with these die-offs by restocking with honeybees imported from other countries, mostly Egypt. Over the past two years the cause of the die-offs were found to be underpinned by uncontrolled infestations of *Varroa destructor*, as well as the negative effects of microbial diseases, lack of bee nutrition and the harsh summer conditions. A package of technologies was developed and put in place to overcome the die-offs and ensure that honeybees survive throughout the year and from year-to-year. Annual survival rates were improved from approximately 10% to more than 96%. After solving the bee die-off issue a program was initiated to produce honeybees bred in the UAE for UAE conditions. This involved, (a) importing mostly genetically improved queen bee stock (in the form of queen bees) from regions with similar climatic conditions to the UAE, (b) assessing this stock under UAE conditions, (c) selecting the best performing stock and, (d) crossing the best-with-the-best. The first generation crosses have proven to be mostly superior to previously imported stock. They survive all year round and from year to year, produce large colonies and more honey. They will be further improved over the coming years.

[Abstract:0715]

Examination of the Importance of the Beekeeping, Women Employment and Local Governments for Ensuring of the Rural Development in Izmir Province

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The Metropolitan Municipality of Izmir Province, Department of The Agricultural Services, Branch Office of The Agricultural Projects

A series of projects have been worked out and conducted for extending healthy, environment- friendly and sustainable agricultural production, employing of women for increasing rural development, improving the existing products/systems, extending the new products and production systems, preventing the migration of the young people from country sides to the towns via creating employment areas in agricultural and transporting of the trustful/healthy products that have been produced from these areas by city hall of Izmir in the rural areas of İzmir Province that have a good potential about agricultural production and commerce. In this leaflet, the issues of the maintainability of the women employment by beekeeping on rural development which are ensured by the local government and beekeeping as an important agricultural activities that has low investment cost and getting products with high added-value for the employment of the women live in rural areas and getting women strong economically will be presented. Achievement of this project includes as well as technical and practical education about beekeeping, hives with the honeybee colony, hives without honeybee, queen bees and beekeeping equipments are given to producers who want to do beekeeping, also methods of the producing the royal jelly and breeding the queen bee have been trained by “The Mobile Training Vehicle” to the producers who live in the rural areas have been carried out since 2015 by Metropolitan Municipality of İzmir with the aim of improving especially increasing the employment of the females in the rural areas will be examined in that development of beekeeping and ensuring the accessibility of the other honeybee products except honey which are very important for the consumer’s health in better conditions.

In this paper, giving supports for the aims of the project as preventing the migration by increasing the women producers’ employment and welfare in rural areas, side income for producers and healthy and quality honey and other honeybee products for the consumers, main results and achievements and results obtained until today will be presented in detail.

[Abstract:0724]

Current Situation and Development of Beekeeping in China

Lucia Ma

Shenzhen Benefitbee Bee Industry Co., LTD

With development of China's economy, the beekeeping industry is growing rapidly. In view of current situation, much consideration has been made on how to achieve sustainable beekeeping in China. China is the world's beekeeping country, where bee population and bee product over the years have been ranked top in the world. Beekeeping has always been an important part of agriculture, and essential part of economic, social, and ecological benefits. It does not occupy land and fertilizer, nor pollute the environment, for which it does no harm to industry. However, the foundation of sustainable development of beekeeping in China is not stable, the standardization of scale production is not high, and the degree of organization is low, even part of bee farmers’ legitimate rights and interests are not guaranteed. There is still a far distance between China’s beekeeping and developed countries’. This paper is to analyze the existing problems and development direction of beekeeping industry in China.

[Abstract:0744]

Using the R'WOT Technique to Develop the Western Mediterranean Region Strategic Action Plan for the Beekeeping Sector

Ufuk Cosgun

Karabuk University, Forest Faculty, Department of Forest Engineering, Chief of Forest Policy and Management

This approach combines the “Ranking Technique” and the multi-factor decision making “Linear Combination Technique” used in problem solving, together with the SWOT analysis to identify priority values of the decision making factors. Thus, the SWOT Analysis Technique, using the R'WOT Technique by combining the Ranking and Linear Combination Techniques, allows the SWOT groups, and each of the SWOT factors within each SWOT group, to be quantitatively identified and prioritised.

AIM: To develop a “strategic action plan” according to the priority areas which shall be the basis for the beekeeping sector strategic plan, developed with the aim of providing solutions to problems of the beekeeping sector for beekeepers in the Western Mediterranean region.

METHOD: In order for the study to reflect the beekeeping sector, four target groups were established. These four groups are: i) Executive Boards of the Beekeepers Associations of Antalya, Burdur and Isparta provinces; ii) Rural beekeepers who have participated in the beekeeping training provided by the Regional Beekeepers Association; iii) Beekeepers and muhtars of forest villages who have taken ORKÖY beekeeping loans and who are continuing their beekeeping activities; and iv) Other forest villagers in the ORKÖY beekeeping loan region whose main source of livelihood is beekeeping. The study included a sample total of 156, as 63 from Antalya, 41 from Burdur and 52 from Isparta with the five target groups with which the R'WOT technique was applied.

CONCLUSION: For each provincial level, the following were ranked in regards to beekeeping in the region: i) ranking of SWOT groups according to degree of importance; ii) the sub-groups for all SWOT factors were ranked in order of importance for each of the SWOT groups; and iii) all factors were ranked in order of importance for all SWOT factors by combining all SWOT factors of the groups into one. Analysis showed that the first three ranked variables were Threats/Risks for Antalya, Opportunities for Burdur and Opportunities and Threats for Isparta. The “Beekeeping Sector Strategic Plan” was developed for each province by identifying the medium and long term factors for each of the prioritised aspects related with the beekeeping sector.

[Abstract:0745]

Boosting the Potential of Beekeeping Through Free Access to Validated Practices and Technologies: the Role of TECA

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TECA - Technologies and Practices for small agricultural producers (<http://teca.fao.org>) - is the FAO's online platform for the exchange of agricultural knowledge and information for smallholder farmers. The platform consist of two components: (i) a Repository of agricultural practices and technologies that have been tested by farmers in the field and which are described in an easy to understand language and format to facilitate their adoption by farmers; and (ii) Exchange Groups, these are thematic focused groups where stakeholders can virtually meet and discuss about challenges and opportunities to boost smallholders producers' livelihoods. The TECA Beekeeping Exchange Group was initiated in 2010 in response to a growing demand for a central place for the sharing and exchange of reliable and validated information on beekeeping. The TECA Beekeeping Exchange Group is available in English, French and Spanish and is managed by FAO – Research and Extension Unit (AGDR) in collaboration with Apimondia, FILAPI and BNNS/MMH. To date, 11 registered partners from around the globe shared on TECA almost 100 technologies and practices on various aspects of beekeeping. To meet the community needs, over 25 moderated discussions have been organized on a wide variety of relevant topics in beekeeping since the launch of the group. To keep up with the global raising demand for quality beehive products, and to allow for farmers to increase their income from beekeeping, free access to reliable and validated information on sustainable beekeeping practices and innovations, among other things, is essential. This paper outlines how the TECA platform can play a key role in making reliable and validated beekeeping practices and technologies freely available to smallholder beekeepers around the globe. It also explains how research can benefit from TECA to disseminate their results that have been tested by beekeepers as well as how beekeeping communities can benefit from TECA content. It concludes with illustrating how TECA offers the opportunity for all interested stakeholders to share sustainable practices to increase the benefits from beekeeping and meet the growing demand for quality beehive products.

[Abstract:0756]

Beekeeping with *Apis cerana indica*: A Valuable Tool to Increase Incomes for Smallholder Farmers

Sujana Krishnamoorthy, Rhea Cordeiro, Dhara Patel, Sachin Dhavle

Under The Mango Tree

84% of India's farmers are small and marginal farmers, owning less than two hectares of land. Agriculture is rain fed and subsistence with income being insufficient to meet household expenditures. Marginalisation means little access to improved agricultural practices, skills or new livelihood opportunities. It is in this context that Under The Mango Tree pioneered the Bees for Poverty Reduction model in 2009 - training farmers in beekeeping with the native *Apis cerana indica* through year round farmgate, practical trainings. The bee is well-suited to diversified farming systems, input costs are low as the bee is locally available, resilient, does not need to be migrated and is well adapted to local flora.

To date, 4000 farmers have been trained as beekeepers, Master Trainers in 3 states in India – Gujarat, Maharashtra and Madhya Pradesh. Ecosystems of supportive services – local carpenters producing bee boxes, women's groups stitching swarm bags, bee veils, traditional honey hunters trained as colony spotters – have created additional livelihoods.

Impact:

- a) Quantifiable increases in yields of local crops – cashew, mango, guava and vegetables like cucumber, chillies – leading to sales in local markets and increasing household income.
- b) Honey has been an additional source of revenue.
- c) Honey hunting has stopped due to increased awareness on role of bees. Bees are now put in beehives instead of destroying combs and killing bees, contributing to an improvement in local pollinator density and better ecosystem services for entire villages, some having 50-60 beehives.
- d) Another quantifiable outcome has been crops like sunhemp – earlier a little grown fodder crop, now widely grown – thanks to better pollination, leading to new income streams.
- e) Realizing the potential of women in the activity, a women's beekeeping project was undertaken in 2014. Baseline and endline surveys revealed the breaking of gender stereotypes. Initially, 80% felt that beekeeping 'was a man's job'. In two years, 60% women felt that both men and women can do beekeeping equally well, with women Master Trainers emerging as role models.

These outcomes point to the need to incorporate beekeeping with local bees to agricultural and rural development policies especially in countries like India.

[Abstract:0795]

Local Bees are the Best Bees

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A consideration of how to make use of genetic variation and adapted honey bee populations in beekeeping. Local bees are the best bees for Europe, Africa and Asia, but what about other regions? What are we to consider regarding the replacement of *Apis cerana* in many areas of Asia by *Apis mellifera*? Is it always a bad thing or can there be accounting for economic realities or perceptions?

BEEKEEPING TECHNOLOGY AND QUALITY

[Abstract:0138]

Innovative Modifications of Effective and Healthy Ukrainian 3-storeys Vasyl Priyatelenko Beehive and Unique Frames with Metal Top Bars

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²Private Beekeeping Farm, Village Zherdova, Kiev District, Ukraine

Propolis is a natural substance known to be beneficial for human health and used as a folk medicine in many parts of the world. In this study, phenolic profiles, antioxidant properties and anti-alpha glucosidase of Beijing propolis extracted by different ethanol/water solvents were analyzed. Our results reveal that phenolic compounds, anti-alpha glucosidase, and antioxidant properties of propolis extracts were significantly dependent on the concentration of ethanol/water solvents. Totally, 29 phenolic compounds were identified: 12 phenolic acids, 13 flavonoids, and 4 phenolic acid esters. In particular, 75wt.% ethanol/water solvent may be the best for the highest extraction yield and the strongest antioxidant properties. The presence of high level of pinobanksin- 3-O-acetate in Chinese propolis may be a novel finding, representing one-third of all phenolics. Our studies also reveal that these propolis extracts with complex phenolic composition presented higher antioxidant activities. All extracts were significantly effective in inhibiting α -glucosidase from baker's yeast and rat intestinal sucrase in comparison with acarbose ($P < 0.05$). The 75% ethanol extracts of propolis (75% EEP) showed the highest inhibitory effect on α -glucosidase and sucrase with a noncompetitive inhibition mode. 50% EEP, 95%, EEP and 100% EEP exhibited a mixed inhibition mode, while water extracts of propolis (WEP) and 25% EEP demonstrated a competitive inhibition mode. These results suggest that 75% ethanol extracts of propolis may be best used as antidiabetic nutraceuticals.

[Abstract:0156]

Properties, Production Technology and Efficient Use of Beeswax Foundation with the Addition of Propolis (Bee Glue)

Valerii Dombrovskiy

Ltd Kyivobltdzholprom

Vital functions of honeybees depend on many internal and external factors, including the state of the brood nests. The quality of raw beeswax for producing foundation and the honeycombs rebuilt on it has a subsequent effect on the processes associated with the development, productivity and spreading of diseases in the brood nests. We have set the goal to ground theoretically and experimentally the efficiency of applying the additives of bee glue fractions in producing the wax foundations, as well as to improve the equipment and technology of their production and study the efficacy of their application. At the first stage, by applying conventional techniques, we conducted microbiological, physical, biochemical research of the wax foundation samples produced in a traditional way (control group), and the samples obtained from raw beeswax to which we have added various bee glue fractions. At the second stage we made a comparative evaluation of beeswax samples directly in bee-colonies using zoo-technical and ethological research methods. Microbiological studies have shown that the wax foundation with additives of the bee glue fractions inhibits the growth of microorganisms during the first five days, including *Ascosphaera apis* (by 85-95%) and *Aspergillus niger* (by 75-90%) and increases the survivability of bee-families in winter, when the reduction of bee wastes in winter due to a decrease of fecal load of colon and absence of excrement traces in the nest are observed. In cases of expansion of brood nests it has been determined that compared to the control group, the number of bees was in 3,6-5,8 times higher on the experimental beeswax, and bee-families were rebuilding their honeycombs faster and more actively. Through using conventional and experimental wax foundations in the commodity apiaries in different regions of Ukraine the increase of productivity of honeybee-families within the experimental group by 16.2 kg for 5 years, compared to the control group ($P < 0.01$), has been set. Given the inhibiting effect on pathogenic microflora, stimulating influence on the development and performance of the bee-families, the experimental beeswax is recommended for widespread use in beekeeping. All rights to the above products are protected by patents and copyrights.

[Abstract:0200]

Effect of Aqueous Ethanol Extracts of Propolis on Phenolic Profiles, Antioxidant Properties and Anti-alpha Glucosidase

Hongcheng Zhang

Institute of Apicultural Research, Chinese Academy of Agricultural Sciences

Propolis is a natural substance known to be beneficial for human health and used as a folk medicine in many parts of the world. In this study, phenolic profiles, antioxidant properties and anti-alpha glucosidase of Beijing propolis extracted by different ethanol/water solvents were analyzed. Our results reveal that phenolic compounds, anti-alpha glucosidase, and antioxidant properties of propolis extracts were significantly dependent on the concentration of ethanol/water solvents. Totally, 29 phenolic compounds were identified: 12 phenolic acids, 13 flavonoids, and 4 phenolic acid esters. In particular, 75wt.% ethanol/water solvent may be the best for the highest extraction yield and the strongest antioxidant properties. The presence of high level of pinobanksin- 3-O-acetate in Chinese propolis may be a novel finding, representing one-third of all phenolics. Our studies also reveal that these propolis extracts with complex phenolic composition presented higher antioxidant activities. All extracts were significantly effective in inhibiting α -glucosidase from baker's yeast and rat intestinal sucrase in comparison with acarbose ($P < 0.05$). The 75% ethanol extracts of propolis (75% EEP) showed the highest inhibitory effect on α -glucosidase and sucrase with a noncompetitive inhibition mode. 50% EEP, 95%, EEP and 100% EEP exhibited a mixed inhibition mode, while water extracts of propolis (WEP) and 25% EEP demonstrated a competitive inhibition mode. These results suggest that 75% ethanol extracts of propolis may be best used as antidiabetic nutraceuticals.

[Abstract:0216]

The Current and Prospective Applications of GIS in Beekeeping

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The Geographic Information System (GIS) techniques are being employed profitably in science, planning, and development purposes. This digital tool still at the first steps in apiculture research, and beekeeping applications. Beekeeping is a place-dependent industry. Therefore, GIS can do several services for beekeeping research and practices. It can be used to analyze the spatial situation of beekeeping, and to plan spatially the optimum beekeeping activities distribution. Currently, the web search engines (till April 28, 2017) shows few tens of publications has used GIS in apiculture research. These research efforts were applied on territories in almost 20 countries. These studies have focused mainly on the beekeeping suitability, and some ecological issues. Moreover, some research efforts have used GIS techniques in pollination studies. From the other side, few companies and governmental agencies have used GIS in beekeeping services. However, still beekeeping research and practices can get great benefit from GIS. It is expected to get a GIS based app that can be used internationally to share data and services among apiculturists, beekeeping authorities, and bee business bodies. Such expected (or suggested) cellphone app will lead to better utilization of beekeeping resources, and to sustainable beekeeping.

[Abstract:0248]

Authenticity Testing of Honey by Targeted and Non-Targeted Analytical Methods

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The simplest way to adulterate honey by economically driven manufactures involves the addition of sugar syrups directly to the honey. Consequently, honey is one of the 10 food items most at risk of being adulterated according to the European resolution from January 2014. The EC Joint Research Centre recently posted in a technical report about the final results of the 2015/16 Coordinated Control Plan for honey, that 14.2% of 893 analysed honeys did not match the purity criteria due to addition of foreign sugars. These sugar syrups are made by C4 or C3 plant species such as beet, wheat, rice or corn and are much cheaper than honey and therefore preferably used to increase desired profit margins. Highly sophisticated analytical methods are absolutely necessary to detect such exogenous sugar additions. According to the current state-of-the-art, targeted methods and non-targeted screening methods (e.g. NMR, EA/LC-IRMS) are used to detect all known and yet unknown adulterants with acceptable sensitivity and accuracy. In principle, non-targeted screening methods are based on an authentic honey reference database to generate a unique fingerprint, targeted methods are based on specific marker compounds for the added syrup. In this presentation, advantages and disadvantages of different authenticity control methods are presented and based on a few examples a comparison between non-targeted and targeted analysis results is shown. In summary, the targeted- and non-targeted techniques both contribute to a significant improvement of the authenticity control of honey and demonstrate their importance on the elimination of adulterated honeys before entry into the market, thus strengthening the fair honey trade and the consumers' trust in natural high-quality products.

[Abstract:0251]

Prospective Contribution for Ecuadorian *Scaptotrigona* Pot-honey Norm

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"Stingless bees (Hymenoptera; Apidae; Meliponini) produce a diversity of pot-honeys in Ecuador since Pre-Columbian periods, but they are excluded in the honey norms INEN 1572. *Scaptotrigona* is one of the bees (named 'catiana' in El Oro, and 'catana' in Loja provinces) frequently kept by meliponicultors in Ecuador. In this work we studied physico-chemical quality indicators of 10 *Scaptotrigona* pot-honey samples from southern Ecuador, using official methods. Averages of analytical parameters of the Ecuadorian *Scaptotrigona* pot-honey, were similar to those previously reported, but different from *Apis mellifera* honey due to higher values for moisture (23.6 ± 0.4 g/100 g), Aw [water activity] (0.698 ± 0.004), free acidity (51.3 ± 10.7 meq/kg), and water insoluble matter (0.218 ± 0.099 g/100 g); lower values for diastase activity (1.34 ± 0.68 DN) and invertase activity (173.2 ± 21.8 IU/kg). The sugar spectrum, with higher maltose (0.3 ± 0.2 g/100g) and lower F+G [fructose + glucose] (53.4 ± 0.6 g/100g) was different from that of *A. mellifera* floral honey. The Honey Directive exception for a lower minimum F+G 45 g/100g is permitted for honeydew honeys and admixtures with floral honeys, in contrast to 60 g/100g for floral honeys. Similarly, the maximum moisture varies for Calluna heather honey to a higher maximum of 25 g/100g, instead of the 20 g/100g for other floral honeys. This fact shows intermediate moisture contents for *Scaptotrigona* honey, as well as for the maximum permitted water insoluble matter of 0.1 g/100g increased up to 0.5 g/100g for pressed honeys, and the maximum of 80 meq/kg permitted for free acidity of bakers' honey. "The values of electrical conductivity (0.290 ± 0.045 mS/cm), HMF (10.1 ± 4.0 mg/kg) pH (3.7 ± 0.1), and fructose/glucose ratio (1.34 ± 0.03) complied with those of *A. mellifera* honey standards. Proline (240 ± 41 mg/kg) and glycerine (1412 ± 177 mg/kg) contents are reported here for the first time. They are not included in the Honey Directive, as well as Aw, and the invertase activity. The physico-chemical data set generated here for *Scaptotrigona* pot-honey is a useful reference for the proposal of a new Ecuadorian Pot-Honey Norm."

[Abstract:0252]

Sensory Uniqueness of Tanzanian Honeys

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Honey is a local product with an increasingly global trade. Quality evaluations are often carried out to access export markets, provide information to the consumers, and to differentiate one honey from the other, e.g. based on the flowers visited by bees and taste attributes of the honey. Several authors have stressed the importance of including sensory analyses in quality evaluations when identifying and differentiating honeys from specific botanic origins. For African honeys, only a few studies present quality evaluations, very few studies have addressed sensory qualities and uniqueness, and none, to our knowledge, have simultaneously addressed sensory evaluations, pollen analysis and physical-chemical attributes.

This paper presents the results of physicochemical, melissopalynological and sensorial evaluations of honey samples from six villages in two districts in Tanzania. The study helps to close the knowledge gap of quality characteristics of honeys from an East African semi-arid area by assessing the variation in quality of honeys from seemingly similar environments and relating the sensorial characteristics to the physicochemical qualities and melissopalynological attributes.

The results show that honey from Tanzania can be differentiated based on their sensory properties and that the honeys are very diverse. Further, some of the honeys are expected to be more attractive than others due to more positive descriptors. The variables Water content, pH-value, Electricity conductivity, Acidity and HMF are good predictors of different sensory descriptors and the fraction of pollen of particular types that is best for predicting sensory properties are Helianthus, Triumfetta and Poaceae. The geographical location of the honeys might be an indicator of their profile but this has to be confirmed in future studies, due to the relatively low number of samples of honeys.

[Abstract:0275]

Development of Beekeeping Information Management System: A Case Study

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Beekeepers can be described as mobile beekeepers or stationary beekeepers in terms of managing their colonies. For mobile beekeepers, it is extremely important to seasonally collect nutrients because of the variety of flowering periods of the forage plants of bees. As a result of the condensation, the bees in the region are entering serious races in food gathering behavior and the productivity of the colony is decreasing. According to official records in Turkey, the number of beekeepers is around 57,897. These beekeepers have a total of 6.8 million hives. Approximately 75% of these beekeepers, or 42,000 of them, are mobile beekeepers. Approximately 5.1 million of 75% of the bee colonies are subjected to traveler beautification. Turkey has a wide variety of nectar and pollen types because of its unique plant cover and many kinds of plant cover. What information is available about our country is where and where the sources of nectar are. Mobile beekeepers can be guided by taking into account the nectar resources. It may not be enough to consider nectar resources alone. It is imperative that meteorological conditions are also appropriate for the period of beekeeping to pass well. Considering nectar and pollen resources and meteorological conditions in this study, mobile beekeepers in Turkey will use both floral sources in the most efficient way and they have been studying that mobile beekeepers will complete the year with the highest honey production. Firstly, the most important parameters for honey production (beekeeping potential) of 81 provinces in Turkey were evaluated for nectar resources and meteorological conditions. In this evaluation, fuzzy cognitive maps (FCM) were used. The limit values of each parameter which is the effect of beekeeping potency are determined. As a result of evaluation, 33 provinces were found to be the most suitable for nectar resources and beekeeping potential.

This study was supported by Karabük University within the scope of Scientific Research Projects with a KBÜ-BAP-15/2-DR-025 code

[Abstract:0289]

High-tech Solutions for a Precision Beekeeping

Khaled Bouchoucha, Naoufel Hihli

Iris technologies

According to AFO in recent studies, one third of your meals get to your table thanks to crops pollinated by the mighty bees. Same studies claim that the world have to increase our food production by an incredible 70 percent to feed the 9.1 billion people population in 2050. While the world honey consumption is still increasing, *bees* are suffering from *mortality*, *diseases*, lack of *key performance indicators*, data and project management. *Real-time monitoring* of beehives is a wealth of useful information for people involved in any beekeeping activity. The data gathered from the monitoring process, such as the internal and external temperature of the hive, humidity, weight and buzz, are used to model the behavior and activity of hives. *IRIS technologies* is a company studying bees, developing and designing *high-tech tools* to help *beekeepers* developing their projects, concerned *investors* looking to invest in modern, profitable beekeeping and *R&D researchers* seeking for a better bees understanding.

We aim to control and maximize benefits throughout the beekeeping *value chain* by improving hive's productivity, honey's quality, the survival of bee colonies and providing key performance indicators for a better apiaries management.

We meet our customer requirements in 3 main terms:

- *Data gathering*: collect all possible data about the apiary and its hives (temperature, humidity, weight, GPS, Buzz,...)
- *Data mining*: communicating, storing and displaying the resulted data to the beekeeper.
- *Profound data analysis*: using Business intelligence tools in partnership with Microsoft, we provide risk Management analytics, growth and exit strategies useful for fundraising purposes.

CEO IRIS Technologies, khaled Bouchoucha

[Abstract:0296]

Developing a Solar Powered Electronic Hive Scale to Compare Flow™ and Langstroth Hive Performance

Andrew Wootton¹, Emily Grace²

¹The Beekeepers Club Inc., Melbourne Australia

²Beeinventive Pty. Ltd. PO Box 8 Suffolk Park NSW 2481 Australia

Weighing hives provides information about the colony and its honey stores. Using scales allows direct comparison of weight changes and facilitates comparison of the Flow hive with conventional Langstroth equipment. A solar powered microcontroller with mobile phone network communication (Sodaq Co., Netherlands) was developed, since many apiaries lack mains electrical power and internet connections. The electronic scale employs four 50kg load cells connected with a Sparkfun HX711 breakout board to the Arduino- compatible computer. Data was stored using ThingSpeak, an "Internet cloud" based application that allows data retrieval. Graphical data display is available through any browser. Two scales (Flow and Langstroth) were connected to each microcontroller and reported hourly.

Langstroth and Flow weights were compared at three sites in inner and outer suburbs of Melbourne, Australia. Data was collected for three complete months (autumn, February – April 2017). In order to allow for the different hive and colony sizes, weight gain or loss was expressed as a percentage of the starting weight. At one of the sites, honey was harvested from both hives and this removal was corrected for in the comparison of performance. The season was a poor one for bees in the relevant area with many beekeepers in the region harvesting no honey. As a result, one of the colonies with a Flow super remained too small to expand storage into the Flow frames and so its data have been excluded. At one of the other sites the Flow hive gained 14% in weight whilst the Langstroth hive lost 6%. At the other site with valid data, the Langstroth gained more weight (8%) than the Flow hive (-3%). When the data from all sites was averaged there was little overall difference.

The hive scales were reliable, facilitating effortless data collection. In this proof of concept experiment, it seemed that the hive type played little role in the performance of the colonies and probably the strength of the colony had more effect on weight changes. A more extensive comparison with increased number of sites and longer data collection is planned.

[Abstract:0296]

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[Abstract:0342]

Spring Application of JATIE CAP® and Vitamin Complexes on the Development of Hives in Argentina

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The aim was to evaluate the effects of pollen supplement, vitamin complexes and combinations in spring on brood area and honey yield. The experimental sites were in two locations (Coronel Suarez and Casbas) in Buenos Aires province, Argentina. A completely random design was followed using 30 hives at each site. The treatments (n=5) were six, Control, without supplementation (CON), Jatie Cap® (JAT) as pollen supplement, Promotor L® (PRO) and Pronut® (PRN) as vitamin complexes and combinations of JAT with PRO (JAT+PRO), and JAT with PRN (JAT+PRN). Supplementation started on 10/1/2011. The different commercial complements were used according to the manufacturer's instructions. In the case of JAT, 800 g/hive was applied, distributed in two applications of 400 g with 15 days difference. Two liters of sucrose syrup (66%) were added to all hives, every 15 days during supplementation. Each hive received a total of six liters of syrup. The brood area was measured at the beginning (1/10/2011) and end (2/1/2012 in Suarez and 12/11/2011 in Casbas) of the supplementation. At the end the honey yield was also measured. Data at each site were analyzed separately with ANOVA, and means were compared using the LSD Fisher test (5%). The supplements were consumed completely in all the hives. In Coronel Suarez JAT and JAT+PRO L was different than CON with an average increase of 76% in brood area. While in Casbas no differences were found between treatments. In Casbas the bees used a *Vicia villosa* crop that flourished during the experiment period, while in Coronel Suarez the hives were in a mostly agricultural sector with, few species of bee interest. Difference in honey yield was found in Coronel Suárez, with a higher yield in JAT (23.7 kg/hive) compared to CON (1.3 kg/hive). Casbas show only one difference, PRN had a lower yield than JAT (23.0 vs 33.5 kg/hive). The addition of vitamin complexes on Jatie Cap® did not show an additional effect on the brood area and honey yield. Spring supplementation with Jatie Cap® allowed an increase in the brood area and honey yield in situations where flowering of apicultural interest was limiting.

[Abstract:0352]

Honeybee Breeding Selections for *Apis mellifera syriaca*'s Hybrid Vigor

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Apiculture's contribution to the agricultural welfare has been highly acknowledged recently, with a remarkable impact on human lives as especially highlighted upon the surfacing of the worldwide phenomenon dubbed as Colony Collapse Disorder (CCD). In many developing countries rich with their floral cover, Lebanon being on of them, such contribution remained insufficient, exacerbated by the lack of record keeping for the proper assessment of CCD's spread and impact. However and with the applied research conducted at the Honeybee Lab at the American University of Beirut (AUB) in collaboration with local, regional and international beekeepers over the past 20 years, major breakthroughs have been achieved with regards to the adoption of the breed mostly appropriate for the prevailing production conditions. The relatively low productivity of the local race, *Apis mellifera syriaca* - also spread over a number of countries in the region - subject to the resulting unsystematically diverse gene pool, has played a major role in underlying such a generally low productivity. With continuous breeding efforts to arrive at the most domestically suitable cross breed or hybrid vigor, two international strains, among many, were selected to cross breed with the local race, *Apis mellifera lugistica* and *Apis mellifera carnica*, where four of the best blood lines existing in Australia were chosen for the task, encompassing a record of high productivity and hygienic behavior. A large queen rearing experiment, with performance trials, has been underway, with three cross breeds selected for evaluation: Domestic queens from highly productive colonies for mating with drones from the Australian breeder colonies upon drone flooding; Italian and Carniolan queens from the breeder colonies for mating with domestic drones; and Italian and Carniolan queens from the breeder colonies for mating with drones also from the breeder colonies. The expected results of the ongoing experiment is believed to determine the hybrid vigor mostly productive and meeting the local or similar production conditions, a step that furthers the preliminary results of the two-decade applied research on queen breeding.

[Abstract:0374]

The Adulteration of Honeys, Analysis and Solutions

Etienne Bruneau

Cari asbl

The adulteration of honeys is today a major problem on the market. We will study the various points that are at the origin of this phenomenon present on the world scale and which has important repercussions on the price of honey and on the survival of the commercial beekeepers. To do this, we will use a DPSIR approach: Drivers, Pressures, State, Impacts, Responses. This technique allows to have a global vision of the problem and allows to target the solutions to bring to the different levels concerned. On the basis of data on the honey market, we will see the importance of such factors as growth in demand, behavior of buyers of international marketing groups... This will have an impact on the management of the colonies and on the quality of honeys and more particularly on their adulteration. Following this analysis, various proposals for action will be presented at the level of consumers, as well as sales channels, as well as beekeeping organizations and official bodies. An improvement in the current situation will be possible only by grouping together the various actors in order to define and put in place at these various levels a global action plan for the future.

[Abstract:0380]

Planet Earth Honey Fingerprint Database of NMR Profiles by World Beekeeping Community

Federico Berron

Amema, A.C.

A healthy honey market cannot coexist competing with adulterated honey or 100% syrup honey mimic. LCIRMS dC13 C3/C4 adulteration test has created many false positives. Yet, false negatives are higher in magnitude and damage, giving a purity certificate as honey to blends of hydrolyzed starches of C3 plants tapioca, potato, rice, beets and wheat. These syrups achieve C13 isotopic values of honey and further micro doses of pollen and enzymes complete the fake, after being ultra-filtered to disguise any traces like enzyme precursors of the hydrolysis. The false syrup has been sold in the world honey market at prices reduced 20 to 50% of Argentinean and Mexican honey, main origin countries for US and Germany, world largest importers. An insider expert estimates that in 2016, 90,000 tons of syrup entered the EU as honey and 60,000 reached the USA, under crony country origins that hide any of 4 syrup factories in China, probably now expanded to other countries. Our proposal to world beekeepers, traders and packers, is Planet Earth Geographical and Botanical Honey Fingerprint Database of NMR profiles, hosted in ADOR, a practical, simple and world available web application database system. All input, from sample process validation to NMR profiles of honey samples, to be supervised by the Scientific Commission of Apimondia or its appointee. Aim is a World Beekeeping Community resource available to any laboratory.

Process: Beekeeper opens web-app and registers himself and then a photograph of hive/bee-yard, which the application links to location using GPS technology, within 2 days 2nd GPS linked photo is taken to the sample of the harvested honey, sample then is taken to a registered facilitator that will attest the beekeeper fidelity and 3rd photo will be of courier envelope with honey sample numbered by the system for the appointed PEHFD laboratory. All data, including validation steps and the complete NMR profile will be in the cloud. Database coverage will be public, containing amount of samples and time of harvest for each province on every country that participates. Industrial users' information will be protected when sending their samples of blends to the database.

[Abstract:0383]

Reliable Registered Method for Determination of Pure and Adulterated Honey Produced by Feeding Bee Colonies with Industrial Sugars

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Purity, fraudulent state, plant origin and region of honey are determined by using many methods based on its sugar components, pollen and carbon isotope ratio (IRMS) analysis. The carbon isotope values of foods make it possible to determine the origin of the food. In particular, the ratio of d13C /d12C in honey, difference between the d13C value of honey and its protein ($\Delta\delta^{13}C$, ‰) are the most reliable methods. However, none of these methods can detect the fraudulent made with C3 sugars such as sugar beet. In our work, standard discrimination and identification functions have been developed for the 7 properties of honey. The method can safely be used for discrimination of pure and fraudulent honeys which their sources are unknown. By using standard descriptor coefficients, a software program was developed for the Microsoft Windows operating system that supports English and Turkish languages consisting of two windows in the Visual Basic 2010 software development environment. The invention is directed to the use of national and international institutions and organizations in the area of import and export control. With the present invention it is possible to determine the fraudulent made with all kinds of sugar (C3 and C4). In the lab the analytical results of the honey samples in relation to C4, Vitamin C, Fructose/Glucose ratio, Viscosity, Invertase, Prolin and difference between the d13C value of honey and its protein ($\Delta\delta^{13}C$, ‰) are entered into the system. Operation bar designed in green is running and the Show Report and Reset buttons are shown after the calculation. When the Reset button is clicked, all data for the new operation is reset and returned to the input screen. Turkish and English reports can be taken in line with the entered data. The user can save the report in RichTextFile (.rtf). The icon for the software is custom designed with IconCreator freeware software. On the opening screen of the design there are Ten Label, Textbox, three Button, one Progressbar and one Timer object. The invention is registered in the General Directorate of Copyright of the Ministry of Culture and Tourism.

[Abstract:0404]

A Summary to Technological Progressing of Beekeeping in a World Living Smart Production Systems Revolution Through Industrial 4.0

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The production systems changing named as Industrial Revolution or revolution has been changed to smart production system where cyberspace physical spaces used than from the mechanical systems that has run out steam power about 3 centuries-(Industrial 4.0) Reached this point has been showed the progressing of knowledge and communication technologies, showing the dates occurred of production systems- Industry 4.0 concept that has been followed with a increasing interest because of its providing of social and economical added value in the whole world has been showing the last point reached of industry revolution and the effectiveness of knowledge and communication in production chain.

The changing in industry has showed itself in agriculture and agricultural activities, beekeeping as one of the agricultural activities has gained its important from this changing. Though relations of human beings with honey bee has gone back to old days, human beings have brought the colonies as portable colonies without omitting them in the last period of 18 cc and in the 19 cc and has identified the colony individuals. After these years, beekeeping which has been showed a rapid changing has kept industry 4.0 in both the definition of genetic of bees and bee's equipment's and also in bee production. Today not all the bee owners used, beekeeping has caught the changings of using the requirements of industry 4.0's knowledge and communication technologies.

[Abstract:0420]

Spectrum-effect Relationships between HPLC Fingerprints and DPPH Scavenging Activity of Brazilian Green Propolis

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Brazilian green propolis (BGP) is a well-known natural product with many health benefits due to an abundance of compounds. For quality control, a fingerprint-efficacy study of BGP was carried out in this work. 2,2'-Bipyridyl,2,2-diphenyl-1-picrylhydrazyl radical(DPPH) scavenging activity and principle common components was measured, a quantitative and chemical fingerprint analysis method was developed for quality control of BGP based on HPLC-UV combined with chemometrics methods. The results showed that the chemical fingerprints and DPPH radical scavenging activity were influenced obviously by the origins of propolis. 28 common chromatographic peaks were identified in different propolis samples, and 9 compounds were discovered with DPPH radical scavenging activity as follows: chlorogenic acid, caffeic acid, 3,4-di-caffeoylquinicacid, 4,5-dicaffeoylquinicacid, 3,5-di-caffeoylquinicacid, 3,4,5-tricaffeoyl-quinicacid, kaempferol, kaempferide and artemillin C. Given the specificity and strong antioxidant activity, caffeoylquinic acids and artemillin C might be the major effective components for quality control of BGP. This study provides a general model to screen markers for the quality assessment of BGP and its derived products.

[Abstract:0424]

Development of Program for Management of Honey Bee Disease

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Turkey has great potential in beekeeping due to climate conditions, land structure, vegetation and genetic diversity. In 2015, the number of hives in Turkey has exceeded 7.5 million, but honey average per hive is 14 kg. In 2016, honey production was determined as 105,727 tons. Both in our country and in the world, the biggest obstacle in honey production is bee diseases. There are 26 preparations licensed by the Ministry of Food, Agriculture and Livestock in the fight against bee diseases in Turkey. Drug use in the fight against diseases is absolutely necessary; but many problems arise due to drug use. The most important of which is the residue problem caused by medicines. Moreover, uncontrolled and misuse of medications lead to economic problems and reduced effectiveness of medications. Many problems such as difficulties in treatment of bee diseases, difficulty in treatment, residual problem, resistance to drugs, it is important to take precautions before the colonization of these diseases or to develop early diagnosis systems.

It is also important to choose the right medicine to treat the disease as effectively and timely as it is diagnosed. The software to be developed is related to this topic and will be downloadable to smartphones and tablets. In this program, information about which bee diseases licensed drugs are used and how to use them will be easily reached. This will lead to an improvement in the conscious use of bee medicines. It is aimed to be a program easily used by beekeepers and developable in the future. Thus, dissemination of this Program through the Official Institutions or Associations; It will be possible to make data entries for bee pests and pathogens. Detection of disease agents (such as hive beetles (*Aethina tumida*)) that can enter our country from the surrounding countries will be a great convenience for beekeeper and will have important contributions to solve problems related to beekeeping.

[Abstract:0432]

GC-MS Analysis of Propolis Samples Collected from Different Regions of Turkey

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Propolis is a sticky substance with very strong antiviral, antibacterial and antifungal properties, which is collected by honey bees from the secretion of plant buds, shoots and formed by the addition of a number of enzymes and secretions of bees. It is used to clean the inner surface of the hive, to repair cracks and to narrow the hive inlet opening by the bees. The propolis samples collected from beekeepers in Sinop, Muğla, Sivas, Mersin and Ordu were analyzed by GC-MS to investigate the chemical contents. In our study, compounds such as butanedioic acid, hexadecanoic acid, oleic acid, eicosanoic acid, octanoic acid, propanoic acid, azelaic acid and dodecanoic acid were described as aliphatic acids in propolis samples. The highest aliphatic acid content was obtained from the propolis of Mersin region. Benzoic acid, cinnamic acid, phthalic acid, ferulic acid and caffeic acid were described as the aromatic acid group. The aromatic acid content of the propolis obtained from the Sivas region was found higher. Chalcone, quercetin and pinocembrin compounds were identified in the flavonoid group and flavonoid content was found higher in propolis obtained from Sivas region. Besides these defined groups; in propolis samples, compounds such as esters, alcohols, terpenes and sugars were also found in different proportions. At the end of our study, differences between the contents of propolis collected from different regions were determined. Propolis collecting tendency and plant preference of the bees, flora source, climatic conditions, bee characteristics and colony needs are thought to cause this difference in the chemical content of propolis.

[Abstract:0438]

Venoms of Lebanon bee "Apis mellifera syriaca " Massive Collection and Extraction, optimization of the isolation process, characterization and exploration of functional properties

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Honey bee venom collection and usage is gaining in popularity and the different components are used in pharmaceuticals, cosmetics and Apitherapy. Many studies are also pointing for its Anti-cancer effects. HBV collected in Lebanon from "Apis mellifera syriaca " was never studied. This studied aimed at first to adapt the collector used for venom collection without harming bees. It also aimed to find the best way to apply massive collection. Venom was collected from different apiaries and different altitudes. The study aimed as well to separate, identify and determine quantitatively the major constituents of the samples (mainly Melittin, Apamine, Phospholipase A2) by the usage of high performance liquid chromatography (HPLC) and to determine the chemical composition of the domestic product by running in vitro routine test. The different components were purified and characterized by LC-MS / MS and additional needed tests were also applied. The results obtained for the massive collection as well as the comparison between the components of the venom the different origins was addressed, and possible future usage of the venom were discussed.

[Abstract:0442]

Hivelog - Keep it Simple. An easy way to keep track on your colonies

Flemming Vejsnæs, Ole Ole Kilpinen

Danish Beekeepers Association

Become a better beekeeper with this Danish produced free available Hivelog program, made by beekeepers for beekeepers. A hive log/note program that can be used on your smartphone, iPhone. This program is not an app, so it is easy to access and use.

Within modern farming it is getting more and more common collecting data during the season to improve/optimize the use of fertilizer, pesticides, feeding, soil use, etc. The opposite is the case within "common" beekeeping. In general no or very few information are collected and stored on single colony level for later use/experience/development. Using this program, you will be able to get an easy and fast overview comparing queens, colonies, behavior, feeding, varroa treatment, varroa count, bee diseases etc., but also memories how and when you did your activities. The program stick to simple statistic, that is needed by the most beekeepers. For beekeepers with special needs, they can export the data to excel spreadsheets and here personalize own statistics. We have focus on only the most important information that is needed for improving beekeeping. The backbone is the Danish queen breeders paper hivelog. We focused on making data collection easy and fast. Beekeepers do not have time for time-consuming logging. We try to keep the program simple and user friendly. There is no fancy setup, layout. More information on www.myhivelog.org. The program is now translated into 6 languages – Danish (www.stadekort.dk), English (www.myhivelog.org), Spanish (www.RaApi.org), Norwegian, Swedish and Estonian. To encourage the use of this non-commercial program, it is for free, no matter how many colonies are logged in the program. Within the next 3 years, we will in connection to the program develop a bee disease "app", giving the beekeepers "hands on" bee disease information directly in the apiary.

Within this project we all produced the Nordic Baltic honey meter www.mybees.buzz having more than 100 hive scales under production colonies all over the Nordic Baltic countries showing the net income/consumption on a daily basis all year around.

[Abstract:0459]

Commercial Production of N Chromosome Royal Jelly, Bee Venom, and Royal Jelly

Hossein Yeganehrad

Caspian Apiaries

Developments in electro-stimulation of worker bees has led to innovative methods of bee venom collection, allowing for large-scale commercial bee venom collection operations. Caspian Apiaries continues to build on these advances with new techniques applied to the electrostimulation process developed by Mihaly Simics. The key to these new developments is the use Caspian Solution™, a proprietary mixture of pheromones and bee pollen. In combination with electro-stimulation techniques, Caspian Apiaries can maximize the yield of bee venom in three ways by employing techniques that allow Caspian Apiaries to collect bee venom from up to 500 hives a day, using Caspian Solution™ to increase the per colony yield of venom, and using Caspian Solution™ to shorten the recovery period needed before a colony's venom can be harvested again. By stimulating bees to release the Nasamov pheromone, Caspian Solution™ mitigates the effects of the alarm pheromone released as a byproduct of the electro-stimulation. Caspian Solution™ makes the environment around the collecting device safer and allows for the rapid re-deployment of electro-stimulation equipment to other colonies. N chromosome royal jelly relies heavily on bees pollen consumption; when these consumption levels are elevated there is an increased quantity of n chromosome royal jelly production. During the winter months there is a decreased pollen supply causing bees to limit their protein consumption thereby reducing their production. Caspian Solution™ is developed through a unique method whereby royal jelly is not in limited supply through the winter season as the bees continue to produce consistent levels of royal jelly to feed the larvae and maintain a reserve.

[Abstract:0503]

When can we collect honey bee venom?

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There are many enemies to honeybee colony which target it for its honey or brood, the primary role of defending the colony is stinging behavior using the venom apparatus that modified from ovipositor apparatus, a single sting of bee contains a small amount of venom, which acts as a painful deterrent for vertebrates but has lethal effect on a wide variety of invertebrates. In first experiment, Twelve honey bee colonies at same strength were used to study the effect of collecting time at three dates through the day, the best time to collect venom from honey bee colonies through the day was before sunset, the result showed that the highest amount of venom was 26.9 ± 1.9 mg. before sunset and was 17.0 ± 3.8 , 15.0 ± 2.6 mg. at early morning and midday, respectively. In the second experiment, Twenty four honey bee colonies at same strength were used to determine the best periods time between venom collections, The results showed that the best period time between 1st and 2nd collection time were 14 days which target 21.5 ± 3.7 mg. with significant difference between the other two groups, After 7 days, After 21 days which target 17.7 ± 2.2 , 20.7 ± 2.1 mg. respectively.

[Abstract:0506]

Antioxidant Properties of Eastern Anatolian Flower Honey

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Turkey is one of the rare countries with a rich honey flora suitable for honey production for 3 seasons. It is also very rich in diversity with flower honey, honeydew honey, mono-floral and hetero-floral honey varieties. The great majority of Turkish honey, also known as highland honey, which is mostly hetero-floral honey, is produced in the Eastern Anatolia region. However, there is little scientific research on both the characterization and biologically active properties of Eastern Anatolia region honey.

The present study aimed to investigate the color, conductivity, total polyphenol and antioxidant capacities in 30 honey samples harvested in 5 different Eastern Anatolian provinces in June-July of 2016. Based on the Hunter Lab criterion, the color of the honey samples were found L: 75,20±11,64, a:11,77±9,84, b:67,38±16,57, respectively, and they were classified as light colored. Honey conductivity values were between 0.30-0.52 mS/cm and optical rotation angles were positive. Polyphenols responsible for the biological active value of honey were measured as total amount of phenolic substance and the mean value was 30,75 ± 7,51 mg GAE/100 g. Based on the findings of the continuing characterization studies, the regional honey was characterized as highland honey–flower honey.

Within this project we all produced the Nordic Baltic honey meter www.mybees.buzz having more than 100 hive scales under production colonies all over the Nordic Baltic countries showing the net income/consumption on a daily basis all year around.

[Abstract:0508]

The Effect of Heating, Heating and Storage Time on HMF and Diastase Number in High Plato Honey Samples

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This study was carried out with the purpose of determining the effect of heat following the harvest, heating duration and storage time on HMF and diastase number, which are important quality criteria of the honey in high plato honey samples which are intensively produced across the Turkey. Within the scope of the study, Firstly, some of the important biochemical analyses (ash, moisture, pH, acidity, HMF, diastase, electrical conductivity, invert sugar and sucrose) were conducted in order to reveal the general structure of the honey samples. These analyses resulted in the determination of the composition of honey samples. Following the biochemical analyses, honey samples were divided into two equal pieces for the water bath (benmari) and the ultrasonic water bath heating methods. Then, different heating temperatures (Control, 40 °C, 60 °C, 80 °C) and times (45 and 90 minutes) were applied for each heating process as three repetitions. The HMF and diastase number of honey samples were determined following the heating process, in 6 and 12 months by analyzing samples in 3 different periods of deposition. The HMF amount in honey samples were 20.64±0.98 mg/kg and 26.26±0.95 mg/kg while the diastase number of honey samples were 26.13±1.23 and 25.97±1.24 for water bath (benmari) and ultrasonic water bath heating methods, respectively. In the present study, the increase in the account of HMF values in honey samples were significantly affected by heating temperature and time (P<0.01), but were not significantly affected by the interaction between methods and heating time (P>0.05), as statistically. The heating temperature and time were significant (P<0.01) for the decrease in the diastase number in honey samples, but the interaction of heating methods and heating time were not significant (P>0.05) as statistically.

[Abstract:0520]

Technical progress with the cryopreservation of honeybee genetic resources

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Research on the cryopreservation of honeybee semen dates back to the 1970ies. Although it has long been possible to thaw living drone sperm cells, the low number of sperm cells reaching the spermatheca and generally low proportions of female brood obtained have hampered the practical application of the technique. Here we report on progress made in our labs since 2009. The first step was to validate different tests of sperm quality for the evaluation of thawed semen. A simple motility test as well as the proportion of cells moving in circles when placed under a coverslip proved to be best correlated to the success of inseminations. We then optimized a new freezing protocol that is based on the addition of cryoprotectants by dialysis. In contrast to conventional protocols, this allows to avoid mechanical stirring of the semen and to preserve the dense bundles of sperm characteristic of untreated drone semen. At the same time, water is withdrawn from the semen, a process that can be thought to contribute to the avoidance of intracellular ice formation during freezing. With this cryo-protocol, average numbers of sperm reaching the spermatheca after insemination are around 1 million, with up to 4 million cells obtained in some cases. The proportion of female brood varies between 3 and 97.5%, with an average of approximately 45-70 %. Some overwintered queens still produced female brood the following year, while others only produced only drone brood. Female bees produced from thawed semen were morphologically normal, and female larvae could be reared into fertile queens. The protocol has been turned into a commercially available kit by a cooperating company, so that it can now be used for the establishment of genetic reserves.

The next frontier is the effective cryopreservation of honeybee embryos, which would enable the conservation of diploid genomes that could be used for the reconstitution of both male and female individuals. As a first step in this direction, we present an improved and simplified hive for the mass production of precisely-timed eggs that can be used for the optimization of cryo-protocols.

[Abstract:0522]

The Effect of Heating, Heating and Storage Time on HMF and Diastase Number in High Pine (honeydew honey) Honey Samples

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This study was carried out with the purpose of determining the effect of heat following the harvest, heating duration and storage time on HMF and diastase number, which are important quality criteria of Pine Honey (honeydew honey) produced about 90 % in Muğla city, Aegean region, in the world. Within the scope of the study, Firstly, some of the important biochemical analyses (ash, moisture, pH, acidity, HMF, diastase, electrical conductivity, invert sugar and sucrose) were conducted in order to reveal the general structure of the honey samples. These analyses resulted in the determination of the composition of honey samples. Following the biochemical analyses, honey samples were divided into two equal pieces for the water bath (benmari) and the ultrasonic water bath heating methods. Different heating temperatures (Control, 40 °C, 60 °C, 80 °C) and times (45 and 90 minutes) were applied for each heating process as three repetitions. The HMF and diastase number of honey samples were determined following the heating process, in 6 and 12 months by analyzing samples in 3 different periods of deposition. The HMF amount in honey samples were 10.76±0.04 mg/kg and 15.19±0.66 mg/kg while the diastase number of honey samples were 29.56±0.82 ve 29.51±1.06 number for the water bath (benmari) and ultrasonic water bath heating methods, respectively. In the present study, the increase in the account of HMF values in honey samples were significantly affected by heating temperature and time (P<0.01), but were not significantly affected by the interaction between methods and heating time (P>0.05), as statistically. The heating temperature and time were significant (P<0.01) for the decrease in the diastase number in honey samples, but the interaction of heating methods and heating time were not significant (P>0.05) as statistically.

[Abstract:0537]

Cities or Rural Areas: Interests for Beekeeping

Carine Massaux, Etienne Bruneau

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In recent years, declines in both wild and domesticated pollinators are observed. The potential causes of these losses are principally agrochemicals, pathogens, climate changes and loss of natural habitats. In response to these concerns, urban beekeeping is growing all over the world because cities seem to offer some interesting solutions. To evaluate this alternative, a comparison is made between beekeeping conducted in Brussels and rural areas of Wallonia in Belgium. The Walloon region is made up of large areas of intensive cultivation as well as very wooded areas while Brussels is an urban area, with many parks and gardens.

Several parameters are evaluated as regular monitoring of the weight of bee colonies, main gather pollens, botanical origin and quality of honeys. Some differences are observed between urban and rural areas. For example, the apiaries located in rural areas benefit from abundant resources in very larger zones. But in the city, the apiaries often benefit from a more favorable environment, linked in the first place to a milder temperature at the beginning of the season, which allows an earlier start of the colonies. The city also offers large melliferous floral assemblies and trees, which allows the production of honeys with particular organoleptic characteristics.

[Abstract:0540]

Social website in favor of the beekeeping sector in Lebanon

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The internet, smart phones and social media (Facebook and WhatsApp) are relatively new tools used by the beekeepers all over the globe for different reasons: from the "search for the info" to the connection with other beekeepers, to the usage of the Forums, ...

In 2010 the author created a blog in the favor of the beekeeping sector in Lebanon and transformed it in 2015 to a Social Website. The new site was connected to the social media networks and to the Lebanese beekeepers through their smart phones. The site permits to the beekeepers to interact with each other, search for info, and add valuable info. The user can share at any time, the location of the apiary, photos of the apiary, photos for possible problems and/or disease occurring in his apiary.

The site can publish on a seasonal basis, the map of Lebanon showing the distribution of the apiaries in the country, yearly honey production, occurrence of diseases, timing of transhumance, and can eventually in a later stage predict the figures based on last years' numbers and variables. This study is summarizing the different features of the website, and how it is working in favor of the beekeepers and shows the results for 2017. A major role is asked from this site shall be the first, fast and reliable source of statistics and figures the beekeeping sector. These figures, ready on time, can be used, when needed, by the different stakeholders of the beekeeping sector.

[Abstract:0553]

Effect On Some Honeybee Behavior Of Different Radio Frequency

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Aim

The aim of this study is to determine the potential effects of radio frequencies on honeybees and the ways of protection from them and to report the results to all beekeepers.

Material and Methods

In 2016, the research was carried out on 70 Caucasian hybrid bee colonies purchased from local breeders and in standard Langstroth type wooden beehives.

Materials such as radio frequency generator, tesla meter and suede top were used in the study.

At the beginning of the study, the number of beaked frames and the amount of the litter area of the test colonies were equalized.

During the study period, responses were determined by applying different frekans radio waves simultaneously to each group. In order to prevent the frequency applied to a hood from affecting the other hives, the generator with a maximum of 1.5 m is used and the hives are positioned at 2 m from each other.

A black suede ball was used to determine the tendency to defiance. The suede ball is swung in front of the flight hole for a minute, at the same columns and at the same time selected randomly for each trial group. At the end of each application, the number of needles that the bears left on the ball were determined and evaluated as the measure of the tendency of the group to be irritable. In order to determine the flight activity, all the columns in the experimental groups were counted in the hours of 09:00 -10.00.

Conclusion and Recommendations

As a result of this work, it has been found that honey bees are very sensitive to external magnetic fields and radio waves as they are in social insects (ants, bears and termites).

As a result of the experiment, there were differences in tendency of irritation among experimental groups, placement of adult bees in incubation area and flight activities. In terms of frustration, the maximum number of needles was determined in the hives where the highest frequency was applied. Again, the lowest data in terms of flight activity was determined in the hives where the highest frequency was applied.

[Abstract:0554]

Comparison of flavonoid fingerprints and antioxidant capacities of pine bark extract and honeys from different origins

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Honey is a well known natural bee product for its high nutritional value and possible health benefits, which is the result of its chemical composition. Honey includes phenolic acids and flavonoids, that exhibit wide range of biological effects and act as natural antioxidants. Antioxidants are chemicals that deactivate free radicals which damage cells and contribute to diseases. Antioxidant activity of flavonoids results from their iron-chelating properties. Flavonoids or polyphenols are herbal secondary metabolites. Flavonoids and phenolic acids constitute the most important classes of polyphenols and especially flavonols and flavan-3-ols are the most famous sub-groups for their antioxidant and anti-inflammatory benefits. Natural powder extracts which contain polyphenols are widely used in traditional medicine. The Pine bark extract is one of the most relied antioxidant powder extract due to its phenolic composition. Aim of this study was comparison and evaluation of flavonoid fingerprints and antioxidant capacities of honeys from different origins and pine bark extracts. For this study 200 honey samples of 5 different origins (Pine, Polyfloral, Sunflower, Cotton, Citrus) were investigated. A comprehensive analytical procedure for the determination and quantification of 31 individual flavonoid compounds in honey was developed using HPLC-DAD detection. The antioxidant activities were evaluated using scavenging assay of DPPH. Antioxidant activity of honey varied greatly depending on its floral source. Pine honey has similar flavonoid profile with pine bark extract which includes protocatechonic acid, 4-OH Benzoic acid, Vanilic acid, Caffeic acid, Taxifolin, Ferrulic acid, Pinocembrin, Crhysin, Gallic acid, p-Coumaric, Galangin, Quercetin, Catechin, Syringic acid, Kaempferol flavonoids. Pine honeys and pine bark extract gave the same fingerprints spectrum. Floral honeys gave different flavonoid fingerprints with the detection of Hesperetin, Kaempferol, Quercetin, Apigenin, Naringenin.

Results obtained in this study confirm that honey's phenolic and antioxidant compositions depends on its floral and geographical origins and the source of flavonoids in pine honey is definitely pine tree. The research also showed, honey samples with the same total flavonoid contents showed different antioxidant capacities meaning each flavonoid species contribute to the total antioxidant capacity differently.

[Abstract:0564]

Development of cost and time effective, high-sensitive multiclass method for quinolone, macrolid and tetracycline antibiotic residues in honey by UPLC-ESI-MS/MS

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Antibiotics are commonly used in bee hives to control bacterial disease although it is prohibited in many countries including EU countries. In the EU regulations antibiotic Maximum Residue Limits (MRLs) for honey are considered as zero tolerance. Zero tolerance leads laboratories to develop methods capable of detection to the lowest concentrations. Thus, LC-MS/MS is currently common analytical approach for the quantification of antibiotic residues in honey. When considering today's advanced technology, analysis of single class antibiotics is insufficient and expensive. Sample preparation for multiclass methods can be time and labor intensive, often involving, hydrolysis, liquid-liquid extraction, solid phase extraction, solvent evaporation and pre-concentration. These steps approximately 30-45 minutes depending on the operator. In this study a quick, sensitive and cost-effective multi class residue method for the simultaneous determination of 11 antibiotics of 3 different classes (macrolides, quinolones, and tetracyclines) in honey was developed.

The developed method is simply an extraction method based on dissolution of the samples in buffer solution and direct injection to UPLC-ESI-MS/MS system. Scientific data proved that some macrolides have tendency to degrade at some pH levels. Macrolides were stabilized and prevented from further depletion with pH adjusted buffer solution while dilute and shoot procedure. To overcome the matrix effects, we achieved to retain the analytes of interest more than 2 minutes that gives us enough time to prevent clogging of ESI inlet because of sugars.

MS instrument was operated in the ESI positive mode and data acquiring was in MRM mode. Run time and sample preparation time were 6 and 5 minutes respectively. The method efficiency was evaluated in 4 different type of honeys (sunflower, blossom, citrus, pine). Validation is performed according to Commission Decision 2002/657/EC. Matrix-matched calibration applied with regression coefficient of ($r^2 > 0.99$) and investigated with range of 0.5, 1, 2, 5, 10, 20 ug/kg. Typical recoveries of the analytes were ranged from 85 to 104%. CC α and CC β ; were 0,50 to 1,00 ug/kg respectively. Intra-day RSDs and inter-day RSDs were lower than 10% and 13% respectively.

[Abstract:0566]

Development and validation of cost effective, high-sensitive multiclass method for nitrofurans, nitroimidazoles and amphenicols antibiotic residues in honey by UPLC-ESI-MS/MS

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Beekeepers occasionally use some prohibited antibiotics to treat infections. If these are present in honey, allergic reactions and even serious diseases could occur. Multiclass methods are preferred in order to achieve sufficient and cost effective detection of residues in foods. Sample preparation is the most important step for this types of methods to gain good extraction recoveries for different classes. The aim of this study was to develop and validate a sensitive multi-class UPLC-MS/MS analysis for the simultaneous determination of 14 antibiotics of different classes (Nitroimidazoles, Amphenicols, and Nitrofurans metabolites) in honey.

Honey contains sugars, enzymes, proteins as well as other minor components. Sample clean-up is generally employed because of the honey complexity. In this study, time consuming and labor intensive SPE procedures were avoided and only a single step modified liquid-liquid extraction protocol is applied. Sample preparation consisted in acidic hydrolysis of homogenized honey, derivatization of nitrofurans metabolites using 2 nitrobenzaldehyde and extraction with ethyl acetate. Results were evaluated on the basis of extraction efficiency for all components. In order to improve the sensitivity of detection, nitrofurans metabolites were derivatized and honey samples were acid-treated to liberate matrix-bound residues. Modified nitrofurans were determined via analysis of their metabolites while nitroimidazole and amphenicol residues were determined directly.

Un-retained interferences moved to waste during the initial step of analysis. This was followed by organic elution of analytes from reversed phase analytical column and gradient applied with Acquity UPLC system. Micromass Xevo TQ-S triple quadrupole mass spectrometer was used with ESI source operating in positive and negative ionization modes. Acquisition was in MRM mode with 6 minutes run time. The method efficiency was evaluated in 4 different types of honey (sunflower, blossom, citrus, pine). Validation is performed according to Commission Decision 2002/657/EC. The accuracy and precision of the assay were measured at 0,2, 0,5 and 1,0 ug/kg levels. The Recoveries were in the range of 91,0-105,0% with CV% of 7,2-10,4% and 8,35-12,58% for repeatability and within-laboratory reproducibility, respectively. The CC_α, CC_β, were 0,12-0,44 ug/kg, 0,21-0,57 ug/kg, respectively.

[Abstract:0568]

The characteristic properties of bee pollens collected from different regions of Turkey

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Bee pollen is a good source of nutrients for human diet. The quantities of these nutrients may vary depending on the botanical origin of the pollen and the harvesting area. In this study, 54 bee pollen samples from different regions of Turkey were examined in terms of physicochemical, botanical and functional contents. Physicochemical properties such as moisture, sugar profile, total fat, protein, mineral, amino acid, ash and fiber content and functional properties such as total phenolic content, flavonoid content and antioxidant capacity were analyzed.

Moisture, ash, protein and total lipid contents were analyzed by gravimetric method, by muffle furnace, kjeldahl method and Weibull-Stoldt method respectively. Sugar profiles were investigated using HPLC-RID. Mineral contents were determined using ICP-MS. Total phenolic contents, antioxidant activities and flavonoid contents were analyzed by Folin Ciocalteu, using DPPH and by HPLC-PDA respectively. Fiber contents were analyzed by enzymatic-gravimetric method. Amino acid analysis were performed by GC-MS and botanical origins of the samples were investigated using microscopic method.

All samples were rich source for Zinc, Manganese, Copper and source for Chromium, Calcium, Potassium, Molybdenum, Magnesium, Selenium and Iron. We determined that the average protein content was 18,1% with values ranging between 11,8% and 25,8%. Lysine, Glutamic acid, Aspartic acid and Proline were the main amino acids found. The average antioxidant activity and total flavonoid content were 73,4% and 6 mg/g respectively. 10 plant families were identified as dominant pollens: Asteraceae, Brassicaceae, Cistaceae, Fabaceae, Fagaceae, Oleaceae, Papaveraceae, Ranunculaceae, Rosaceae, Salicaceae. The carbohydrates levels were between 30-56% as fructose, glucose being primary carbohydrates. The average fiber content was 14,0%. Values were between 6,2% and 19,4%. In this study it was determined that bee pollens collected from different regions of Turkey were source even rich source in terms of mineral, protein and fiber content according to EU Food Regulation. This study also shows that bee pollens are natural sources of antioxidant substances of high importance due to the average total phenolic and total flavonoid contents were 18 mg/g and 6 mg/g, respectively.

[Abstract:0573]

Nutritional differences between color sorted Turkish polyfloral bee pollens

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As bees can not collect monofloral pollen of wildflowers, commercial bee pollens are usually polyfloral. However, it is assumed that the nutritional content of different plant-derived pollens will be different. The aim of this project is to obtain bee pollens with standard nutritional values.

For this reason, 41 polyfloral pollen samples collected from different regions of Turkey were separated according to their colors leading to 234 different samples and were examined for physicochemical (sugar profile, total fat, protein, mineral, amino acid, ash and fiber content) and functional properties (total phenolic, flavonoid content and antioxidant capacity).

Pollen samples were separated automatically with Sortex device and analyzed under stereo microscope before analysis. Sorted samples were classified using pantone color catalog.

Ash, moisture, protein and total lipid contents were analyzed by muffle furnace, gravimetric, kjeldahl and Weibull-Stoldt method respectively. Sugar profiles were investigated using HPLC-RID. Mineral contents were determined using ICP-MS. Total phenolic contents, antioxidant activities and flavonoid contents were analyzed by Folin Ciocalteu, using DPPH and by HPLC-PDA respectively. Fiber contents were analyzed by enzymatic-gravimetric method. Amino acid contents were investigated by GC-MS and botanical origins were determined by microscopic method.

38 different plant families were detected; Cistaceae, Asteraceae, Fabaceae, Brassicaceae and Rosaceae.

Protein contents of the samples were between 12,7% and 28,6%. *Onobrychis* sp., *Vicia sativa*, and *Trifolium pratense* were high in protein, while *Cistus salviifolius* has the lowest content. Oil contents of the samples were found to be at least 2,1% (*Centaurea depressa*) and highest 14,8% (*Taraxacum butleri*). Fiber contents varied between 5,3% and 22,0% with the highest found in *Verbascum sinuatum*.

Total phenolic contents were between 7,0 and 32,0 mg GAE/g. Antioxidant activity and total flavonoid contents were found between 31,4%-97,0% and 0,2-9,7mg/g respectively.

As a result, it was determined that the nutrient contents of pollens from different plant species were different. It is proposed that pollen mixtures with high nutrient contents and bioactive effects can be prepared by using different monofloral pollen segments with known analytical values.

[Abstract:0578]

Remote Hive Monitoring - Sensor Synergy

Huw Evans

arnia Ltd

Increased focus on the importance and fragility of the honey bee has led to the growing need for precision apiculture, which in turn has given rise to remarkable developments in both the sophistication and the adoption of nonintrusive bee monitoring technologies. Arnia equipment now remotely monitors multiple parameters from hundreds of hives in more than 25 countries around the world.

In this presentation we demonstrate how nonintrusive hive monitoring has influenced bee husbandry, allowing hobby beekeepers to become more intimate with their bees while disturbing them less. We show how remote monitoring enables commercial beekeepers to run their operations more efficiently while scientists have access to an unprecedented volume of highly granular data from a wealth of geographical locations.

The modular system comprises of sensors measuring hive weight, temperatures, humidity, colony acoustics and more recently a bee counter at the hive entrance which accurately logs forager activity, along with apiary weather conditions. While measurements of hive homeostasis, activity, productivity and metrological conditions are all useful in their own right, it is the cross correlation of the various data sets that facilitate the greatest insights and understanding, due to synergy between the various sensor readings.

Presenting examples from both beekeeping and scientific applications, we illustrate how illuminating and powerful this synergy can be, in better understanding colony behaviour but also the bees' interaction with their local environment.

Not only is this technology nonintrusive per se, the principal aim of this monitoring is to actively minimise the amount of disruption associated with normal beekeeping practice. It is our hope that this presentation will stimulate further thought about applications of this emerging technology in this exciting new field.

[Abstract:0601]

Commercial Apiary Management Software

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The rapid development of computing technologies and the ever increasing availability of mobile device access to the internet has created a great opportunity to leverage technology to improve beekeeping and the health of honey bees around the world. Cloud based software for record keeping offers a convenient, secure, and valuable tool for beekeepers in the complex world of managing healthy and productive honey bees. Storing a variety of data including observations, inspections, management actions, photos, videos, instrumented hive data, lab reports, and more, these software tools give a beekeeper the information needed to make wise management decisions.

To sustain the ever growing pollination needs of the food production industry in the presence of ongoing annual colony losses arising from a host of challenges, commercial beekeepers are faced with an increasingly complex mix of business opportunities and growing operational costs to maintain the requisite number of healthy honey bee colonies. And while the knowledge of how to deal with the health threats of parasites, pests, pathogens, poor nutrition, and pesticides is increasing through research, individual beekeeper experience and ingenuity, great potential remains for the development of data driven best management practices through the application of technology to the beekeeping industry. This potential is even greater with an integrated software solution to guide the use of this technology.

The critical component in realizing this potential is for beekeepers to augment existing practices and processes with technology in such a way that captures data and information in a form that can then be analyzed, both for the individual beekeeping operation and then collectively for the broader beekeeping industry. Convincing commercial beekeepers to adopt new technology and incorporate it into their daily operations requires overcoming a number of obstacles, not all of which can be directly addressed by the technology companies. These include a commercial beekeeping culture resistant to change and an aging owner population not familiar or comfortable with technology. This talk describes the Hive Tracks apiary management software developed for commercial beekeepers in the USA, Canada, and New Zealand, the challenges encountered in the development process, and the next steps for the software.

[Abstract:0604]

Chemotaxonomic markers of Mugla Pine Honey with Chemometric Approach

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Various kinds of honey are produced in various regions of Turkey due to the biodiversity of the flora. Pine honey is resistant to crystallization due to its preventive characteristics. Therefore, it has been used as a natural food additive in many products (for example, ice cream), including medicine. Pine is exported 90% among the other kinds of honey produced in Turkey. This means that almost all of the exported honey is pine honey. Although it has a great export and usage in various industries, there has been no more study to specify the pine honey. Therefore, the aim of the study is to identify the phenolic and flavonoid compounds.

In this study, pine honey samples collected from 16 various regions of Mugla at three different dates by Mugla Beekeepers Association (MAYBİR) were studied. The collection dates of the honey also taken into consideration. Totally 48 pine honey sample were studied using GC-MS for their ingredients. Then to classify the samples all the results were analysed by chemometric methods using the principal component analysis (PCA) and cluster analysis (CA) by Minitab statistical software 16.2.1.

The results demonstrated that in pine honey collected from various regions of Turkey included four chemotaxonomic markers which are also affected by the environment. The four chemotaxonomic markers are detected as 3,4,5-Trimethoxybenzyl methyl ether (1), Dehydrovomifolol (2), coniferol (3) ve 5,8-Dihydroxy-2,7-dimethoxy-1,4-naphthalenedione (4). The results can be used to identify and specify the pine honey by using phenolic fingerprint in future.

[Abstract:0622]

Smart frames - The Next Generation of Nonintrusive Hive Monitoring

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Typically, honeybee hives are manually inspected, frame-by-frame, by beekeepers assessing the health and productivity of the colony. Importantly, decisions regarding when to intervene (feeding, supplementing with brood frames, or pest control) rely on a qualitative judgment made by experienced beekeepers during such labor-intensive inspections. For the past several years, nonintrusive electronic monitoring devices have been used to quantify specific hive characteristics, such as weight, temperature, internal humidity and even acoustic sampling within and surrounding the hive. These measurements provide useful information about the state of the colony and its environment, such as the start and end of nectar flow, swarming, presence of brood, supersedure and absconding, which allows beekeepers to make management decisions and inferences about the health of the colony.

We demonstrate a new, high resolution technology that allows beekeepers and scientists to gain far greater insight by monitoring bee colonies at individual frame level, thus reducing the need to open the hive for manual inspections. These smart frame systems will collect temperature, humidity and vibration data, offering unprecedented insight into honey bee health and communication as well as the possibility to identify subtle environmental factors affecting bee colonies that are likely to be buffered when measured at the colony level.

Critical routine questions of queenrightness, brood volume, and the general health of the colony may be answered without opening the hive, saving both bees and the beekeeper from the hassle of an unnecessary inspection. Furthermore, smart frames have the potential to verify and expand our understanding of on-comb communication. This provides live, ongoing detection and interpretation of the waggle-dance, allowing mapping of those signals to forage locations. With this information we can geofence areas of desirable and undesirable forage to enhance honey quality. Directly detecting and monitoring the signatures of common pests or non-lethal pesticide exposures, will alert the beekeeper as to when intervention is required. Ultimately, a smart frame system provides greater resolution than currently available technology and further reduces the labor burden on beekeepers.

[Abstract:0624]

BPRACTICES project: New indicators and on-farm practices to improve honeybee health in the *Aethina tumida* era in Europe

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BPRACTICES is a project funded from the European Union's Horizon 2020 research and innovation program under Grant Agreement n° 696231, ERA-Net SusAn – European Research Area on Sustainable Animal Production Systems, that aims to develop a sustainable breeding system by implementing innovative management practices in beekeeping (Good Beekeeping Practices - GBPs). The project consortium, coordinated by the Istituto Zooprofilattico Sperimentale del Lazio e della Toscana "M. Aleandri" (Italy), includes: University of Namik Kemal (Turkey), Agricultural Institute of Slovenia (Slovenia), Centro de Investigación Apícola y Agroambiental de Marchamalo (Spain), Austrian Agency for Health and Food Safety (Austria), Mississippi State University (USA) and Istituto Zooprofilattico Sperimentale delle Venezie (Italy). Moreover the project involves: the International Federation of Beekeepers Association (Apimondia), the University of Genova (Italy), and has the valuable collaboration of the European Union Reference Laboratory for Bee Health (ANSES, France) and of the Food and Agriculture Organization of the United Nations (FAO). Technologies and practices for small agricultural producers (TECA) platform. Eight work packages aim at the following specific accomplishments: prevention and control of the main honeybee diseases adopting proper good beekeeping practices (GBP), economic evaluation of competitiveness and resilience of European beekeeping, development of an innovative traceability system approval at the apiary level of all the innovations developed within the project and dissemination of results. Innovative biomolecular techniques will be used to detect preclinical signs of honeybee diseases (e.g. PCR analyses from innovative matrices), and will be validated and standardized at international level in collaboration with the EU reference laboratory. Methods to control honeybee diseases avoiding the application of chemical treatments and guaranteeing quality and safety of hive products will be studied and tested at the apiary level, in collaboration with APIMONDIA and the other project partners. Beekeepers and consumers will benefit from an innovative technology (QRCode/Rfid system based) able to give information on the product's origin. Data on consumers' knowledge and perceptions will be collected to identify the weaknesses and the strengths of the system. Communication activities will be organized to ensure visibility and sharing the project results with beekeepers, consumers, policy makers and the scientific community.

[Abstract:0643]

Building a Business Analytics Platform for Enhancing Smart Hive Development

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In the past decade, big data analytics and data availability have become priorities to many scientific fields and business operations. The decision making process is now seen as less cumbersome due to automation through data processing. Computers can be programmed to make decisions based on numeric information with minimal intervention from a human. However, the data analytics sector of apiculture is merely at its inception. Daily inspection information produced by beekeepers is contained largely on clipboards and personal hard drives. The lack of a cloud-based data platform for apiculturists to store inspection and management information about their hives is potentially detrimental in the endeavor to increase honey bee livelihood.

This project demonstrates progress in building a comprehensive data platform that records data for better management of beehives. The collection and analysis of this data will allow for the application of advanced data analytics techniques that will lead to a better understanding and evaluation of the economic and best management practices for commercial beekeepers and growers of pollinated crops. This paper describes the process through which data was collected from hobbyist, sideline, and commercial beekeepers in the form of inspection and checklist forms that are currently being used to perform hive inspections across the US. Recruiting a community of “citizen scientists” to input hive health data from inspections creates a database of best management practices that can be used universally in monitoring hive health. In standardizing the data gained from beekeepers, we can gather best management practices to enhance the solvency of technology in improving hive health.

[Abstract:0644]

Venom Collection

Karen Lally, Hossein Yeganehrad, Sharon Lally

Caspian apiaries

Venom collection is one of the most difficult parts of the beekeeping process. Apitoxin is another word for honeybee venom. The active portion of apitoxin is a complex mixture of proteins which causes local inflammation and acts as an anticoagulant. The venom is produced in the abdomen of worker bees from a mixture of acidic and basic secretions. A honeybee can inject 0.1 mg of venom via its stinger. Bee venom has many commercial, medical and therapeutic applications. Among the growing list of uses, Bee Venom Therapy (BVT) has been used to treat arthritis, rheumatism, skin diseases, lyme disease and chronic fatigue syndrome. Historically, collecting bee venom was a laborious and technical procedure, requiring skillful handling of each individual bee. Recently, developments in electro-stimulation of worker bees have led to a revolution in bee venom collection, allowing for larger-scale commercial bee venom collection operations. Caspian Apiaries continues to build on these advances with new techniques applied to the electrostimulation process developed by Mihaly Simics (Simics, 1999). The key to these new developments is the use of Caspian Solution™, a proprietary mixture of pheromones and bee pollen. In combination with electro-stimulation techniques, Caspian Apiaries is able to maximize the yield of bee venom in three ways: First, the techniques allow Caspian Apiaries to collect bee venom from around 500 hives a day. Second, the use of Caspian Solution™ has been shown to increase the per colony yield of venom. Finally, the use of Caspian Solution™ in these techniques has also been shown to shorten the recovery period needed before a colony's venom can be harvested again. By stimulating bees to release Nasamov pheromone, Caspian Solution™ mitigates the effects of the alarm pheromone released as a byproduct of the electro-stimulation. The pacifying effect of Caspian Solution™ makes the environment around the collecting device safer, as well as allows for the rapid re-deployment of electro-stimulation equipment to other colonies. This presentation will include a description of the techniques, including donor hive selection, proper parameters for the electro-stimulation, a working time-frame for efficient and scalable collection and the hygienic, collection, transportation, desiccation and storage of bee venom.

[Abstract:0660]

Antimicrobial Effects of Propolis Against Some Pathogenic Microorganisms

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Propolis, a nontoxic resinous substance produced by honey bees, has a wide range of biological activities such as antibacterial, antiviral, anti-inflammatory, anticariogenic, antioxidative and anticancer. This study was carried out to investigate the antimicrobial effect of propolis and to determine the chemical content by GC-MS (Gas chromatography–mass spectrometry). In vitro inhibitory activity of propolis was investigated by the disc diffusion method against six gram positive, three gram negative bacteria and one yeast like fungi. As a result of GC-MS analysis, it has been observed that the chemical content of propolis was detected compounds belong to hydrocarbons, aliphatic acids and their esters, cinnamic acids and their esters, flavonoids, alcohols, terpenes, aromatic acids, ketones. All microorganisms tested were susceptible to the propolis extract except for *Klebsiella pneumoniae*. Also minimum inhibitory concentration (MIC) values were determined by twofold dilutions of the preparations. MIC values against microorganisms ranged from 25 µg/ml to 200 µg/ml. Our findings shows that propolis has weaker antimicrobial effect compared to ampicillin but it has broader spectra than.

[Abstract:0691]

beeXML - Exchanging Data about Bees and Beekeeping

Walter Haefeker

European Professional Beekeepers Association, Oppenau, Germany

Governmental institutions, academic research projects as well as breeding programs of beekeeping associations inevitable gather data about bees and beekeepers. Unfortunately these databases become data islands and the information is of limited value for the beekeeping community as a whole.

beeXML is intended to be the answer to this problem. The project is not about creating a central database. Rather, XML is a self-describing data format that can allow the exchange of data.

In order to create an XML standard, it is necessary to agree on what data is collected on a particular topic. The self-describing structure makes the exchange much more flexible than it would be with rigid table definitions.

beeXML.org is focused on supporting your use of the beeXML standard by:

- Documenting the standard
- Documenting our implementation experiences
- Providing a beeXML Implementation Guide
- Collaboration with other standards bodies
- Providing assistance in properly understanding and interpreting the BeeXML standard
- Supporting all projects in their efforts to exchange of data about bees and beekeepers in a standardized format
- BeeXML.org is not an electronic market place or a software!

The beeXML standard enables the following benefits:

- Accurate data
- Reduced costs for exchanging data between projects and institutions
- Consistent information throughout the beekeeping sector
- Interact between project partners in an uniform manner
- Simplify the process for dealing with multiple sources of data
- Reduced manual work, resulting in fewer entry errors
- Real-time exchange of information and greater electronic information availability

The beeXML standard is intended to cover different data domains:

- colonies / beekeepers / operations / baggage systems
- biodiversity of bees and breeding lines – (also for the Apimondia license)
- bee diseases / pathogens / strains / treatments
- Environmental data / contaminants and residues bee products
- data on authenticity of bee products (NMR method etc.)
- market data for bee products

[Abstract:0693]

Effect of Starvation Days and Starving Periods on Larval Development, Survival Rates and Emergence Weights of Worker Honeybees Reared In Vitro

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AIM: This study was carried out to determine the effects of starvation days and times on adulthood periods of larvae, survival rates and emergence weights of worker honeybees reared in vitro.

MATERIAL-METHODS: Two-days old larvae were grafted into petri dishes filled with larval diets. All larvae were fed with same larval diet. Larval diets were poured into polystyrene disposable Petri dishes and 2 days old 15 larvae were grafted into each dish. One day after the grafting, First groups were taken out of the incubator and transferred to new Petri dishes without food. After one hour starvation 25% of them were transferred to new Petri dishes had food, after two hour starving other 25% of them were transferred to new Petri dishes had food, after three hour starving other 25% of them were transferred to a new Petri dishes had food and after four hours starving 25% of them were transferred to a new Petri dishes had food. In second day, third day and fourth day same procedures were done for second, third and fourth day starving groups that were described above.

FINDINGS: The average adulation periods of worker bees were 16.00, 17.13, 18.28, 17.66 and 16.13 days in starving day 1, day 2, day 3, day 4, and control groups respectively. The survival rates to the adult stage were 59,65%, 40,10%, 53,90%, 48,72% and 58,44% in starving group 1 to control respectively. The average weights of the newly emerged worker bees were 142,57±19,22 in starving day 1, 142,87±31,92 in starving day 2, 99,95±22,11 in starving day 3, 123,27±22,22,49 in starving day 4 and 144.48±25,30 mg in control group.

RESULTS: Starving in one and two days didn't have any effect on pre-defecation larval weights, survival rates and newly emerged weights. Starving in third day has the highest effect on larval and newly emerged weights. Larval and newly emerged weights of all starving groups were found lower than control groups..

[Abstract:0721]

Queen Performance and Colony Productivity Decreases after Queens are Exposed to Temperature Extremes

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The health and performance of honey bee queens is an important factor determining colony productivity and survival. We have observed that when recently mated queens are exposed to temperature extremes in the laboratory or during transport the quality of their sperm decreases before any symptoms of poor health are visible. In a field study of colonies headed by control or temperature-treated queens, we showed that temperature-induced reduction in sperm quality results in decreased queen performance, as observed by poor brood pattern and reduced brood quantity. This in turn had a marked effect on colony productivity as shown by reduced adult bee population and decreased honey production. Further, the overwinter survival of colonies headed by temperature treated queens was also reduced. We will discuss how these results can guide queen producers and beekeepers on queen handling and management decisions to reduce the need for frequent queen replacement and improve colony productivity and survival.

[Abstract:0741]

International Royal Jelly Standard

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International Royal Jelly Standard was published by ISO in Switzerland in 2016. This is the first international standards on royal jelly in the world. The paper will show the new chemical requirements of royal jell, such as moisture 62-68.5%, 10-HAD 1.4 %, protein 11-18 %, total sugar 7-18 %, fructose 2-9 %, glucose 2-9 %, sucrose <3%, erlos <0.5%, maltose < 1.5%, maltotriose <0.5%, total acidity 30-53, total lipid 2-8%, C13/C12 isotopic ratio -29 - -20. It specifies the production and sanitary requirements for royal jelly and a series of organoleptic and chemical test methods to control royal jelly quality. It also specifies the requirements of transport, storage, packaging and marking for royal jelly. It applies to the royal jelly production including collecting, preliminary processing, packaging and trade links. It will compare with the royal jelly standards of China, the main royal jelly production country, and the others. Is it a good new international standard to promote royal jelly industry in the future? let us discuss in the Turkey.

New approach: Chemical and fluorescence profiling of NZ honeys

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Abstract

New Zealand manuka (*Leptospermum scoparium*) and kanuka (*Kunzea ericoides*) honeys contain a unique array of chemical markers useful for chemical fingerprinting. We investigated the presence of 13 potential marker compounds in nectars of the major honey crop species. We confirmed that leptosperin, lepteridine, 20 -methoxyacetophenone, and 2-methoxybenzoic acid are exclusive to manuka nectar whereas lumichrome is unique to kanuka nectar. 3-Phenyllactic acid and 4-hydroxyphenyllactic acid are present in manuka and kanuka nectars. Leptosperin, lepteridine, 3-phenyllactic acid, and 4-hydroxyphenyllactic acid are chemically stable over prolonged storage, but not 2-methoxybenzoic acid and 20 -methoxyacetophenone. Accordingly, leptosperin and lepteridine are definitive chemical markers for authentication of manuka honey. An optimal concentration cut-off was established for the floral source-specific markers: leptosperin (94 mg/kg), lepteridine (2.1 mg/kg), 20 -methoxyacetophenone (2.0 mg/kg) for manuka honey, and lumichrome (4.5 mg/kg) for kanuka honey. The use of leptosperin and lepteridine as fluorescence markers for manuka honey authentication is reinforced.

Keywords: Manuka, *Leptospermum scoparium*, Leptosperin, Lepteridine

[Abstract:0787] / PLENARY TALK

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Abstract

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Keywords: Manuka, *Leptospermum scoparium*, Leptosperin, Lepteridine

POLLINATION AND BEE FLORA

[Abstract:0021]

A Study of Some Melliferous Plant Species To Provide a Guide for Establishment of *Apis mellifera* *Adansonii* Honey Forest In Rainforest Zone of Nigeria

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The melliferous plant species in the rainforest zone of Nigeria was studied. The high rate of deforestation as well as other factors affects the production of honey and other bee products in this zone. The study however, was carried out to identify some of the excellent floral sources of nectar and/or pollen visited by the honeybees, within this region using the mellisopalynological method. Five (5) honey samples and three (3) pollen samples from *Apis mellifera adansonii* were collected from hives located within this zone and used for the study. Results obtained indicated the predominance of some of these plants in the honey and pollen samples. Plants such as *Cocos nucifera* had the highest frequency of occurrence (580) in Honey sample 1; *Elaeis guineensis* with frequency (1106) in Honey sample 2 as well as other plants with high frequencies of occurrence in other honey samples were identified. The predominance of these plants in the honey and pollen samples is an indication that it must have been their flowering periods as well as that they are of preference to the bees. Moreso, findings from the study revealed that honeybees in this zone store about 4-7 plants per pollen pellet. This must have resulted as a result of the vegetation type which is multifloral. Inclusively, these plants must have been combined by the bees in each of the pellets because of the individual nutritional value of the plants in the pellets that satisfy the needs of the bees in brood rearing. In conclusion, these excellent sources of nectar and/or pollen can be inter planted while establishing apiaries for *Apis mellifera adansonii* honey production. Also, the plant species combined by the bees in each of the pollen pellets should also be inter planted the way they are stored in each pellet. The inter planting of these pollen and nectar sources can thus boost the production of honey in this zone as nectar is the main energy source of the bees while pollen is their source of protein and other nutrients which is important in brood rearing, improving colony population, strenght as well as production.

[Abstract:0057]

Energy Wars on World of Honey Bee (*Apis mellifera* L.)

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Samsun Provincial Directorate of Food, Agriculture and Livestock

Honey bees which are the most important component of pollination have a mutually beneficial relationship with flowers that evolved together. During the pollination of flowers by honey bees, flowers provide to honey bees the nectar as a source of energy, and pollen as a source of protein. While honey bees receiving nectar as a reward, they provide pollination and collect oversupply pollen for the needs of himself and his offspring. The main reason of the honey bee nectar foraging is to meet the energy needs of itself and its colonies. For this purpose, honey bee goes to the plants and absorbs nectar at the bottom of the flower then accumulates in the honey stomach. When the density of nectar sugar was below 20% level, to blow out the water content in order to produce honey required energy level cannot be economical to collect nectar. Collecting nectar with high sugar content is the advantage of bees as fast as possible. After the factors affecting the attractiveness of nectar, is the abundance of nectar. Taking into account the energy content while collecting their food by honey bees has is of great importance in balance of nature. However, when evaluated the event in terms of energy requirements, food sources are exploited by honey bees as a result of the spread of bee colonies. In this case less food remains other insects and especially pollinators. This situation shows that there is an energy war between honey bee colonies as well as other pollinators. Unfortunately today this war is developing in favor of honey bees. However, bee mortality in recent years should be evaluated as an effort to maintain its nature balance.

[Abstract:0111]

To Be or Not to Be of W.Shakespeare Has Been Much Discussed, But "Bees or No Bees" is Today the Biggest Question in World Agriculture

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One of the biggest problems of apiculture worldwide detected by Apimondia in the last ten years has been the CCD (Colony collapse disorder) and the decline of the pollinators, especially the bees. In relation to the death and decline of bees populations and in particular CCD, several causes have been identified by the researchers as: Varroa mite, bacteria, fungi, pesticides, deforestation, climatic oscillations usw. However, lately the most obvious causes of mass death of bees and have been pesticides used in agriculture. In Brazil the pesticides are used today indiscriminately and the mortality of bees increases every year. We have been developing, for about three years, a campaign to protect bees named "Bee or Not To Be" inspired in W. Shakspeare, but meanning "Bees or No Bees". The site online is: www.nobeenofood.com. In paralel to this campaign we developed the App " Bee Alert " to record bee deaths and CCD. In the last three years we registered more than 250 occurrences of bee losses, with death of more than 20,000 bee colonies (*Apis mellifera* and stingless bees). This represent more than 1 billion bees killed mainly by pesticides registered in 18 states of Brazil. The most affected states are São Paulo, Minas Gerais and Rio Grande do Sul. It is known that mass death of bees is already a worldwide problem. In the European Community the pesticides neonicotinoids have been banned in the last three years with high tendency to banishment for another period. In Brazil the neonicotinoids pesticides are used freely and indiscriminately. The problem of pesticide contamination is increasing every year. We are today the world's largest consumer of neonicotinoid agrotoxics and a significant number of beekeepers is abandoning their ctivities. We are a serious candidate to have the "Bee Man" doing the work of pollination by hand like occurs today in Sichuan, a region of China. The elimination of bee colonies, the main insect pollinators, represents today the major concern of beekeeping in many countries and perhaps this fact is one of the greatest risks in beekeeping and agriculture in relation to food production.

[Abstract:0118]

Determining Plant Origin in the Honey with DNA Based Methods

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Honey has an important place in our nutrition in terms of its ingredients glucose, amino acids, vitamins and minerals. Bees produce honey by collecting nectar and pollen from various flowers. The pollen spectra of honey help to identify which flowers visited by honeybees and, therefore, will help detect the geographical origin of honey. Plant families can be detected by the microscopic analysis of pollen in honey. DNA based methods for the determination of the origin of honey are regarded as faster and more reliable in the recent years. In this study total 75 honeys, including sunflower, pine, canola, chestnut, citrus, Rhododendron, clover, oak, milkvetch, mullein, Anzer and Ardahan honey were collected from various regions of Turkey with the help of the Turkish Association of Beekeepers (TAB). The quantitative melissopalynological analyses were determined by light microscopy. 40 honey samples were selected according to their high pollen quality and unifloral origin. After DNA isolation (Eurofins GeneSpin Kit), DNA quality was determined by spectrophotometric and PCR based method. 18S rRNA gene was used as a control gene and amplicons were run on agarose gel. According to results from both spectrophotometric and PCR, we can say that isolated DNAs have enough quality for the next step experiment such as next generation sequencing. With this study, have been taken the step to join a new dimension the determination of the botanical origin of the honey that can be identified only microscopic method until today instead of DNA based methods. Also in the next years by this methods, patenting of honeys' according to the provinces, geographical marking, determining of GMO, endemic and toxic plants pollen in honey will be provided.

Acknowledgements: We would like to thank Hacettepe University Scientific Research Unit (project number FHD-2015-8179) for financial support and Turkish Association of Beekeepers (TAB) for providing samples during our study.

[Abstract:0154]

Efficacy of Honeybees "*Apis Mellifera*" on the Production of Khilla Plant "*Ammi Visnaga*" Seeds in the Sudan

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The present study was conducted to assess the efficacy of honeybees in the production of khella seeds. It was conducted in west soba agriculture project south of Khartoum, during November 2014- June 2015. The complete randomized block design (CRBD) with three different treatments and four replicates was adopted. The treatments were: visnaga plants caged with honeybees (C+B), visnaga plants caged without honeybees (C-B) and open pollinated plants. The highest mean weight of seeds /umble was obtained from plants in open pollination (2.68g). It was significantly similar to that of the plants caged with honeybees (2.46g). Both were significantly heavier than the control plants (1.26g). The mean seed yield /plant was (35.34g), (32.54g) and (17.17g) in the open pollination system, the honeybee pollinating plants and the plants caged without honeybees. This resulted in significantly similar mean seeds yield /fadden (927.6kg) and (854.23 kg) in open and honeybee pollinated treatments. The control treatment resulted in significantly the least seed yield/ fadden (450.73kg). The mean weight of 1000 seeds was significantly similar for the open and honeybees pollination treatments (0.91gm) and (0.89 gm); the treatment without bees had significantly the least mean weight of 1000 seeds (0.68 g). The seed set indicated no significant differences between (O) and (C+B) treatments which were (89.7%) and (86.8%) respectively. Both treatments significantly surpassed the seed set of the treatment (C-B) where it was only (68.5%). Therefore the results of the study revealed that the honeybees are very effective in pollinating Khilla plant and promising to be subjected to further investigation on the quality of the produced seeds.

[Abstract:0160]

Pollination for Conservation and Agro-ecological Sustenance on Crop Pollinators in Kigezi, South Western Uganda

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¹AICAD

²Busitema University

³James Cook University

Biodiversity conservation is not limited to protected area systems but stretches across agro-ecological zones world over. Prior to the introduction of agro-chemicals to Kigezi, all farming was carried out organically. Finally the functions at play in conservation of biodiversity, sustenance of preferred crop varieties, co-existence of protected area systems and the growing human population needs related to anthropogenic practices both traditional, indigenous and modern development diversions will help develop a model hinged on three pillars, namely biodiversity conservation, food yield production and maintenance of a harmonious agro-ecological system and wild ecosystems. Eventually a stable co-existence of agro-wild systems will enhance food production and biodiversity conservation in general.

Kigezi, which stands out as a very fertile area is one of the food baskets of Uganda and is key in the production of pulses, cereals, potatoes and vegetables. Prior to the introduction of agro-chemicals to Kigezi, all farming was carried out organically. However, farmers have gradually continued to employ the use of growing amounts of these chemicals in a bid to contain the increasing threat of various pests and diseases. As a consequence, this has indiscriminately killed and almost wiped out many beneficial insect pollinators e.g. stingless bees of (*Meliponula*) and (*Trigona*) genera; Apidae mainly (*Apis mellifera*) – the Africanized honey bees and other pollinators known and unknown to the biodiversity data sets of the greater Kigezi region.

The close proximity of agricultural fields to protected area systems in the region namely Echuya forest, Bwindi Impenetrable National Park forest, Garamba forest in neighbouring Democratic Republic of Congo boarder, Queen Elizabeth National Park, Maramagambo-Kalinzu-Katsyoha-Kitomi forests, Kigezi Game Reserve and a few remaining swamp and marsh lands complicates mapping of the extent to which migratory pollinators move between wild environments and agro-ecological zones. Sustenance of the biodiversity that does not know and respect border lines can only be achieved if farmers are educated on the implications of use of agro-chemicals and conservation procedures in place for sustainable co-existence.

[Abstract:0162]

Honeybees Management Increase the Pollination of Less Preferred Flowers

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Most varieties of cultivated pear are self-incompatible and depend on cross-pollination for optimum fruit-set. Honeybee, *Apis mellifera* colonies are usually used for pollination in crop. However, pear flowers are not very attractive to honeybees, because of small amounts of nectar with low sugar content. Different honeybee pollination management techniques are tried to improve pollination of different crops. We experimentally tested different colony manipulations techniques to improve the honeybee foraging performance of pear through: (1) pollen trapping with sugar syrup feeding (PTSS); (2) pollen trapping only (PT); (3) sugar syrup feeding only (SS) and (4) control group (without pollen trapping and sugar syrup feeding). Number of bees incoming with pollen, the amount pollen trapped and the proportion pear pollen were collected and analyzed. The results clearly show that pollen collection rates of bees and pollen amount significantly varied ($P < 0.05$) among the treatment groups. The mean amount pollen harvested was higher for PTSS (19.2 g) followed by PT (16.4 g) compared to control colonies (9 g) per day. A highest proportion of pear pollen (85.8%) was acquired from the total pollen types collected during pollen trapping. Therefore, PTSS was the most effective treatment for improving pear pollination, while other treatments such as PT and SS could also be useful. The study contributes to the understanding of how foraging behavior of honeybee is shaped through colony manipulation, which is critical when pollination of pear is required in the orchard.

[Abstract:0163]

Native Honeybee Outperform Adventives Honeybee in Increasing Pear (*Pyrus bretschneideri*) Pollination

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Foraging behavior of different bee species is a key factor influencing pollination efficiency. Little is known on pear pollination behavior of native *Apis cerana* and adventive *Apis mellifera* in China. Comparative evaluation was carried out to explore the foraging differences of *A. cerana* and *A. mellifera* on pear flower under the natural conditions of pear growing areas. The results show that pollen gathering tendency was significantly varied ($P < 0.05$) between bee species, among days and time of the days. *A. cerana* started foraging at earlier time and the pollen gathering tendency was higher in the morning compared to *A. mellifera*. *A. mellifera* shows variable foraging preferences which vigorously forage pear flower on the first day, and then diverge gradually to non-target floral resources. However, *A. cerana* persists on pear flower without shifting the preference to other competitive flowers. Our results strongly suggest that *A. cerana* significantly outperform than adventive *A. mellifera* on pear flower foraging tendency under natural conditions. This study adds the arguments for further maintaining *A. cerana* for pear pollination and developing different pollination management techniques for *A. mellifera*.

[Abstract:0180]

The Appropriate Sex Ratio and Density of the *Osmia* Bee (*Osmia Cornifrons*) for Apple Pollination

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We investigated nesting behavior and pollination efficiency as functions of the sex ratio and density in released bees to determine standard quantities of *Osmia cornifrons* per 2,000m² for apple pollination. The nesting behavior, reproduction, fruit set and shape of *O. cornifrons* varied significantly with the released sex ratio of *O. cornifrons*. A female: male sex ratio of 1: 2 was resulted in a 3.4 to 6.7 fold higher than other sex ratio in a nesting behavior. Releasing only females resulted in a 1.2 to 6.7-fold higher trap nesting rate than other sex ratios. A ratio of 1: 2 resulted in a 1.2-fold nesting rate, which was slightly higher than other nesting rates. Releasing only males resulted in a 2.4-fold greater amount of fruit set in non-pollinated sites. A sex ratio of 1: 2 gave a slightly higher shape index and a 1.2 to 1.6-fold lower asymmetric index than other sex ratios. Therefore, an efficient sex ratio of *O. cornifrons* to release is 1: 2 for apple pollination. The nesting behavior and reproduction varied significantly with the release density of *O. cornifrons* females. Releasing 400 female bees resulted in 1.8 to 3.5-fold higher nesting behavior and a 4.3 to 7.8-fold higher trap-nesting rate than other numbers of female bees. However, there was no significant difference between female release numbers in fruit set, and 100 to 200 females gave a slightly higher shape index than 400 females. Thus, we determined that 200 females should be released per 2,000m² and that the sex ratio of females to males should be 1: 2.

[Abstract:0253]

Comparison of Honey Bee Hives of Different Sizes, and Hive Product Income in Hybrid Seed Canola Pollination in Southern Alberta, Canada

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We compared the performance of differently sized commercially managed honey bee (*Apis mellifera* L.) hives: singles (one nine frame brood chamber) and doubles (two brood chambers) in hybrid canola seed production fields in southern Alberta in 2014 and 2015. Currently, hybrid canola seed companies only contract double brood chamber units to pollinate canola seed production fields, but there may be advantages for beekeepers and growers alike if singles could also be contracted for pollination, as they are in many other crops. The colony populations of both the single and double-brood chamber hives in this study were highly variable. In 2014 the singles had less populous adult bee and brood populations than the doubles, as would be predicted. However, the populations of both bees and brood were similar in both hive sizes in 2015, indicating that hive size (singles versus doubles) is not necessarily a reliable indicator of colony size. Our findings indicate that in comparison to doubles, on a per-frame basis, singles yielded more pollen, similar amounts of pollen and nectar foragers, and similar amounts of honey. Therefore we conclude that singles could be used to provide the same level of pollination services as doubles currently do in hybrid seed canola pollination as long as the number of frames of bees stocked per acre is similar to current practices. We further examined the potential of pollen-collection as a supplementary income source for beekeepers contracted to pollinate hybrid canola seed production fields. We found that in the canola pollination system, gross income per colony was increased with the collection of pollen as a supplementary hive product to honey production alone, without negative consequences on brood production.

[Abstract:0257]

The Project of the Digital Recording of Beekeeping Spots in Muğla Province

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Our province is the global pine honey center with a production of 21 thousand tons of pine honey produced by 1.25 million local colonies and 1.25 million colonies owned by mobile beekeepers from all over Turkey with the aim of producing pine honey. Due to this over-density each year, the digital recording of beekeeping spots in Muğla province has been improved and being carried out since. In this project, our aim is to raise the level of rivalry with the help of the researches, planning and other actions about beekeeping spots. We also aim to accelerate the local development and record the production of bee products in Muğla province which is the center of mobile beekeeping and the source of pine honey which is the consumers' preference. Revealing the mobile beekeeping's social and economic potential, solving the problems of beekeeping settlement, forming the necessary structure for this and protecting tourism from the negative effects of beekeeping settlement are among other targets. In the project run by the cooperation of Food, Agriculture and Livestock Provincial Directorate of Muğla, Muğla Beekeepers Union and Forestry Operation Directorate, the terrestrial coordinates of 489 neighbourhoods, 3151 fields and 12715 spots in 13 districts. The detected coordinates are recorded in web-based databases so the map of beekeeping spots of the region is formed. The beekeepers are directed by the signboards which can be found and read easily by the beekeepers. By means of this project a web page is formed and a password is given to each beekeeper. Beekeepers can be aware of the vacancies and book spots for their hives so that possible problems like over-population or settlement in the same spot can be solved easily. Through the web-based database, local and mobile beekeepers' profile and number, bee movements, colony efficiency at different spots can be reported. The beekeepers are provided to settle in the right spots, so that our villagers and tourism sector are saved from damages especially as a result of uncoincious applications. This project that's carried out has outspreaded all over the country.

[Abstract:0272]

Determination of Pollination Effectiveness of Different Pollinators on Alfalfa in Lakes Region of Turkey

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Pollination, which is defined as transfer of pollen from a stamen to a pistil, is one of the main critical stages for fruit and seed set in flowering plants. Alfalfa (*Medicago sativa* L.) is the important forage crops, cross pollinated and self-sterility. Its seed set directly depends on pollinator insect activity. Some effects such as increasing environmental pollution and intensive use of insecticides cause to decreasing of natural pollinator insects. For this reason, using of commercially reared pollinator insects has a crucial importance for sustainable agricultural practices. Bumblebees (*Bombus terrestris* L.) and honeybees (*Apis mellifera* L.) are most widely used pollinator insects that reared in industrial scale. This experiment was carried out to determine the bumblebee and honeybee pollination on alfalfa seed production in Lakes Region of Turkey. In the experiment, caged with bumblebee, caged with honeybee, pollinator excluded and open-pollinated groups were compared in terms of some traits which are related to pollination such as podding rate, number of pods per raceme, number of seeds per pod, seed yield and 1000 seed weight

[Abstract:0279]

Development of Melliferous Pollen Spectra Using Field Emission Scanning Electron Microscope Technique

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Development of melliferous Pollen spectra using Field Emission Scanning Electron Microscope technique. Melliferous pollen grain from Pakistan were examined by Field Emission Scanning Electron Microscope in an attempt to develop melliferous pollen spectra of the region. On extensive conditions photographic method and the systematic observation were carefully carried out to identify and distinguish melliferous species on the basis of distinctive features. It presents a first attempt from Pakistan, involving extraction of pollen from honey, its identification and development of pollen spectra based on scanning microscopy. Acetolysis, critical point drying, gold coating were carried out. Technique applied is outlined in paper.

Specific pollen identification was based on typical distinguishing structure and exine sculpturing, however shape and size proved useful in some instances. Forty nine pollen grains of twenty five families including Graminae, Apiaceae, Brassicaceae, Amaranthaceae, Chenopodiaceae, Caryophyllaceae and Plantaginaceae, Pinaceae, Cyperaceae etc. have been identified. Pollen identified up to genus- level like *Arthernera* sp., *Iris* sp. and most of them to species level viz., *Justicia adhatoda*, *Peristrophe paniculata*, *Chenopodium album*, *Plantago ovata*, *Artemisia dubia* etc. *Acacia modesta* and *Zizyphus jujuba* native local flora served as major melliferous source. Pollen morphology ranged from spheroidal, prolate, fenestrate, pantaporate, polyad to bisulcate. Psilate to fenestrate, scabrate to reticulate, striato-reticulate, bireticulate and echinolophate or areolate sculpturing were observed. Key for identification of common melliferous pollen was developed. Angiosperm pollen representation was found dominant, only one species of gymnosperm was observed. Current study presents pollen spectra of particular region which is considered as a characteristic of site. It proved helpful for determining the bee flora of regions which could result in promoting the apiculture industries by creating awareness about the bee foraged plants and helps in promoting the sustainability of the biodiversity.

[Abstract:0306]

Bee Diversity, Bee Pollination and Seed Set of *Trigonella Moabitica* Zoh. (Leguminosae) as a Native Range Plant Grown under Semiarid Mediterranean Conditions

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This investigation was conducted at Jordan University of Science and Technology campus (32°30' N, 35°59' E), Irbid, Jordan, to identify the different bee visitors and to assess their accountability in seed set of *Trigonella moabitica* grown under semiarid Mediterranean conditions. Two treatments were forced on *T. moabitica* plants before flowering: 1) Plants were covered as (control) or 2) Plants were left uncovered to permit bee visiting. The results showed that 37 bee species were identified visiting *T. moabitica* flowers. A single plant produced on average 38 clusters, 13 flowers per cluster and 13 ovaries per flower. Open pollinated flowers produced higher significant pods and seeds than covered flowers. Furthermore, weight of 10 pods as well as the weight of 100 seeds, seed weight per pod and total seed weight was also significantly higher under open pollinated treatment compared to covered treatment. Good management program is needed to conserve the diversity of wild bee flower visitors and to improve their value in flowers pollination.

[Abstract:0307]

Effects of Some Behavior Characteristics for Honey bee and Bumble Bee in Cherry Pollination

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Pollinators (insects) who take part in pollination for good fruit set are important in their presence and behavior characteristics in the field. In this study, it was aimed to determine the benefits of honey bees *Apis mellifera* L.) and bumble bees (*Bombus terrestris*) in terms of visiting frequency to cherry blossoms (0900 Ziraat), field activity and efficiency. The experiment was performed as netting closed application (3.8 mm x 3.8 mm porous gauze) and open application in 24 trees with three plots and 8 plots per parcel. Counts of flowers were made in the branches where the practice was going to be done, and the flowers were taken out of the gauze cage by tree branch restriction method. Prior to flowering, pollinators were brought to the orchards and during the flowering, honeybees, bumble and other insects were counted on the flowers. According to the results it was determined that the honey bees were the most effective pollinators by visiting frequency of 93% in the orchards with bee pollinator and 77% open visited by natural pollinators, respectively. It was determined that 58% bumble bees and 42% honey bees and other pollinators were effective in the orchards where bumble bees were found. It was determined that the foraging activity reached maximum level at 12:00 am in accordance with the climatic conditions, and it decreased significantly ($P < 0.05$) after at 15:00pm. There were differences between years and applications in fruit setting ($P < 0.05$) statistically. It has been determined that as the visiting frequency to flowers of bumble and honey bees increases, the efficiency of pollination increase. At the end of the study, it was determined that the honey bees were the most visited pollinators whereas the most fruit set was obtained from the free application of honey bees.

[Abstract:0317]

Pollinators' Activity on Apple Trees, Blackcurrants, Strawberries, Blueberries and Raspberries

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The first results of the monitoring of pollinators' activity on selected fruit trees and berry shrubs in different locations in Slovenia in 2016 and 2017 will be presented. Pollinators' activity was monitored during the whole flowering period and in different weather conditions. The number of pollinators was determined by counting at the sample sites. Great differences in pollinator communities between different plants were found. In general, the most numerous pollinator of all plants except blueberries were honeybees. Bumblebees were the main pollinators of blueberries and frequent pollinators of currants. Other observed pollinators were solitary bees, hoverflies, wasps, beetles and butterflies. Great differences in pollinator communities among days were observed presumably due to different weather conditions and the availability of alternative food sources. Honeybees became active later in the morning than bumblebees and were active mostly in warm weather. Bumblebees were the most active in the morning and also at low temperatures and in rainy and windy weather. The complexity and dynamics of pollinator communities and activities show the great importance of maintaining pollinator diversity.

[Abstract:0373]

The Effect of Honey Bee Pollination on Watermelon (*Citrullus lanatus*) Fruit Quality

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The use of honey bees in pollination in fruit and vegetable cultivation ensures higher fruit set and more seeds. For this reason, when watermelon is grown, honey bees are the best pollinators when compared to foreign pollinators (insect, fly etc.). In this study, the effect of honey bee pollination on watermelon fruit quality was examined. The application of bee visited and bee restriction pollination was carried out in four different watermelon types and completely randomized block design with three replications. The average fruit length, average fruit weight, fruit width, meat thickness, fruit meat weight, fruit peel weight and peel thickness measurements were taken from fruits. Least square means for average fruit length in watermelon were found to be 27.00 ± 5.80 in bee visited pollination and 33.42 ± 5.63 in bee restricted pollination. The average fruit weight was found in bee visited pollination 3.96 ± 0.62 and in bee restricted pollination 6.49 ± 1.04 . For fruit width, these measurements were found as 18.59 ± 3.14 and 22.59 ± 4.29 . Fruit meat weight was found to be 3.54 ± 0.90 and 4.86 ± 0.73 , fruit shell weight was found to be 3.08 ± 0.82 and 4.43 ± 0.74 , fruit flesh thickness was found to be 15.77 ± 2.99 and 20.13 ± 3.90 , and shell thickness was found to be 1.32 ± 0.35 and 1.18 ± 0.33 .

Average fruit size did not differ in terms of the pollination applications and watermelon varieties ($P > 0.05$). Average fruit weight, fruit width and fruit meat thickness were different according to the pollination applications ($P < 0.01$). Fruit weight, fruit peel weight and peel thickness were found to be different according to the varieties of watermelon ($P < 0.01$).

Fruit quality is also expected to increase with increasing visiting number of honey bees in watermelon. Honey bee pollination is not as effective as expected in number and size of fruit, honey bee pollination affects fruit quality and shape positively and increases its marketability. The use of honey bees for pollination will provide great contribution to the agriculture of our country by increasing the productivity of the watermelon.

[Abstract:0381]

Investigation of Importance of Opium Poppy (*Papaver somniferum* L.) for Beekeeping

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Productivity in beekeeping mainly depends on natural conditions such as climate and floral resources. Therefore, determination and know of suitable areas for beekeeping has vital importance. Opium poppy (*Papaver somniferum* L.) which important for pharmacy and medicine sectors is also valuable pollen source for honeybee colonies. This plant is cultivated especially in Afyonkarahisar, but also in Burdur, Isparta, Uşak, Konya and Kütahya provinces in Turkey. In this study, investigation of importance of opium poppy for beekeeping was aimed in light of the Afyonkarahisar model. According to results of the study, flowering period takes about a month from late May to late June. Because of the high pollen yield and high pollen protein content of opium poppy (35 – 40%), cultivated areas of this plant are preferred intensively by migratory beekeepers for increase the worker population before the major nectar flow. In flowered period of opium poppy, about 1500 migratory beekeepers preferred the Afyonkarahisar region, mainly districts of Sinanpaşa, Şuhut and Emirdağ in 2016. It was determined that many of the beekeepers that preferred the Afyonkarahisar province came from Muğla region, and many of the beekeepers migrated to pine honey production areas at the end of the flowering period of opium poppy.

[Abstract:0423]

An Investigation about Bee Plant (*Phacelia tanacetifolia* benth.) from Olur District (Erzurum)

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Olur district of Erzurum province has a very favorable price for beekeeping in terms of some geographical structure and vegetation cover. This study was carried out in order to determine the developmental characteristics of the bee plant and the relationship and visit characteristics of the bees with the bee plant by taking measurements from bee plant cultivated in three different locations in the district center of Olur and in Kekikli and Bozdoğan villages of this district. In the study, the numbers of flower clusters per 1 m² area were determined according to the number of flower buds in the area, flower colors, the number of bees visiting the flowers in the area of 1 m² in 5 minutes, the duration of flowers in the bees and the plant height. According to the results of the study, it was determined that the number of flower clusters in 1 m² area increased with increasing height and the best result was obtained from Kekikli village. It was determined that the number of bees visiting the flowers in the area of 1 m² in 5 minutes decreases as the height increases. For this reason, in the center of Olur, it was noted that the number of bees visiting the flowers in the area of 1 m² in 5 minutes was the highest value. It was determined that the duration of the bees in the flowers was between 40 and 70 seconds for all three places. As a result of the measurements in all three places; it was noted that the number of flower clusters increased due to the increase in length of the plant. In addition, the relationship between bees and bee plant was determined by obtaining data in terms of beekeeping activities and flowering period of the bee plant cultivated in the study areas. The topics covered in this context were dealt with along with our study in Erzurum for the first time and we were not able to find adequate studies related to applications in other cities.

Abstract:0475]

The Role of Honey Bees (*Apis mellifera* L.) in the Pollination of Almond Plants

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The intent of fruit growing is obtaining abundant and quality product. An important way of this is realization of poolination and impregnation events healthy. The first action that providing the impregnation and the most important factor that determining the product amount is pollination. At the same time, pollination affects the fruit form and size. Pollination of plants consists according to flower structure with wind and insects. Almond plant belongs to the class of plants dusted with bugs (entomophilous). This study has examined the effects of honeybees over the yield and quality components on almond plant. The research was carried out in a almond garden at an altitude of 650 m in Kilis province. Three different points were determined from the beginning, middle and end of the experiment field, and 6 Ferranges tree and 6 Ferredual tree which had the same characteristics were chosen from each point. 3 trees from each determined points were taken into a cage covered with netting that had pores with the parameters of 3.8 mm x 3.8 mm 1 week before blossoming. The other 3 trees constituted the control group. It was found that the honeybees are completely effective on the fruit set (%34.38 of the flowers are polinated and turn into fruits in the bee entrance free trees while %1.47 of the flowers are polinated and turn into fruits in the bee restricted trees.) and yield (5.913 kg/tree yield of trees in the bee entrance free areas; 0,218 kg/tree of trees in the bee restricted areas), however they had no effect over the parameter of fruit quality.

[Abstract:0478]

To Determine the Honey Bees' Conditioning Priorities against Aromatic Flowering Herb Extract with Parlance Extraction Reaction (PER) Method

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PURPOSE: In this study, plant species priorities against oily aromatic extracts obtained by maceration method of 7 different trees, shrubs and grasses (eucalyptus, pseudo-pepper, murt, rosemary, thyme, lavender and chamomile) were obtained by using the language subtraction reaction (PER) in conditional conditioning of honey bees Priorities have been researched. **Utensils and METHODS:** Research; Osmaniye Korkut Ata University, Düzici Vocational High School Campus was realized in the main building (37 ° 15'17.54 "North, 36 ° 27'15.29" East, 367 m Height). In the study, fresh flowers belonging to 7 different plant species have been used in close proximity to the flowering periods that the honey bees visited intensively. Aromatic plant extracts were obtained from fresh flowers by maceration method. In the survey, isolated workers who did not engage in field activities were used. Workers bees; They are conditioned in a 7x5 meter (35 m2) room with 4 low atmospheric pressure conditioning cabins. Each worker bee used in the study was subjected to three repetition tests of three repetitions at intervals of 15 minutes with a rest period of 30 minutes.

RESULTS: Differences between the mean number of tongue removal reaction (PER) counts among the aromatic extracts of plant species were statistically significant (P <0.05, sd: 7, F: 23.707). Eucalyptus 544.00±19.34, Rosmarinus 518.00±17.00, Myrtus 494.00±18.71, Thymus 488.33±19.53, Artemisia 481.67±11.89, Schinus Molle plant extract 453.00±14.17 (± SH) tongue in olive oil used as a control group and 298.00 ± 10.6 in the control group. (PER) was determined.

CONCLUSION: It has been recognized meaningful differentiates on conditioning against different types of herb extract at the end of the investigating done with different types of herb extract in order to investigate whether honey bees have priorities or not. At the end of the experiment checking's, it has been observed that most of the honey bees are conditioned and remembered the odours used in investigate. In the made controlling, it has been identified that the workers bees conditioned to as specific odour hasn't given any reaction to other odour.

[Abstract:0516]

Honeybee Forage Plants, Bee Visitation Counts and Properties of Honey from Different Agro-ecological zones of Uganda

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The current study was conducted in selected agro-ecological zones of Uganda. The aim was to document honeybee forage plants, assess honeybee visitation counts on different forage plants and properties of honey from selected agro-ecological zones of Uganda. In order to achieve the objectives of the study, a survey of about two kilometers radius of each apiary and beekeepers was done by selecting fifteen bee farmers with established colonies per agro-ecological zone. The preferred forage plants were established by questionnaires and independent field observations on plants that were visited by honeybees. Samples of honey were collected from apiaries in the selected agro-ecological zones for laboratory analyses. Specifically, honey: colour, water content, pH, acidity and sugars were analysed in the laboratory. The results indicate that a total of forty six plant species belonging to twenty families were identified as honeybee forage sources. Although, the Eastern and Lake Victoria agro-ecological zones had the greatest number of honeybee forage plant species that were visited by honeybees during the study period, other agro-ecological zones equally had honeybee forage sources that can support the beekeeping industry. Honeybee visitation counts on forage plants during the different times of the day varied significantly in some forage species and not in others and the bee counts on forage plants in the different agro-ecological zones did not vary significantly in all cases except between Eastern and Northern agro-ecological zones in the late afternoon. The chemical properties of honey (water, sugar and pH and acidity) varied among the agro-ecological zones but in all cases met the UNBS and international standards. From this study, I recommend that beekeepers should plant more honeybee forage plants that have been identified in this study or crops that can act as sources of forage in cases where the natural honeybee forage has been cut down. In addition, bee farmers should maintain proper honey harvesting and processing techniques so that they can ensure no contamination of honey.

[Abstract:0532]

The Pollen Spectrum of Some Monofloral Honeys from Turkey

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The legal regulations of honey have been addressed to establish the minimum marketing level of the product and the need for consumer protection by correct naming and labeling. Research oriented to determine floral origination may increase the commercial value of these products. Therefore, the characterization of honeys is necessary in order to better our response to consumer demands. The main objective of this study was to evaluate the composition of honey from different part of Turkey in respect of botanical origin and to detect the botanical similarity of different honey types with cluster analysis. The total numbers of 30 honey samples were studied and botanically typified as chestnut (12), canola (4), sunflower (3), clover (5), rhododendron (2) and citrus (2), mullein (1), astragalus (1) honeys. Monofloral honeys were considered as such whenever the dominant pollen was found at over 45% of total pollen except for overrepresented pollen types as chestnut and underrepresented pollen types as citrus. Cluster analysis including 22 different taxa as variables describes the overall nearness between honey samples. Generally, at a similarity level of 70%, the samples clustered into two groups, comprising of honey samples corresponding to botanical origin of the honey.

[Abstract:0565]

Greenhouse Pollination of Cucumber, *Cucumis sativa* L., by Use of Honeybee, *Apis mellifera scutellata* Swarm

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Migrating or reproductive Honeybee swarms could be domesticated or conserved, in a Bee hotel, for utilization in pollination services. Cucumber, *Cucumis sativa* L., benefits from honeybee pollination. The crop was planted from seed in a greenhouse, 8x24 Meters in size. Drip irrigation was applied. *Apis mellifera scutellata* swarm, from a known bee conservation Hotel was introduced for pollination. The resultant flowers were tallied and compared with the resultant fruits, for productivity. The latter was compared with the plants on the outside plot, exposed to multiple pollinators. The greenhouse plants yielded more Cucumber and were straight in appearance, compared to the bend ones from the outside plot, clearly demonstrating pollination deficiency, due to the perimeter wall surrounding the area. The Cucumber in the greenhouse were effectively and efficiently pollinated by the single pollinator, the honey bee, *Apis mellifera scutellata* swarm. Aphid invasion was, however, notable in the greenhouse than on the outside plot. The sudden effect on the plant was adverse, requiring instant remedy as the aphids sucked juices from the Cucumber plant, leaving it to dry-up. It was recommended that the affected plant be uprooted and disposed of as soon as the infestation was manifest, to limit the rapid spread to neighbouring plants.

[Abstract:0577]

Honeybee Pollination as a Bio-intensive Technique for Achieving Increase in Crop Yields; Project Report Excerpt of Usaid Markets II Beekeeping/pollination Project- 2014-2017 Nigeria

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United States Agency for International Development

Introduction

The chief constraint to achieving food security in developing economies is low per hectare yield of strategic cash crops which limits optimum/maximum production of food quantities as a result of subsistence methods typified by use of low technologies.

The African Union Inter Bureau for Animal Resources (AU-IBAR) Bee project is designed to achieve food security through limiting pests and diseases in honeybees and native pollinators in her member countries.

The USAID MARKETS II Apiculture/Beekeeping project is an intervention for 'household economic strengthening' and yield increase of rural smallholding farmer enterprises in three commodity value chains.

Methodology

- The bee specie of choice was the *apis mellifera adansonii* which is native to Nigeria.
- Three value chains were selected; Soya beans, Cocoa, Oil Palm.
- Training of 1,188 identified farmers in Modern Beekeeping management techniques; from this group 296 persons were trained in pollination service delivery techniques in 8 states of Nigeria.
- Formation of 28 registered Beekeeper Cooperatives for monitoring.
- Every trained Pollination delivery agent was equipped with 2 moveable top bar technology hives and honeybee colonies, management accessories (protective clothing, smokers & hive tools) monitoring material (documentation forms for contractual agreements & yield assessment) & comb support frames plus portable hive carrier cases for ease of transporting colonies to target plots.
- Extension agents to monitor, supervise and report actual pollination service delivery on a session by session basis to ensure verifiable accurate record keeping.

Outcomes and Results

A total of 2,850 plots were pollinated between 2014 & 2017.

Initial results; 8% increase in cocoa and 40% in soybeans.

Final results; 11% in cocoa, 110% in oil palm as a beneficiary 'competing crop' & 60% increase in soybeans.

Constraints to honeybee pollination in cocoa; competing flora, excessive chemical application and limited pollination window.

Project documentation includes 10 quarterly reports, 2 yield assessment reports, 2,658 pictures, 110 videos, 2 dedicated training manuals, delivery notes, cooperative certificates.

The cost of Pollination is approximately 25% of the value of the increase which it directly generates.

Conclusion

Pollination as bio-intensive technique in the food production chain is an indispensable factor to achieving food security in Africa.

[Abstract:0595]

Colony Multiplication and Management of Stingless Bees to Provide Crop Pollination Services in Brazil

Cristiano Menezes
Embrapa

Stingless bees have been studied as alternative pollinators of several crops in tropical and subtropical areas, such as tomato, strawberry, macadamia, coffee and assai berry. Although they are efficient pollinators of around 30 crops, management techniques and multiplication methods still require improvements to attend the demand of growers. In the last decade, we have studied several aspects of basic biology and management of different species of stingless bees, which allowed us to start a colony production system in Brazil. A technique to produce large number of in vitro queens has been developed; queen mating has been successfully managed; an artificial diet for replacing nectar and pollen has been achieved; and incubation techniques have been improved to produce colonies under laboratory conditions. We have also studied the management of this species at several crops, such as strawberry, coffee, macadamia, açai and lychee. We have also developed techniques to transport and protect colonies from environment stress. The advances achieved so far allowed us to establish a production system of stingless bee colonies and also to offer colonies for pollination services to growers.

[Abstract:0610]

Investigation of Species Belonging to Order Diptera (Insecta) in Kastamonu University Campus as a Pollinator

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INTRODUCTION: In spermatophyte plants, the transfer of male gametophyte known as pollen on the stigma of female organ is known as pollination. Pollination carries a great importance for the fruit ripening and development of seeds. Some plants are capable of self-fertilization but a big number of plant species is in need of carrier vector for pollination. Carrier vectors can be sometimes water or wind but most of the flowering plants are pollinated by animal sources. Flowering plant provide pollen, nectar and various oils to carrier animals as a prize for carrying pollens to the female organs for fertilization, guarantying the future of the species. Many animals from different species take role in pollination. In this study, the collection and identification of variety of pollens and carrier vectors in the campus area of Kastamonu University have been done.

MATERIAL-METHOD: For the identification of pollinator varieties, area of campus have been investigated at the May and October 2016. The pollinator insects were placed in 50 ml falkon tubes and transferred to the laboratory, 10 ml of 70% alcohol was put, the tubes were saved. At the time of investigation, the tubes were shaken so that the pollens may mix with the alcohol, the alcohol was then taken into 15 ml tubes and centrifuged at 4000 rpm for 10 minutes. After centrifugation the alcohol on the top was taken and a slides were prepared from the bottom sediments. The insects were also again placed in alcohol after the investigation process.

RESULTS and DISCUSSION: As a result of this study, eight taxa (*Eristalis tenax*, *Eristalis* sp., *Sphaerophoria scripta*, *Syrirta pipiens*, *Sarcophaga* sp., *Gymnosoma nudifrons*, *Musca autumnalis*, *Cynomya mortuorum*) belonging to 5 families (Syrphidae, Sarcophagidae, Tachinidae, Muscidae, Calliphoridae) of Diptera order were detected in May and seven taxa (*Eristalis tenax*, *Eristalis* sp., *Sphaerophoria scripta*, *Syrirta pipiens*, *Melanostoma mellinum*, *Gymnosoma nudifrons*, *Calliphora* sp.) belonging to 2 families (Syrphidae, Calliphoridae) of Diptera were detected in October. The variety and amount of pollens was also investigated from washed and prepared samples.

[Abstract:0626]

Electronic Monitoring of Honey bee and Bumble Bee Colonies to Manage Pollinator Health and Optimise Pollination Efficacy

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Bumble bees are used worldwide for the large scale pollination of a variety of fruit and vegetable crops grown indoors and outdoors. Honey bees are also used widely as managed pollinators for many intensively grown crops. However this 'industrialization' of bees as pollinators for intensive agriculture raises many challenges in terms of managing the health and productivity of the bees and assessing the effectiveness of the pollination services provided, which can have a significant impact on crop yield and quality.

Commercial bumble bee colonies lend themselves to non-intrusive electronic monitoring. In preliminary studies performed in collaboration with Exeter University it was demonstrated that a colony's weight and brood temperature are important indicators of the colony's dynamics and health status. As it became evident that precise activity of the pollinator is a very desirable data parameter, bumble bee and honey bee counters have been developed to measure with utmost precision the number of foragers leaving and returning. Moreover, the counter can also detect the speed of the traffic.

Using Arnia's electronic monitoring system performance of bumble bee and honey bee colonies can be assessed in different settings including pollinator density, various hive positions, and different weather (and indoor environment) conditions. Sensors can also be used for instance to monitor the health and status of the bees during transit. The paper shows how better data on managed pollinator colonies can help develop strategies to manage pollinator health and welfare whilst maintaining pollination effectiveness.

[Abstract:0712]

Lavatera thuringiaca and Echinops sphaerocephalus are Important Plants in the System of Nectariferous Conveyor in Russia

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Most nectar plants in the central part of Russia blossom in late summer and autumn that affects negatively the development of bee colonies. In the middle-end of July the main honey-plants blossom: *Trifolium pratense*, *Trifolium repens*, *Melilotus officinalis*, *Melilotus albus*, *Medicago sativa*, *Echium vulgare* and others. Introduction of *Lavatera thuringiaca* and *Echinops sphaerocephalus* to the nectar line allows eliminating the period without honey. *Lavatera thuringiaca* is a perennial plant of the Malvaceae family up to 1.5 m high. It is widely distributed in the European part of the Russian Federation, Western Siberia, and the Republic of Kazakhstan. This plant can be used on behalf of animal husbandry and beekeeping. It begins to bloom at the end of June and blossoms for about two months. The sugar content in the nectar of a single flower varies from 1.5 to 2.0 mg. Nectar productivity ranges from 125 to 189 kg/ha of sugar. By creating some optimal conditions for soil nutrition it is possible to increase this parameter by 80 %. Flowers are well visited by honey bees collecting nectar and pollen. At the area with *Lavatera thuringiaca* 92-144 pieces / 100 m² of bees work simultaneously. *Echinops sphaerocephalus* is a perennial plant of the Asteraceae family up to 2 m high. This European-West Asian species grows on forest fringes, hills and ravines. Numerous single-flowered baskets are collected at the end of the stem and its branches into some spherical heads 4-5.5 cm in diameter. Forming large vegetative mass this plant tolerates many nutrients, so it is responsive to soil fertility. *Echinops sphaerocephalus* blooms in the second year after sowing and blooms from the middle of July for 40 days. The species develops best in the third year of life. One flower has 0.2-0.3 mg of sugar in nectar a day. The nectar productivity is 142 kg/ha of sugar in nectar. The number of honey bees for one account is 327 pieces/100 m². Thus, *Lavatera thuringiaca* and *Echinops sphaerocephalus* are important and valuable nectar and pollen plants for beekeeping in the late summer and autumn periods (from late July to September).

[Abstract:0739]

Government Attaches Importance to Pollination, Promoting Beekeeping Development in China

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China, the largest beekeeping country, beekeeping was used mainly to produce bee-products, but neglected the main AIM: pollination. 2009, the present president Xi Jinping attached importance to pollination and pointed out that the main role of bee pollination, act as go-between in marriage, for the crop and ecology should be held in high esteem. 2013, government issued a Plan of Application Demonstration for honeybee pollination. 2014, Ministry of Agriculture (MOA) set up 20 demonstration bases of bee pollination for more than 10 species of nectar plants or insect pollinated plants such as rap, Soybean, sunflower, apple, pear, orange, strawberry, tomato, melons, cotton, etc. in Anhui, Jiangxi, Sichuan, Shanxi, Shandong, Shanxi, Beijing, Hebei, Shandong, Inner Mongolia, Xinjiang, Henan, Hubei and Heilongjiang provinces. Each area of demonstrates base is approximate 600-6,670 hectares. There are also separately 24 and 29 demonstrated bases for 35 species of fruits, vegetables, crops and oil plants in different provinces. It will be continued in 2017. It has made a great progress in pollination industry. Nowadays, China beekeeping is booming with both bee-products and pollination.

[Abstract:0748]

Beekeeping with *Apis cerana indica* as an Agricultural Input to Improve Yields for Small Farmers: Evidence from the Field in Two Districts of India

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Under The Mango Tree

Pollination services are an “essential agricultural input” that ensure the production of crops (FAO,2016). Under The Mango Tree (UTMT) in collaboration with the National Bank for Agriculture and Rural Development (NABARD), India undertook a project to train 1000 Self Help Group women in *Apis cerana* beekeeping in two of the poorest districts, Dhule (Maharashtra) and Dangs (Gujarat) from 2014- 2016.

This paper presents the impact of this intervention on agricultural yields for some key crops in the area.

METHODOLOGY: Baseline and endline surveys were conducted with 10%-15% of beekeepers in both districts at the start of the project and at the end. Data was also collected from a control group in villages where there was no beekeeping.

Key FINDINGS: Households were very poor with a majority (67% in Dang and 96% in Dhule) being Below Poverty Line households as per government records. Rainfed, subsistence farming was the norm with households growing millets, rice, vegetables alongwith cash crops like mango, cashew as part of an intervention designed to improve their economic status on 0.4 – 1 hectare of land.

- a) Increase in Production of fruits and vegetables: A significant increase in production of fruits and vegetables of beekeepers was seen in both districts, compared to the control group in mango, custard apple, guava and cashew.
- b) Actual Sales: Total sales proceeds of fruits for a group of women beekeepers in Dhule had increased to Rs.1,24,300 compared to before beekeeping total of Rs 26,600 – an increase of Rs. 97,700.
- c) Many of the plot neighbours also benefited from better pollination as their yields saw a significant improvement vis a vis control group yields. A number of beekeeper case studies also provided rich data on the positive impact of beekeeping. These findings point to the need for greater policy attention in developing countries to the role of small scale beekeeping in increasing yields, especially for smallholder farmers.

[Abstract:0753]

Protocol for Assessment of Pollinator Population Density

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In response to the need to derive empirical data on the status of pollinators especially in Asia, we developed a protocol to assess the pollinator population in managed, natural, and disaster-hit ecosystems. The three important steps are planning, implementation of the survey, and computation of indices. In the planning step, experts rank and classify the pollinator hotspots in various ecosystem types (orchard, agroecosystem and natural vegetation) based on the seasonality and likelihood of having high number of flowers and pollinators. Two-stage sampling and mapping of each hotspots are designed. The number of sample hotspots is computed according to sampling precision and confidence levels assigned per class per ecosystem type. In each sample hotspot, sample survey sites are randomly selected according to the agreed sampling precision and confidence levels. In the second step (orchard and agroecosystem), a grid map with 100 sq m divisions is surveyed. For natural vegetation, survey sites are randomly selected according to the location of pollinator nesting sites. All sampling are conducted during the blooming period of the plants, with consideration of the peak of anthesis, because this is the period when the pollinators are actively foraging, the pollen viability is high and the nectar secretion is at its peak.

An MS Excel template is created to compute for diversity measures (Modified Shannon index for pollinators and Modified Shannon index for flowers) and pollination matching measures (Plant-to-Pollinator ratio index and Pollinator-to-Plant ratio index).

OIE SYMPOSIUM ABSTRACTS

**OIE SYMPOSIUM ON
EMERGING INFECTIOUS AGENTS IN HONEY BEES AND OIE-LISTED DISEASES**

to be held during the

45th APIMONDIA International Apicultural Congress
Istanbul (Turkey), Monday 2 October 2017



VESPA VELUTINA, IN EUROPE: IMPACT ON HONEY BEES, MONITORING, SENSITIVITY AND LIMITS OF DETECTION AND CONTROL METHODS

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The Yellow-legged hornet, *Vespa velutina nigrithorax*, originates from eastern temperate to subtropical zones of Asia (Villemant et al., 2011); it was unintentionally introduced in France before 2004 (Haxaire et al 2006) via the importation of Chinese pottery for horticulture (Arca et al 2015).

Bees being one of its main preys, this hawking hornet is an additional threat to European beekeeping that already suffered multiple decline factors. It is of great concern among public authorities and beekeepers because of its rapid multiplication and high impact on bee colonies. More than direct predation on honey bees (Perrard et al 2009), its main impact is due to its hawking behavior that disrupts bee foraging activity (Monceau et al 2013; Arca et al 2014) and leads the most fragile colonies to die from depletion in the following winter.

As a result of this nuisance, the Asian hornet was classified in France as Health Hazard of Second Category and Invasive Alien Species (IAS) and IAS of concern to the European Union (Commission Implementing Regulation (EU) 2016/1141, 13 July 2016). Surveillance, prevention and control measures have been subsequently defined.

In France, the spread of *V. velutina* has been followed for twelve years using a monitoring protocol based on citizen warning and local networks: today, the hornet invasion extends in almost all French territory and reached the neighboring countries (Spain, Portugal, Italy, Germany, Belgium and Great Britain) (<http://frelonasiatique.mnhn.fr/home>), progressing at a rate of about 60 km per year (Rome et al. 2013; Robinet et al. 2016). Also introduced in South Korea in the early 2000s, it arrived in Japan in 2015 (Kishi and Goka 2017).

We described here the monitoring data validation protocol used to reliably confirm the locations where *V. velutina* is able to establish. We also show how these presence data registered in the INPN database (INPN 2003) are used to make predictions on hornet expansion (Villemant et al 2011; Barbet-Massin et al 2013) and evaluate the effectiveness of control methods.

We finally go around the detection and control methods currently used to struggle this species and discussed their sensitivity and limits.

OIE ACTIVITIES RELATED TO HONEY BEE HEALTH

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The World Organisation for Animal Health (OIE) is an intergovernmental organisation established in 1924 with 181 Member Countries (as of September 2017). Its mandate is to improve animal health, veterinary public health and animal welfare world-wide; the health of bees is included in the OIE remit.

Under this general mandate, the OIE is dedicated to:

- ensuring transparency of the animal disease situation world-wide, including diseases transmissible to humans (see paper on the World Animal Health Information System),
- collecting, analysing and disseminating veterinary scientific information,
- providing expertise and promoting international solidarity for the control of animal diseases,
- guaranteeing the sanitary safety of world trade in animals and animal products,
- improving food safety from the farm to the abattoir,
- promoting animal welfare through a science-based approach,
- improving the legal framework and resources of national Veterinary Services.

In application of its mandate, the OIE has published different Standards related to bee diseases. They are mainly laid down in two publications: the *Terrestrial Animal Health Code (Terrestrial Code)* and the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Terrestrial Manual)*.

For bee diseases, the OIE and its Member Countries can benefit from the support and expertise of several OIE Reference Laboratories.

The OIE also published recently a publication titled bee health and veterinarians (2014) providing useful information to all the actors involved in the management of the health of bees.

CRITHIDIA SPP. AND LOTMARIA SPP., POSSIBLE EMERGING PATHOGENS IN HONEY BEES

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Trypanomatids are obligate parasites and their presence in European honey bees (*Apis mellifera*) has been recognised as highly prevalent. According to Schwartz et al. (2015), the current classification places all Hymenoptera trypanosomatidis within a novel clade (Clade 3) of the Leishmaninae subfamily that includes *Crithidia mellificae* (*C. mellificae*) and *Lotmaria passim* (*L. passim*).

C. mellificae Langridge and McGhee, 1967 was described in *A. mellifera* and is present in Asia, Australia, USA and Europe; it can infest a wide variety of hymenopteran hosts (e.g. *A. mellifera*, *Apis ceranae*, *Vespula squamosa*, *Osmia bicornis*, *Osmia cornuta*).

L. passim was described in *A. mellifera* and in *A. cerana*. According to Ravoet et al. (2015), it is the dominant species in Belgium, Japan and Switzerland. It has also been found in Chile. Many isolates initially identified as *C. mellificae* were reclassified as *L. passim*, thus making this species the most predominant trypanosomatid in honey bees worldwide, while *C. mellificae* seems currently considered less frequent.

C. mellificae and *L. passim* colonize the honey bees at the digestive tract level (rectum tissue) being transmitted by fecal-oral route. The presence of infected feces in the hive promotes the presence of parasite cells on the surface of insect body and increases the number of honey bee workers able to transmit the parasite to other healthy bees.

Seasonal occurrence of these protozoa seems to be significantly lower in spring compared to summer and autumn even if their pathological effects on the honey bees are still not well known: some researchers state that they do not affect the health of the colony; other researchers report a positive correlation on honey bee winter losses or colony longevity, when associated with varroaosis and *Nosema ceranae*. Also bacterial infections by *Spiroplasma* spp. were associated with *C. mellificae* presence.

At present, the isolation methods for *C. mellificae* and *L. passim* are: axenic cell lines cultures isolated from the dissected ileum/rectum of adult honey bees; in vivo inoculations with trypanosomatid axenic cultures established from *A. mellifera*, genetic characterization (phylogenetic analyses) of the isolated strains and electron microscopy.

COULD THE NEOGREGARINE APICYSTIS BOMBI BECOME A THREAT TO HONEY BEES?

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About 20 species of bumble bees (*Bombus* spp.) worldwide are known to be natural or typical hosts (*i.e.*, the pathogen is commonly found and can complete development) of the neogregarine (Apicomplexa: Neogregarinorida) *Apicystis bombi*. The pathogen has also been reported in association with other hosts from the same family, the Apidae (stingless bees, honey bees) and others, such as the Megachilidae and Andrenidae. In bumble bees, infections primarily proliferate in adipose tissue leading to reductions of energy reserves for host growth and reproduction, and possibly to alterations of intermediate metabolism. Effects on the European honey bee (*Apis mellifera*), however, are still unknown. Although a few reports about this association exist, possible deleterious effects on honey bees have not yet been examined. Detection techniques for *A. bombi* are mainly two: host dissection and observation of tissues and organs with compound microscopy, and molecular analyses using specific primers (e.g.: NeoF and NeoR). Using one or both techniques, the association between *A. mellifera* and *A. bombi* was examined in Finland, Argentina, Japan, Belgium, Spain, and Algeria, with the parasite always at relatively low prevalence. In Argentina, monitoring across eight years at a northwestern Patagonian site within the only region of the country where this pathogen has been found, not just in *A. mellifera* but also in bumble bee species, determined a mean prevalence of 11.3% of infected honey bees per season. In parallel, *A. bombi* was never found in other localities of the country, despite screening more than 400.000 honey bees. A salient feature of *A. bombi* infections in honey bees of Patagonia as opposed to those in bumble bees is that virtually all oocysts in honey bees were not refractive suggesting the possibility that they do not reach maturity and viability in that host. Leaving aside the unknown (but potential) pathogenicity on infected individuals, this fact could suggest that the lifecycle of *A. bombi* in *A. mellifera* would not be completed properly, and conceivably pathogen transmission would be interrupted. If that is true, and honey bees are indeed suboptimal or atypical hosts, their colonies would be threatened only in areas where infected bumble bees (or other suitable host) are present.

VIRAL DRIVERS OF HONEY BEE LOSSES – THE DEFORMED WING VIRUS- CLADE AND THE AKI-COMPLEX

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The recent colony losses among honey bees (*Apis mellifera*) have worried not only beekeepers but also the general public. Even simple causal relationships remain elusive and the picture has emerged that such losses are of multifactorial origin, it became more and more clear that viral diseases with members of the AKI-complex and the Deformed wing virus-clade, both associated with *Varroa destructor*, play a key role. Acute bee paralysis virus (ABPV), Kashmir bee virus (KBV) and Israeli acute paralysis virus (IAPV) form the AKI-complex and Deformed wing virus (DWV) and *Varroa destructor* virus-1 (VDV-1) form the DWV-clade. Like most honey bee viruses, all these are RNA-based and consist of complex distributions of mutant genomes termed quasispecies. This quasispecies nature of RNA viruses must be considered when evaluating bee virus detection studies performed via PCR-based methods, as primers designed for a specific virus will always only detect those viruses of the mutant cloud whose genome sequences in the region of the primer binding sites are not (yet) mutated.

CRITERIA FOR THE INCLUSION OF DISEASES, INFECTIONS AND INFESTATIONS IN THE OIE LIST

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The OIE list is a list of terrestrial and aquatic animal diseases, infections or infestations of compulsory notification by the Veterinary Authorities of Member Countries (181 as of 2017). Once a disease, infection or infestation is listed, the OIE: (I) verifies, validates and disseminates the information reported by each Member Country to other countries, which can take the necessary preventive action, and (II) can develop standards for harmonising disease detection, prevention and control, and for safe international trade in animals and their products. The OIE standards are recognised by the World Trade Organisation as reference international sanitary rules for animal health.

In order to be included in the list, a disease, infection or infestation has to fulfil 4 criteria. For terrestrial animals, the criteria are as follows:

1. International spread of the pathogenic agent has been proven.
2. At least one country has demonstrated freedom or impending freedom from the disease, infection or infestation in populations of susceptible animals.
3. Reliable means of detection and diagnosis exist, and a precise case definition is available so that an affected animal can be clearly identified and distinguished from other diseases, infections or infestations.
4. Significant impact on the health of either humans or domestic animals or wildlife.

The list is reviewed regularly by the OIE Specialist Commissions. Modifications (addition of new pathogenic agents or removal of diseases, infections or infestations already listed) can be proposed by the Veterinary Authorities of Member Countries, experts from OIE Reference Laboratories and Collaborating Centres, International Organisations with which the OIE has cooperation agreements, or the Specialist Commissions themselves. If modifications are adopted by the annual World Assembly of Veterinary Delegates (the highest authority of the OIE), the new list comes into force on 1 January of the following year.

For year 2017, the OIE list is comprised of 116 animal diseases, infections and infestations, including 6 that affect bees. These are: infection with *Melissococcus plutonius* (European foulbrood), infection with *Paenibacillus larvae* (American foulbrood), infestation with *Acarapis woodi*, infestation with *Tropilaelaps* spp., infestation with *Varroa* spp. (Varroosis) and infestation with *Aethina tumida* (Small hive beetle).

DIAGNOSIS AND DETECTION OF DIFFERENT GENOTYPES OF PAENIBACILLUS LARVAE, THE CAUSAL AGENT OF AMERICAN FOULBROOD DISEASE

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American foulbrood (AFB) is the most contagious and destructive infectious disease affecting the larval and pupal stages of honey bees (*Apis mellifera*) and other *Apis* species. The causative agent, *Paenibacillus larvae*, is a Gram-positive bacterium that can produce over one billion spores in each infected larva. AFB occurs in temperate or subtropical regions throughout the world and leads to huge losses not only in the apicultural economy but also in pollination rates since *Apis mellifera* is the most widely used actively managed pollinator in the world.

Only bacterial spores are capable of inducing the infection. Spores can remain viable for extended periods of time, survive adverse conditions (desiccation, high temperatures, ultraviolet light exposure) and resist contact with standard disinfectants.

Traditional methods such as the recognition of typical clinical symptoms of infection, culture of *Paenibacillus larvae* from diseased brood and microscopy are efficient and inexpensive ways to diagnose the disease. Clinical diagnosis of AFB is based on the identification of the pathogenic agent by microscopic examination of stained smears of dead or sick larvae. Apart from the distinctive clinical symptoms, laboratory confirmation of the presence of *Paenibacillus larvae* is required in most countries where AFB is a notifiable disease.

For laboratory diagnosis, *Paenibacillus larvae* can be isolated and cultured from various sources including ropy larval remains, scales, honey, pollen, wax and adult bees. Routine analysis of honey samples or adult bees for viable spores of the pathogen is strongly recommended to detect not only subclinical infections but also different *Paenibacillus larvae* genotypes.

PCR amplification of repetitive elements present in bacterial DNA (rep-PCR) is useful for genotyping, and ERIC-PCR amplification (rep-PCR by using enterobacterial repetitive intergenic consensus primers) has shown four *P. larvae* genotypes, named ERIC I, II, III, and IV. This typing scheme correlates with phenotypic differences including spore surface configuration, colony morphology, and virulence.

This presentation will focus on current methods for diagnosis and the potential application of various schemes for epidemiological studies of the pathogen.

RESURGENCE OF EUROPEAN FOULBROOD IN SWITZERLAND: A CHANCE TO IMPROVE OUR KNOWLEDGE OF THE BIOGEOGRAPHY AND PATHOGENICITY OF *MELISSOCOCCUS PLUTONIUS*

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In Switzerland, European foulbrood (EFB) is a honeybee disease which should be controlled according to the Swiss Animal Epidemic Regulation. After being under control during more than 30 years, cases have recently been reported with increasing frequency. From 1970 until 1998, 20 to 50 disease cases per year were sanitized by the veterinary authorities. Since 1999 there is a significant increase of the cases, with a peak of almost 1000 apiaries affected in 2010, representing an incidence rate of 5,7 %. In 2016, still 401 new cases were registered.

Little is known on the pathogenesis of EFB and until today only the application of costly and laborious control measurements limits the spread of the disease. A better understanding of the disease would be necessary to develop more effective control strategies.

I will present hypothesis about the causes of this huge increase of EFB-cases in some regions of Switzerland. Especially the variation in the virulence of *M. plutonius*, which impact its pathogenicity will be discussed and we will explore the causes of this variation. With the technic of multilocus sequence typing (MLST) we looked for genetic sub-types of *M. plutonius* in Switzerland and we investigated their geographic dispersal.

I will also present more practical aspects of the EFB diagnosis and control measures, ability of the bacteria to survive on wood or in honey and the disinfection options.

SMALL HIVE BEETLE; RISK ASSESSMENT FOR TURKEY

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Turkey is the second largest world producer of honey; however the beekeeping industry is not supported with appropriate income, especially from the export of honey and honey products. The main reason for this is the presence of pesticide residues in the honey.

In addition, many bee diseases are present in Turkey. In this report, a detailed description of the epidemiology of small hive beetle (SHB) has been performed: While SHB is not present in Turkey a risk assessment and consequence assessment was performed to better prepare should SHB be introduced and identify introduction pathways. The process of risk assessment was performed in several stages: i) hazard identification; ii) identification of risk pathways; iii) assessing of risk for introduction with identified pathways; and iv) consequence assessment and assessing the risk that diseases becomes endemic after introduction in Turkey. A spreadsheet using RiskAMP add-in for excel was constructed with probability distribution for each route of introduction as per the adopted pathways and simulations were conducted using the Monte Carlo method.

With the given assumptions for the simulations, the probability of introduction of small hive beetle in Turkey varies from the lowest 0.17 per 1,000 events/days (or 1.7 per 10,000 days or 27 years) to the highest level of probability of introduction of SHB in Turkey of 0.6 per 1,000 events/imports (or 6 per 10,000 days or in 27 years) for the year no. 2 of the simulation. According to the results of the simulation, the highest likelihood of introduction comes from importation of fruit (11/15) and importation of soil/compost (4/15). The mean probability of introduction of SHB infestation after 1000 iterations of the constructed model is 0.37 per 1,000 events/days (or 3.7 within 10,000 events/days i.e. 27 years).

Consequences of the destruction caused by the introduction of SHB are great: Simulated average consequence after introduction of SHB is 520 million USD.

PARASITIC TROPILAELOPS SPP. MITES: CONFINED TO ASIA OR GLOBAL BEEKEEPING THREAT?

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At least two parasitic mites have moved from Asian species of honeybees to infest *Apis mellifera*. Of these two, *Varroa* spp. is more widespread globally while *Tropilaelaps* spp. has remained largely in Asia. *Tropilaelaps* mites are most problematic when *A. mellifera* is managed outside its native range in contact with Asian species of *Apis*. In areas where this occurs, beekeepers of *A. mellifera* treat aggressively for *Tropilaelaps*, and *Varroa* is either outcompeted or is controlled as a result of the aggressive treatment regime used against *Tropilaelaps*. *Tropilaelaps* mites are very similar to *Varroa* as both are honeybee ectoparasites that feed on immature developing bees (brood). Mite parasitism can cause brood mortality and colony decline. Currently four species of *Tropilaelaps* are recognized, *Tropilaelaps clareae* Delfinado and Baker, *Tropilaelaps mercedesae* Anderson and Morgan, *Tropilaelaps thaii* Anderson and Morgan and *Tropilaelaps koenigerium* Anderson and Morgan (henceforth collectively referred to as *Tropilaelaps*).

Tropilaelaps mites have expanded their host range as *A. mellifera* were introduced into Asia. The giant honeybee (*Apis dorsata* F.) is thought to be the original host of *Tropilaelaps*. *Tropilaelaps* mites now pose a major threat to managed *A. mellifera* but the mite has not expanded its range as has *Varroa*. For many years it has been predicted that *Tropilaelaps* would spread outside of Asia to other areas where honey bees are managed; to a large degree this spread has not occurred. However, *Tropilaelaps* has recently been found in Korea and in Northern areas of China, challenging the assumption that cold climates alone would limit *Tropilaelaps* spread.

The current distribution pattern of *Tropilaelaps* mites will be presented. Additionally, the current methods for mite detection and data on mite control will be discussed in order to better understand the threat that *Tropilaelaps* mites pose to beekeepers worldwide.

NEW APPROACHES TO A LONG-KNOWN DISEASE: SHOULD VIRUSES BE INCLUDED UNDER THE DEFINITION OF VARROOSIS?

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Traditionally varroosis has been defined as the infestation of honey bees by the obligate *ectoparasitic* *Varroa* mites. *Varroa destructor*, the only species described to parasitize *Apis mellifera*, has spread from its native range since more than 40 years ago. It is nowadays present in nearly all countries with honey bees without exhibiting an adapted host-parasite relationship in the vast majority of cases. Varroosis, therefore, is currently considered to have the most negative impact on apiculture worldwide.

Along with the direct pathogenic effects of the mite feeding activity, it has been shown that *V. destructor* vectors different viruses that can be directly injected into the haemocoel of the host, causing a systemic infection. Mechanical and/or biological vectoring has been proven for viruses of the AKI-complex and Deformed wing virus (DWV). The synergistic action of pathogens is characterized by: (I) the remarkable increased virulence of the viruses and their involvement in large colony losses worldwide since the dispersion of the mite, (II) the diminution over time of the number of *V. destructor* mites required to cause colony damage, (III) the triggering of latent viral infections already present in the honey bee after its feeding activity, and (IV) some clinical symptoms observed in collapsing honey bee colonies, such as crawling and crippled bees with deformed wings and shortened abdomen.

Different studies have confirmed the important role of viruses in *Varroa*-induced colony collapse, but further knowledge is needed in order to clarify and contextualize the precise role and relative importance of *V. destructor* itself and the different viruses carried by the mite. In the varroosis chapter of the OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* (2.2.7) viruses are not currently mentioned. Discussions should be held on their potential inclusion and the convenience, or not, to include molecular diagnostic techniques specially targeted to virus detection. Furthermore, the tests should be quantitative, because viruses can be already present in bees as latent infections, and different parameters like the pathogenic threshold of viral load, the type and proportion of samples to be taken from the colony and apiary, and specific transport requirements would have to be established and standardised.

POSTER



APITHERAPY

[Abstract:0039]

Tooth Coating Containing Propolis and Casein Phosphopeptide – Amorphous Calcium Phosphate (CPP-ACP) for Preventing Dental Caries and Inhibit Dental Demineralization

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Dental caries or tooth decay is an irreversible teeth cavity which occurs because of *Streptococcus mutans*. Dental caries can be prevented by Casein Phosphopeptide – Amorphous Calcium Phosphate (CPP – ACP) though re-calcification and demineralization – inhibiting action to a dentin. Propolis is used to prevent *S. mutans* growth. We produced two kinds of tooth coating in gel and also spray form. The result for the gel is tooth coating gel containing CPP – ACP and 2% EEP has good stability and the tooth treated with it has a good prism pattern and smooth uniform pores identified by SEM. Tooth coating gel containing CPP – ACP and 6% EEP can inhibit 73.78% the growth of *S. mutans* related to negative control. For tooth powder spray and tooth liquid spray was made with active ingredients of 10% w/w CPP-ACP (Casein Phosphopeptide - Amorphous Calcium Phosphate) and EEP (Ethanol Extract Propolis), with the variation of 0%, 2%, and 4% w/w EEP in each preparation to inhibit demineralization. Each preparation should pass organoleptic and viscosity study to maintain the quality. pH of each preparation was evaluated to ensure that each preparation has pH above the critical pH of the oral environment. The stability of polyphenol as the antibacterial agent was evaluated for a month to assure the bioavailability in the preparations. The result shows that each preparation has enough organoleptic aspect and proper viscosity. pH level in each preparation is stable above critical pH of mouth environment (5.5), it ranges between 6.5 – 7.12. Polyphenol content in each preparation is stable with highest polyphenol content in tooth powder spray of 4% EEP, i.e. 1.39 – 1.45% (w/w). Qualitative evaluation of tooth morphology by SEM shows that preparations can inhibit enamel demineralization relatively to negative control.

[Abstract:0043]

Effects of Honeybee Venom in Drinking Water on Growth Performance of Broiler Chickens

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The effects of water supplementation of bee venom (BV) on performance, antioxidant activity and liver function in Arbor Acres broiler chickens were investigated. Hence, 2 experimental treatment groups (control, 0.5ppm BV) were allocated to 3 replicates of 15,000 one-d-old chicks each. The control group was kept on tap water, whereas the other 2 groups were supplied water supplemented with 0.5ppm of BV, respectively, per liter of drinking water. Broilers were provided ad libitum access to feed for the experimental period of 1 to 28 d of age. Supplementing drinking water with BV significantly increased BW gain at 28 d of age ($P < 0.05$). The average daily weight gain from d 1 to 28 was increased ($P < 0.05$) for birds supplemented with BV compared with control birds. An improved feed intake was noted in groups supplemented with BV as compared with control chicks. Liver function enzymes, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activities including total cholesterol, total protein, albumin and globulin were not changed by BV supplementation. Tap water supplementation of BV did not alter the number of leukocytes, erythrocytes, heterophil and lymphocyte. For 28 days, We analysed chemical composition and meat quality. Crude ash increased approximately 15% in BV treatment groups as compared to control. These data indicate a possibility of better broiler performance and the quality of meat through BV supplementation under conditions of severe stressful challenges the newly born chicks encounter.

[Abstract:0044]

Evaluation of Anti-acne Property of Purified Bee Venom Serum in Humans

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Acne vulgaris is a chronic dermatologic disease with four factors involved in the development of lesions. Treatments need to address as many of these underlying factors as possible in order to reduce acne lesions. As such Purified Bee Venom (PBVTM) serum is an attractive therapeutic option for acne, but little data exists on the efficacy of this treatment strategy. In this prospective, non-comparative study, 30 subjects having mild to moderate acne vulgaris were enrolled and treated with PBVTM serum twice daily for a period of 6 weeks. Clinical evaluation of lesions by expert visual grading and image analysis were made at weeks 0 (baseline), 3 and 6. The average visual acne grade of all volunteers significantly improved with the PBVTM serum treatment at weeks 3 ($p < 0.05$) and 6 ($p < 0.001$) when compared with the baseline grade at week 0. In addition, there was a mean percent improvement of 8.6% and 52.3% in acne grade observed after 3 and 6 weeks of PBVTM serum use, with 20% and 77% of the subjects showing improvement, respectively when compared with baseline. Moreover, the subjects showed improvement in open comedones, closed comedones, papules, pustules and nodules after 3 and 6 weeks of PBVTM serum use. Six weeks of treatment with PBVTM serum was found to be effective in the treatment of mild to moderate acne vulgaris, with no incidence of serious side effects or irritation.

[Abstract:0045]

Effects of Honeybee Venom against Methicillin-Resistant Staphylococcus Aureus

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Methicillin-resistant Staphylococcus aureus (MRSA), along with other antibiotic resistant bacteria, has become a significant social and clinical problem. There is thus an urgent need to develop naturally bioactive compounds as alternatives to the few antibiotics that remain effective. Here we assessed the in vitro activities of bee venom (BV), alone or in combination with ampicillin, penicillin, gentamicin or vancomycin, on growth of MRSA strains. The antimicrobial activity of BV against MRSA strains was investigated using minimum inhibitory concentrations (MIC), minimum bactericidal concentrations (MBC) and a time-kill assay. Expression of *atl* which encodes murein hydrolase, a peptidoglycan-degrading enzyme involved in cell separation, was measured by reverse transcription-polymerase chain reaction. The MICs of BV were 0.085 µg/mL and 0.11 µg/mL against MRSA CCARM 3366 and MRSA CCARM 3708, respectively. The MBC of BV against MRSA 3366 was 0.106 µg/mL and that against MRSA 3708 was 0.14 µg/mL. The bactericidal activity of BV corresponded to a decrease of at least 3 log CFU/g cells. The combination of BV with ampicillin or penicillin yielded an inhibitory concentration index ranging from 0.631 to 1.002, indicating a partial and indifferent synergistic effect. Compared to ampicillin or penicillin, both MRSA strains were more susceptible to the combination of BV with gentamicin or vancomycin. The expression of *atl* gene was increased in MRSA 3366 treated with BV. These results suggest that BV exhibited antibacterial activity and antibiotic-enhancing effects against MRSA strains. The *atl* gene was increased in MRSA exposed to BV, suggesting that cell division was interrupted. BV warrants further investigation as a natural antimicrobial agent and synergist of antibiotic activity.

[Abstract:0046]

Characteristic Component of Sugar Fed Honeys Compared to Natural Honeys

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We investigated and compared some chemical properties of Korean natural honeys and sugar fed honeys for the quality characteristics. Specified component was extracted with an organic solvent and a single substance was isolated and identified as (E)-2-decenedioic acid. The content of (E)-2-decenedioic acid was 121 ± 5.9 mg / 100 g in sugar cane fed honeys and 127 ± 4.5 mg / 100 g in sugar beet fed honeys. Natural acacia, chestnut, and multifloral honeys have its contents of 13 ± 0.9 mg / 100 g, 17 ± 0.6 mg / 100 g, and 13 ± 1.3 mg / 100 g of honey, respectively. As a result, the (E)-2-decenedioic acid was found to be a major component in sugar fed honeys, but it was found to exist in trace amount in natural honeys. It was judged that there is a possibility of distinguishing between natural and sugar fed honey.

[Abstract:0047]

Quantitative Analysis of Chrysin and Pinocembrin in Propolis

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Propolis has been employed as a nutraceutical agent with benefits and therapeutic promises for humans for many centuries. The chemical composition and biological activities of propolis depend on its botanical and geographical origin. The aim of this study was to characterize Korean propolis by quantitating their chrysin content by ultra high-performance liquid chromatography (UPLC). Methanol extracts of propolis were comprehensively analysed by UPLC for the isolation and quantification of chrysin in propolis of different origin. The reproducibility of the method was 1.9% to 6.0%, and accuracy was confirmed with average recovery ranging from 80% to 120%. The chrysin content in propolis samples was successfully determined within 13.299 min. All of the propolis samples, except that from Jeju island, contained chrysin. Concentration of chrysin showed some variation between the propolis samples from different origins. The chrysin of the analysed propolis samples confirm its affiliation to the Korean propolis and the proposed UPLC method yielded good sensitivity, linearity, repeatability, and accuracy.

[Abstract:0062]

The Expression of Cyclooxygenase Enzymes in Inflamed Rat Dental Pulp After Capped with *Trigona* sp. Propolis from Indonesia

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Recently, propolis, an adhesive substance produced by honeybees has been drawn much attention due to its anti-inflammatory property. Cyclooxygenase (COX) enzymes responsible for conversion of arachidonic acids to prostaglandins biosynthesis. COX-1 is constitutively expressed in most cells of tissue to maintain homeostatis, while COX-2 is inducible in response to inflammatory reaction including in the pathogenesis of dental pulp inflammation. The aim of present study is to analysis COX-1 and COX-2 expressions in inflamed rat dental pulp after propolis application. Propolis obtained from South Sulawesi Province, Indonesia. Flavonoid and non-flavonoid materials were purified from an ethanol extract of propolis. Eighty male, 8-16 week old Sprague Dawley rats were divided into five groups, each consisting of 16 rats. As a negative control (group I), rats were not conducted any treatment. A Class I cavity (Black's classification) was prepared on the occlusal surface of permanent maxillary right first molar. Dental pulp was exposed and allowed in oral environment for 1 hour, then capped with ethanol extract of propolis (group II), propolis flavonoids (group III), non-flavonoids propolis (group IV), or calcium hydroxide (group V). All cavities were filled with glass ionomer cement as permanent filling. The animals were sacrificed at 6 hours, 2, 4 or 7 days after treatment, biopsy samples were obtained, processed for immunostaining of both COX using the biotin-streptoavidin method and viewed under light microscope. Data was statistically analysis using Freidman and Kruskal-Wallis tests at a significant level of $P < 0.05$. The results showed that COX-1 expression was weak in all groups at all time periods. Execpt in group IV, COX-2 expression was decreased in group II, III, and V with the longer of observation time periods. In group II and group V, COX-2 expression was weaker than group III and IV at all periods time. However, there was no statistically significant differences ($P > 0.05$) of both COX expressions among groups for each time period. As conclusion, COX-1 expression was weak in all groups at all time periods, while ethanol extract of propolis as well as calcium hydroxide were stronger than other materials test to decreased COX-2 expression in inflamed rat dental pulp.

[Abstract:0063]

The Influence of *Trigona* sp. Propolis on Antibacterial Activity of Glass Ionomer Cement Toward *Streptococcus mutans* Growth

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Many investigations have shown a positive correlation between the number of *Streptococcus mutans* (S.mutans) in dental plaque and the prevalence of dental caries. Consequently, this bacteria has been the prime target for the prevention of dental caries. Propolis is a natural resin material collected by honey bees from various plant known has a potent antibacterial activity. The aim of the present study was to investigate whether adding ethanolic extracts of propolis (EEP) might influence the antibacterial activity of conventional glass ionomer cement (GIC) used as restorative filling toward S.mutans growth. Raw propolis was collected from honey bee combs in Luwu regency, South Sulawesi, Indonesia. Propolis was subjected to maseration process using 95% ethanol for 5 days and evaporating to get EEP, which was then diluted to 2.5%; 5%; and 10% concentrations using 90% ethanol. Aquadest and GIC liquid were also used as negative and positive control solution. 0.1 ml EEP from each concentration was added into 0.1 ml GIC liquid. After that, paper disc was soaked in each liquid test and inserted in medium Mueller Hinton agar containing cultured S.mutans followed by incubated for 24 and 48 hours, at temperature 37°C. Antibacterial activity was reflected by the diameter of the inhibition zones which occurred around the paper disc. Data were statistically analyzed using ANOVA and LSD tests with significance level of 5%. The results showed that after incubated for 24 and 48 hours, there was significant difference ($P < 0.05$) between inhibition zone of GIC which added with 5% and 10% EEP compared negative and positive control. Therefore, the present results suggest that addition of 5% and 10% EEP solution to GIC liquid may increased GIC antibacterial activity toward S.mutans growth in vitro

[Abstract:0090]

A Bee Miracle: APILARNIL

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Apilarnil is mainly a drone larvae extract, which also contains small amounts of royal jelly, bee bread, honey and propolis and it has to harvest the larval stage of 3-7 days before the pupa of the male bee larvae (Iliesiu, 1991). The nutrient composition of the larvae changes in the pupa after the larval cell are closed, so it is suitable to harvest the larvae in the best food form (Iliesiu, 1980; Iliesiu, 1993(a)). Apilarnil, a very powerful biological agent, is a bee product that has a homogeneous, milky consistency, a yellowish gray color and slightly astringent, which is easily imitable and requires cold chain preservation in raw form. Apilarnil is considered "full food" due to it contains all the essential amino acids of the basic building block of the bee larvae. Improve the quality of apilarnil proteins, carbohydrates, fats, polyphenols, amino acids, vitamins and minerals that are at contents, and also include only sucrose as sugar. The protein profile varies depending on the pollen variety, especially consumed by the bees and It has a high level of antioxidant properties (Okada ve Matsuka, 1973; Matsuka vd., 1973; Palos vd., 1981; Iliesiu, 1993(b); Stangaciu, 2002; Barnutiu, 2013; Barnutiu vd., 2013; Yücel ve Kösoğlu, 2015).

It has aextensive useage area in field of medicine; It stimulates the release of androgenic hormones in men, as the natural anabolic stimulant increases muscle mass in the body (Athletes (bodybuilding)), due to the strong catabolic effect in the body, It prevents the loss of glycogen in the muscles by stimulating the oxidative mechanism of action which causes the production of energy, insufficient reproductive function in women, in the feeding of animals, in the anorexia, in te hippproteinemi, in the development of premature children, in bone development problems and skeletal system diseases, in nervous system diseases, in the treatment of Alzheimer, in endocrine disorders, pituitary and adrenal insufficiency, immune system diseases and also in geriatrics (Yücel ve Kösoğlu, 2015). It is emphasized that it is necessary to use apilarnil in doctor's control and at specified doses (like 300mg in adults) as in all bee products subject to apitherapy.

[Abstract:0091]

Supplement with Honey as an Apitherapy: Antioxidant and Hepatoprotective Effect of A.Cerana Honey against Acute Alcohol-induced Liver Damage in Mice

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A. cerana honey (honey of *Apis cerana*) gathered by *Apis cerana* Fabricius (*A. cerana*), has not been studied fully. Samples from six geographical origins were investigated to estimate its antioxidant and hepatoprotective effect against acute alcohol-induced liver damage. The results showed that A. cerana honey from Qinling Mountains owned high total phenolic content (345.07-502.13 mg GA per kg), and strong antioxidant activity in DPPH radical scavenging activity (87.50-136.22 IC₅₀ mg mL), ferric reducing antioxidant power (191.78-317.41 mg Trolox per kg), and ferrous ion-chelating activity (27.47-35.52 mg Na₂EDTA per kg). Pretreatment with A. cerana honey (Qinling Mountains) at 5, 10, 20 g kg⁻¹ twice daily for 12 weeks significantly inhibited serum lipoprotein oxidation and increased serum radical absorbance capacity (ORAC) (P<0.05). Moreover, A. cerana honey inhibited acute alcohol-induced the increase of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) in serum (P<0.05), reduced the produce of hepatic malondialdehyde (MDA) (P<0.05), and promoted superoxide dismutase (SOD) and glutathione peroxidase (GSH-Px) activities (P<0.05). More importantly, it also remarkably inhibited the level of TGF-β₁ in serum and liver (P<0.05). The study indicated that administration with A. cerana honey prevents acute alcohol-induced liver damage probably attributed to its antioxidant properties and intervention of oxidative stress.

[Abstract:0099]

Endemic Source of Natural Antibiotics from Chilean Honeybee Pollen Extracts

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The discovery of new antibiotics has stimulated the growing acceptance and demand of natural products in order to replace the chemically synthesized compounds for controlling microbial pathogens. It has been shown that bee-pollen and honey are natural resources of polyphenols with antibacterial properties and that these capacities depend on the floral or botanical origins. Aims of the present work were: i) the characterization of the phenolics acids and flavonoids occurring in the extracts by HPLC-DAD; ii) the botanical origin; iii) the protein and carotenoids content; iv) the determination of antioxidant activity in the extracts; and v) the determination of antimicrobial activity in the extracts. Characterization included chlorogenic, caffeic, 3-hydroxybenzoic, sinapic, p-coumaric, ferulic and cinnamic acids; and myricetin, luteolin, quercetin, phloretin, apigenin, pinobanksin, kaempferol, chrysin, pinocembrin, galangin, catechin, cyanidin, malvidin, and rutine. In vitro antioxidant activity was evaluated by FRAP. Carotenoids and proteins content were determined by HPLC-DAD and Kjeldahl method, respectively. In-vitro antimicrobial activity was evaluated by inhibitory diameter measurement and MIC. The assays were conducted against relevant bacteria (*Escherichia coli* ATCC-25922, *Staphylococcus aureus* ATCC-25923, *Pseudomonas aeruginosa* ATCC 27853, and *Streptococcus pyogenes* ISP 364-00). Chilean bee-pollen has an average of 30% of proteins, 13mg/Kg of carotenoids and a 36mmol Fe²/Kg; polyphenolics concentrations found vary depending on the botanical origin. Extracts had the largest and most significant inhibition zone compared with penicillin and showed the lower MIC against *S.pyogenes*. These natural resources have a great potentiality to be used as a component in developing new functional food products.

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[Abstract:0113]

Inhalation Therapy of Adrenal Intoxication of Rats with a Preparation of Royal Jelly and Propolis "Apingalin"

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A number of biochemical indices of blood serum of rats were studied in the simulation of adrenal intoxication in animals and inhalation therapy with a preparation based on propolis and royal jelly. Studies were carried out on 30 white rats (females of the Wistar breed, weighing 180-200 g.). Intoxication was caused by intraperitoneal injection of adrenaline hydrochloride at a dose of 0.5 mg / kg. 1 hour after the injection and further daily, for 10 days, for 15 minutes, animals were inhaled the drug "Apingalin" ("A drug that has a bronchodilating effect": RU patent No. 21740002 dated September 15, 2000). Blood sample was carried out on the 11th day after the start of the experiment. Serum was used to determine enzymes that indicate the functional state of the liver: total protein, albumin, creatinine, urea. It was found that in the control group (adrenal toxemia) a decrease in the total protein concentration by 63%, albumin by 50%, an increase in the creatinine level by 22%, and urea by 25% compared to intact animals (without toxemia). The received data indicated about total destruction of protein, which can be caused by a violation of the functional activity of the liver and the development of liver failure. During the course of inhalation of animals with adrenal intoxication, an increase in the concentration of total albumin and albumin (by 50% and 16%, respectively) was noted in the preparation on the basis of bee products, a decrease in the level of creatinine and urea (10% and 12%, respectively). From the obtained results it can be concluded that course inhalation with the complex drug "Apingalin" on the basis of propolis and royal jelly leads to the restoration of biochemical parameters of the blood of rats with experimental adrenal intoxication and indicates restoration of liver functions.

[Abstract:0114]

Royal Jelly and Ubiquinone-10 Improve Hematological and Physical Performance in Swimmers

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Currently the search for effective bimodality means of natural origin, devoid of many side effects of synthetic drugs and non-doping is important. We have proposed the use of swimmers Royal Jelly (RJ) together with coenzyme Q-10 (ubiquinone-10). 16 athletes 15-17 years old male with a sports title of Master of sports of Russia in swimming, took part in the study. It was formed two groups of subjects with similar morphological and functional indicators. Athletes received sublingually daily for 10 days in group A (control): honey (placebo) at a dose of 10 g/day, in group B (study group) – honey + RJ (400 mg/day) + Q-10 (60 mg/day). On the first and tenth day of the study test in the form of an anaerobic physical activity in the zone of submaximal capacity was presented to the subjects. At the same time we determined in the blood the activity of creatine kinase, lactate dehydrogenase, the content of lipid peroxidation products (Schiff bases). Analysis of the results of the study showed a significant difference of indices between dates 1 and 10 days (after a course of medication). Temporary swimming metrics were improved and the activity of creatine kinase and lactate dehydrogenase was increased by reducing the content of Schiff bases. It is possible to conclude that the drug with Royal Jelly of bees and ubiquinone-10 has beneficial effects on the antioxidant system of the organism of athletes in terms of physical activity, preventing the accumulation of Schiff bases, reducing the need of the body to lactate formation mechanism of energy and improving lactic endurance.

[Abstract:0116]

Royal Jelly and Ubiquinone-10 Improve Blood Counts and Endurance of Rats During Physical Exertion

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We have showed a high efficiency of Royal Jelly (RJ) in combination with ubiquinone-10 (Q-10) in the previously conducted animal studies for modeling the pathology of different genesis. In the present work, to study the possibility of using drugs in sport, we examined the effect of these drugs on performance of rats during exercise. In the experiment, the rats of the experimental groups within 10 days, received daily oral a probe: 1 - freshly prepared solution of native RJ (RJ 100 mg/kg) and 2 - combination of solutions RJ (RJ 100 mg/kg) and Q-10 (Q-10 15 mg/kg). On the 11th day, animals of control (without feeding drugs) and experimental groups were subjected to forced swimming to failure with a load amounting to 10% of body weight in rats (Porsolt test). In the experiment, we recorded the duration of the swimming phases. When the animal was not able to stay above the water surface independently, we took it out of the water, anaesthetized, decapitated and produced blood samples for research. It was revealed in the experimental groups that the time of active swimming increased by 2.4 times (up to 415±44,6s) after feeding RJ, and 3 times (up to 516±66,5s), after the feeding combination of substances, regarding the 172±22,8s in control. Passive swimming lasted, respectively, 188±6,3s with when fed RJ and 312±81,7s when fed with RJ+Q-10, relative to the 140±34,3s with the control. Increased efficiency was accompanied by an improvement of blood counts. The number of erythrocytes (10¹²/l) increased in the 1 and 2 group experience to 4.81 ± 0.5 and 5.79 ± 0.35, respectively, relative to 3.94 ± 0.52 in control and 4.57 ± 0.63 in intact rats. Hemoglobin (g/l) increased to 79.71 ± 9.03 and 93.14 ± 4.75, respectively, compared to 68.88 ± 8.79 in control and 78.28 ± 0.18 in the intact animals. These data allow concluding that the studied drugs can not only restore the disturbed functions of the body, but also stimulate them to normal. In addition, the combined use trophotropic (RJ) and energotropic (Q-10) drugs in this respect has been more effective.

[Abstract:0148]

Antioxidant Properties and Total Phenols of Propolis Samples from Algeria

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Propolis is a resinous substance collected by honeybees to seal honeycomb, which has been used in folk medicine due to its antimicrobial and antioxidant properties. In the present study, methanol was used to extract phenolic compounds from propolis collected in three different regions of Sidi bel abbes (western Algeria). Total phenols content was determined by colorimetric assay whereas the antioxidant capacity of propolis extracts was assessed through the scavenging effects on DPPH (2,2- diphenyl-1-picrylhydrazyl) and TAC (Total Antioxydant Activity) assays. The results show that propolis samples from three locations of Sidi bel abbes were rich in phenols. Low values of IC₅₀ on DPPH scavenging assay were obtained (ranged from 41,91µg/ml to 164,31µg/ml). For TAC test the values were ranged from 6,5 and 18,62 mg GAE/g DW. These findings indicate that Algerian propolis is an important source of total phenols showing high antioxidant properties that could be beneficial for human health.

[Abstract:0176]

Using Facilities of Apilarnil (Bee Drone Larvae) in Animal Breeding

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Apilarnil is a bio-active bee product handled from drone larvae of 4-7 days old. The chemical composition of the apilarnil is so complex. Apilarnil is a highly concentrated nutritive elements containing fat body protein accumulation of lipids and carbohydrates, particularly glycogen, carbohydrates which play an important role in the metabolic process. It is widely use in human and animal diets because of containing all essential aminoacids. Because of having rich polyphenols, apilarnil has high antioxidant properties. Due to this complex compositions and strong biological activity, drone larvae extract is indicated in general sexual disorders and physical deficiencies that occur with age and especially those related to the immune system, hormonal balance and emotional self-adjustment, brain, nerve system, vegetative body strength.

Apilarnil recruits activity of internal secretion glands and strengthens immun system in animals. In male broilers, apilarnil effects sperm ejaculat volume positively. Especially, it increases glandular weights and sexual activity in male livestock. Sperm motility and volume are found more higher with using apilarnil in diets. Also, apilarnil increases muscle competency with its anabolic impact. So, it can be used in diets of racing horses. Moreover, it has catabolic effect on glucose metabolism of animals and involves serious increase of energy in consumption of muscle glycogen. Besides this, egg production, fertility and hatchability are increase in layers by using apilarnil in feed. It is needed to make more studies on the contribution of the magnificent apilarnil have on animal health and nourishment in order to create more awareness and influence the production of qualified apilarnil.

[Abstract:0186]

Improve Oxygen-transport Function of Blood Under the Action of Bee Venom

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A key role in energetic and metabolic supply of the organism belongs to the blood, especially red blood cells, transporting oxygen to the tissues. Full execution of the erythrocytes oxygen-transport function is possible only in terms of their quick and free movement in the blood stream due to electrostatic repulsion of the cells from each other and from the walls of the blood vessels. Relevant is the study of the state of erythrocytes under the action of bee venom. The work was the analysis of changes in electrophoretic mobility of erythrocytes (EPME), their aggregation properties, the level of 2,3 DPG in the action of bee venom. EPME – measure of the total charge of red blood cells, which largely determines the aggregation of cells. Erythrocyte aggregation affects microcirculation, increase blood viscosity. Experimental studies have shown that intraperitoneal injection of bee venom in a concentration of 0.5 mg/kg resulted in pronounced changes of the studied characteristics. Change EPME under the action of bee venom was characterized by an increase of this indicator to 1 day – 1 week and was maintained during 2 weeks of observation. Manifestation deaggregation effect was detected as early as 1 hour of the experiment and also persisted throughout the period of registration (2 weeks). Thus, we can say that the action of bee venom led to the improvement of microcirculatory parameters of blood that will largely determine the improvement of hemodynamics and respiratory function of the blood. In turn, it is necessary to consider that the respiratory function of the blood is largely determined by level of 2,3-DPG. 2,3-DPG serves as an important allosteric regulator of the binding of oxygen to hemoglobin. Study of the level of 2,3 DPG showed an increase of this metabolite by 1 day of observation after intraperitoneal administration to rats of bee venom in relation to control. Thus, the increase of 2,3 DPG in the course of action of bee venom on the animal organism is likely to reduce the affinity of hemoglobin for oxygen, improving oxygen supply to tissues.

[Abstract:0208]

Is Acacia Honey Having Potential Wound Healing

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BACKGROUND: Honey had been well documented as the oldest traditional medicines. It is also mentioned in the Holy Qu'ran. It has been used for suppress inflammation and enhancing the growth of tissues in particular for wound repair and bring about rapid autolytic debridement. The objective of this study was aimed to determine is acacia honey having potential wound healing as well as antibacterial activity and cytokine levels. **MATERIAL-METHODS:** The fresh acacia mono floral honey sample (3 kg) was kindly provided by Alnahal aljwal Company, 2016 flowering season. Honey sample was collected in a sterile universal glass container and kept at 2– 8°C until tested. Physiochemical analysis was done. Evaluations of the healing activity as well as bacterial examination of the wound was performed. Serum cytokines levels (IFN- γ , IL-1 and IL-6) were evaluated before and after treatment. **RESULTS:** Honey was found to stimulate the healing of wounds broad spectrum antibacterial activity and suppress inflammation as reduction of the levels of TNF- α , IL-1 β and IL-6. **CONCLUSION:** Honey bioactivities had been a good evidence that enhance the immune response as promoting the growth of tissues for wound repair as well reduction of inflammation.

[Abstract:0209]

Bee Venom: A Source of Medicine for Protozoal Infections

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Bee venom is one of the bee products that constitute mainly of protein. Venom Melittin is an important peptide that proved therapeutic potentials against different diseases. Protozoal infections as trichomoniasis, trypanosomiasis, leishmaniasis and malaria represent a main public health concern. Although, traditional medicine is still use in treatment of these infections but the need of new, more potent and save drugs is exist. While doing their jobs, honey bees introduce healthy and valuable food for human. But more importantly is the medicinal potentials of this food. Bee venom is one of the bee products that constitute mainly of protein. Venom Melittin is an important peptide that proved therapeutic potentials against different diseases. Protozoal infections as trichomoniasis, trypanosomiasis, leishmaniasis and malaria represent a main public health concern. Although, traditional medicine is still use in treatment of these infections but the need of new, more potent and save drugs is exist. Role of bee venom or its peptides in treatment of protozoal infections is discussed.

[Abstract:0241]

Antioxidant Properties and Total Phenolic Contents of Propolis Samples Collected from Turkey

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Propolis is a natural substance, collected by honeybees *Apis mellifera* L. from buds and leaves of trees and plants, exhibits important biological and chemical properties attributed to the presence of polyphenols. It contains a variety of flavonoids and phenolic acids which makes it a valuable antioxidant additive. The objective of the present study was to evaluate the phenolics and antioxidant activity of propolis samples collected from Adana, Balıkesir, Sivas, Muğla, Rize provinces of Turkey. Among the provinces, the sample which belong to Rize showed the highest antioxidant activity. Total phenolic content was determined in comparison with standard gallic acid and the results expressed in terms of mg GAE/g propolis. Total phenolic content of ethanolic propolis samples were found to be 87-255 mg GAE/g of ethanolic propolis extract by using Folin-Ciocalteu method. In the study, all samples showed high level of phenolic compound, except Sivas sample. In the study high antioxidant activities were obtained from all samples according to DPPH results. As a consequence, the results of the study confirmed that propolis collected from the stated provinces can be used in the prevention of various free radicals related diseases because of their rich source of natural antioxidants.

[Abstract:0316]

Effect of Storage on Antioxidant Activity of Pollen with Packaged Different Method

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Antioxidants are compounds, that block or avoid oxidation associated with free radical mechanism with various organic compounds at low concentration. Recently, because of it is thought that synthetic antioxidants have risk with regard to health, attention is increasing to botanical antioxidant. Pollen, is a foodstuff, obtain by picking from anther of plants by bees, attract notice as potential antioxidant. In this research, fresh pollen have been bought from beekeepers in spring to search antioxidant activity of pollen. Half of pollen has been dried to 5-7% moisture content. Fresh and dried pollen has packaged with vacuum, normal atmosphere and modified atmosphere (MAP 1: 5% O₂+10% CO₂+85% N₂, MAP 2: 10% O₂+5% CO₂+85% N₂). Pollen has stored for 1 year. Antioxidant activity analysis (TPC, DPPH, FRAP) have been made at first day and then every 3 months. While IC₅₀ values are increasing, IC₅₀ of dried pollen value is higher than fresh pollen's at all groups at the end of 12 months period for DPPH analysis. The highest IC₅₀ value has been determined at MAP 1 treatment at dried pollen, the lowest IC₅₀ value has been determined at MAP 1 at fresh pollen. The high IC₅₀ value is indicator of low antioxidant activity. The highest TPC has been detected at fresh pollen at the end of 1 year. Significant differences between dried and fresh pollen groups have not been observed at the end of storage. FRAP values of fresh pollen have been higher than dried pollens. FRAP values have been determined higher at MAP treatments than normal atmosphere and vacuum package at both of pollen groups.

[Abstract:0343]

Wax Cream with Anti-inflammatory and Bio-Stimulating Effects

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The existing trend in making formulations from apiculture products is about a wide range of their components — honey, pollen, bee-bread, royal jelly, propolis, beeswax, and bee venom. Apart from that, the prospects of adding plant-based natural compounds to bee products have emerged of late. Such a combination enables to enhance the beneficial effects of the formulations for human body. The major problem in that the blend is related to potential mutual suppression of the bee and plant-extracted components. Zdorov Company has offered using wax cream, comprised by propolis, *Apis mellifera* extract with bee venom, and bee wax, as the medication. To enhance the curative effects we have offered adding the Siberian pine resin (dip in Russia) to that compound. Dip represents gum flowing from the cuts on various species of pine (coniferous plants). Under chemical classification it is a solution of terpenes (terpenoids), mainly colophony in turpentine oil, and their derivatives. Manifesting incredible ability to heal wounds and promote tissue regeneration, the Siberian pine resin has long ago been deemed a very valuable product and applied by the peoples of Siberia to treat various diseases. The problem about cream preparation concerned the ability of terpenic series compounds in the dip to inhibit the bee venom peptides. The problem was solved by optimal quantitative selection of components and preparing a formulation based on the vegetable (olive) oil. As a result, we managed to preserve the biological potency of bee venom in the bee wax. The blend of bee venom and dip in the same product enabled to receive a medicinal product with unique properties and use it with substantial positive effects in various locomotor and nervous disorders, in a wide range of injuries. Zdorov wax cream has existed in the market of Russia and some other countries for four years now, and we have received a multitude of factual evidence proving its efficiency. Such statistics include sales volumes, buyer feedbacks that show effects in case of various diseases.

[Abstract:0359]

The Antioxidant Effects of Natural Additive that Bee-Pollen in Yogurt

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Antioxidants are excellent natural additives and have been presented as alternatives to synthetic additives that present in plants, algae, mushrooms and honey products. Phenolic compounds, carotenoids and vitamins are considered the most natural antioxidant molecules. The phenolic compounds are considered among the most interesting and relevant natural compounds to be used as food preservatives and bioactive ingredients. Bee-pollen has long been used as a dietary supplement and also as an additive in cosmetics, food and medicine. Pollen has been a rich source of flavonoid glycosides, which contains beneficial antioxidant, anti-inflammatory, anti-allergen, antiulcer, antibiotic and anti-carcinogenic properties. Yogurt is a fermented dairy food product. Due to its importance in human diet, yogurt has a limited content of bioactive compounds, which can remove some value from yogurt. Therefore, plant or fruits based additives have fortified the yogurt to overcome this removing value. The aim of this study was to evaluate antioxidant properties of bee-pollen and its antioxidant effect on yogurt to prevent lipid oxidation during processing and storage. The pollen was extracted with water. The phenolic compounds in water extract of pollen were determined by high-performance liquid chromatography diode-array detector (HPLC-DAD). Syringic acid, hyperoside, kaempferol, isorhamnetin, pinocembrin, chrysin and galangin were detected in pollen. And also the antioxidant property of pollen extract was evaluated according to Folin-Ciocalteu and ABTS methods. The pollen was added in yogurt after/before pasteurization such as antioxidant preservative. The antioxidant effect of pollen in yogurt was determined by Folin and ABTS methods after first and seventh days of fermentation. It was understood that the pollen prevented oxidation of yogurt and the yogurt extract included pollen has showed higher antioxidant capacity than control group. Consequently, yogurt with natural additive showed higher antioxidant activity and honey products can be used to replace synthetic preservatives.

[Abstract:0362]

Evaluation of Antimicrobial Activity of Methylglyoxal - The Major Antibacterial Component of Manuka Honey

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Infectious diseases continue to disrupt human health and shorten lifetime. In developed countries, increased life span and health complications due to the sharp rise in obesity and diabetes have made chronic infections particularly problematic. Treatment of these infections is becoming increasingly difficult due to antibiotic resistance to currently available drugs. Development of new antibiotics has decreased for few decades. Scientists are in search of new approaches to treat these infections. Methylglyoxal (MGO), believed to be the major antibacterial compound in manuka honey, which is formed by a non-enzymatic conversion of nectar-derived dihydroxyacetone. The aim of this study was to investigate the effect of MGO on *Escherichia coli*, *Pseudomonas aeruginosa* ve *Staphylococcus aureus*. Purchased MGO (sigma-aldrich) used for all tests. Agar diffusion test was used for evaluate the antimicrobial activity of MGO. 100 µL aliquots of 10⁹ CFU/mL overnight culture of each of the bacteria were spread uniformly onto Muller Hinton agar (Sigma-Aldrich). Blank paper discs placed onto the agar surface. Ciprofloxacin disc is used as positive control. 10 µL aliquots of 10%, 20% and 40% solutions of MGO were impregnated to blank discs. Inhibition zones were measured after incubation at 37°C for 24 h. Assays were performed three times in duplicate. The mean diameter of the inhibitory zones of *Escherichia coli* on a filter disc were 27,67mm, 31 mm and 40 mm for 10%, 20% and 40% solutions of MGO respectively. The mean diameter of the inhibitory zones of *Pseudomonas aeruginosa* on a filter disc were 16 mm, 19,33 mm and 25,67 mm for 10%, 20% and 40% solutions of MGO respectively. The mean diameter of the inhibitory zones of *Staphylococcus aureus* on a filter disc were 28,83 mm, 34 mm and 51 mm for 10%, 20% and 40% solutions of MGO respectively. The results showed that each tested bacteria species is susceptible to MGO solutions significantly. Statistical analyses were revealed that *S. aureus* is the most and *P. aeruginosa* is the least susceptible to MGO solutions. The results of this study are encouraging, and controlled clinical studies are needed to define the efficacy of Methylglyoxal in vivo.

[Abstract:0364]

Proline in the Honey

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Proline is one of the 20 essential amino acids found in nature. Proline, a non-essential and glucogenic amino, is soluble in water. Proline is imino acid, because of it has secondary amino group instead of primer amino group. This property differs from other amino acids. Analysis of proline content in honey is easy because the proline is structurally different from other amino acids. When the amino acids enter the reaction with the ninhydrin, the blue compounds are formed, while the reaction with the proline results in the final yellow compounds. Honey is the dominant amino acid in the low content of protein. 50-85% of the amino acids in the honey are proline, and the content of proline varies considerably among honey varieties. Because pollen is the main source of amino acids in honey, the amino acid profile of honey is characteristic of botanical source. It serves as an indicator for the determination of freshness and glucose oxidase activity. Proline content can be used to estimate the quality of honey, antioxidant activity and botanical origin. In the Turkish Food Codex Honey Communiqué, the amount of proline that should be generally 300 mg / kg in the blossomhoney, 180 mg / kg in canola, lime, citrus, lavender, eucalyptus honey, 120 mg / kg in rosemary and acacia honey and 300 mg / kg in honeydew honey, baking honey and mix of blossom and honeydew.

[Abstract:0368]

Apilarnil – A Hidden Champion in Bee Keeping and Apitherapy

Thomas Gloger

Api-Zentrum-Ruhr

Apilarnil was invented and developed in the 1980th. Due to the limited supply of the material which has to undergo a complex production procedure like lyophilisation its supply was restricted to very privileged during socialism. Later it has been nearly forgotten. Till a short time ago handy supply was negligible. Now a new generation of ecologic and health oriented bee keepers and apitherapists has arrived together with the availability of good processing facility like cooling and freeze drying. This new generation is now asking for clear orientation how to use Apilarnil in the jungle of applications.

Apilarnil has three main therapeutic properties:

1. Micronutrients
2. Hormonal push and
3. Immunologic push

Within this system a stringent logic can be constructed for the multiple applications like typical women diseases, as menopause problems like heat rushes, cyclic problems. Also male impotence, lacking sperm quality and availability can be treated. But also liver diseases and today sports comes more into focus. The classic reputation of being a “green Viagra” runs much too short. As both sexes can be treated especially in their specific developmental problems it is clear that Apilarnil will develop a much stronger position in the Apitherapy. Production of fresh Apilarnil is much more critical. It contains three quarter of water and a very good mix of proteins, sugars and lipids. This is an ideal media for bacterial growth. Bee keepers, who are used to honey, have to make aware of the possible dangers of bacterial degradation. Even the stabilisation by lyophilisation has to be made in a straight hygienic process.

[Abstract:0375]

Honey as a Functional Food

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Last decades, the term of functional food underlines the positive relation of nutrition with health. Functional foods should help the improvement of the quality of nourishment, and protection and preservation of health, the compound of the product should not differ from the similar type of foods' nutritional substance components within normal conditions, the product should be a well-used food in daily diets, as all bee products have. Bee products are accepted as "functional food" by adding them in other food products to increase their nutritional value or used alone with its natural and rich nutritinal content and high bioactive components. Honey is a bee product that is used for nutritional and therapeutic purposes in many cultures since ancient times. It is a functional food that contains inulin and fructo-oligaccharide and it has prebiotic features that have beneficial effects to our gastrointestinal system. Undigested oligosaccharides are found naturally in honey. Honey is not only a functional food but also has many positive impacts on human health. It comes forward as an important antioxidant source due to its vitamin C, flavonoids and phenolic content. Honey's strong biological activity originates from its rich phenolic content. Flavonoids stimulate antibacterial, antiviral, anti-inflammatory and vasodilator effect. Antibacterial feature of honey that comes from its osmotic effect is a outcome of the sugar molecules in the setting which drain the water around and leave so little to the microorganisms that cause the bacterias in the honey to die from dehydration. Due to this feature it can be understood that honey defends the body successfully against the destructive effect caused by oxidative stress. The antioxidant effect of honey can be evaluated with the lipid peroxidation system. Honey stops the bacterial growth in dry-aged and wet-aged meats and even acts like a bacterisid. Phenolic and flavonid compounds inside the honey's composition increase the capacity of the antioxidants and prevent the activation of hydrogen peroxide. It is needed to make more studies on the contribution of the magnificent honey has on our health and increase the conscious selection and consumption of the honey made by consumers.

[Abstract:0376]

Using Bee Pollen as a Nutrient Supplement or Feed Additive in Poultry Production

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Pollen is a one of the bee products which is gathered from plant anthers by worker bees. It may just be the most important and oldest superfood on earth. It contains nearly all nutrients required for growth and development in human, including carbohydrates, proteins, fatty acids and lipids, vitamins, minerals, enzymes, co-enzymes and phenolic compounds. It has more amino acids than animal protein sources like beef and egg. In addition, pollen is accepted as a 'natural drug concentration' because of its hypolipidemic, hypoglycemic, detoxifying, anti-inflammatory, antiallergic, antidepressant, antimicrobial, antioxidant, antiatherosclerotic, immunostimulating etc. activities. Currently, pollen is described as a "natural functional food" due to its nutritional and therapeutic properties.

In recent years, several studies have been conducted to determine the availability of pollen in poultry nutrition. In studies conducted with broiler, it has been reported that pollen promotes early development of the digestive system and improves growth performance, breast meat colour and immunity. Dietary pollen supplementation has positively affected egg production, egg mass, semen quality and hatchability in breeder chicken. In addition, pollen extract has been used in ovo feeding to enhance hatchability and chick weight.

Pollen has potential protective activity on lipid peroxidation. Polyphenolic compounds contained in pollen have the ability to block the free radicals. Pollen has several antioxidant active compounds such as catalase, peroxidase and superoxide dismutase. Dietary pollen supplementation might be helpful supporting antioxidant defence system, alleviating lipid peroxidation and extending shelf life of poultry products.

Antimicrobial property of pollen is also related to phenolic compounds. Pollen or its extracts are effective against to different pathogenic bacterial strains, fungi and yeasts. It is expected that bee pollen supplementation to diet might protect gastrointestinal tract health in chicken.

[Abstract:0377]

A New Hope in Neurology: Honey Bee Venom as a Neuromodulator

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Neurologic disorders are almost devastating, progressive, chronic and socially incapacitating. A considerable part of neurological disorders has degenerative process such as Alzheimer Disease, Parkinson Disease, Amyotrophic lateral sclerosis, Multiple Sclerosis, Epilepsy and Prion diseases. These disorders are heterogeneous in terms of epidemiologic, histopathologic, symptomatic. Since conventional treatments for neurological disorders provide only symptomatic relief and have high incidence of serious adverse effects, there is an urgent need to investigate neuroprotective and neuromodulating agents. From ancient times to date honeybee venom has been used to treat neurological disorders as well as in most diseases. In addition to neurodegenerative disorders other neurologic diseases such as migraine, discopathies, fibromyalgia, chronic cervical and lumbar pain, neuropathic disorders have been treated with honeybee venom successfully. The main target of honeybee venom is central nervous system. Since BV and its components have antineuroinflammatory effects and suppress the microglial activation give hope to develop new treatment agents. Today, according to most-widely accepted opinion, pathophysiologic process of most of diseases is based on inflammation. Neurodegeneration follows chronic neuroinflammation and microglial activation. Modern therapies could not provide curable solutions for most neurologic disorders. Honeybee venom as an effective, natural neuroprotective and neuromodulator agent should be investigated in detail and developed as new treatment method in neurology.

[Abstract:0378]

Polyphenol-Rich Extract from Propolis Reduces the Expression Streptococcus Mutans Glucosyltransferases and Regulatory Genes at Subinhibitory Concentrations

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Streptococcus mutans [S. mutans] is considered a main causative agent in the development of dental caries. That bacteria can water-insoluble glucans from sucrose, leading to the accumulation of these glucans in a dental biofilm. Glucosyltransferases B and C [GtfB and GtfC] and other regulatory genes such as vicR/vicK, SpaP and CcpA, are involved in sucrose-dependent and independent mechanisms in biofilm development. Many biological properties of propolis are related to the synergistic effect of its polyphenols. The aim of this study was to identify and to quantify the main polyphenols present in Chilean propolis, evaluate the antimicrobial activity and quantify gene expression of glucosyltransferases and other regulatory genes when treated with a Polyphenol-Rich Extract of propolis [PEP]. Strains of S. mutans were obtained from salivary samples of children with active tooth decay. The biofilm was incubated at 37 °C for 72 hrs in a 5% CO₂ atmosphere. Antimicrobial potential of PEP was determined by dilution in microplates following the CLSI Guidelines. To identify the compounds present in the polyphenol-rich extracts we used Liquid Chromatography-tandem Mass Spectrophotometry (LC-MS). For Real Time PCR amplification forward and reverse primers and Fast SYBR-Green Master Mix. Results were analyzed by the comparative C_q method [$2^{-\Delta\Delta C_q}$]. All results were compared with chlorhexidine 0.2% as positive control. Statistical analysis was carried out using an ANOVA test with a significance level of $p < 0.05$.

Polyphenolic compounds contained in Chilean propolis are diverse and Pinocembrin was quantified in high concentrations. PEP inhibited gene expression of glucosyltransferases [GtfB, GtfC, and GtfD] and their related regulatory genes, for example, VicK, VicR, and CcpA with dose-dependent effect at sub-inhibitory concentrations. Moreover, significant differences were observed in the level of gene expression for gtfB, gtfC, vicR, VicK, SpaP and CcpA in comparison with control [$p < 0.5$] when treated at concentrations between 0.1 and up to 0.8 g mL⁻¹ of entire polyphenols. With these results, we can conclude that Chilean propolis inhibits genes involved in S. mutans virulence and adherence through the inhibition of glucosyltransferases, showing an anticariogenic potential of polyphenols from propolis beyond S. mutans growth inhibition.

[Abstract:0390]

Study of Interaction between Origanum Vulgare Essential Oil and Twelve Honeys (Aromiels) from Palestine and Morocco against Six Bacterial Strains Pathogens

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The emergence of pathogenic microbial strains with resistance to commonly used antibiotics has necessitated a search for novel types of antibacterial agents. The main objective of this study was to evaluate the interaction effect between honeys and the essential oil of Origanum Vulgare against six bacterial strains. In the first step, for determination the antimicrobial activity of honeys and essential oil we used several techniques eg: agar diffusion, minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC). In addition the interaction effect between the essential oil and honeys were carried out by determining the fractional inhibitory concentration (FIC). $FICI \leq 0.5$ = Synergy; $FICI < 0.5-0.75 \geq$ = partial Synergy; $FICI \leq 0.76-1.0 >$ = Additive; $FICI > 1-4 \leq$ = No interaction (not differential) and $FICI > 4$ = Antagonism. In the second step, we evaluated the physicochemical characteristics and antioxidant activity of twelve honeys from diverse floral origin. The results of the antibacterial activity on different strains showed that interaction between the honeys and the essential oils of Origanum vulgare ranging from partial synergy and no interaction.

[Abstract:0391]

Identification of Phenolic Compounds in Two Palestinians Propolis with Antibacterial and Antioxidant Properties

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Propolis is a natural honeybee product with wide biological activities and potential therapeutic properties. The main objective of this study was to evaluate the in vitro potential antioxidant activity of hydro-ethanolic extracts of two Palestinians propolis. Total phenolics, total flavonoids, total antioxidant capacity, DPPH and Reducing Power were studied by spectrophotometric methods. In addition HPLC analysis was used to identify the phenolic compounds. In second objective, the antibacterial activity of two Palestinians propolis was evaluated against Gram-positive and Gram-negative bacterial strains by agar well diffusion assays, minimum inhibitory concentration (MIC) assessment and minimal bactericide concentration (MBC).

Which concern the RESULTS: The propolis samples showed high antibacterial activity. High total phenols and flavonoids and higher antioxidant activity were also recorded. Different phenolic compounds of two propolis were identified for the first time in palestinians propolis. To the best of our knowledge, this is one of the few works describing a detail characterization of palestinians propolis together with identification of the phenolic compounds of significant therapeutic value.

[Abstract:0392]

Antioxidant Content, Free Radical Scavenging Activity and Identification of Phenolic/flavonoid Compounds in Pollen of Fourteen Plants Using HPLC-DAD Analysis

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Pollens is the male gametophyte of flowers found in the anthers of stamens in angiosperms, important for plants reproduction but also crucial to honeybees because it will provide them of all of the nutrients like proteins, fats, vitamins, and minerals. The aim of this study was to identify the HPLC-DAD phenolic/flavonoid profile and the antioxidant (in vitro) potential of pollen hand collected from fourteen plants: *Anethum graveolens* (Apiaceae); *Capparis spinosa* (Capparidaceae); *Opuntia-ficus-indica* (Cactaceae); *Calendula officinalis* (Asteraceae); *Anacyclus clavatus* (Asteraceae); *Scolymus hispanicus* (Asteraceae); *Papaver rhoeas* (Papaveraceae); *Justicia adhatoda* (Acanthaceae); *Malva sylvestris* (Malvaceae); *Anacyclus radiatus* (Asteraceae); *Echium creticum* (Boraginaceae); *Mentha pulegium* (Lamiaceae); *Mentha spicata* (Lamiaceae); *Acacia pycnantha* (Fabaceae).

The results show that all samples presented excellent antioxidant content and activities with different strength. The HPLC-DAD analysis of hydro-ethanolic pollen extracts showed the presence of a wide variety of flavonols and flavones, mainly glycosides of luteolin, apigenin...kaempferol and quercetin. The phenolic acids are represented by derivatives of caffeic acid, p-hydroxybenzoic acid and vanillic acid, in *Malva sylvestris* and *Scolymus hispanicus* some compounds found could be alkaloids, however in this work the confirmation of such chemical group was not carried out but it will be include in further studies.

[Abstract:0394]

Chemical Composition, Antioxidant and Antimicrobial Profile of Propolis from Different Regions of Morocco

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Propolis is a traditional nutritional supplement produced by honeybees and widely used to treat several diseases as a folk remedy around the world. Propolis is a bee product that is becoming increasingly popular thanks to its antioxidant and antimicrobial properties both conferred by phenolic compounds, especially flavonoids. These widely documented properties as well as the misuse of antibiotics led to consider propolis as a natural alternative to antibiotics. The present study was performed on some propolis samples from different moroccan regions to assess their antioxidant, antimicrobial activities and flavonoids profile by RP-HPLC. Antioxidant activity was assessed through analyzing hydroalcoholic extracts of propolis by DPPH, ABTS and ferric reducing power assays as well as determining the total phenolic and flavonoid contents; while antimicrobial activity was assessed against different bacterial species and expressed as the minimal inhibitory concentration in mg/ml according to Resazurin method. The results showed that the antioxidant and antimicrobial activities are correlated and depend on the botanical and geographic origin of propolis. The study concludes that propolis has broad spectrum antimicrobial activity.

[Abstract:0406]

Antibiofilm, Antioxidant and Quorum Quenching Activities of Propolis Samples from Southwest Anatolia

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The purposes of the study were to determine antibiofilm, antioxidant and quorum quenching activities of propolis samples from seven different areas; Marmaris (Osmaniye: AP1; Merkez: AP5); Fethiye (Yanıklar: AP2; Uzunyurt: AP3); Datca (AP4); Milas (AP6); and Bodrum (Gumusluk: AP7) in Muğla located in Southwest Anatolia. Propolis samples were prepared using ethanol extraction. Antibiofilm activities in MIC, MIC/2, MIC/4 and MIC/8 concentrations for propolis extracts were determined microplate biofilm method. The antibiofilm activity results showed that the highest biofilm removals were observed for MIC concentrations. The biofilm removals were determined as 82.60% for AP1 sample against *S. mutans*, 67.45% for AP2 against *L. monocytogenes*, 93.43% for AP6 against *S. typhimurium* for MIC concentration. DPPH radical scavenging, β -carotene linoleic acid and ferric thiocyanate methods were used for determination of antioxidant activities. The extraction sample from Bodrum, Gümüşlük (AP7) showed the highest antioxidant activities with IC50 value of 3.94 mg/ml for DPPH radical scavenging method and with 91.10% reduction rate for β -carotene linoleic acid method. The lowest antioxidant activity was determined as IC50 26.33 mg/mL for DPPH radical scavenging method in AP2. The highest antioxidant activity was shown at AP1 extract with a rate of 51.77% using ferric thiocyanate method whereas AP4 extract showed the lowest prevention of lipid peroxidation (34.74%). However, there were no activity detected for AP1, AP2, AP3, AP5 for antiquorum quenching activity, the maximum activity was determined for AP7 extract. Also, the highest inhibition of violacein production was determined in 100% at concentrations of MIC, MIC/2 and MIC/4, and 51.0% at a concentration of MIC/8 for AP7 extract. In conclusion, two propolis extracts from Bodrum and Milas showed the important antimicrobial, antibiofilm and antioxidant activities for reducing harmful effect of free radicals causing health problems.

Acknowledgement

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[Abstract:0407]

Propolis: A Review on its Composition and Chemistry, Antioxidant and Antimicrobial Activities, Bioavailability, and Health Benefits

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Propolis is a resinous material collected by honeybees. They mix it with bees wax to use in the hive for many purposes such as blocking holes, repairing combs, strengthening the thin borders of the hive, embalming killed insects and even using to defend the hive from invaders and pathogenic microorganisms. Propolis may contain more than 300 components such as flavonoids, phenolic acids and their esters, hydrocarbons, polysaccharides and sugar alcohols, aldehydes and ketones, terpenoids, steroids etc. Chemical composition of propolis is very complex and depends on the flora of the location where the hive is. Also, chemical composition of propolis is effected from the time of collection. Approximately, propolis occurs from 50% resin and balsam, 30% wax, 10% aromatic and essential oils, 5% impurities and 5% pollen. Propolis has been used by human since antient times (about 300 BC). The usage area of the propolis has a wide variety. Propolis is known as its antibacterial, antifungal, antiviral, cytotoxic, anticancer, antiulcer, anti-inflammatory, immunomodulatory, anti-HIV, local anaesthetic, antiseptic, antioxidative, hepatoprotective and photoprotective effects. Therefore, it is used in pharmacology and medicine. Also, it is used in healthy food and beverages as a disease protector due to its health benefits. It is considered that propolis can prevent some diseases such as inflammation, diabetes and cancer. Another reason that propolis is used in food and drinks is its vitamin and mineral contents. Propolis may contain vitamins B1, B2, B6, C, D, E, and elements calcium, magnesium, manganese, potassium, sodium, iron, zinc, copper, silver, cesium, mercury, lanthanum, antimony, aluminium, vanadium and silicon. Some studies shows that propolis is also beneficial for the treatment of oxidative stress, asthma, wounds caused by different reasons, dental problems and some specific cancers. Propolis is well known for its antimicrobial effect. There are many in vivo studies done on different bacteria species about the antibacterial effect of propolis. These studies evidence its antimicrobial effectivity. Because of its benefits, today, interest to propolis is growing. This study represents a review about nutrient and phenolic composition, antioxidant and antimicrobial activities, bioavailability and health benefits of propolis.

[Abstract:0417]

Using Honey in Extraction of Foods, Pharmaceutical Drugs, Cosmetics and Herbal Medicines

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This method increases the shelf-life or storage time of the product by decreasing the volume and weight of the composition without need for any additives and without losing Useful materials of composition. This method has been registered as an World Invention on WIPO switzerland at August 2016.

As you know the Ginger plant is one of the most known and most important plants in herbal medicines. For example we explain the extraction method of fresh Ginger juice with honey. It is internationally recognized that good quality honey should be processed at less than 19% water content(moisture).

With addition specified amount of the fresh Ginger juice to honey, moisture of composition will increase up to 30%.

With Dehumidification at below 40°C within some hours, the moisture of composition will decrease down to 14%.

By repeating addition the fresh ginger juice to composition and continuing dehumidifying, the whole process is repeated using honey for extraction.

At this method of extraction of 200Kg fresh ginger juice and 100Kgs honey with 14% humidity, we will have 130Kgs "Ginger extract with honey" with 14% humidity at temperature below 40°C within one month. The time of this process depends to some fields like area of dehumidifier system.

The final composition is without any additives and without losing useful materials of ginger plant, and it has high shelf-life or storage time. This will be a healing herbal medicine. This medicine is useful to treatment of cold, Influenza, bloating and in a large description this is a Natural Antibiotics.

[Abstract:0457]

Effects of Bee By-Products on Autoimmune Diseases

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Caspian Apiaries

Immune system disorders are a result of atypically low activity or over activity of the immune system. Autoimmune disease causes the body to attack and damage its own cells; immune deficiency disease decreases the body's capacity to fight causes of infection. Over 80 autoimmune diseases affect millions globally and causes of these are unknown, resulting in the use of powerful immune suppressing medication that inhibits or prevents activity of the immune system. The purpose of this presentation is to show the correlation between subjects using bee by-products and the reduction or elimination of symptoms associated with autoimmune diseases. Studies were performed to gauge the effects of bee by-products on individuals suffering from, but not limited to, type 1 and type 2 diabetes, fatty liver, psoriasis, eczema, hormonal imbalances, and mineral deficiencies. Insulin dependency, libido, mineral levels, flare-ups, inflammation, amputations, and other factors were measured in individuals with autoimmune diseases who used bee by-products. Bee by-products were also shown to reduce and eliminate symptoms of eczema and psoriasis. One study showed that the use of bee by-products prevented over 600 amputations caused by diabetes. Another study of 624 individuals suffering from type 2 diabetes who were using bee by-products resulted in over 75% of individuals not requiring insulin and a decrease in insulin dependency by 70-80% in the remaining 25% of individuals. Bee by-products are effective supplements for the treatment of symptoms of many autoimmune diseases. Future studies can be performed to assess the effect of bee by-products on other autoimmune diseases.

[Abstract:0458]

Effects of N Chromosome Royal Jelly, Bee Venom and Propolis on Antimicrobial Resistant Bacteria

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The rapid development of antibiotic resistant pathogens has created increased global health concerns as antimicrobial resistance prevents disease treatment and increases disease severity and fatality rates. Haphazard use of antibiotics has led to the emergence of antibiotic-susceptible and antibiotic-resistant bacterial strains. The objective of this presentation is to show the antibacterial properties n chromosome royal jelly, bee venom, and propolis have on antimicrobial resistant bacteria. Mehran Mohamadi, a microbiologist at Farvardin Lab in Tehran, Iran, cultured microbes by streak-plating bacterial cultures to isolate the following bacterium: Acinetobacter, Streptococcus Pyogenes, Streptococcus Agalactiae, and Staphylococcus Aureus. Antibigram tests using n chromosome royal jelly, bee venom, and propolis were performed on the cultured microbes to determine the resistance of antimicrobial bacteria. The study showed that the bacteria cultures were sensitive to the bee by-products. Acinetobacter showed sensitivity to n chromosome royal jelly and bee venom. Streptococcus Pyogenes showed sensitivity to n chromosome royal jelly, bee venom, and propolis. Streptococcus Agalactiae showed sensitivity to n chromosome royal jelly and bee venom. Staphylococcus Aureus showed sensitivity to n chromosome royal jelly, bee venom, and propolis. The findings presented showed that topical and/or oral consumption of n chromosome royal jelly, bee venom, and propolis showed low risks of developing resistance from antimicrobial resistant bacteria. Although all three by-products are recommended, n chromosome royal jelly has the highest antimicrobial properties and are effective supplements for certain antimicrobial resistant bacteria.

[Abstract:0473]

Inhibitory Growth Effect of Melipona Beecheii Honey against Two Relevant Human Pathogens, Salmonella Typhimurium and Helicobacter Pylori

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Antimicrobial resistance is a major concern in developed countries and this phenomenon is currently extended to low-income populations. For this reason, the isolation of novel compounds to control outbreaks caused by antibiotic resistance bacteria is an urgent need. The use of natural compounds could be useful in the treatment of resistant bacteria and fungi, also novel compounds with antibacterial effect could be isolated from plants and insects. Melipona beecheii is a stingless bee species that produces honey with useful for the treatment of different human diseases. The main purpose of this work was to evaluate the inhibitory growth effect of Melipona beecheii honey against Salmonella typhimurium and Helicobacter pylori, two causal agents of digestive disorders in humans. Also, we tested protein extract in order to establish if there are antimicrobial proteins in Melipone honey. Protein extract was obtained using phosphate buffer and ultrafiltration procedures. We used agar diffusion test, disk diffusion assay and microdilution methodology to determine the effect of different concentrations of Melipona beecheii honey and its protein extract on the growth of both bacteria. As a result, we determined that 10% (v/v) of stingless bee honey was able to inhibit the growth of H. pylori in agar diffusion assay. Interestingly, protein extract showed antimicrobial activity against this bacteria using 400 µg of total protein content in disk diffusion assay. Determination of Minimal Inhibitory Concentration (MIC) in liquid media is currently performed for H. pylori. On the other hand, with respect to disk diffusion assay for S. typhimurium, concentrations of 80% (v/v) of Melipone honey caused inhibition of growth until 48 hours, concentrations up to 500 µg of total protein extract only caused bacteriostatic effect on this bacterium, inhibition disappeared after 48 hours. The MIC in liquid media determined for S. typhimurium was 10 % (v/v) and 200 µg/mL showing that the diffusion of honey components are determinant in antibacterial activity. The results obtained here demonstrated that Melipone honey is a natural product with antibacterial activity against relevant human pathogens. Also, Melipone honey contains proteins with inhibitory growth activity on Gram negative bacteria as H. pylori and S. thyphimurium

[Abstract:0477]

Antioxidant Activity, Free Sugar and Organic Acid of Pollens from Quercus Spp. In Korea

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In this study, we have analyzed the antioxidant activity and compared species differences of antioxidant activity in pollens of four Quercus spp. in Korea. We used pollens of four species selected from Korea, Q. acutissima, Q. mongolica, Q. serrata, and Q. variabilis. In this study, we evaluated antioxidative capacity and reducing power of pollen extracts. We also analyze the free sugar and organic acid content in pollens of four Quercus spp. Glucose, galactose, fructose and sucrose were the major sugar components of pollens. The antioxidant activity was measured by the DPPH (1, 1-diphenyl-2-picryl hydrazyl) method and the reducing power was determined according to the potassium ferricyanide method. The contents of total phenol and vitamin C of pollen extracts from Quercus spp. were also investigated. Among 4 species, the pollen extracts of Q. acutissima had the highest antioxidant activity (EC50 = 166.13 µg/ml). The highest free-radical scavenging activity and reducing power were 94.79% (Q. variabilis) and 2.24 (Q. serrata), respectively. Vitamin C content in four Quercus species ranged from 14.08 µg/g in Q. serrata to 34.99 µg/g in Q. acutissima.

[Abstract:0490]

Comparison of the Antioxidant and Anti-inflammatory Properties of Royal Jelly from Different Countries of the Mediterranean Basin

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Royal jelly (RJ), a bee secretion, is a natural substance considered as one of the most important products of hive because it plays a critical role in caste determination in honey bees, it serves as the source of nutrition for young larvae destined to become queens. It is also fed to adult queens, with high nutritional and biological properties (1). Royal jelly possesses numerous functional activities and thus has been used as a medication, health food, and cosmetic in many countries. In this work we compare the antioxidant and anti-inflammatory properties of RJ from some countries of the Mediterranean basin. Six samples of RJ from Morocco, Portugal and Spain were investigated regarding their total phenols and flavone/flavonol contents, and the antioxidant and anti-inflammatory activities using several methods. The results show that RJ presents an important total phenols content (varying from 9388.69 ± 0.76 to 2930.59 ± 0.08 μg Acid Gallic Equivalent / g RJ) and flavone/flavonol (from 70.910 ± 0.05 to 527.258 ± 0.03 μg Quercetin Equivalent / g RJ). Regarding the anti-inflammatory activity, sample from Portugal has the lower IC₅₀ (2.77 ± 0.02 mg/ mL and 4.52 ± 0.38 mg/ mL) in comparison with those from Morocco (3.07 ± 0.02 mg/ mL and 4.72 ± 0.11 mg/ mL) and Spain (3.078 ± 0.05 mg/ mL and 5.86 ± 0.10 mg/ mL) for the lipoxygenase and tyrosinase inhibition properties, respectively. But regarding the antioxidant activities, samples from Morocco showed the lower IC₅₀ in comparison with those from Portugal and Spain in the DPPH, ABTS and the superoxide scavenging activities (5.72 ± 0.09 mg/ ml; 9.54 ± 0.11 mg/ ml and 0.077 ± 0.001 mg/ ml).

[Abstract:0492]

The Volatile Composition of Moroccan Propolis

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Propolis, called also bee glue, is a popular bee product. This sticky, usually dark colored material, is made by honeybees (*Apis mellifera*) from buds, leaves, exudate and bark of various trees and herbal plants and mixed with beeswax and salivary enzymes. The volatiles composition from twenty four propolis samples collected in different geographical locations in Morocco were evaluated. Propolis volatiles were isolated by hydrodistillation during 3 h using a Clevenger-type apparatus, according to the European Pharmacopoeia method, and analyzed by gas chromatography and gas chromatography-mass spectrometry. Moroccan propolis showed a major chemical variability in the volatile profile. Cluster analysis based on the propolis volatiles chemical composition defined two main clusters, cluster I being sub-divided in three sub-clusters. Whereas oxygen-containing sesquiterpenes dominated in cluster I together with sometimes relatively high amounts of alkanes and fatty acids, cluster II showed only trace amounts of alkanes and was dominated by sesquiterpenes hydrocarbons and oxygen-containing sesquiterpenes.

[Abstract:0494]

Protective Effect of Propolis in Proteinuria, Crystaluria, Nephrotoxicity and Hepatotoxicity Induced by Ethylene Glycol Ingestion

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Background and Aims. Propolis is a natural honeybee product with wide biological activities and potential therapeutic properties. The aim of the study is to evaluate the protective effect of propolis extract on nephrotoxicity and hepatotoxicity induced by ethylene glycol in rats. **Methods.** Five groups of rats were used. Group 1 received drinking water, group 2 received 0.75% ethylene-glycol in drinking water, group 3 received 0.75% ethyleneglycol in drinking water along with cystone 500 mg/kg/body weight (bw) daily, group 4 received 0.75% ethylene-glycol in drinking water along with propolis extract at a dose of 100 mg/kg/bw daily, and group 5 received 0.75% ethylene-glycol in drinking water along with propolis extract at a dose of 250 mg/kg/bw daily. The treatment continued for a total of 30 d. Urinalyses for pH, crystals, protein, creatinine, uric acid and electrolytes, and renal and liver function tests were performed.

Results. Ethylene-glycol increased urinary pH, urinary volume, and urinary calcium, phosphorus, uric acid and protein excretion. It decreased creatinine clearance and magnesium and caused crystaluria. Treatment with propolis extract or cystone normalized the level of magnesium, creatinine, sodium, potassium and chloride. Propolis is more potent than cystone. Propolis extract alleviates urinary protein excretion and ameliorates the deterioration of liver and kidney function caused by ethylene glycol. **Conclusions.** Propolis extract has a potential protective effect against ethylene glycol induced hepatotoxicity and nephrotoxicity and has a potential to treat and prevent urinary calculus, crystaluria and proteinuria.

[Abstract:0498]

Antioxydant Activity, Nephroprotective and Hepatoprotective Effect of Hydro-ethanolic Extract of Fresh Bee Pollen Against Acute Toxicity of Radio Agent in Rats

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BACKGROUND

Radiocontrast agents are substances intravenously injected into the body to artificially increase contrast. Indeed, the renal toxicity of contrast products is an earnest problem that scientific community seeks continuously to resolve, so it is imperative to look for solutions to this problem. In this context the present study proposes that fresh bee pollen being one of the richest hive products in term of nutrients and phenolic compounds, is a product able to protect organism from the aggressiveness of radiocontrast products.

MATERIALS-METHODS

This study was carried on 20 rats divided into 4 groups, a single dose of Hydro-ethanolic extract of bee pollen HEEBP (500mg/kg) was given orally and daily using gavage. After the injection of one dose (0.2ml/kg) of the radioproduct shoosen Magnivest© during 10 days, blood samples were collected for analysis. Different parameters of antioxydant activity were determined and the hepato and nephro-protective effects of HEEBP were monitored by the measurement of ASAT, ALAT, ALP, LDH, creatinin, urea, Na⁺, K⁺ and Cl⁻, the results were compared with the control groups.

RESULTS

The results show that our extract has a high total phenolic content and total flavonoid content that may be the major contributors to its strong antioxidant activities. Moreover, (HEEBP) significantly prevented the increase in serum ALAT, ASAT, ALP, LDH, decreased serum levels of creatinine and urea and corrected the electrolytes's level in blood.

CONCLUSION

In the end, the results of this study demonstrate that HEEBP is effective for the prevention of Magnivest-induced hepatic and renal damages in rats. According to this finding, abundant flavonoid compounds are considered as the main hepato & nephro-protective factor in HEEBP.

[Abstract:0499]

Evaluation of the Antioxidant Activity and Nephrohepatoprotective Effect of Propolis in Wistar Rats

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Natural substances are becoming increasingly important in therapeutics, propolis constitutes a real chemical plant from which the maximum profit must be taken for the well-being of the population. Has wide range of biological activities which include antimicrobial, antioxidant, anti-inflammatory, anticancer properties and hepatorenale protective effect. The aim of this work was to determine the antioxydant activity and the nephrohepatoprotective effect of ethanolic extract of propolis following treatment with ultravist. To do so, 30 adult male Wistar rats were randomly divided into 6 groups of 5 rats: group I received orally distilled water at a dose of 1 ml /100g body weight. This group served as a control. Group II received orally 250 mg/Kg /bodyweight of EEP. Group III received intravenous injection of a single dose of D1 ultravist the 8th day (2ml/Kg/ bodyweight). Group IV received intravenous injection of a single dose D2 ultravist the 8th day (4ml/Kg/ bodyweight). Group V was pre-treated with EEP (250 mg/kg PO) 7 days prior to exposure to ultravist (2 mg/kg of bodyweight) and 3 days after. Group VI was pre-treated with EEP (250 mg/kg) 7 days prior to exposure to ultravist (4 mg/kg body weight) and 3 days after. We found that pretreatment with ethanolic extract of propolis leads to a recovery of the basal levels of the key enzymes of the liver and kidney function. This result suggests that EEP pretreatment prevents the hepatotoxic and nephrotoxic effect induced by ultravist. Hence it is proposed to adopt a preventive strategy in the hospital setting.

[Abstract:0521]

Characterization of Water Extract of Turkish Propolis by HPLC and GC-MS Methods

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AIM: The aim of this study is qualitative and quantitative determination of contents of water extract of Turkish propolis, a food supplement used by people, collected from various regions of Turkey using HPLC-DAD and GC-MS.

MATERIALS-METHODS

Water extract of Turkish propolis were prepared in samples collected from different regions of Turkey. Characterization of all the components of water extract of propolis qualitatively and quantitatively was obtained by powerful chromatographic tools such as HPLC which frequently used in analyses of polyphenolic substances and has high reliability, and GC-MS which has high repeatability and used for identification of volatile substances.

RESULTS

In HPLC-DAD analyses, it was determined that water extract of Turkish propolis contains phenolic acids such as caffeic acid (204 µg/mL), trans-cinnamic (28.9 µg/mL), chlorogenic (10.2 µg/mL), and caffeoylquinic (7.75 µg/mL) acids. GC-MS analyses done with Rtx-1 and Rtx-5ms columns showed that more compounds have been detected by Rtx-5ms column in water extract of propolis. It was determined that water extract of propolis contains some sugar derivatives (29.8%), benzoic acid (5.44%), cinnamic acid derivatives (2.20%), quinic acid (0.23%), ferrulic acid (0.27%) and proline (0.16%) by Rtx-5ms column.

CONCLUSION

Qualitative and quantitative HPLC-DAD and GC-MS analyses were revealed that water extract of Turkish propolis contains high amount of flavonoids, phenolic acids, and also caffeoylquinic acids which they possess some biological and medical activities.

[Abstract:0527]

Investigation of Protective Effect of Water Extract of Turkish Propolis Against Oxidative Damage Induced by Tert-butyl Hydroperoxide on the Erythrocyte Cells

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AIM: The aim of this study is to evaluate the protective effect of water extract of Turkish propolis against tert-butyl hydroperoxide (t-BHP)-induced oxidative damage on the erythrocyte cells (RBCs).

MATERIALS-METHODS: The erythrocyte cells were isolated from the blood obtained by the ethical committee approval from health individuals. The erythrocyte package obtained was divided into four groups as control, water extract of Turkish propolis, positive control (quercetin) and negative control (t-BHP) group. Red blood cells package as experimental model was treated firstly with propolis extract. Then t-BHP was added to the cells packages. Protective effects of water extract of Turkish propolis were investigated by malondialdehyde (MDA, final product of lipid peroxidation), total oxidant capacity (TOC), total antioxidant capacity (TAC) and antioxidant enzyme activities of superoxide dismutase (SOD) and catalase (CAT).

RESULTS: In the water extract of Turkish propolis group, MDA, CAT, SOD, TOC measurements were found to be significantly lower than those in the negative control group ($p < 0.05$); whereas TAC measurements were found to be significantly higher than those in the negative control group ($p < 0.05$).

CONCLUSION: The protective effect of water extract of Turkish propolis against oxidative damage induced by t-BHP on erythrocytes was revealed. Decreased SOD and CAT activities may be explained by water extract of Turkish propolis extract have antioxidant compounds that they removes free radicals from the cells. In addition, findings obtained may lead to further *in vivo* and *in vitro* studies on cells.

[Abstract:0535]

Effect of Pollen Density on Antioxidant Activities of Citrus Honeys Produced in Muğla (Turkey)

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Citrus Honey, ruled by a temperate climate, especially Mediterranean and Aegean Region (Turkey) are produced in the coastal region. Citrus Honey is light yellow and flowing. It has a distinctive flavor of its woods and contains plenty of C vitamins. It has been determined that citrus honey contains high levels of calcium phosphate and iron phosphate. The positive effect on the liver is known. Experts have noted that medical attention should be given to citrus fruit. It is used in nerve diseases with the cause of nerve soothing, cramp solvent properties. In this study, it was aimed to investigate the effect of honey on antioxidant activity depending on the amount of pollen of citrus honey. The citrus fruit honey produced in the same locality was selected as the subject of study in order to make comparisons and to ensure that the secondary plant pollen remained unchanged and the results were reliable. For this purpose, antioxidant activities were calculated after 8 different citrus honey pollen species and numbers were determined in Köyceğiz-Ortaca region of Muğla (Turkey). Citrus Honey's antioxidant activities were determined at 5 different concentrations by β -carotene linoleic acid color-opening test and ABTS cation radical elimination activity methods. According to pollen density of citrus balls; 45-60% (group C); 61-75% (Group B); 76-100% (Group A) were evaluated in three different categories. The analysis results; According to the β -carotene linoleic acid colorimetric method, group A showed 64.54% inhibition and group C showed 42.77% inhibition at a 20% honey concentration. The ABTS cation radical scavenging capacity was calculated as 54.98% in group A and 43.51% in group C, respectively. As a result of the researches we conducted, it was observed that the antioxidant activities were increased as the density of citrus honeys pollen increased. As the concentration of honeys pollen increased, antioxidant activities also increased. Acknowledgements The authors are grateful to the Selçuk University Science Source Projects (Project BAP No: 16201002) for financial support.

[Abstract:0538]

Ethanollic Extract of Turkish Propolis Induces Apoptotic Cell Death in Human Cervix Cancer (HeLa) Cells

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AIM: Cancer is a pathologic condition where the normal mechanisms of cell cycle regulation are dysfunctional either due to excessive cell proliferation, insufficient apoptosis or both. It is known that 11 million people are diagnosed with cancer every year in the world and it is predicted that this number will increase to 16 million by 2020. Various studies have investigated the antiproliferative effects of propolis, a natural bee product, from different countries, and its cytotoxic effects have been attributed to its polyphenol contents. The aim of this study is to determine the cytotoxic effect and mechanism of action of the ethanollic extract of Turkish propolis (EEP) in the cervical cancer cell line (HeLa), which has the second highest mortality rate in women in the world.

MATERIALS-METHODS: Cytotoxic effect of EEP on HeLa cells was revealed using the thiazolyl blue tetrazolium bromide (MTT) assay. Mechanism involved in the cytotoxic action of EEP on HeLa cells was then investigated in terms of apoptosis by flow cytometry using Annexin V-7AAD apoptosis detection kit.

RESULTS: The results showed that EEP significantly decreased HeLa-cell viability in a dose-dependent manner. The in vitro cytotoxic activity of EEP showed an IC₅₀ value of 88.3±1.2 µg/mL in 72 h of treatment. The treatment of HeLa cells with 45-180 µg/mL of EEP induced apoptosis in a dose dependent manner. The annexin V-7AAD assay revealed 39.4%, 51.1%, 85.1%, and 90.8% apoptotic cells in HeLa culture exposed to 45, 90, 135, and 180 µg/mL of the EEP, respectively.

CONCLUSION: This study was the first to investigate the effect of apoptotic properties of Turkish propolis extract on cervix cancer cells. Further studies are now necessary to understand in more detail the exact interaction of the involved signaling pathways.

[Abstract:0544]

Acetylcholinesterase and Butyrylcholinesterase Enzyme Inhibition Activities of Thyme Honeys Produced in Muğla (Turkey)

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Honey is a good source of nutrition as well as minor organic compounds and minerals other than sugars are important contributors to the functional food of honey. In addition to nectar from nectar sources of bee, there are also differences in the medical activities of honey depending on whether other bee products such as pollen and propolis are included in honey. People who feed on the products produced with good agricultural practices are also able to protect from many diseases. Alzheimer's disease is also known to increase as the average age of death increases. Alzheimer's, cancer and other diseases of our time are also increasing due to the decrease in nutritional quality or the consumption of industrial foods. Feeding with natural products or increasing the consumption of functional foods such as honey will provide a significant advantage in the fight against our epidemic diseases.

Muğla has an important potential in the production of other monofluorals such as thyme honeys, citrus and heather honey as well as the potential of pine honey production. Undoubtedly, this situation depends on Mugla's floristic climate and the richness of its flora. In this study, acetylcholinesterase and butyrylcholinesterase enzyme activities of thyme honeys produced in three different towns of Muğla were investigated and the regions were compared among themselves. At a concentration of 20% honey according to the activity tests performed at 5 different concentrations; According to the results of ACHE, the average of 40.52% inhibition produced in Datça has the highest activity compared to the other two regions. Thyme honeys produced in Ula province has the lowest enzyme activity with 39.25% inhibition. In terms of inhibition of butyrylcholinesterase enzyme; The thyme honeys produced in Datça region showed the highest activity with 35.51%, while Köyceğiz showed 32.41% and Ula 31.55% inhibition respectively. Both AChE and BChE inhibition showed that thyme honeys differed according to their production places and it was determined that thyme honeys produced in Muğla provinces showed the same order of inhibition of both enzymes.

Acknowledgements

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[Abstract:0588]

Nonpolar Organic Compounds of *Lavandula Stoechas* Honey

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Lavandula stoechas is endemic and growing naturally southwest part of Turkey. Flowering period of that plant is March and April and which is important nectar source for beekeepers. In this study, our aim was to investigate, nonpolar organic components of honey which is obtained from *Lavandula stoechas*. For this purposes, *Lavandula stoechas* honeys collected flowering period of plant and extracted with chloroform for 5 times. After evaporation of solvent, extract has derivatized with TMS to volatile organic compounds. Thus, the derivatized extract was subjected to qualitative and quantitative analysis by GC-MS systems. Cis-4-decene 1,10-dioic acid, 3-methyl furan-2-carboxylic acid, sebacic acid, cis-11-octadecenoic acid, 2-phenyl-2'-hydroxy-acetophenone, palmitic acid, linolenic acid ve α -hydroxy-cinnamic acid were found major components of *Lavandula stoechas* honeys. Additionally, some phenolic bioactive compounds were found such as; benzoic acid, phenyl-acetic acid, o- and p-hydroxy benzoic acids, 3-methoxy-4 hydroxy-benzene propionic acid and syringic acid. Also, fatty acid type of compounds available in honey extract of *Lavandula stoechas* honey; stearic acid, palmitic acid, linolenic acid, cis-11-decenoic acid, docosanoic acid, 3-hydroxy capric acid.

[Abstract:0600]

Investigation of Cytotoxic Effects of Bee Venom on Cervical Carcinoma (Hela), and Colon Adenocarcinoma Cancer Cells

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"Apitherapy" is a term that refers to a wide range of treatment methods by bee products and is included in traditional and complementary medicine. Bee venom promises hope in the field of apitherapy in recent years because of its high potential for biological activity. The compound is composed of low molecular weight proteins and peptides. The contents of bee venom may vary according to geography and bee species. In this study, we have investigated the therapeutic effect of bee venom of the Black Sea bee against some cancer cells. For this purpose, cytotoxic activity of bee venom against cervical carcinoma (HeLa), and colon adenocarcinoma (HT-29) was investigated and compared with healthy cell, retina pigment (ARPE). Bee venom will be provided by Zonguldak Arıcılar Unity. Anti-tumoral activity was measured by the MTT (3-(4,5-Dimethylthiazole-2-yl)-2,5-diphenyltetrazolium bromide) assay. Although the bee venom exhibited a significance cytotoxicity against cervical carcinoma (Hela) (IC₅₀: 49 µg/mL), the colon (HT-29) and the health retina pigment (ARPE) were not inhibited. The study results show that bee venom has a significant potential and further research is needed to illuminate the actual mechanism.

Acknowledgments This study was supported by TÜBİTAK project(114Z370).

[Abstract:0602]

Concentration of Propolis in Inhibiting *Candida Albicans* Invitro, in Selection for Candidiasis Vagina

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Vaginal discharge is still a problem for productive women in Indonesia. The most common cause of vaginal discharge is a fungus called candida sp, especially *Candida albicans*. Candidiasis vagina therapy could be as topical (ovule) and oral regiment. Topical regiment has advantage of not circulating systemic and not through the process in the stomach. The drug of choice of Candidiasis vagina, the fluconazole was reported resistance to *C. albicans*, so alternative regiment is needed. Propolis as one of the substances products by bees containing polyphenols and flavonoids were already known having anti-inflammatory, anti-viral, antioxidant, and antimicrobial activities. The concentration of propolis to overcome *C. albicans* in mouth mucosa is 2%, so we want to know the best concentration of propolis to overcome *C. albicans* in vaginal mucosa. Before that, we should determine in invitro. The aim of this study is determine the best concentration of propolis which effective against *C. albicans* invitro. This study was conducted at the Parasitology Laboratory, Faculty of Medicine, Universitas Indonesia and Biology Oral Laboratory, Faculty of Dentistry, Universitas Indonesia. The fungus is *C. albicans* ATCC 90028. We used two methods, first is disc diffusion method with blank disc and the second is Broth Microdilution (on going). We used three types of propolis (regular, coral and mixed), and also three different concentration for each type (1%, 5% and 7%). As a controle, we used nystatin. Based on the results of the invitro, the disc diffusion method, we found that the best concentrations were 5% and 7% for every type of propolis, and no difference between type of propolis. But the ability in inhibiting *C. albicans* growth were still below nystatin. This is probably due to the presence of wax that inhibits the spreading ability of propolis into agar medium, so that propolis could not maximized in inhibiting *C. albicans* growth. While with microdilution broth method we are still running. Propolis is an alternative substance in overcoming candida infections. Propolis concentration levels 5% and 7% could be an alternative therapy in overcoming vaginal candidiasis.

[Abstract:0603]

Biologically Active Peptides Derived from Royal Jelly

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Bioactive peptides are specific protein fragments that have beneficial impacts on health. Bioactive peptides of antihypertensive, immunomodulatory, anticarcinogenic, antibacterial, antimicrobial, antithrombotic, antioxidative have been isolated from many food products. Because of these various health-promoting properties, there is increasing interest in bioactive peptides. Honey and other bee products such as pollen, bee bread, royal jelly and propolis have high nutritional value and biologically active substances. Aforementioned health- promoting properties have also been found for bioactive peptides derived from bee products. Literature says that royal jelly showed hypocholesterolemic effect in healthy mid hypercholesterolemic adults. In addition to some studies has revealed that royal jelly has an antimicrobial peptide, jellein, located within the larger aminoacid sequence of major royal jelly protein 1 (MRJP1). Besides antimicrobial and hypocholesterolemic effect of the purified peptides, royal jelly proteins hydrolyzed with protease N show antioxidative activity against the peroxidation of linoleic acid. Current studies demonstrate the need for much additional research to illuminate for health-promoting properties of bioactive peptides in bee products.

[Abstract:0605]

Comparison of Anti-Inflammatory and Antioxidant Activity of Flower Honeys Produced in Various Countries

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Pharmaceutical anti-inflammatory drugs are widely used. When anti-inflammatory drugs used, a shell is formed on the wound and healing process of the wound is short-lived. However, due to some side effects, the use of anti-inflammatory drugs has been limited. Because of that it is necessary to search for new alternative anti-inflammatory drugs. To the best of our knowledge honey which accelerates the healing process of wounds is a strong anti-inflammatory agent. There are some papers in the literature, reporting that there is a correlation between anti-inflamatuvar and antioxidant activity. For this reason, as a continuing study we studied the anti-inflammatory and antioxidant activity of various flower honey samples produced in different countries.

In this study, the anti-inflammatory and antioxidant activities of flower pine honey samples produced in Bratislava, Nitra, Nove Mesto, Luky, Zloven and Zilina of Slovakia, and Almaty region of Kazakhstan, and Bandırma ve Bitlis region of Turkey, and Constanta region of Romania, and Moutava region of Bulgaria. The anti-inflammatory activity was performed using ROS method, while the antioxidant activity by the DPPH, ABTS, CUPRAC and β -Carotene-linoleic acid assays.

According to results, chloroform and ethyl acetate extracts of all honey samples exhibited anti-inflammatory activity. In general, the honey samples produced in Bratislava, Bandırma and Almaty regions exhibited higher anti-inflammatory activity in the ranges of 14.7 ± 0.7 and 27.6 ± 1.7 $\mu\text{g/mL}$ IC50 values. It is found that there was a correlation between anti-inflammatory and antioxidant activities.

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[Abstract:0607]

Apitoxin Reduces CD4+ Cell Proliferation Modulating an Anti-replicative Response in Lymphocytes from Patients with Human T- Lymphotropic Virus 1 (HTLV-1)

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BACKGROUND: HTLV-1 is a retrovirus that infects primarily CD4+ T lymphocytes inducing cell proliferation influenced by a Tax viral protein. HTLV-1 is characterized by a strong Th1 response where CD4+ lymphocytes secrete high levels IFN- γ in vitro. We hypothesized that components of the Apitoxin from honey bees could reduce CD4 T-cells proliferation, under homeostatic control of T regulatory (Treg) lymphocytes.

METHODS: The effect of Apitoxin (1.0 $\mu\text{g/mL}$) and Melittin (1.0 $\mu\text{g/mL}$) on Peripheral Blood Mononuclear Cells (PBMCs) isolated and cultured from both patients with 25% of HTLV-1- infected PBMC (n=3) and healthy donors [HD] (n=6) was evaluated. Phenotyping both CD4+ T and Treg lymphocytes were made by FACS and analyzed by FlowJo software. Additionally, both tax mRNA and IFN- γ mRNA levels were measured by RT-qPCR system. Non-parametric tests were used for the statistical analysis.

RESULTS: In patients with HTLV-1, both Apitoxin and Melittin were not cytotoxic and reduced about 30% and 40% of CD4 T-cells proliferation respectively. PBMC with HTLV-1 showed increase around 20% of CD4+ CD25+ CD39+ lymphocytes subsets after exposing Apitoxin. Expression of tax mRNA showed to be modulated both 1.0 $\mu\text{g/mL}$ Apitoxin and 1.0 $\mu\text{g/mL}$ Melittin (about 20-fold). Finally, we found that Apitoxin and mainly Melittin increased IFN- γ mRNA levels on HTLV-1-infected cells (Spearman $r = -0.866$; $p < 0.0001$).

CONCLUSION: Apitoxin reduce CD4 T-cells proliferation in HTLV-1 infected cells, where Melittin triggers the lysis of cell and expand memory Treg lymphocytes. We conclude an important role on the replicative potential of HTLV-1 in T lymphocytes could be because: (a) the main component of Apitoxin would act synergistically, and (b) there was a down-regulation of tax mRNA, and an increase of IFN- γ mRNA and memory Treg.

[Abstract:0619]

Antimicrobial Effects of Propolis against Plant Pathogens

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Propolis is a resinous product collected by bees used in their hives to have a safe place. Bees provide it from various plants in nature. It is rich in terms of phenolic compounds so it is very important for the role natural preservative. In this study the in vitro antimicrobial activity of the ethanolic extracts of the propolis collected from Rize Province of Turkey were determined against plant pathogen microorganisms *Agrobacterium tumefaciens*, *Spiroplasma citri*, *Xanthomonas translucens*, *Clavibacter michiganensis*, *Erwinia caratovora* by using the disc diffusion and agar dilution method. According to results, among the tested microorganisms, *X. translucens* and *A. tumefaciens* were the most sensitive to ethanolic propolis extract. According to statistical analyses, the sensitivity of the microorganisms were followed by *X. translucens* > *A. tumefaciens* > *S. citri* = *C. michiganensis* = *E. caratovora*.

In the study, also the evaluation of minimum inhibitory concentration of the extract by means of agar dilution experiment method is determined. The propolis sample required minimum inhibitory concentration of 2.5 µg/ml for *X. translucens* and 5.0 µg/ml for *A. tumefaciens*. The study has very importance to show the potential usage in the management of plant diseases caused by specifically *X. translucens* and *A. tumefaciens* that is the is the causal agent of crown gall disease and agent of bacterial leaf streak, respectively. This study offers that propolis may provide an alternative to chemical preservatives against several plant diseases.

[Abstract:0625]

Melittin Reduces In-vitro Human T Lymphotropic Virus Type 1 (HTLV-1) Replication and Proliferation of Peripheral Blood Mononuclear Cells (PBMC) from Infected Patients

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BACKGROUND: Melittin (MEL), major constituent of apitoxin, has a strong binding affinity to the lipid bilayer interface inducing pores in membranes. HTLV-1 is a retrovirus capable of transforming primary T lymphocytes both *in vitro* and *in vivo* causing T-cell leukemia lymphoma in human adults and is involved in a demyelinating disease. HTLV-1 spreads by mitosis cellular and immature virus particles are release during viral replication. We hypothesized that lytic effects of MEL might inhibit both HTLV-1 replication and cell proliferation from HTLV-1 infected PBMCs.

METHODS: The lytic activity of MEL on PBMCs isolated from infected patients: (a) up to 25% of infected PBMC (n=3), (b) up to 50% of infected PBMC (n=1), and the human T-cell lines MT-2 totally infected was compared in cell cultures. HTLV-1 replication was measured in culture supernatants using a core viral protein (p19 Gag) capture by ELISA. Viability were measured using exclusion of Trypan Blue (TB) assay. The sub-lytic effect was defined as presence of TB positive cell and decrease viability. Preliminary findings are described.

RESULTS: We did not find TB positive PBMCs. Mel <2.5ug/ml was not cytotoxic and reduced both p19 release and PBMCs viability in a dose-dependent manner when less than 25% of cells are infected. However, when there are more than 50% of infected cells only MEL >2.5ug/ml reduced both viability and p19 release. No change in p19 release was observed in the MT-2 cell line; only a sub-lytic effect of MEL 5.0ug/ml was associated with presence cell TB positive.

CONCLUSION: When some cell are infected MEL reduces strongly the HTLV-1 replication as well as proliferation of PBMC infected with HTLV-1 for one way disrupt membranes, which decrease more over 50% virus particles. This effect shows us MEL could reduce the spread of the HTLV-1. Analysis of this promissory result is in process to explore potential to disrupt infection with HTLV-1.

[Abstract:0632]

Anti-aging Effects of Dietary Bee Products and Calorie Restriction on Semen Production and Oxidative Damage in Older Broiler Breeder Males

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This study was conducted to investigate the effects of calorie restriction or dietary bee product (apilarnil plus royal jelly) supplementation on reproductive and oxidative responses and to determine the possibilities that these treatments may be used in retarding reproductive aging of broiler breeder males. At 52 weeks of age broiler breeder males were assigned to 4 treatment groups. Control group was fed on restricted feed as recommended by the breeder company throughout study; ad *libitum* group was fed ad *libitum* for a 4 week period; bee product group was fed similar to control group except that diet was supplemented with apilarnil and royal jelly for a 4 week period and in the last group calorie restriction (45% of standard diet) was applied for a 4 week period. After a 4 week adaptation period, experiment was continued for 18 weeks. The results obtained in present study have demonstrated that percentage dead sperm was the most affected semen characteristic by reproductive aging. Long-term moderate feed restriction could not prevent age-related declines in sperm production. Dietary bee product supplementation or calorie restriction for a 4 week period positively affected the semen characteristics and these beneficial effects could be maintained to some extent up until 72 weeks of age. Calorie restriction enhanced antioxidant defence for the first 4 weeks period however, this beneficial effect could not be sustained until the end of experiment. In conclusion it seems to be possible that dietary bee product supplementation or calorie restriction for a 4 week period can be used to slow down the rate of the aging process and extended reproductive life span of older broiler breeder males.

[Abstract:0635]

Propolis Addition to Heat-treated Dry Fermented Sausage Formulations as a Powerful Antimicrobial Agent from Sensory Analysis Perspective

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Sensory analysis of the nine different formulations of heat-treated dry fermented sausage samples was carried out in a sensory analysis laboratory with 25 °C. Duo-trio test procedure is applied to determine whether product differences result from a change of propolis extract content in their formulations and an overall difference exist between samples. Constant reference mode is applied in which the same sample, which contains 150 ppm nitrite but no propolis extract, is always the reference. The heat-treated dry fermented sausage samples in sensory panel are including: (R) reference sample with 150 ppm nitrite; (A) 150 ppm nitrite and 0.25% propolis extract; (B) 150 ppm nitrite and 0.50% propolis extract (C) 50 ppm nitrite and 0.25% propolis extract; (D) 50 ppm nitrite and 0.50% propolis extract; (E) 75 ppm nitrite and 0.25% propolis extract; (F) 75 ppm nitrite and 0.50% propolis extract; (G) 100 ppm nitrite and 0.25% propolis extract; (H) 100 ppm nitrite and 0.50% propolis extract. The procedure of this method is to present to each subject an identified reference sample, followed by two coded samples with three digit numbers, one of which matches the reference sample. Ask subjects to indicate which coded sample matches the reference. The number of correct replies were counted and interpreted according to reference tables. According to reference table, minimum correct answers for 5% significance level should be 17 and the samples have correct answers above this have statistically significant difference from the reference sample. As a result of this study it was observed that sample A, sample E, sample F results are below this significance level having 14, 15 and 13 correct answers, respectively. It can be concluded that using half of the amount of nitrite than reference sample and addition of propolis as a powerful antimicrobial agent to dry-fermented sausage formulations result in no statistically significant sensory difference. It would be more healthier alternative to use propolis as an antimicrobial agent to decrease the nitrite amount in production of heat-treated dry fermented sausage.

[Abstract:0654]

The Effects of Propolis and Flunixin Meglumine on Feed Intake, Body Weight, Body Weight Change, and Histological Changes in Liver and Kidney Tissues against Excess Copper in Rats

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This experiment was designed to determine the effects of propolis and flunixin meglumine on feed intake (FI), body weight (BW), body weight change (BWC), and histological changes in liver and kidney tissues against excess copper in male rats. In this study were used thirty-six Sprague-Dawley rats which are individually housed. Animals were randomly divided into six groups; Control, Copper Sulphate (Cu) (500mg/kg BW/day, gavage), Flunixin Meglumine (FM) (2.2mg/kg BW/day, ip), Propolis (P) (100mg/kg BW/day, gavage), Copper Sulphate+Flunixin Meglumine (Cu+FM) (500mg/kg BW/day of copper sulphate by gavage and 2.2mg/kg BW/day of flunixin meglumine, ip) and Copper Sulphate+Propolis (Cu+P) (500mg/kg BW/day of copper sulphate and 100mg/kg BW/day of propolis by gavage) during 21 days. Feed intake and BW of rats applied Cu decreased significantly in comparison with that of the control group over a period of 21 days ($P<0.001$). The study demonstrated that BW and BWC when flunixin meglumine and propolis supplementation was provided rats to applied Cu increased numerically. Besides BWC in Cu+P group ameliorated significantly in comparison with that of Cu group ($P<0.01$). Flunixin meglumine administration (Cu+FM) did not significantly attenuate BWC and FI of rats that had induced Cu, while propolis administration significantly increased ($P<0.001$). The livers and kidneys of the control rats and those of the rats that were treated with both flunixin meglumine alone and propolis alone showed no abnormalities. But the livers from the Cu-supplemented rats showed severe centrilobular hepatocellular degeneration and necrosis in their livers. Also, the kidneys from the Cu-treated rats demonstrated severe degeneration and necrosis of mostly proximal and minority distal tubules in the cortex. Swelling, karyomegaly and karyolysis were observed in epithelial cells of proximal tubules. Flunixin meglumine and propolis treatments prove that they markedly decreased severe tubular degeneration and necrosis and the majority of changes in the cortex had been caused by the Cu supplements and could be reasonably counteracted with their supplements. Propolis could be used for treatment of some diseases which are caused to necrosis in the liver and kidney.

[Abstract:0683]

Investigation of Phenolic Compounds and Antioxidant Capacity of Bee Pollen Collected from Different Geographical Regions in Turkey

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OBJECTIVE: Bee pollen produced by bee from flowering plants that focused for human and animal diet because of its nutritional value. Bee-collected pollen contains considerable amounts polyphenol substances and antioxidant compound. Phenolic acid and Flavonoids are known by their health-promoting effects, which are usually attributed to their powerful antioxidant activities. The aim of the this work was to evaluate the antioxidant activity, total phenolic acid and total flavonoid content in bee pollen from different regions of the Turkey.

Material and METHOD: 81 samples bee pollen from 6 different regions of the Turkey Total 81 samples bee pollen were collected from different regions of Turkey; Central and Eastern Black Sea, Marmara, Central Anatolia, Mediterranean, Aegean, East-South Anatolia. The study was conducted in the Department of Biochemistry, Faculty of Veterinary Medicine. The findings of the present study were the total phenolic content of pollen samples was determined expressed as gallic acid equivalent (GAE) in g pollen. The total flavonoid content of pollen was expressed as quercetin equivalent (QE) in g pollen. For potential antioxidant activity using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) method for antiradical activity.

RESULTS: In this study determined that antioxidant activity in different pollen (between 77,93 and 69,49 DPPH-sc % inhibition), their total phenolic contents (between 21,23 and 27,66 mg GAE/g) and total flavonoid contents (between 03,72 and 4,97 (mg QE/g) variation showed.

CONCLUSION: The present study revealed that Turkey bee pollen suggests that the therapeutic potential.

[Abstract:0684]

Evaluation of the potential properties of *Pediococcus acidilactici* isolated from *Apis mellifera* gut microbiota, as therapy for skin wounds

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Recent reports suggest that probiotic applications may be an effective strategy to promote skin health. In this study, the potential of *Pediococcus acidilactici* isolated from *Apis mellifera* gut microbiota and identified by molecular methods based on 16S rDNA sequence analysis, was assessed against to the important skin pathogens *Pseudomonas aeruginosa* PAO1; ATCC 27853, methicillin resistant *Staphylococcus aureus* MRSA; ATCC 43300 and their hospital derived strains isolated from skin chronic wound samples. The ability of *P. acidilactici* to directly inhibit growth of the skin pathogens was assessed using well-diffusion assays. The cell free supernatant (CFS) of the strain was neutralized to determine whether the inhibitory activity against pathogens was due to the presence of acids or other inhibitory substances. As a result, the strain and its CFS were inhibited the growth of all pathogens. When the CFS of the strain grown in MRS were neutralized, no inhibition zone was observed. Different enzymes and heat treatment of CFS were reduced the activity. It was found that, inhibition of pathogen growth was principally via the production of organic acids. Lactic acid production was determined by an assay kit and found as 118mg/mL. Concentrations of lactic acid and acetic acid in CFS were also determined using high-performance liquid chromatography (HPLC). MIC (minimum inhibitory concentration) of the CFS against to all tested pathogens was determined according to Clinical and Laboratory Standard Institute and found as 25mg/mL. The strain displayed no hemolysis (gamma-hemolytic), exhibited a strong autoaggregating phenotype (91.47%) and demonstrated 9.26 and 18.09% co-aggregation with MRSA and PAO1, respectively. Antibiotic resistance was examined by disc diffusion and micro titer plate assay and found as safety. Cytotoxic effect of the lyophilized CFS on HT-29 cell line and anti-oxidant activity were also determined. By using MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay, *P. acidilactici* has cytotoxic effect on HT-29 cells. In conclusion, our results suggest that *P. acidilactici* or its CFS may have therapeutic potential in terms of wound healing with its anti-microbial, anti-oxidant and safety concerns and topical application of this strain or its extracts can be designed recently as a treatment for infected wounds.

[Abstract:0699]

Anti-biofilm Forming and Anti-quorum Sensing Activity of *Pediococcus Acidilactici* Isolated from *Apis Mellifera* Gut Microbiota

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The aim of this study was to investigate the effect of *Pediococcus acidilactici*, its cell free components (CFC) and exopolysaccharides (EPS) on the formation of biofilms and on the inhibition of quorum sensing (QS) for important skin pathogens. *Pediococcus acidilactici* was isolated from honey bee (*Apis mellifera*) gut microbiota and identified by molecular methods based on 16S rDNA sequence analysis. *Pseudomonas aeruginosa* PAO1; ATCC 27853, methicillin resistant *Staphylococcus aureus* MRSA; ATCC 43300 and their hospital derived strains isolated from skin chronic wound samples, were used as skin pathogens. CFC of the *P. acidilactici* was tested against the selected bacterial strains for its inhibitory activity using a modified broth microdilution method according to Clinical and Laboratory Standard Institute. A wide range of CFC based on MIC (minimum inhibitory concentration) value, viable cells of the strain, release and bound form of EPS were used as active ingredients for their anti-biofilm activity. Biofilm formation was measured by crystal violet assay following the 24 h co-incubation period and also after pre-treatment of the active ingredients. Anti-biofilm activity was also visualized using Scanning Electron Microscopy (SEM) and Confocal Laser Scanning Microscopy. QS inhibitory efficiency of CFC was determined by testing QS controlled virulence factors (motility, total proteolytic and elastase activity, production of pyocyanin and rhamnolipid) against *P. aeruginosa*. The sub-MIC concentration was selected for the assessment of anti-QS activity. As a result, co-incubation of the viable cells decreased the biofilm production of MRSA as 67 %, and *P. aeruginosa* as 52 %. Reduction (99% for MRSA and 70% for *P. aeruginosa*) on biofilm production of skin pathogens was also obtained by different MIC values of CFC. Similar results were also obtained with release EPS and bound EPS against *P. aeruginosa*. Inhibition of swarming, twitching and swimming motility of *P. aeruginosa* was observed at concentrations of sub-MIC value of CFC. CFC clearly decreased the protease and elastase activity and also significantly reduced the pyocyanin production of the pathogen. In the present study, we highlighted that active components of *P. acidilactici* can be used as a novel and natural strategy for development of potential anti-infective therapy.

[Abstract:0700]

Antioxidative Properties of Water Soluble Propolis Made with Honey

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Propolis is a Greek word for a material that safely keeps a filled bee population. Propolis is a sticky substance with various colors such as dark brown, yellow, green, etc, which is made by bees collecting protective material or essence of plants and mixing with saliva. It is used to repair the inside of the honeycomb, keep it sterile, and adjust the temperature and humidity. The bees also use propolis to keep the wreckage of the intruders from decaying in the beehive. Propolis is a natural antibiotic substance that is made by coating thinly coated worker bees before spawning queen bee and making clean rooms, and preventing the bacteria from invading by using with wax when sealing the nursery room. Propolis is composed of more than 200 substances because it differs depending on the type of plant and season of the collector, polyphenols and flavonoids have strong antioxidant and antibacterial effects. The propolis extract is registered as a raw material for health functional foods and is used for food, in order to use propolis the active ingredient is extracted with ethanol. Water soluble propolis was prepared by using honey and propolis extracts in order to use extract of propolis extracted with ethanol conveniently. We have confirmed the total flavonoid content, the antioxidant effect and the antimicrobial effects of water soluble propolis.

[Abstract:0702]

Does Propolis Protect Against Radioactive Ray Effects?

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Propolis is used to protect the colony from external influences, such as rain and cold. The purpose of this study is to find the answer to the question “Does it also protect against radioactive effects?”

In this study, the radioactive ray absorption capacity of propolis was determined. The measurements of linear absorption coefficient of propolis discs were performed with high-purity coaxial germanium (HPGe) detectors (ORTEC ©) of 55% relative efficiency and resolution 1.9 keV at the 1332 keV. The energy and efficiency calibration of detector were done with ¹⁵²Eu liquid source (Amersham Company, UK) of known activity. The spectrums were evaluated using Gamma Vision Software. An ²⁴¹Am source emitting gamma rays of 59,5 keV was used for determination of linear absorption coefficients. Lead collimator with 1 mm diameter holes was used to prevent undesired scattering, to place the samples and sources and for arriving of rays as parallel to the detector. The measurements were done first without sample and then with samples using gamma rays emitted from radioactive source at three times for 1200 s. The intensities of the gamma rays coming from the sample and passing through the sample were found using the areas below the corresponding peaks in the obtained spectra. The linear absorption coefficients (theoretical), mass absorption coefficients and HVL values (absorbent sample thickness required to reduce the 50 % of intensity of gamma radiation passing through the sample) of the materials were determined. The results were compared with materials such as wood, polypropylene, concrete, cellulose, mica, polyamide, and the potential use of propolis was discussed. Linear absorption coefficients, the radioactive ray absorption capacity and HVL values of propolis were found as 0.224 cm⁻¹, 0.196 cm², 3,096, respectively.

[Abstract:0709]

Antifungal Activities of Clove Oil *Eugenia caryophyllata* Thunb. against *Ascosphaera apis* a Causal Agent of Chalkbrood Disease on Honey Bee (*Aphis mellifera* L.)

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Clove oil is an antifungal, antimicrobial, antiseptic, antiviral, aphrodisiac and stimulating properties. The oil is used for treating a variety of health disorders including tooth aches, in digestion, cough, asthma, headache, stress and blood. Many people believe that clove oil is useful in preventing and treating cancer. In this study, the antifungal activities of different doses (10, 20, 30, 50, 100 and 200 µg/ml) of clove oil were investigated against *Ascosphaera apis*. The volatile effect of different doses of clove oil were determined against *A. apis* *in vitro*. Sterile distilled water was used as a control. Antifungal effect of clove oil was compared with that of *Thymra spicata* var. *spicata* essential oil (50 µg/ml) which is known a very strong antifungal essential oil. The highest dose, 200 µg/ml, of clove oil had a maximum antifungal effect on *A. apis*. It was thought that this antifungal effect can be result from the presence of some main components as eugenol, eugenyl acetate, β-caryophyllene and the other components (α-pinene, p-cymene, limonene+1,8 cineole, linalool, α-copaene, α-humulene). This study is the first report on antifungal effect of cloves oil against the fungal pathogen, *A. apis* a causal agent of chalkbrood disease on honeybee.

[Abstract:0718]

Glycemic Index Values of Highbush Cranberry Juice (*Viburnum Opulus*) with Honey

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Highbush cranberry juice is traditionally used in Anatolian folk medicine for the maintenance of general health. The Glycemic Index is a classification of the blood glucose-raising potential of carbohydrate containing food and low-GI foods were found to induce benefits on certain risk factors for some chronic illnesses. The aim of this study was to determine the glycemic index of highbush cranberry (*Viburnum opulus*) juice (in four varieties: unsweetened, sweetened with fructose, sweetened with sucrose or sweetened with honey) on a total of 24 healthy volunteers, with the mean age of 20.57±1.39 for men, and mean age of 19.37±1.02 for women. Anthropometric measurements of each participant were taken and their diet histories were recorded. Highbush cranberry juice containing 50 g carbohydrates in different forms were given together with glucose as a testing nutrient. The participants fasted for 12 hours and then consumed the testing and reference nutrition. Fingert blood samples were taken in fasting state and 15, 30, 45, 60, 90, and 120 minutes after the meals. By using the incremental area method, the glycemic index values of the highbush cranberry juice samples were determined. These were as follows; unsweetened juice; 39.95, honey sweetened juice; 46.74, fructose sweetened juice; 53.42 and sucrose sweetened juice; 63.76. Therefore, we suggest that highbush cranberry juice and flavoring it with honey could be used in a healthy diet because of having low GI values.

[Abstract:0747]

Bioactive Properties of Medical Honeys in Turkey

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Honey is a viscous supersaturated sugar solution derived from nectar gathered and modified by the honeybee *Apis mellifera*. The use of traditional medicine to treat infection has been practiced since the origin of mankind, and honey produced by *Apis mellifera* (*A. mellifera*) is one of the oldest traditional medicines considered to be important in the treatment of several human ailments. Medical and aromatic plants are used as medicine to prevent diseases, maintain health and cure diseases. Thanks to rich flora of our country there are too many different kinds of medical plants and honey is produced from them. Bioactive properties of different medical honeys like lavender, thyme and linden honey are investigated in this research. The TPC was determined in accordance with the Folin-Ciocalteu method, antioxidant activity with phosphomolybdenum, and FRSA with the 1,1-diphenyl-2-picryl hydrazyl (DPPH) assays. Total phenolic content, antioxidant and antiradical activities of honey samples was between 97.47-212.06 mgGAE/100 g, 36.50-138.29 mgEEA/g, %12.20-66.02 respectively.

[Abstract:0761]

A Study on Antifungal Activity of Propolis Extract against *Fusarium Oxysporium*

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Propolis is a sticky gummy resinous substance collected by worker honeybees from the young shoots and buds of certain trees and shrubs. The plants secrete it to coat the young shoots and buds in order to protect them from the adverse effects of bad weather and from attack by bacteria, fungi, moulds and viruses.

The effectiveness of propolis on the pathogen *Fusarium oxysporium* was studied. The propolis extract was prepared by mixing 1900 ml 70% ethanol and 100 g propolis. Isolated *Fusarium oxysporium* pathogen were cultured in PDA(Potato Dextrose Agar). Five mm in diameter *Fusarium oxysporium* culture discs were placed in the petri dishes containing PDA and 50 ppm, 25ppm, 12.5 ppm, 6.25 ppm, 3.125 ppm and 1.56 ppm of 5% propolis extract, incubated at 31±1 °C. The growth of the pathogen was evaluated after the 1 month of incubation period. Propolis extract was found to be highly effective against to *A.apis* pathogen in vitro conditions.

[Abstract:0772]

In Vitro Inhibition of *Staphylococcus Aureus* by Apitoxin and Mellitin

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Apitoxin is the venom secreted by honey bees and it is composed by a complex mixture of proteins and peptides. It exhibits various properties, such as antimicrobial activity against gram positive bacteria. The extraction of the apitoxin does not represent significant reduction of the productivity of honey or other by-products of the hive. Melittin (a major component of apitoxin) is considered the main active fraction of apitoxin and it was demonstrated to have various biological activities related to its ability to interact with the cell membrane. To explore the feasibility to use apitoxin or melittin as alternatives to synthetic antimicrobials, the inhibitory activity of the whole venom and melittin against several strains of *Staphylococcus aureus* was assessed. Apitoxin was obtained from an apiary located in the province of Santa Fe, Argentina. Purified melittin was obtained from a commercial supplier. Their ability to inhibit the growth of three *S. aureus* strains isolated from bovine mastitis cases and one *S. aureus* reference strain ATCC 29213 was evaluated by means of Minimum Inhibitory Concentration (MIC) assays in liquid medium. Differences were observed in the MICs required to inhibit the growth of isolates using apitoxin (from 15.62 µg /mL to 31.25 µg / mL)- or melittin (from 25 µg / ml to 50 µg / mL). In addition, comparative time-kill curve assays were performed that supported the MIC results. The results indicate that apitoxin and melittin may represent a natural and effective alternative for the prevention or treatment of bovine mastitis caused by *S. aureus*.

[Abstract:0774]

Lifelong Treatment with Royal Jelly Extends Healthy Lifespan of Genetically Heterogeneous Mice.

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OBJECTIVE: In aging society, the difference between life expectancy and healthy life expectancy become social problem in the aspect of quality of life. Royal jelly (RJ) is expected to extend healthy lifespan because RJ has reported to a variety of health benefits. In this study, we have examined the effect of royal jelly on the healthy lifespan by using genetically heterogeneous (HET) mice.

METHODS: We used HET mice in this study. HET mice are offspring of four different grandparents' inbred strains, so that there is a variety in the cause of death like human population. HET mice have been lifelong-treated with RJ from 6 month-old. After RJ treatment, we observed lifespan and estimated the changes in motor functions such as muscle strength and motor coordination with aging. We further investigated the changes in protein and mRNA expression in the muscle and liver.

RESULTS: Median survival tended to increase in RJ-treated mice. Importantly, the motor function was significantly higher in RJ-treated mice than that in control mice at 36 month-old (final stage of murine life). We observed that the expression of muscle stem cell marker gene (Pax7) decreased and muscle atrophy genes (MuRF1 and atrogin1) increased with aging, respectively. However, in RJ-treated aged-mice, the expressions of these muscle genes were similar to those in young mice. In the liver, the genes that are related to lipid metabolism were changed during aging in control mice, but in RJ-treated aged-mice, they maintained the same as level of young mice. Furthermore, the protein acetylation such as histone H3 was increased with RJ intake in aged-mice in comparison with control aged-mice, suggesting that long-term RJ treatment could affect epigenetic status.

CONCLUSIONS: RJ supplementation may extend healthy lifespan via improving motor functions and age-related metabolic changes in the liver.

[Abstract:0775]

Effects of Bilberry, Lutein and Brazilian Propolis Diet on Eye Fatigue in Humans: A Double-blind Randomized Placebo Controlled Crossover Study

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OBJECTIVE: The aim of this study was to evaluate the effect of bilberry, lutein and brazilian propolis diet (BLP) on eye fatigue in healthy adults.

METHODS: Six men, six women ranging from 32 to 57 years old with eye fatigue participated in this randomized controlled trial for 2 weeks. They ingested daily three capsules containing 270 mg bilberry extract, 90 mg lutein, and 107.4 mg brazilian propolis ethanol extract, or placebo. Before and after ingestion, and VDT (visual display terminal) evaluation, we have conducted several tests such as: VAS (visual analogue scale), Schirmer, and autonomic function by the acceleration pulse wave and questionnaire for Evaluating Work-Related Fatigue Feelings.

RESULTS: Eye fatigue symptoms such as: eyestrain, dry eye, and listlessness were significantly improved in the active group after two weeks ingestion. Also parasympathetic function (High Frequency: HF) was higher in active group than placebo group.

CONCLUSIONS: The result of current study suggests that the BLP could improve eye fatigue and alleviate disturbance in the balance of autonomic function.

[Abstract:0776]

Yoga Bee, A New Approach for Health

Catherine Flurin

Ballot-Flurin Apiculteurs

Catherine Flurin founded a new holistic and unique in the world method to cure with bees: Gentle beekeeping. It is also named Yoga des Abeilles, Yoga Bee. This is a new practice. Benefits are for children, adults of all ages and conditions, healthy or with all kind of diseases. Progress with a deep change in the beekeeping business. Based on the responsibility of beekeepers and on full respect of the ecosystem: bees, their environment, consumers, and the economic system. Bees have been living on Earth for so many years. They have a deep knowledge, intelligence of life, and a special energy. Bees collapse is the sign of human errors about the way they manage their life and the world. Gentle beekeeping teaches us how to learn from the bees. Gentle Beekeeping is the fruit of 30 years research at the innovative Ballot Flurin Beefactory located in a small village of South West of France. Bees, Nature and Humans are connected to live healthy and rich together. To promote this new era in beekeeping and in communication with bees, join our movement.

[Abstract:0781]

The Antidiabetic Effect of Saharan Algerian Honey and Pollen "In Vivo Study In The Rat"

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Traditional medicine offers alternative remedies such as medicinal plants and natural products whose honey is most important. They possess hypoglycaemic properties to control or treat diabetes and its complications. Moreover, they are rich in antioxidants which ensure the prevention or the delay of different pathologies. The objective of this study is to evaluate the antidiabetic activity of two natural products, honey and pollen in the diabetes model. After 21 days of prolative treatment with euphorbia honey (10%), multifloral pollen extract (1%), and mixed-honey and pollen in male oral rats (VO). Streptozotocin at 60 mg / kg body weight was induced intraperitoneally (PI) and at a single dose. The toxicity test at the selected doses showed no effect on all the test batches. The results obtained from the glycemia, before the induction of diabetes by the STP, show a stability in this analysis in all the rats to be tested.

On the other hand, after diabetes induction, a highly significant increase in blood glucose is remarkable in diabetic rats (D) compared to control (T) rats. However, treatment of diabetic rats with honey (DM) and mixed honey and pollen (DMP) revealed a remarkable hypoglycaemic effect; Significant decrease compared to diabetic rats (D). The histological study showed lesions in the pancreatic tissue of diabetic rats (D) compared to the control rats. On the other hand, the histological aspect of the pancreas of the diabetic rats treated with honey (DM) and mixed (DMP) closely resembles that of the control rats. The histological study of hepatic parenchyma in diabetic rats (D) and in rats treated with pollen (DP) revealed moderate hepatitis translated into more marked lymphocytic infiltration in diabetics (D). The results of the histology reflect the results of the biochemical parameters studied, namely cholesterol, transaminases and triglycerides, which asserts the antidiabetic activity of the honey studied.

This study shows that Euphorb honey has a better antidiabetic effect under the conditions of the present experiment.

[Abstract:0782]

Impact of Propolis on Cryopreservation of Arctic Charr (*Salvelinus Alpinus*) Sperm

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Cryopreservation of sperm causes damages and adversely affected sperm motility and viability resulting in lower hatching rates. The aim of this study is to determine whether propolis has potential protective effect on cryopreservation and fertilization ability of spermatozoa of *Salvelinus alpinus*. The extenders were prepared by using simple glucose solution (0.3 M glucose) to which 10% Me2SO added with different levels of propolis (0.4, 0.8 and 1 mg/ ml) and 10% egg yolk (as a control without propolis). The pooled semen samples diluted at the ratio of 1:3 by the extenders were subjected to cryopreservation. The percentage and duration of motility and fertilization tests of cryopreserved sperm samples have been done immediately after thawing and compared with control and fresh semen. The extenders containing propolis showed higher percentage motility and motility duration than control group ($P < 0.05$). Especially the group II (0.8 mg/ ml propolis) and the group III (1 mg/ ml propolis) showed significant positive effects on both post thaw motility and hatching ability. In conclusion, this study confirms that the propolis is an appropriate cryoprotective agent in fish semen and it maintained the integrity of the spermatozoa during the cryopreservation process.

[Abstract:0785]

Influence of Bee Venom Therapy on Twenty Five Cases of Multiple Sclerosis

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Bee venom is a highly active biological compound, a mixture of powerful chemicals, and is used as an alternative therapy in many countries. The present investigation was done in some private clinics in Cairo and was designed to determine whether repetitive injection of diluted bee venom produces more potent analgesic effects on multiple sclerosis and whether those effects are associated with increased neuronal activity and movement. Diluted bee venom 40 micrograms (from 1g bee venom diluted in 1L physiological saline) was administered subcutaneously twice weekly for a week. Injections were done on the Chinese pathways (especially urinary bladder and bile duct meridians) on the reflective points to stimulate the vital electromagnetic energy biologically. The injectable dose of bee venom was elevated in an ascending manner to reach 100 micrograms in the first month, 250 micrograms in the second month and 350-500 micrograms in the second month according to improvement of the cases. Results showed that starting from day 5-15, the patients with new injuries/early sickness showed rapid response of the nervous responses in the form of pulse reflex actions directly after injection. Repetitive diluted bee venom administration in combination with diet program, phytotherapy, immuno enhancer and physiotherapy for 5 months significantly ($P < 0.05$) improved the hand movements to become more flexible in 60% of the cases. Furthermore, laboratory investigations showed that bee venom in the previous pattern altered the acidity degree (PH) to be more alkaline, improved Erythrocyte Sedimentation Rate (ESR), C- Reactive Protein (CRP) and lowered the enzymatic activities of liver specially Glutamic Oxalacetic Transaminase (GOT) and Antistreptolysin- O (ASLO). In conclusion, subcutaneous injection of bee venom twice weekly for few months succeeded to improve many cases of MS through decreasing markers of pain and inflammation following the treatment and could simply be the effect of compensatory mechanisms kicking in.

BEE BIOLOGY

[Abstract:0027]

Telepathy Bees

Uladimir Pyatrovich Usik
individual

When I watched bees, I noticed, that they have ability to understand thoughts.

- 1) When I went to break out queen cells, that I do not need, I heard very loud sound similar to crash of ratchet. This sound was gone from very small queen cell.
- 2) The bee disturbed the man. He began to ignore it absolutely on the advice of surrounding people. The bee paid the attention to other person.
- 3) The atocous queen began to look intensively for queen cells with queens having heard the continuous sound of queen's voice recorded on phone. It even tried to gnaw cells of working bees. But it ran, having begun to gnaw. The queen bee could bite brood of working bees only knowing about absence on the frame of other uterus.
- 4) The queen with a large number of bees was on beehive walls in the family that should be eliminated at honey selection. The attempt to catch bees with the queen on framework was not successful.
- 5) I did not notice reaction to suggestion attempt, but I allow existence at bees of emotions connected with their safety. Concern of queens was noticeable in some families in which there was a need for replacement of queen, association of families.

[Abstract:0042]

The Influence of Dopamine on Flying Behavior of Honey Bee Workers

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The biogenic amines like dopamine (DA), octopamine and tyramine have effects on physiology and behavior as neuroactive substances in vertebrates and invertebrates. Several studies have been investigated the effects of DA on various behaviors in honey bee workers. However, effects of DA on flying behavior of the workers is not studied yet. In the present study, we investigated the effect of DA on flying behavior of foraging workers in the European-honey bee "Apis mellifera". We injected two doses of DA (10-2 M and 10-3 M) and those of DA antagonist (flupenthixol) into the abdomen of foragers and measured their flight initiation time. Injections of 10-2M DA-antagonist into foragers caused a significant delay to fly in comparison to control. However, the foragers injected 10-3 M DA-antagonist and, 10-2 M and 10-3 M DA did not show any significant delay compared to the control. Our results suggest that strong inhibitions of DA signaling may affect flying behavior of honey bee workers. In the future, we would investigate the effect of other biogenic amines, i.e. octopamine and tyramine on the flying behavior of honey bee workers.

[Abstract:0056]

Factors that Effect the Productivity of Honey Bee (Apis mellifera L.) Colony

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Productivity in beekeeping emerges under the influence of many factors as well as in other sectors. Each factor affecting the production process affects the quality and quantity of bee products which is the most important indicator of productivity in the rate of power. Animal breeding "yield = genotype + environment" as equality briefly outline the situation that has emerged.

When we consider the event in terms of productivity in the concept of beekeeping, bees honey, pollen, propolis, royal jelly; quantity and quality characteristics of bee products such as bee venom, the color of all the bees that make up the colony, length, wingspan, external appearance, such as body size, spawning capacity of the Queen bee, worker bee hives executive success in internal service and cleaning behavior, colony development, honeycomb processing activities, aggressive behavior, wintering includes all events. Therefore evaluating events like the queen bee or colony quality it is worth examining not only one character but many of the features in terms of character. Otherwise, the mistake is inevitable. However, it is considered here as having economic importance of bee products.

The most important factor that affects yield and productivity is the genotype consisting of mother and father. If a honey bee colony is meant for queen and 10-15 drone bees mate in the air. Queen bee determines the properties of colony transferring own characteristics and received reproductive properties of drones. Queen bee receives sperm from drones are used in order. Therefore, the characteristics of the colony may change over time. Thus, docile colonies became aggressive and honey production changes to an inefficient state.

This event has effected by significantly environmental factors and order of sperm used by queen bee. Environmental factors affecting productivity include those taken under control the most difficult. Because climatic conditions such as temperature, humidity and wind affect both forage level and pollen and nectar emission of plants. Environmental factors being complement of productivity acting together with genotype determine the productivity of bee colonies. Some environmental factors can be controlled or even features that can be improved.

[Abstract:0075]

Subspecies Differences in Chromatin Methylation and Gene Expression Rates Associated With Colony Survival in Honeybees

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Molecular regulation of heat tolerance and survival rates of the local honeybee subspecies, *Apis mellifera jemenetica* under extreme high temperatures was investigated. Four loci of the life essential gene (protein lethal (2) essential for life: ID: 323388986) were used. Expression rates of these loci in different life stages of the local honeybee subspecies (heat tolerance) were compared with imported subspecies, *Apis mellifera carnica*, (heat susceptible) under heat stress. Histone methylation at these loci was also investigated. Antibodies included H3K4me2, H3K4me3, H3K27me2 and H3K27me3. Results showed that expression rates of the genes known as life essential is significantly higher in the local honeybee race compared with the imported subspecies and broad H3K4me3 and H3K4me2 is associated with increased transcription of these loci in the local honeybee subspecies. Along with, higher enrichments folds at the H3K27me2 and H3K4me3 in the imported honeybee subspecies were associated with suppression at these loci. This indicates obviously that importance of histone methylation in heat tolerance regulation in the honeybee.

[Abstract:0080]

Bee Feeding

Jude Ssettaba

Native Products Ltd, Uganda-Kampala, General Manager

Before getting into the facts of why feeding bees is crucial from time to time, let's be clear on one thing. Natural organic honey comes from nectar source harvested by bees (*Apis mellifera*), Feeding bees with syrups and other supplements, using immense amount of chemicals to fight termites, such syrups and molasses, beet sugar can degrade into compounds which contains toxic to bees and impurities that can cause dysentery. Bees stockpile food in their hives, to provide food for winter and dry season when nectar is unavailable, bees get on their stored honey, and during this time it is very important to habitually monitor the amount of honey in the hive to avoid the starvation of the colony. The best way to guarantee that bees have enough pollen, is to ensure that, there are adequate and suitable bearing plants close to the apiary.

PREVENTION OF COLONY STARVATION

Starvation can be prevented by using recommended methods of feeding bees, Like: Bee immigration, Feed honey from the right sources.

1. Bee Immigration

This done during drought or winter season, bees are being conveyed to abode where there is enough nectar source, however applications of natural beekeeping must be applied to new apiary.

2. Feeding bees with Honey.

It is not recommendable to feeding the bees using honey, unless it comes from your own disease free hives. Using honey from unknown source to feed the bees, for example from shops may cause infection in the bee hives, honey suitable for feeding bees must be placed directly inside the hive

3. Water feeder

Water is very important in terms of processing stores, making brood food, maintaining humidity to ensure that egg hatch and cooling the colony in hot weather. Water can be provided using water feeder.

Major reasons why bees need to be fed.

If the climate, weather, genetics, available forage, pests, colony strength and environment stresses are beyond the beekeeper's control.

If the spring nectar flow is late, depending on the year, summer or drought may avert the bees from storing enough honey.

[Abstract:0082]

Determination of Pesticide Residues in Bee Produces Honey Using Gas Chromatography Mass Spectrometry

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Increasing emissions of chemical compounds to the environment, especially of pesticides, is one of the factors that may explain present honey-bee colony losses. The widespread and careless use of toxic pesticides during the blooming periods of agricultural and horticultural crops not only kills honeybees but also contaminates hive products. For this reason the analysis of pesticide residues in honey helps to assess potential risk of this product to consumer health and gives information on the pesticide treatments that has been in field crops surrounding apiary site. The study was conducted in West Arsi and East Shoa Zones, Oromia Region of Ethiopia with the objective of determining the presence of pesticide residues in honey samples and its conformity with to determine whether it is within the limits of European Union range of Maximum Residue with Levels (MRLs). For this study a total of eighteen locally bee produce honey samples (six apiaries; three samples from each apiary) were collected directly from beekeepers just after harvesting from the selected districts namely Dugda, Arsi Negele and Sheshamene. The samples were analyzed based on solid-phase extraction with octadecyl sorbent followed by gas chromatography mass spectrometry (GC-MS). The result obtained from the study revealed that none of the targeted pesticide compounds, which included organochlorine, organophosphorus, pyrethroids and aryloxyalkanoic acid appeared in samples or exceeded 0.001mg/kg detection level. The quality of honey produce in studied area is met the standards set by codex and European Union and free from pesticide residues and safe for human consumption. Therefore, honey produced in the studied area is able to penetrate the EU market if proper measures are put in place. Although the study results showed none significant pesticide residue in the analyzed honey samples, a special precaution should be taken regarding to production of pesticides, their sale, and application in the future.

[Abstract:0097]

Reflections in Colony of Inbreeding on Honey Bees

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Honey bee queen mating with a large number of drones. Thus, creating genetic diversity in the colony. However, breeding in closed population causes a decrease in genetic diversity and increased inbreeding in the colony. When genes that determine productivity in inbreeding become homozygous, improve yield and survival rate. But it could be the opposite.

Due to inbreeding in the colony, many negative situations are encountered. Due to inbreeding there are diploid drone in the colony. Diploid men are unwanted in the colony. Due to inbreeding, survival rate of the colonies are reduced, colony performance and productivity is negatively affected, resistance to disease is reduced, resistance to environmental conditions are negatively affected. There are also studies about the fact that the inbreeding negatively affects colony thermoregulation.

Nutrient behavior in the colony is reduced by a decrease in genetic diversity in inbreeding. It has also been reported that inbreeding may also cause changes in morphological characters.

In honey bees, other influences of the inbreeding on the colony should also be investigated, and results should direct future works, and reproductive strategies need to be determined accordingly.

[Abstract:0098]

Vision of Morphological Studies in Beekeeping

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The shape and physical characteristics of living things are investigated with morphology. Phenotypic structures of living things are determined by genotype and environment. There are different geographical races and ecotypes because of honey bees living outside the poles spreading to all parts of the world and adapting to the environment. Physical properties are utilized in their manifestation and morphological studies are also used to investigate morphological properties. The first classification of geographic type and ecotypes were done in the 19th century and practices of morphological measurements have developed until nowadays.

Morphology on honey bee was used to determine the population race in the region, compare genotypes, determine genetic and morphological origin of the genotypes in the region, compare the differences of pure breeds and hybrid breeds, discrimination of races, to determine the effect of morphological characters on yield, determine the diversity of the same race in one country according to ecological conditions, determine the morphological effect of the climatic difference on the same race, determine the difference between sexes, determine the mother of the offspring. Morphometry was also used to identify differences of hypopharyngeal glands, determine the variability of venom glands in different races, determine differences in muscle morphometry between races, determine the variability of the sting on different race and determine seasonal differences in sperm cells. In this review, morphological studies on honey bees from past to present are mentioned.

[Abstract:0128]

From Wintering Inside the Honeycomb to Wintering in the Club

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Honey bees came to the middle geographic area following the receding glacier. In new severe living conditions, instinct of preserving the colony taught bees to wintering in the bee club. The bee club is formed when the external temperature falls below a threshold value in depend of the number of bees in the bee colony.

During wintering in the club, if the colony has enough bees to heat the wax of honeycombs that divide the bee club, bees are located in the free honeycombs and in the streets between them. The mass of the bee club in 1 kg can be considered as the threshold of the unconditional bees survival for wintering in the conditions of central Ukraine. The survival threshold for the mass of the colony can be significantly lower for wintering in a temperate climate, when there are no long periods with negative temperatures.

In a passive period, the weak bee colonies of mass 100...200 g, possessing the instinct of self-preservation, can comfortable carry a low temperature period, if situated in emptiness inside the honeycomb, which are adjacent to honeycombs with a full food supply. In this case, the feeding zone will be located on each side of the location of bees, and not on top of it. Exactly, this bees position was observed when they were preparing for wintering in the autumn of 2016. During October, the bee colonies of mass not more than 150 g which were concentrated on three frames half filled with honey had gnawed the emptiness in the average honeycombs for their placement, and honey was transferred from this area to the adjacent honeycombs.

It is hardly, that the described behavior of small bee colony is a manifestation of the instinct acquired in the new habitat. Probably, it is the wintering of bees in the state of the club that is an evolutionarily acquired instinct, when the bees colonize the area of the medium geographical zone during their migration from the warm edges.

[Abstract:0129]

Apiculture in the Context of Global Climate Change

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Global climate changes caused by the anthropogenic factor together with the intensive chemicalization of agricultural production put the honey bee on the brink of survival. However, the person who contributed to this can weaken the impact of negative factors, and move from consumerism to partnership with bees. The partnership of a man with a bee is based on the unconditional taking into account the sole goal of the honey bee, namely, the pollination of the flowers of entomophilous plants. This main bee function is most effectively performed by the genotype that has evolved in its habitat, its climatic features, flora and microbiological environment.

The most effective genotype can be entrenched in the territory by pairing young queen bees with their brothers by the mother, but not by the father, since the drones have no native father, which precludes the accumulation of negative factors in inbreeding.

To realize this possibility in conditions of crowded bee colonies at apiaries, it is necessary to maximum use of the biological potential of bee colonies. It is recommended to practice the annual replacement of the queen bees, and beekeeping must be organized in such a way that in every colony the intensive own drone background (their sufficient number) was created to the time of pairing of the young queen bees. Each bee family must implement both the maternal and paternal functions simultaneously. It is recommended to replace the queen bee at such time that the young queen bee could use the sperm from the last marriage partner in the current year only to build up the strength of the colony for wintering, and in the next year also for the colony progress to the main bribe period.

Thus, mainly the working bees are accumulated in the bee colonies, the sisters from one mother and one father with a degree of genetic kinship of ¾. It is these colonies will produce the most quality-bred brood and will become the most powerful during the main honey-flow, active and resistant to adverse environmental factors.

[Abstract:0134]

Breeding of Disease Resistance Honeybee Lines in *Apis Mellifera* Basis of Hygienic Behavior

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Honey bees, *Apis mellifera*, which perform hygienic behavior, quickly detect, uncap and remove diseased brood from the nest. Hygienic behavior of the honey bees is considered to be a potential characteristic associated with resistance to bee disease and many pathogens. Hygienic behavior is a complex, genetically-based quantitative trait that serves as a key defense mechanism against parasites and diseases in *Apis mellifera*. In this study, six inbred lines of *Apis mellifera* that have been bred in the National Academy of Agricultural Science (NAAS) in Korea. To determine the ability of Hygienic behavior of the 6 inbred lines of *Apis mellifera*, freeze-killing method was applied in 24 and 48 hours. Colonies evaluated 2 times for hygienic behavior on April to July each year. Based on the result, two inbred lines were classified as non-hygienic (removal of dead brood < 50 %), three inbred lines exhibited intermediate behavior and one inbred line was highly hygienic (removal of dead brood > 90 %). And then, we identified the 5 inbred lines according to measured morphological values and conducted discriminant analysis. The morphometric characters analyzed include basitarsus length (ML), proboscis length (PL), fore wing length (FWL), cubital vein, distance (a), cubital vein, distance (b) and counted the number of hook (Ha). According to the this data, measured means of each body part showed significant differences by one-way ANOVA and post hoc Tukey HSD test ($p < 0.0001$). To evaluate the individuals correctly classified, discriminant analysis was performed using 6 morphometric variables. When all characters were included, the analysis gave 77.4% separation of the individuals to their groups. Among them, line C was assigned 100% and line F was classified 90%, respectively, which determined more accurately classified than other groups. The result shows that the two inbred lines controlled mating and presence of a more pure population

[Abstract:0157]

The Assessment of Non-Reproduction Rate of Varroa (Varroa Destructor) in a Selection Apiary in Romania – A Comparative Approach 2015-2016

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Recent international research attempts, concerning the natural resistance of honey bee colonies to Varroa (Varroa destructor), are focused on specific traits such as Varroa sensitive hygiene and Suppressing mite reproduction. Some international researchers demonstrated that the low reproduction rate of varroa can be influenced by an important genetic trait of bees which could be identified and used for selection. Thus, since 2014 a standardized assessment procedure for this trait was established in the frame of RNSBB network and Smartbees project. The first evaluations on Romanian bee (*A.m. carpatica*), regarding the mites' non-reproduction rate, using the established protocol, were done on samples collected in 2015-2016 and the results show a relatively high variability of the values. Additionally, on the same test population in 2016 we used a particular developed by our side, artificial brood decapping method in order to evaluate the impact of this technique on the mites' reproduction rate. The results of the experiments reveal that the mites' non-reproduction rate in the infested brood samples ranged between 18% and 38% in 2015 and between 16% and 58% in 2016, respectively. In artificially decapped brood the mites' non-reproduction rate increased in average by 9,79%, being artificially generated by the adult females escaping out of the cells before finishing their biological cycle. The findings of the evaluations in this experiment (2015-2016) will be analyzed and presented.

[Abstract:0166]

Annual Production of Bee Venom Collected in an Apiary in the Central Region of the State of Guanajuato, Mexico, Using an Electric Collector of Bee Venom

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INTRODUCTION: Bee venom has been widely used medicinally in several countries, especially for treatment of rheumatic diseases, and is including in a practice known as Apitherapy. The use of live bee stings on the patients is being replaced by application of injectable venom using pure bee venom obtained with collectors based in electrostimulation. **OBJECTIVE:** To evaluate the potential of annual production of pure bee venom collected in an apiary located in the central region of the state of Guanajuato, Mexico, using an apitoxin collector. **METHODOLOGY:** An apitoxin collector (Chivilcoy-industry Argentina®) was used which provides electrical impulses followed by a time without electrical stimulation, and was placed in a hive for 20 minutes. The collector was placed in each hive every 15 days, and the collection of venom was interrupted when there were abundant nectar flows, so as not to affect honey production. Bee venom was collected for 10 months, and always were used the same hives to place the collector. A completely random experimental design with five repetitions was used, and the F, Tukey and "t" statistical tests were applied for analysis of data. **Results and DISCUSSION:** Under the methodology used in the present investigation, was obtained 681.3 mg of bee venom per hive during the 10 months of work. The range of production of venom was between 19.23 mg (January 15 in hive 1) and 68.18 mg (May 31 in hive 3), corresponding the lowest production to weakened hives due to high infestations of the *Varroa jacobsoni* mite; this showed that the vigor of the colony significantly influenced the production of bee venom. Considering only the vigorous colonies, there were no significant differences in bee venom production among the different dates of the year. It is inferred that by maintaining vigorous colonies and increasing the collections to 12 months of the year, the potential for production of bee venom could be increased to 999.74 mg/hive. Also, it is suggested to seek new national or international marketing channels to market the pure bee venom, since its sale proved difficult.

[Abstract:0168]

Honeybee Gut Microbiota is Altered by Sugar Feed Type and Overwintering

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Honeybees not only were the maker of bee products but also were the important crop pollinators. So honeybee colonies' health was of great significance for bee products and agricultural production. Large numbers of microbes are present in the gut of honeybees, which was closely related to colonies' health. Whether the effect of sugar feed type on the honeybees' health in winter was related to gut microbiota remains unclear. The purpose of this study was to research the influence of different diets on honeybee gut microbiota. Nine overwintering colonies of honeybees (*Apis mellifera* L) with the same colony population were used in this experiment. The nine colonies were randomly divided into three groups (three colonies/group). Each group was fed different food (honey, sucrose and high fructose syrup) from Nov 2nd to Nov 22 before winter. Before feeding, 50 worker bees from each colony were collected on Nov 2nd, 2015 for data analysis before feeding as a control. After feeding, 50 worker bees from each colony were collected on Jan 2nd, 2016 to analyze the overwintering effects of the various sugar types. The midgut and rectum were sampled to determine the microbe composition using the Illumina MiSeq platform to target the V4 regions of 16S rDNA. Our experimental results show that Proteobacteria (63.17%), Firmicutes (17.61%), Actinobacteria (4.06%) and Bacteroidetes (1.72%) were dominant. Furthermore, we found that sucrose and honey can multiply the number of beneficial bacteria, such as Alphaproteobacteria, Gammaproteobacteria and Bifidobacteriales, and high fructose syrup can multiply the abundance of Betaproteobacteria and Neisseriaceae. Therefore, honey and sucrose as the overwintering feed for honeybee are potentially better than high fructose syrup.

[Abstract:0179]

Drone Rearing Situations Reflect the Subsistence Strategy of Honeybee Population

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The functions of Honey bee (*Apis mellifera*) drones are more related to colony reproduction. They show differences in morphology, physiology, behavior, and genetics with workers. In order to reveal the rearing biology and social status of drone bees in the colony, we investigated the cell amount of drones built in different developmental stages of the colony, the unfertilized egg amount and survival, the temperature and relative humidity in drone brood nest. The RESULTS: Stage preference of the build of drone cells was reflected, and also the unfertilized egg amount; the rigorous regulation of microenvironment in drone brood nest was neglected by the colony compared with that of worker brood. The stage rearing mode and not rigorous regulation of microenvironment of drones reflect the low cost subsistence strategy of honeybee population to some extent. The results have positive effects on the understanding of social status and presence significance of drone bees.

[Abstract:0182]

Distribution and Ecological Characteristics of Cocoons of the Solitary Bees *Osmia cornifrons* and *O. pedicornis* (Hymenoptera: Megachilidae)

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Osmia cornifrons and *O. pedicornis* are a cavity-nesting solitary species used mainly as an apple pollinator in Korea. To elucidate the characteristics of those bees for the efficient the pollination of agricultural crops, we investigated the distribution, the number of cocoons per straw, sex ratio, and characteristics of cocoon at different locations in 2010. We collected four species of *Osmia* spp. consisting of *O. cornifrons*, *O. pedicornis*, *O. taurus* and *O. satoi* in Yeongwol, Bonghwa and Yechon locations. *O. pedicornis* was the dominant species, which accounts for 59.6% to 76.4% in the three locations. The mean number of *Osmia* spp. was varied in different 3 locations. In the number of cocoons per bamboo straw, there were from 7.6 to 8.5 in *O. cornifrons* and from 6.8 to 7.1 in *O. pedicornis* at one side straw, and from 16.3 to 16.5 in *O. cornifrons* and from 13.3 to 13.5 in *O. pedicornis* at both sides straw. The sex ratio of *Osmia* spp. were from 1:1 to 1: 2.8 in *O. cornifrons* and from 1:2.8 to 1: 5.5 in *O. pedicornis*. The sex ratio of *O. cornifrons* and *O. pedicornis* was different in 3 locations. The female and male cocoons of *O. cornifrons* were the long elliptical-shaped and grey-brown color. The width, length and weight of the female cocoon were 5.6±0.6mm, 10.2±0.8mm and 89.5±20.0mg, respectively. The width, length and weight of the male cocoon were 5.0±0.4mm, 9.0±0.6mm and 62.1±11.3mg, respectively. The female and male cocoons of *O. pedicornis* were the long elliptical-shaped and polished dark-brown color. The female cocoon had the width of 6.5±0.6mm, length of 12.9±1.0mm and weight of 89.5±20.0mg. In case of the male cocoon, the width, length and weight of were 5.0±0.4mm, 9.0±0.6mm and 151.5±29.4mg, respectively. In both species of *O. cornifrons* and *O. pedicornis*, the cocoon size of the females was significantly larger than that of the male. Between those two species, the latter had a relatively bigger size than the former.

[Abstract:0183]

Sexual Maturity and Mating Ability of the Bumblebees, *Bombus Terrestris*

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To secure superior traits of the *Bombus terrestris* through increased mating rate, we investigated the age of sexual maturity of queen and male, and mating ability of male. In the age of sexual maturity of queen, mating occurred at 6.7% immediately after eclosion and it was the highest as 85.0% at 10 days after emergence. However, a remarkable decrease was occurred at 20 days after the emergence. With regard to oviposition rate, the highest rate was observed as 81.3-81.8% at 6 to 10 days of eclosion. The rate of colony foundation and progeny-queen production were the highest as 43.8% and 37.5%, respectively, at 8 days of eclosion. In the age of sexual maturity of male, mating rate was as high as 38.3% immediately after the eclosion, the highest as 80.0% at 25 days of eclosion, and 76.6% at 8 days of eclosion. The oviposition rate was the highest as 76.9% at 6 days of eclosion, and decreased to 75.0% at 8 days and 72.7% at 10 days of eclosion. The rate of colony foundation and progeny-queen production were the highest as 40.9% and 40.9%, respectively, at 10 days of eclosion. Summarized, our results indicate that sexual maturity for mating of *B. terrestris* is most favorable 6-8 days after eclosion for queen and 6-10 days after for male. In terms of mating ability of male, it turned out that each *B. terrestris* male is able to mate up to seven times. The mating rate was 74.3% at first mating, 25.3% at second mating, 15.3% third mating, 11.7% at fourth mating, 7.0% at fifth mating, 3.3% at sixth mating and 0.3% at seventh mating. The rate of oviposition, colony foundation and progeny-queen production of the queen mated for only one time were 83.0%, 45.0% and 45.0%, respectively, presenting two-fold improvement in the colony development that of twice mating.

[Abstract:0217]

Differentiation of Russian Honey Bees Subspecies by DNA Barcoding and Mutagenic PCR-RFLP

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Apis mellifera carpathica, *Apis mellifera caucasica*, *Apis mellifera carnica* and *Apis mellifera mellifera* are the most common subspecies of honey bees in Russia. The bee subspecies differentiation is important because of different ability to collect honey in specific environmental conditions, fecundity, aggressiveness and other behavioral characteristics. At the moment, the differentiation of the subspecies of *Apis mellifera* in most cases is carried out according to morphological features, which is a difficult task that can be solved only by a highly qualified entomologist. We have previously carried out the analysis of the nucleotide sequence of the cytochrome oxidase subunit 1 genes from the mitochondrial DNA of different subspecies of honey bees (obtained from specialized bee farm in Russia). Nucleotide sequence differences for 4 main honey bee subspecies (*Apis mellifera carpathica*, *Apis mellifera caucasica*, *Apis mellifera carnica* and *Apis mellifera mellifera*) were found. At least 11 exhibitors of bees from each subspecies belonging to different families were subjected for analysis. The obtained sequences are registered in the Genbank under the numbers KY271890.1-KY271939.1. SNPs characteristic for each of the honey bee subspecies were revealed. It has shown that *Apis mellifera mellifera* is characterized by 2 haplotypes. In 17% of the cases, the nucleotide sequences of *Apis mellifera carnica* and *Apis mellifera carpathica* were coincided. We have developed a method for differentiation of the bee subspecies based on the mutagenic PCR-RFLP using pre-amplified fragment of the cytochrome oxidase subunit 1 gene. The mutagenic primers (SRg1-r, SRg2-f, K / KR-r, KA-f) for each of the bee subspecies have been developed. Designed primers caused additional mutation inclusion into the PCR product, which together with the SNP sites, specific for each subspecies, forms a recognition site for restriction enzymes. Depending on the bee subspecies and the selected pair of primers, one of the restriction enzymes was used: Msp I, Hinf I, HspA I, Ahi I. Full set of the restriction enzymes was used to identify *Apis mellifera caucasica*. The proposed method for honey bee subspecies differentiation is highly sensitive, well reproducible, economically effective and does not require expensive equipment for quick analysis

[Abstract:0235]

Spatiotemporal Expression Levels of the Chemosensory Proteins Amel-CSP3 and Amel-CSP4 in Adult *Apis mellifera ligustica* Workers

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[Objectives] Chemosensory proteins are abundantly distributed in the antennae and other chemosensory organs of insects, and are believed to play important roles in the chemosensory system. This work aims to study the temporal and spatial expression levels, and explore the functions of, two chemosensory proteins, Amel-CSP3 and Amel-CSP4, in adult *Apis mellifera ligustica* workers. [Methods] Expression levels of Amel-CSP3 and Amel-CSP4 in different organs of nurses and foragers, and in the antennae of 1, 6, 12, 18 and 28 day-old workers, were quantified with RT-qPCR. [Results] Amel-CSP3 was more highly expressed in the antennae of both nurses and foragers, and its expression level in the 28 day-old workers was significantly higher than that in younger workers ($P < 0.05$). Amel-CSP4 was only expressed in workers' antennae, where its expression decreased with age. [Conclusion] The expression of Amel-CSP3 and Amel-CSP4 had a high degree of spatiotemporal specificity in adult *Apis mellifera ligustica* workers. This finding provides important information for exploring the function of Amel-CSP3, Amel-CSP4, and other chemosensory proteins, in *A. m. ligustica*

[Abstract:0244]

The Significance of Preserving Georgian Populations of Mountain Grey Honeybee

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With the aim to preserve purity of mountain grey honeybee *Apis mellifera caucasica* Georgian populations (Megrelian, Gurian, Kartlian, Abkhazian) distinguished by biodiversity, the scientific-research work was initiated to study the current state of Megrelian population. In Chkhorotsku and Tslenjikh municipalities, namely, in the Khobistskali and Skuri gorges the massive study of honeybee colonies revealed a relatively purely preserved material. Based on the study of 6 major exterior signs of a worker bee and the biological-economic indicators of honeybee colonies, the current state of Megrelian population was found to be in accordance with the norms accepted for this population (accepted norm: proboscis length - 7,1-7,2 mm; wing length 9.2 - 9.6mm, width - 3,2-3,3mm, cubital index 45-50%; III tergite length - 4,2-4,6 mm; width - 2,0-2,2 mm; grey, calm, average capacity of honeybee colonies - 4,5-5.5kg bee, average daily egg production - 1200-1600 pieces; honey production - 18-25kg in the conditions of Georgia; wax productivity - 4-5 built honeycombs). However, in some colonies, relatively short proboscis was revealed, which will be eradicated with proper selective works. Based on the laboratory studies and biological-economic indicators, the best honeybee colonies were selected, and the nucleus was formed. The test and control groups were formed with the principle of analogies. Queen bees in experimental honeybee colonies were replaced by queen bees from the best colonies of the selection nucleus, i.e. queen bees were tested on the quality of breed. The study and comparison of the exterior data of the first generation worker bees and economic indicators of honeybee colonies with the same indicators of the control, showed that the properties transmitted by the mothers were revealed in the first generation and were better than the control. Such selection activities will continue during a few generations, until the stability of the desired results is achieved, which has to be accompanied by the expansion of the area of purebred Megrelian population. The genetic study is intended to identify the Megrelian population of Georgian honeybee, which will help us to reveal its distinctiveness from other populations in the Caucasus and abroad.

[Abstract:0255]

Problem of Honey Bee Taxonomy in Ukraine

Gornich Mykola

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According to the published data, four races of honey bees are distributed on the territory of Ukraine: Carpathian bee, Crimean bee (*Apis mellifera taurica* Al.), European bee (*Apis mellifera mellifera* L.), Ukrainian bee. Areal of Carpathian bee find in Carpathian Mountain on the south-west, Crimean bees lived in Crimea, European bees lived in relict forest of north-west and the central Ukraine occupy Ukrainian bees. But such distribution of bee races in Ukraine rather in a historical perspective than it is nowadays. Currently we have completely lost the Crimean bee and almost completely - European bee. They are two main native bee races of Ukraine in present: Ukrainian bee and Carpathian bee. But in the world some different views on the spread of bee races in Ukraine are dominated. Carpathian bees locate as Carniolan bee and Ukrainian bee locate as Macedonian bee.

Our opinion is: the Ukrainian bee and Carpathian bee are two separate and original bee races of Ukraine.

Races of Ukrainian bees and Carpathian bees do not have the Latin name, are not included in any international classification of bees, in particular, it is absent in the most authoritative Ruttner taxonomy. The first step towards the legalization of Ukrainian bees is to assign to Ukrainian bee its conventional international name. We offer the following Latin name for Ukrainian bees - *Apis mellifera ukrainica* Prokopovich. Situation with Carpathian bee requires further research. The natural habitat of Ukrainian bees is Ukrainian steppe, for Carpathian bee - Carpathian Mountains. But it happened historically that Ukrainian and Carpathian bees have spread over the whole world and the general direction was movement to the East. Race of Ukrainian bees has settled in large number of north Eurasian regions during last 230 years. Races of Ukrainian bees deserve that the world gets to know them.

[Abstract:0259]

Evaluation of Royal Jelly Production for Breeding of Honeybee Enhanced Royal Jelly Production

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This research was carried out to evaluate the royal jelly production in *Apis mellifera* to select superior honeybee line with ability of royal jelly production. For the study, two inbred honeybee lines A and C and one hybrid line AC of that have been bred in the National Academy of Agricultural Science (NAAS) in Korea using artificial insemination method. In the experiment, each hive was having three nuclei with eight frames and nucleus frame was containing 33 acrylic cups in two bars. To determine the ability of royal jelly production from the 3 lines, we compared royal jelly production. Based on the result, inbred line A showed a highest production of royal jelly per cup, in three-day collect (0.20 ± 0.04 g) when compared to other lines. However, the inbred line C showed that, when compared with the control, the average royal jelly production per colony highest (33.7 ± 7.41 g) compared to other lines, and percentage of larvae acceptance (87.8 ± 7.5 %) also highest compared to other lines. The royal jelly produced three honeybee lines analyzed for their trans-10-hydroxy-2-decenoic acid (10-HDA) content by using a column liquid chromatography technique. The result of that, the amount of 10-HDA each of royal jelly showed highest in royal jelly produced by inbred honeybee line A.

[Abstract:0273]

Genetic and Phenotypic Correlations Among Queen and Colony Characteristics in *Bombus Terrestris*

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Genetic and phenotypic correlations among some characteristics associated with queen and colony in bumblebees, *Bombus terrestris* L., were estimated. Queens and males produced in colonies mated reciprocally for one and randomly for one generation, and finally base population established for estimations. The full genetic correlations which positive or negative (+1.00 or -1.00) between the some characteristics were determined. While the pre diapause weight of queens was genetically correlated with switch point (+0.63) and competition point (-0.43), post diapause weight of queens was genetically correlated with competition point (-0.58). However, no genetic and phenotypic correlation was found between the pre or post diapause weight of queen and total number of workers that determinative trait for both colony population and pollinator quality of colony. On the other hand, phenotypic correlations was estimated as -0.25 between post diapause weight of queen and the time of the queens' first egg laying, and -0.19 between the post diapause weight of queen and the time of emergence of the first worker.

Acknowledgements: This study was supported by the Scientific and Technical Research Council of Turkey (Grant number: TUBITAK-1140645).

[Abstract:0299]

Determination of Lifespan of Different Honeybee (*Apis Mellifera* L.) Genotypes (Nigde Ecotype, Caucasian, Mugla And Italian) in Nigde Province Condition by Survival Analysis

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This study was aimed to determine lifespan of four different honeybee genotypes (Nigde ecotype, Caucasians, Mugla and Italian) kept in the same time and condition in Nigde province of Turkey in 2015. Total twenty honeybee colonies (five colonies for each genotype) were used in the present study. One hundred one day old worker honeybees were taken from each genotype and marked with different colors and numbered on their thoraxes. Then all marked worker honeybees were replaced into the observation hive and then the numbers of returning and non-returning worker bees to the observation hive were counted daily (24 hours) during the control period (from 0th day to the all marked workers were dead or lost). Survival analysis using life tables was performed for statistical analysis of data. Analysis showed that workers losses in the investigated genotypes were not observed during the first 35 days. The workers losses for the Nigde, Caucasian, Mugla and Italian genotypes were firstly observed in the end of the 38th, 36th, 37th and 36th days, respectively. The cumulative survival rates (CSR) of the Nigde, Caucasian, Mugla and Italian worker honeybees genotypes reached to 0% at the end of the 61th, 60th, 60th and 53th days, respectively. Survival analysis also showed that the mean rate differences among the genotypes were statistically significant ($P < 0.01$). Additionally, pairwise comparison also showed that Nigde ecotype had the best lifespan, however Italian genotype had the worst lifespan in the conditions of Nigde province in Turkey. These results could be interpreted that local honeybee genotypes like Nigde ecotype should be used in a manner suitable to local conditions instead of exotic honeybee genotypes.

[Abstract:0328]

3d Printed, Open - Source, Low Cost (7 Dolars) Queen Bee Insemination Device

Cem Taskent

3D printed low cost (7 dolar) queen bee insemination device

This is a 7 dolar queen bee artificial insemination device printed by a 3D printer.

Main purpose of this project is to spread the bee breeding concept which is postponed up to now in our country.

Although the insemination process does not require a very complicated equipment, the prices for these devices are too high for bee keepers. So it is a handicap for breeding studies. Also queen rearing courses given by local bee associations can not . Also artificial insemination training can not be given in beekeeping courses due to the high cost of equipment

With this project, it is aimed to make the expensive insemination equipments more accessible, which prevented the development of breeding projects. Therefore local bee associations and even ordinary bee keepers will be able to participate in breeding projects....

Because commercial purposes are not intended, 3D drawings are made available to everyone as open source. In any part of the world, the user can download these drawing files, print it and use. The device can be used in two forms as a fully plastic or plastic-metal combination.

[Abstract:0332]

Genetic Diversity of Honeybees in Siberia (Russia)

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In Siberia, the dark-colored forest bee (*Apis mellifera mellifera* L.) was introduced about 230 years ago. The bee colonies have well adapted to the harsh climatic conditions (long winters – 5–6 months) and plant communities of the region and represent artificial populations whose wintering is controlled by humans. In recent years, honeybees of southern origin (*A. m. carpatica*, *A. m. carnica*, and others) have been actively imported to Siberia. As a result, there is a high level of crossbreeding of bees and the loss of unique gene pools of the dark-colored forest bee and native bees adapted to local conditions.

The genetic diversity (mtDNA and microsatellite loci) and variability of morphometric parameters (wing venation) of the honeybee (> 400 bee colonies) of some populations in Siberia (Tomsk region, Krasnoyarsk territory (Yenisei population), and Altai territory) were studied. It was established that 64% of bee colonies from the Tomsk region and all studied colonies from the Krasnoyarsk and the Altai territories originate from *A. m. mellifera* on the maternal line. According to the morphometric study, the majority of bee colonies of the Tomsk region and Altai Krai are hybrids. The Yenisei population may be considered a unique isolated *A. m. mellifera* population (the Siberian ecotype), which existed for more than 60 years in the forest (Old Believers settlement) without the importation of new honeybees.

Differences in the distribution of frequencies of alleles and genotypes for some microsatellite loci (in total, 18 loci were studied) were registered between bee colonies of different geographical locations. The greatest genetic diversity (both in the number of alleles and in the calculated expected heterozygosity) was shown in honeybees from the Tomsk region (Western Siberia); honeybees from the Yenisei population (Eastern Siberia) are characterized by a decrease of the genetic diversity. Allele 162 pb of the locus A008 can be considered the genetic marker of the *A. m. mellifera* Siberian ecotype. It is interesting that the "replacement" of genes of southern subspecies by genes of the dark-colored forest bee is observed in hybrid bees from Siberia according to the data of morphometric and molecular genetic studies.

[Abstract:0355]

Effects of Tongue Lengths of Bumble Bees (*Bombus Sp.*) on Plant Preferences

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Bumble bees (*Bombus sp.*) are large, colorful, very important pollinators, and are found widely throughout the alpine, subalpine and arctic zones of the Palaearctic, Nearctic, Oriental and Neotropic regions. Bumble bees are social insects that live in colonies like honey bees the colonies are much smaller (50-500 members) and their life cycle is different. Bumble bees are totally dependent on the availability of nectar and pollen source. They have a long flight season with the production of many individuals, and thus depend on a continuous food supply. The choice of non-random flowers, which differ between flower-visitor types, is one of the most important features that determine the structure and stability of plant and flower visitor communities. At the community level, the pattern of flower selection by visitor species has largely been explained by direct relationships between interacting plants and visitors, including trait matching (e.g., tongue/proboscis length, corolla tube length), abundance, phylogenetic constraints, and the spatiotemporal distribution of interacting species. In general bumble bees forage on a diverse group of plants, though individual species preferences in plants vary due to differences in tongue length. In this study, the effects of tongue lengths of Bumble bees on plant preferences were investigated and compiled from various sources for this purpose.

[Abstract:0382]

Biodiversity of Bees in The Jijel Region and Toxicological Impact of Pesticides: Enzymatic Activity of Acetylcholinesterase

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The use of pesticides in agriculture has the effect of causing ecological disturbances both on fauna and flora.

The bee is a bioindicator of excellence, in recent years we have observed a mortality increase and a decrease in bee populations due to various factors: diseases (virus), pollution due to the use of pesticides.

The objective of our study is to evaluate the effects of these products on the bee. For this we will consider a biochemical study.

A biochemical test was carried out on a biomarker of environmental stress, which is acetylcholinesterase AChE (Neurotoxicity biomarker); On domestic worker bees from three sites (Tahir, Al-Ancer and Ziama) of north-east from Algeria (Province Jijel); intended to evaluate the impact of pesticides used during the summer (2015) in these regions.

Statistical analysis of the specific activity of AChE show a very highly significant effect concerning the three sites in each month of the summer season (2015) ($P \leq 0.001$).

[Abstract:0398]

Effects of Pesticide Perizin on Behavioral and Biochemical Parameters of Three Honeybee (*Apis mellifera L.*) Subspecies Native to Turkey

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ODTÜ Biyoloji Bölümü

Perizin is a systemic insecticide used in honeybees for the control of Varroa destructor infestation. It contains % 3,2 Coumaphos, an organophosphate type acetylcholinesterase (AChE) inhibitor as active ingredient. In this study, workers of three native honeybee subspecies, (Caucasian honeybee *A.m. caucasica*, Hatay honeybee *A.m. syriaca* and Thracian honeybee *A.m. carnica*) were fed by a single dose of Perizin in sucrose syrup equal to 0, 2 or 5 µg's of coumaphos. Workers than subjected to locomotor activity, electric shock aversion, and brain acetylcholinesterase activity assays. In locomotor activity monitoring for 24 hours, 5 µg coumaphos group of syriaca subspecies demonstrated increased activity for the first 15 hours compared to controls while no such difference was observed in caucasica and carnica subspecies. In electric shock aversion assay, 5 µg coumaphos treatment group of syriaca subspecies showed significant difficulty in learning to escape from electric shock compared to control group. Carnica subspecies had also decreased learning rate but not to the extent of syriaca. On the other hand, no significant alteration in avoidance rate was observed between control and 5 µg coumaphos group of caucasica subspecies. Interestingly, no significant change was observed in brain AChE activities of 5 µg coumaphos groups of all three subspecies compared to controls. These findings may suggest that coumaphos have differential effects on behaviours of Anatolian honeybee subspecies and these effects can be seen even in doses low enough not to significantly alter AChE activity.

[Abstract:0413]

Features of Productive Utilization Use of Ukrainian Queen Bees (*Apis mellifera ukrainica polishchuk*)

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Apis mellifera bee colony is a unique biological system in its structure and organization. That is the result of long development under different climate and multifarious flora conditions. Improvement of its structure occurred due to emergence of polymorphisms and deep specialization in performance of its functions by female specimens. Scientists believe that dividing them into fertile and infertile is an example of sociality of higher, third level organization of living things. Experiencing cooperative interaction of individuals in many thousand populations, the purposeful behavior and perfection of their functions of queen bee and bee workers enriches the scientific basis of use of biological potential of families while developing complex production direction of beekeeping in the range of Ukrainian breed. Therefore, studying the optimization of utilizing the queen bees, identification of the features of their egg production and changes in generations of working specimens; families' strength during year cycle and reasoning the ways of increasing their productivity determine the relevance of the work performed.

As a result of the conducted studies interesting fact was established: queen bees of Ukrainian breed (*Apis mellifera ukrainica Polishchuk*) got the feature of stable and consistently high egg production during the periods of harvesting honey which is not suppressed by high business of bees during procuring the feed. In the second season starting late May to early July queen bees lay at least 1568 eggs, maintaining the level of 2068 - 2200 eggs per day for a long time. The calculated amount of eggs in groups of bee colonies with queen bees of the first year is 82.344 thousands, queen bees of the second year - 89.508 thousands, third - 77.040 thousands. The common feature of queen bees of the first, second and third years of use is superior performance in mid-summer. The overall decline in reproductive function of queen bees in late summer occurs but varies depending on their age.

During preparation of the bees for wintering young queen bees laid 19.91 thousand of eggs, queen bees of the second year - 13.45 thou., queen bees of the third - 12.56 thousand eggs.

[Abstract:0416]

Investigation of Probiotic Properties of *Lactobacillus Plantarum* and *Lactobacillus Fermentum* Isolated From Honeybee

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Probiotics are live microbial that are believed to provide health benefits when consumed. They are organisms which are generally regarded as safe (GRAS). Some health benefits include improvement in intestinal disorders, improved growth, increased disease resistance, altered vitamin content of milk, antagonism against various pathogenic organisms, cholesterol reduction. These bacteria are widely used in the production of fermented foods and beverages and contribute both sensory qualities of the food and the prevention of spoilage. These organisms have added a new dimension to the importance of fermented milks in human nutrition and health. Moreover, they are present in large numbers in the normal human and animal gastrointestinal flora. The propose of this study was to investigate tolerance of tow *Lactobacillus* strains named *Lactobacillus plantarum* and *Lactobacillus fermentum* isolated in previous studies from honey bees in the presence of acid, bile salts, resistance to gastric juice (pepsin, trypsin), lack of hemolytic activity and antibiotic susceptibility test. The results show that *Lactobacillus plantarum* and *Lactobacillus fermentum* has a probiotic properties and which can be utilized as probiotic.

[Abstract:0422]

Dust Phenomenon and Beekeeping Industry in Iran

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Dust phenomenon threatens environment and agricultural activities in western south of Asia and Iran. Destructive effects of dust on honeybee colonies were studied through evaluating of egg laying, brood rearing, population size, arrivals and departures of worker honeybees during dust days and without dust days in Khuzestan province using a completely randomized design and regression models by SPSS. This study was done in three treatments including clear weather time, 24 hours after the occurrence of dust and 72 h after the occurrence of dust with 10 repeats (each hive as one replication). Dust information was collected from Khuzestan weather station. The results showed that queen egg-laying was decreased because of decreasing in pollen and nectar 24 h after the dust occurrence and also a significant decrease was observed in brood rearing 24 h after the dust occurrence. In addition, there was no significant difference in honey bee population size among all treatments. Obtained results showed that the number of returned worker bees with pollen and also departure worker bees were decreased in dust days; however arrival and departure of the honey bees were increased due to weather improvement 24 and 72 h after the dust occurrence. According to the results, the maximum and minimum activity of the colony were observed in dust-free air and dust, respectively. In the other hand the results of correlation analysis indicated significant and negative correlation between dust density with egg-laying, brood rearing, departure worker bees and returned worker bees with pollen in the honeybee colonies that confirmed the last results.

In general, honey bee activity depends on weather conditions and air pollution levels so that foraging behavior would reduce with increasing air pollution level. According to the obtained results, it can be concluded that dust and air pollution in this region would reduce foraging behavior of honey bees and decrease pollen and nectar collection and storage which in turn would lead to reduced colonies performance. Furthermore, dust and air pollution in this region would reduce pollination and agricultural productions, and also negative effects on environment.

[Abstract:0428]

Morphological Characterization of the honey bee (*Apis mellifera* L.) Populations of Thrace Region, Çanakkale province and Gökçeada Island

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This study was conducted in order to identify the morphological characteristics of the honey bee (*Apis mellifera* L.) populations in Thrace Region (Tekirdağ, Kırklareli and Edirne Province), Çanakkale province and Gökçeada Island. Total of 110 experimental worker honey bee samples were evaluated in relation to 41 morphological characteristics. There was no difference ($P > 0.05$) between the groups in terms of femur length (Fe), wax surface width (MSG), wing K19 vein angle, length of hind leg (ABU) and six sternum index (S6I) from 41 morphological characters. There were significant ($P < 0.05$, 0.01, 0.001) differences between the 36 morphological characteristics. In discriminant analysis, Edirne, Kırklareli and Tekirdağ provinces honey bee populations formed a more similar and separate cluster than the Çanakkale and Gökçeada populations. In addition, there was no overlap in the other genotypes in which the overlapping occurred at certain levels in these three province bee samples. The most discriminative morphological characteristic was the length of hair. The correct grouping of 110 worker honey bee samples in their original regions were found to be 94.5%. Three different clusters were formed within the region. The worker bee samples of Tekirdağ, Kırklareli and Edirne provinces were found more similar to each other than those of the Çanakkale and Gökçeada Island. The honey bee genotypes of five areas did not show any morphological similarity to the Anatolian honey bee (*A. m. anatoliaca* M.) subspecies. Honey bee samples showed three different morphological clusters. It was found that there is no morphological resemblance of those honey bee populations to the *A. m. anatoliaca*. Except for Çanakkale and Gökçeada genotypes, Tekirdağ, Kırklareli and Edirne provinces bees were found more similar to Carniolan honey bee subspecies (*A. m. carnica*).

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[Abstract:0429]

Screening Newly GABA-Producing Lactic Acid Bacteria isolated from Honey

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γ -aminobutyric acid (GABA), a non-protein amino acid, is synthesized by glutamate decarboxylase (GAD), a pyridoxal 5'-phosphate-dependent enzyme, which catalyzes the irreversible α -decarboxylation of L-glutamic acid to GABA. It is known as one of the major inhibitory neurotransmitters in the sympathetic nervous system that induces hypertensive, diuretic, tranquilizer and anti-stress effects in humans, and plays an important role in cardiovascular function. γ -aminobutyric acid production by various microorganisms, such as fungi, yeasts and LAB from different sources, such as traditional pickle, cheese and fish have been greatly investigated. Screening of different kind GABA-producing LAB is important for the food industry, because individual LAB have specific fermentation profiles, such as flavor formation and acid production ability. Therefore, the aim of this study was to evaluate GABA producing LAB from the honey stomach and honeycomb of honeybees. A total of 24 dominant strains of LAB isolated in previous studies were screened for their ability to produce GABA. Among them, 18 strains were found capable of producing GABA. Out of which only 8 strains clearly showed the ability to produce high GABA in MRS broth containing 50 mM glutamic acid for 60 h. The strain no. 362 produced the highest GABA of 1.76 mM. However, in these studies, differences LAB were previously isolated from the honey stomachs and honeycombs of honey bees produced GABA.

[Abstract:0447]

Beekeeping Activities II: The Evaluation of Beekeeping Activities in terms of Beekeeper Preferences, Production Quality and Bee Diseases in Malatya Province

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This research was conducted to determine the conditions of beekeeping in Malatya in caring, feeding, breeding and production activities. Face to face interviews with 149 beekeepers were applied by using the random sampling method in selected registered beekeepers to Beekeeping Registration System (BRS). In this study, it is found that 83.7 % of beekeepers use Standard Langstroth Hives, 15.4 % produce bee productions except honey, 57.0 % renovate queen bee once in two years and 83.9 % buy queen bee but not breed it. In this study, it is determined that breeders use 80.5 % Caucasian crossbred bee, and 79.2 % breeders do not use simple selection. In the current study, it is calculated that the ratio of 97.3 % sucrose is used for syrup making, the most common bee disease is varroosis (47.8 %), 69.1 % beekeeping do not have records, 90.5 % of keepers are strollers and 35.2 % do not consider themselves having sufficient beekeeping knowledge and practice. To have a better beekeeping in Malatya, it is necessary to use efficient and local adapted races, give importance to breeding queen bees, keep business records, encourage the production of bee products except honey, fight for the diseases densely and conduct courses, trainings and information activities for beekeepers extensively.

[Abstract:0480]

Biodiversity of Native Honeybee, "Apis Florea" In District Faisalabad And Chakwal Of Punjab, Pakistan

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The selected bee species *Apis florea* is native honeybee species of Pakistan and called "chotii makhi". Thirty to sixty samples of worker honey bees from each hives were collected from Marzipura, Chak 279 Rb, Chak 29 Jb, Shakot, Bhawana, G M Abad, Chak 30 Jb Pansara, Chak 32Jb and Chak 33 Jb areas of district Faisalabad and Kallar Kahar, Dhok Talian, Chak Bakar Shah and Ratta Shrif from district chakwal, Pakistan. These bees were preserved in 70% alcohol before analysis. Thirty morph-metric characters which includes the body weight, body length and body width, number of strips on thorax, number of segments of abdomen, sub segments of antennae, length and width of fore and hind wing and leg, cubital index (a ratio of lengths of two wing vein) of forewing and the number of humuli present on anterior margins of hind wing, basitarsus length and width were measured. Number of humuli were found 11 and 12 and cubital index in the range of 2.88-3.08 and 2.75-3.1 in *A. florea* species from Faisalabad and Chakwal districts, respectively. Number of humuli and Cubital indexes appeared most important characteristics in discrimination of worker bees from ecologically different niches. Length of hind leg (5.92-5.54mm and 5.6-5.81mm), width of basitarsus (0.58-0.62mm and 0.59-0.64mm), width of 2nd (1.64-1.78mm and 1.71-1.74mm) and 4th (1.45-1.47 and 1.44mm-1.51mm) tergite showed variation in *A. florea* collected from Faisalabad and Chakwal districts.

[Abstract:0483]

Mortality of Brood Africanized Bees (*Apis Mellifera* L.) in The Brazilian Semiarid Caused by the Low Relative Moisture of the Air

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Bees through a complex process of temperature control (T) and relative air humidity (RH) work effectively to find an ideal microclimate inside the hive, to ensure that there is no drying of the hatchlings and honeycomb destruction. In this work we measured the variations of T and RH, inside and outside the hives, and monitored the development and mortality of the young during the hot and dry period from October to December 2016 in the city of Teresina / PI. The study used 6 Langstroth hives, with a similar population and using a data logger to record T and RH. The offspring were mapped in a RH and T controlled environment at 60 to 70% and 34°C, respectively, and recorded the phases in which mortality occurred. At the end of the pupa stage development, the brood comb were raised so that the pups emerged in incubated cages with T and RH controlled at 34°C and 65%, respectively, to count the individuals that emerged. The difference between the number of individuals from the previous phase and the following allowed the calculation of the mortality rate in the development period. The Africanized bees were not efficient in controlling the internal RH of the hive when in the external environment the RH was below 60%, this occurred in 60.2% of the measurements. In 36 registers the UR values in the external environment were below 15.00%. During the study the mortality of 63.7% of the offspring was verified. Considering the non-occurrence of diseases and the availability of food in the period, the only factor that influenced the survival of the young was the deficiency of humidity control inside the hive.

[Abstract:0485]

Comparative Activity and Productivity of Carniolan (*Apis mellifera carnica* Pollmann) and Yemeni (*Apis mellifera jemenitica* Ruttner) Subspecies Under Al-Ahsa, Eastern Saudi Arabia Environmental Condition

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The present study was conducted at the apiary of the Agricultural and Veterinary Training and Research Station, King Faisal University, Al-Ahsa, eastern Saudi Arabia during the period from the beginning of April 2015 to the end of March 2016. The study was compared between Carniolan (*Apis mellifera carnica* Pollmann) and Yemeni (*Apis mellifera jemenitica* Ruttner) races for monthly fluctuation of foraging activity, pollen collection, colony growth and honey yield production under the environmental conditions of Al-Ahsa oasis, eastern of Saudi Arabia. The peak of flight activity of the two races was occurred during September-October. The Yemeni bees were found to be superior Carniolan bees for areas of stored pollen, worker and drone sealed brood areas, and adult population size. The Carniolan bees exceeded Yemeni bees in honey production. Foraging activity, pollen collection and worker brood rearing was significantly positively correlated with air temperature, soil temperature, solar radiation and net radiation. It could be concluded that, bee race is an important factor of activity and productivity of honeybee colonies.

[Abstract:0504]

A Regional Breeding Project for Varroa Resistance

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Wherever the ectoparasitic mite *Varroa destructor* is present on the European honey bee *Apis mellifera*, beekeepers enact control strategies to protect their colonies and make their activity commercially viable. Natural selection of resistant honey bee colonies is hindered by veterinary treatments, but the development of resistant colonies would reduce the risk of colony collapse (which may occur due to inefficacy of the treatments) and the risk of chemical contamination within the bee hive. Thus, scientists and beekeepers are becoming more interested in breeding programs that focus on resistance traits. Furthermore, it has been shown that bees of local origin are more likely to survive without treatments. Here we describe a regional project aimed at developing and promoting breeding for varroa resistance starting from colonies of local origin.

The project started in 2014 in the Italian region Emilia-Romagna, with stock from local queen breeders (a starting number of 60 colonies). Colonies are evaluated for hygienic behavior, varroa infestation levels and suppression of mite reproduction (SMR). Traditional traits, honey production and gentleness are also considered. Breeding values were calculated with modified BLUP-Animal Model on www.beebreed.eu. To ensure controlled mating between selected queens and drones, a mating station was established in a mountain valley, and drone congregation areas have been identified, to test whether drones not belonging to the program enter the mating area. Starting in 2015, an average of 100 queen bees have been produced each year. Before reproduction, the selected colonies are analysed to ascertain they correspond to the autochthonous subspecies *Apis mellifera ligustica*. Local beekeepers are being involved with training events, contribution of virgin queens for the mating station and distribution of mated queens.

[Abstract:0529]

A Breeding Study Against Varroa in Mugla Honey Bee (*Apis mellifera anatoliaca*) Population

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This project is being carried out at Breeding Center in Fethiye, İncirköy. 100 colonies, which has not received queen bee from outside of Mugla, were obtained from different beekeepers who has not been practicing migratory bee-keeping for the last 10 years. Instrumental insemination techniques were used for mating control. The breeding values (colony fitness and Varroa tolerance) of the colonies were evaluated by means of the Best Linear Unbiased Prediction (BLUP) - Animal Model. Three different methods were used to estimate the mite loads of the colonies. Powdered sugar methods were applied to determine the number of Varroa on the adult bees and brood cells were opened to determine the number of Varroa. Additionally, number of Varroa fallen from nest to bottom board were counted and recorded. First measurements for the initial populations were carried out in April 2016 and the average numbers of the Varroa determined by powdered sugar method, bottom board method and opened brood cells were 15.48, 61.52 and 16.40 respectively. Second measurements were done for the F1 generations in April 2017 and the average numbers of Varroa determined by three methods were 9.28, 45.02 and 3.42 respectively. Results obtained from F1 generations indicate a decrease in the Varroa densities. Winter loss rate were calculated as 3.7%. Our findings related to high overwintering success of the colonies and good suppression of Varroa populations are promising in terms of breeding studies against Varroa. This Project (TAGEM-15/ARGE/19) is supported by TAGEM (Republic of Turkey Ministry of Food, Agriculture and Livestock) and Mugla Beekeeping Association.

[Abstract:0567]

A Study on Geometric Morphometric Analyses of Some *Marchalina hellenica* Populations in Muğla

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Marchalina hellenica Gennadius (Hemiptera: Marchalinidae) is the main species for producing of pine honey. It is widely spread in Southwest Anatolia, especially in Muğla, Turkey. Determination of morphometric and genetic variation of the *Marchalina hellenica* is very important for economic contribution producing pine honey. The aim of this study was to determine morphometric variation of *Marchalina hellenica* populations collected from 9 locations (Datca, Fethiye, Kavaklıdere, Koycegiz, Marmaris, Menteşe, Milas, Ortaca, Ula) in Muğla located in Southwest of Turkey. A total of 267 of samples were used for the geometric morphometry analysis. The samples were photographed under the microscope camera and 12 landmarks were recognized on body of insect for geometric morphometric analysis and were added using Tpsdig v.2.05. Canonical Variate Analysis (CVA) analyses and distances were done MorphoJ. CVA result for total individual values illustrated that the samples collected from Milas region separated from other populations. First three eigen values of CVA explained 80,09 % of total variation. The procrustes distances were ranged between 0.2181 (Milas and Fethiye) and 0.0301 (Kavaklıdere and Köyceğiz). In conclusion, the first data on the determination of population differences in insects in Muğla has been submitted. The more information about *Marchalina hellenica* population structures will be given using Classical morphometric and mtDNA analyses in future.

This study was supported by Research Fund of the Muğla Sıtkı Koçman University. Project Number: BAP-15/204.

[Abstract:0614]

Detailed Insight in Honey Bee Wing Flapping Mechanics Using Three-Dimensional Fluid-Structure Interaction Simulation

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A modern approach to analysis of honey bee hovering mechanics is presented in this work. The analysis is based on honey bee wing flapping computer simulation, which is conducted by using fully coupled fluid-structure interaction (FSI) solver. As a result, we were able to gain the detailed insight in the non-stationary wing loading nature, as well as non-stationary nature of the fluid flow around. The simulation has been done by using the existing scientific data describing wing displacements and wing mechanical properties as well. As one of the goals of this multidisciplinary study is better understanding of wing flapping dynamics and its influence on the environment in vicinity of the bee, and, on the other side the development of the robust software capable to do such complex simulations. The FSI is based on monolithic cell-centered finite volume method (FVM) – finite element method (FEM) coupling custom developed (C++) in OpenFOAM. The main benefit of this approach is connection between well matured methods from the both sides, FVM on moving meshes for the fluid, and the robustness of the FEM applied to complex three-dimensional geometry

[Abstract:0620]

Doolittle Method from Controlled Queen Bee Production Methods

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The quality of queen bee is influenced many factors such as genetic and environmental factors. In addition to environmental factors affecting the quality of queen bee such as the season when queen bee is grown, the technique of growing, the age of transferred larva, the characteristic of the initiating and finishing colonies, genetic factors are influential.

The selection of the production method, which is one of the factors affecting queen bee quality, significantly affects queen bee quality. Except for the queen bees grown from natural thimbles, Miller method, Alley method, Smith method, Hopkins method, Jenter method and Doolittle (grafting) method are used for controlled queen bee production methods.

In Doolittle method, which is one of the controlled queen bee production methods, aim is to train controlled and qualified queen bees. Because of the advantages that it has when considering the production of queen bees and commercial queen bee production, the most widely used queen bee production method is the Doolittle method. In this method, which develops by going through some stages until today; 12-24 hours old larva in worker bee cells are based on the principle that they are transferred to pre-prepared queen bee cells by various tools. Thus, suitable age larva are fed with enough amount of royal jelly.

[Abstract:0621]

Effect of Bee Biofield on the Human Organism

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The method of treatment which includes the exposure to external electric and magnetic fields has been long used along with the traditional medicine. The studies of the external electric and magnetic fields influence on the human body are widespread (the experiments using the magnets). The magnetite (Fe₃O₄) is the only known biogenic material with ferromagnetic properties. Its therapeutic effect is mainly the result of its magnetic properties. It is known that the ferromagnetic inclusions containing magnetite crystals and consisting of a great number of related but individual nanoparticles of ferrite cause the high sensitivity of microorganisms to the electromagnetic field [2]. Fe₃O₄ arranges in the bee body during its development (the ontogeny) at the larva stage and results in the magnetic dipole properties.

Some modern research evidence the similarity of human and bee biofield and, thus, the beneficial action of bee biofield on the intracellular water properties [1]. Since the human body is a source of a 'living electromagnetic field', the surrounding environment influences it with the corresponding bioelectric energy. Biological tissues magnetic properties (including bee tissues) are characterized by the magnetic permeability property value that is close to unity, since the main chemical components of the biological environment (proteins, carbohydrates, lipids, water molecules) are diamagnetics. The influence of low-intensity low-frequency magnetic radiation of bee biofield on the human body is not covered sufficiently in the research papers, although lately it has its practical application in a form of the so-called 'sleeping on beehives'. Sleeping on beehive is a great complex therapy for the whole body, based on close contact with bee family. The new theory certainly requires more prolonged and thorough research in the area of biomagnetic energy and the external electromagnetic field influence of a beehive and its healing properties on the human body.

[Abstract:0625]

Melittin reduces in-vitro Human T lymphotropic virus type 1 (HTLV-1) replication and proliferation of Peripheral Blood Mononuclear Cells (PBMC) from infected patients

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BACKGROUND: Melittin (MEL), major constituent of apitoxin, has a strong binding affinity to the lipid bilayer interface inducing pores in membranes. HTLV-1 is a retrovirus capable of transforming primary T lymphocytes both in vitro and in vivo causing T-cell leukemia lymphoma in human adults and is involved in a demyelinating disease. HTLV-1 spreads by mitosis cellular and immature virus particles are release during viral replication. We hypothesized that lytic effects of MEL might inhibit both HTLV-1 replication and cell proliferation from HTLV-1 infected PBMCs.

METHODS: The lytic activity of MEL on PBMCs isolated from infected patients: (a) up to 25% of infected PBMC (n=3), (b) up to 50% of infected PBMC (n=1), and the human T-cell lines MT-2 totally infected was compared in cell cultures. HTLV-1 replication was measured in culture supernatants using a core viral protein (p19 Gag) capture by ELISA. Viability were measured using exclusion of Trypan Blue (TB) assay. The sub-lytic effect was defined as presence of TB positive cell and decrease viability. Preliminary findings are described.

RESULTS: We did not find TB positive PBMCs. Mel <2.5ug/ml was not cytotoxic and reduced both p19 release and PBMCs viability in a dose-dependent manner when less than 25% of cells are infected. However, when there are more than 50% of infected cells only MEL >2.5ug/ml reduced both viability and p19 release. No change in p19 release was observed in the MT-2 cell line; only a sub-lytic effect of MEL 5.0ug/ml was associated with presence cell TB positive.

CONCLUSION: When some cell are infected MEL reduces strongly the HTLV-1 replication as well as proliferation of PBMC infected with HTLV-1 for one way disrupt membranes, which decrease more over 50% virus particles. This effect shows us MEL could reduce the spread of the HTLV-1. Analysis of this promissory result is in process to explore potential to disrupt infection with HTLV-1.

[Abstract:0630]

Feeding Effect on the Evolution of Honeybees' Swarms

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The products of bees feeding complement the usual classic food of honeybee colonies, in conditions of dietary deficiencies which often occur naturally due to bad weather or a bad floral diversity. The objective of this work was to assess the effect of different syrups of bee feeding on both the evolution of honeybees and on the state of honey and pollen stocks, by doing a test in an experimental apiary (12 homogeneous swarms divided into 4 groups) in the Higher Institute of Agronomy of Chott Meriem during the period which took place between the first of April and the end of June. Each week, each colony received 500ml of a 50/50 classic solution to the basis of white sugar, brown sugar, or a mixture of fructose and glucose. The consumption of various syrups by bees differs depending on the hours of the first day as well as the days of the distribution. The weight of the hives increased depending on time with a significant difference between the different batches. The evolution of the brood surface, the stock of pollen and honey during the period of feeding has been growing. The bees have drawn from the reserves of pollen to increase the brood. In the course of our trial, the mixture fructose-glucose was the most appreciated and the most favorable for the raising of the brood and making honey. The inversion of sucrose to glucose and fructose by the bees has a significant energetic power for the bee.

[Abstract:0636]

Varying Rates of Dimethyl Sulfoxide (DMSO) Impacts Viability and Motility of the Cryopreserved Honey Bee Semen

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Cryopreservation is an advanced method used to protect germplasm in liquid nitrogen. There has been important progress in the cryopreservation of honey bee germplasm in recent years, leading to the practical recovery of genetic material for breeding purposes following freezing. DMSO is used as cryoprotective agent with drone semen. However, this substance has been suspected of causing genetic damage in sperm based on scientific studies. The study was conducted in order to determine the optimized proportion of DMSO for cryopreservation of honey bee semen. Within the scope of the study, semen samples were collected from honey bee drones, and were frozen with adding the different rate of DMSO. The control was consisted of semen and extender without the addition of DMSO; treatment groups were included the addition of one of the following DMSO rate: 10 %, 12.5 %, 15 %, 17.5 %, 20 %, 22.5 %, 25 %, 27.5 %, 30 %. For each group, 15 µl semen and cryoprotectant mix were loaded into 0.25 ml straws. Straws were heat-sealed on one side after filling, and then they were placed in the standard refrigerator for 2 hours until samples reached 4 °C. Afterwards, they were placed vertically into cryochambers of the controlled rate freezing system programmed to cool from 4 °C to -40 °C at a rate of 3 °C / min. Following freezing process, all straws were removed from liquid nitrogen, and were thawed in water bath at 35°C. Motility of semen was determined under the a inverted microscope for groups of the 10 %, 12.5 %, 15 %, 17.5 %, 20 %, 22.5 %, 25 %, 27.5 %, 30 % via vision observatory as 4.5, 4.5, 4.5, 4, 4, 2, 1, 1, and vitality was determined via staining method as 87±6.43 %, 86±6.60 %, 86±19.31 %, 76±7.34 %, 75±20.24 %, 67±15.60 %, 52±4.17%, 47±7.49 %, 9±13.15 %, respectively.

[Abstract:0641]

Optimizing Drone Fertility with Spring Nutritional Supplements to Honey Bee (Hymenoptera: Apidae) Colonies

Andree Rousseau¹, Pierre Giovenazzo²

¹Andrée Rousseau

²Pierre Giovenazzo

Supplemental feeding of honey bee (*Apis mellifera* L., Hymenoptera: Apidae) colonies in spring is essential for colony buildup in northern apicultural regions. The impact of pollen and syrup feeding on drone production and sperm quality is not well-documented, but may improve fecundation of early-bred queens. We measured the impact of feeding sucrose syrup, and protein supplements to colonies in early spring in eastern Canada. Drones were reared under different nutritional regimes, and mature individuals were then assessed in regard to size, weight, and semen quality (semen volume, sperm count, and viability). Results showed significant increases in drone weight and abdomen size when colonies were fed sucrose and a protein supplement. Colonies receiving no additional nourishment had significantly less semen volume per drone and lower sperm viability. Our study demonstrates that feeding honey bee colonies in spring with sucrose syrup and a protein supplement is important to enhance drone reproductive quality.

[Abstract:0646]

Preservation of Domesticated Honey Bee (Hymenoptera: Apidae) Drone Semen

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¹Marilene Paillard

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Preservation of honey bee (*Apis mellifera* Linneus, Hymenoptera: Apidae) sperm, coupled with instrumental insemination, is an effective strategy to protect the species and their genetic diversity. Our overall objective is to develop a method of drone semen preservation; therefore, two experiments were conducted. Hypothesis #1 was that cryopreservation (-196°C) of drone semen is more effective for long-term storage than at 16°C. Our results show that after 1 year of storage, frozen sperm viability was higher than at 16°C, showing that cryopreservation is necessary to conserve semen. However, the cryoprotectant used for drone sperm freezing, dimethyl sulfoxide, can harm the queen and reduce fertility after instrumental insemination. Hypothesis #2 was that centrifugation of cryopreserved semen to remove DMSO prior to insemination improves fertility. Our results indicate that centrifuging cryopreserved sperm to remove cryoprotectant does not affect queen survival, spermathecal sperm count or sperm viability. While these data do not indicate that centrifugation of frozen-thawed sperm improves queen health and fertility after instrumental insemination, we demonstrate that cryopreservation is achievable and it is better for long-term sperm storage than above-freezing temperatures for duration of close to a year.

[Abstract:0658]

Investigation of Collaboration and Conditioning Through Instrumental Learning in Honeybees (*Apis mellifera*)

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According to the literature, it is a known fact that they have social interactions, problem solving skills and also that they can pass on the knowledge they have learned. Studies on bumblebees showed that bumblebees can do associative learning through operant conditioning and can also pass on their culture to next generation. In the study, researchers put fake flowers that contain sucrose in it, under a plexiglass. In order for the bumblebees to reach the sucrose, they had to pull the string attached to the fake flower to free it from the plexiglass. After observing a trained demonstrator bumblebee, other bumblebees learned the pulling the string for the reward behavior at first hand and they passed on their culture by becoming the next demonstrator for the training of other bumblebees.

In our experimental structure, we conditioned two bees to the fake flower with a key petal which opens the barrier that holds the nectar when its pressed on. After several bees are conditioned, they are released two by two into the system. However, the key petal has been moved away from the reward so that the bee pressing on the key petal cannot drink from the sucrose. With this, we have tried to test whether the bees will collaborate that one of them can open the system so that the other one can feed from it. During this, an HD camera recorded all the movement inside the system.

In the light of all those knowledge, we have tried to test the limits of collaboration and conditioning in honeybee colonies.

[Abstract:0662]

Investigation of Relationships Between Honey Yield and Behavioral Characteristics with Decision Tree Method

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Decision trees are a commonly used data mining approach to classification and estimation. Decision trees are an advantageous classification method in terms of easy interpretation, intelligibility, low cost and reliability. In this algorithm, the data set is improved by dividing the small sets. When classification is done by partitioning, a model is formed in the form of tree structure consisting of decision nodes and leaf nodes according to the property and target. A decision node may contain one or more branches. The first node is called the root node. A decision tree can consist of both categorical and numerical data.

In this study, it is aimed to examine the relationships between the behavioral characteristics of honey yield and decision tree method and CART (Classification and regression tree) algorithm. For this purpose, from 2008 to 2016 in the Aegean Agricultural Research Institute, average of frame bees number, average of frame of brood number, average of aggressiveness, index of frame bees, index of frame of brood cell, Aggressiveness index, nectar index, Honey yield index, wintering index and colony index were collected with 21 day intervals from a total of 1358 hives and analyzed. As a result of the analysis, it was determined that the most effective variable for honey yield was only the index of frame bees and that average of frame of brood number was followed. A total of 1358 hive in the root node are divided into two sub-nodes, Node 1 and Node 2 for index of frame bees which are smaller than or equal to 2.84 and larger than 2.84. The honey yield averages of the hives in Node 1 and Node 2 were estimated to be 1.17±0.81 and 2.10±1.03, respectively. The index of frame bees divided into four subgroups in the form of Node 3-Node 6 nodes to average of frame of brood number. After this point, the splitting process ends

[Abstract:0665]

Queen Productions

Sharon Lally, Hossein Yeganehrad

Caspian Apiaries

This is the study of environmental factors, queen productions, and drone fertility in North America (Alberta, British Columbia, California, and Washington). Brood productions of colonies is related to levels of pollen consumption of natural pollen flow or artificially supplying the pollen patties to the colonies. As a positive result of pollen consumption through honey bees the jelly production from hypo honey bees from their mandibles glands is fed towards the queen to lay more eggs. Therefore the queen bee stays healthy with the right amount of nutrients supplied towards reproduction. Excessive amounts of pollen flow and honey flow creates the healthy environment for over limit of the jelly for queen, larvae, drones, and bees. As a result, over 60% of the drones will be able to produce semen and also 5% chance in the queens' replacement (supersedure); with high nutrients there is a 5% chance of supersedure. In queen productions there are 6 main causes of supersedure which are dry larvae, old larvae, shortage of royal jelly for queen cells, poor mating results, shortage of semen in sperm, and nutrient deficiencies after mating. As a negative result the shortage of pollen means the honey bees will lose over 13% of their weight (fat deposits), dry larvae in the colonies, and the life of a bee is shortened. With the shortage of pollen over 90% of the drones will not be able to produce semen and that creates a large risk of supersedure over 35% in less than three months. The remaining percentage, depending on conditions it can be up 50-80% in yearly matter. Malnutrition and deficiencies on bees has an impact on the royal jelly and on the queen. It will have an impact on semen medica in queen bees and disable the eggs so they would not be able to be fertilized. Brood production can stop due to the result of low nutrients and the bees would not be able to produce royal jelly to feed queen bee.

[Abstract:0703]

Biological Effects of Hydrophilic and Lipophilic Fractions of Pollen Load on the Organism in a Case of Induced Stress

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The use of antioxidants to activate the body at struggle with stress effects has been reviewed by many scientists. However, the problem remains unsolved. Our scientific and practical interest is determined by the use of biologically active complexes obtained from pollen pellet, lipophilic and hydrophilic in particular, possessing a unique and rich in natural antioxidants composition with high bioavailability. According to the results of the studies, the laboratory animals, rats males and females, subjected to immobilization stress at the background of products being studied, stabilization of body weight, morphological composition of blood, glucose level and hemoglobin was established in comparison with the control group of the stressed animals. Progeny from female rats receiving lipophilic fraction differed by a large number, better weight and length. Male rats with hydrophilic fraction of pollen pellet were characterized by a lower level of cortisol in the serum that reflects a more vivid tolerance to stress. The hydrophilic fraction contains almost all essential amino acids in a free state, a large amount of proline participating in collagen synthesis, B vitamins and vitamin C. The mineral composition is represented by K, Mg, P, Ca, Zn, Cu, Fe, Co. All of them are in chelate form. The lipophilic fraction of all types of pollen pellet contains carotenoids and vitamin E possessing the properties of antioxidants. They slow down the oxidation of unsaturated fatty acids, which are a part of lipids that protects the body against free radicals and positively affects metabolism. It also contains essential polyunsaturated fatty acids (arachidonic, linoleic, linolenic), steroids, wax and their positive effect on the body is manifold.

In our case the lipophilic complex obtained from early spring pollen pellet contained about 2300 mg/100 g of vitamin E, up to 900 mg/100 g of carotenoids, 50-60 % of total fatty acids were polyunsaturated fatty acids, up to 6 % of sterols and up to 3 % of squalene. All this may well be the justification of the adaptogenic properties of bee pellet in a case of its use to increase the stress tolerance of the organism.

[Abstract:0710]

Influence of the Carbohydrate Feed Enriched with a Protein-Vitamin Complex Got From the Pollen on Queen Larvae and Royal Jelly Quality

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Modern queens' husbandry and production of royal jelly on an industrial scale are impossible without the use of significant quantities of sugar syrup. At the same time, the processing of sugar syrup by bees is accompanied by their accelerated physiological aging and, as a result, by the reduction of life expectancy. Numerous tests conducted over the past two decades have shown that invert syrups are more acceptable for bees than sugar syrup. To enrich the inverted syrup with a protein-vitamin supplement we used a water fraction of the fermented pollen pellet. This substance is, in contrast to the original material, a microbiological pure product containing free amino acids, B vitamins, flavonoids, macro- and microelements. The tests carried out over several years showed that enrichment of the inverted syrup with water-soluble pollen components promoted an increase in egg production of the queens up to 40 % as compared with the control, correspondingly, an increase in the live weight of bees, bees activity, better preparation of bees for hibernation, made even more possible to reduce the consumption of carbohydrate and protein feed while processing it. The use of the enriched inverted syrup had a particularly significant effect on queens, the amount of royal jelly and the mass of larvae. The use of the enriched inverted syrup in our experiments made it possible to increase the amount of royal jelly in queen cells up to 80 % in the first days of August, the weight of larvae by 58 % during the same period and the larvae reception by 34 % as compared with the control. In comparison with sugar syrup, these differences are more significant.

Besides, worker bees involved in processing the enriched inverted syrup differed by greater body weight and lower water content. With current unfavorable environmental conditions the use of this type of feed would improve the profitability of beekeeping and the creation of industrial feed production in beekeeping would provide the beekeeping industry with quality, balanced fodders excluding the use of dubious sources of raw materials.

[Abstract:0730]

The Behaviour of Honeybee Colonies During Cleaning and Restoring Extracted Honeycombs

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We usually observe that the residual honey droplets are especially stored in dark cells of extracted combs, when they are given to colonies to clean and restore the cells of extracted combs in honey supers. We conducted this study to make objectively certain whether the reaction of workers to different types of extracted honeycombs are different, when they are given to them. At the end of honey flow of 2015, 588 combs in full-depth supers were harvested from colonies. Since no queen excluder was used between brood chamber and super, about half of the combs harvested from colonies had dark areas due to brood rearing activity. After extraction of the combs, the area (cm²) of each dark coloured comb was measured. Both dark and light coloured-extracted combs were installed in supers by applying several location combinations of two types of combs before they were given to colonies. After 3 days, the combs were taken back again from colonies. They were weighed and then re-extracted to determine the change in weight (g and %) of each comb. The amount of honey that was re-extracted were determined. The data obtained was evaluated in respect of the area used for brood rearing activity on combs and the location of different types of combs in supers. The observations and statistical analysis demonstrated that storing honey droplets by worker bees during cleaning the combs depended on comb type ($P < 0.05$) and the location of different types of combs in super ($P < 0.05$). The dark coloured combs installed in the centre of the super were heavier than the light coloured combs that were not used for brood rearing. We concluded that the dark coloured cells previously used for brood rearing were more attractive to worker bees for storing residual honey droplets. The arrangement of extracted honeycombs in super during cleaning and restoring process by worker bees after honey extraction provided 1.5-2.0 kg extra honey per honey super by re-extracting these combs.

[Abstract:0731]

The Analysis of the Honey Extraction of the Harvested Honeycombs

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The aim of this study is to obtain data enabling the estimation and determination of honey yield from harvested honeycombs. The study was conducted in Beekeeping Research Unit of Agricultural Faculty, Ankara University in the honey season in 2014. In the major honey flow period the strong colonies were supered with full-depth frames of combs. No queen excluder was used between brood chamber and super not to prevent brood rearing activity in the honey supers. At the end of honey flow, 348 combs in full-depth supers were harvested from colonies. The combs were allocated into 3 types before honey extraction with respect to their level of use for brood rearing activity in the super. The first type combs were the combs that were used only for nectar processing and honey storage. The second type combs were the combs that were used partially, whereas the third type combs were used fully by bees for brood rearing activity before storing honey in its cells in the super. The capped honey area of each comb (%) was measured before honey extraction. The weight of comb, the amount of extracted honey per comb (kg/comb) and residue of honey in extracted comb after extraction (kg) were determined by weighing each frame of comb before and after extraction. At the end of extraction process, the extracted combs that were installed into supers were given to colonies to clean and restore the cells. The data demonstrated that the weight (kg) of the comb before and after extraction, the weight of the comb after cleaning and restoring process (kg) and the area of capped honey on the comb (%) were affected by comb type ($P < 0.05$). The mean weight of comb with frame was 2.60 kg and 1.97 kg honey (75.6% of the full frame weight) was extracted from the comb. Remaining weight after extraction (0.63 kg, 24.4% of the weight of the comb) consisted of 0.23 kg residual honey droplets and 0.40 kg empty comb (drawn comb) with wooden frame.

[Abstract:0732]

The Use of Standard and Geometric Morphometry for Discrimination of the Honeybee Queens from Two (*A. m. caucasica* and *A. m. ligustica*) Subspecies

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Both standard and geometric morphometry are widely used in discriminating worker honeybees of different subspecies. However, the queens of different subspecies are not regularly distinguished by morphometry due to variation in queen size resulting from environmental effects. The aim of this study is to examine whether the queens from different subspecies can be discriminated by morphometric methods. Throughout the season Caucasian and Italian queens were reared by grafting method. No measures were taken to ensure the same rearing conditions for both subspecies through the experiment. A total of 167 virgin queens were kept in tubes until dissection procedure for measurements. Both left and right forewings, hind wings and hind legs of queens were placed in slide covers. The images of these parts in covers were captured with the digital camera (Leica DFC490) attached to the Leica DM3000 microscope. The length, width and area of forewings, the number and extent of hamuli on the hind wing, and length of femur, tibia, and basitarsus, the width and area of basitarsus on the images were measured by Leica Application Suite (3.3.1). One-way ANOVA and stepwise discriminant analysis were applied to the dataset of morphological characters by SPSS (20). For the geometric morphometrics, forewing images of the queens were used. A tps file was generated from the images using the software tpsUtil (1.70 x64) to prepare a dataset of the cartesian coordinates of the plotted landmarks. Landmarks were plotted on the forewings using tpsDIG2 (2.26). Landmarks were superimposed and discriminant analysis of variance was performed using MorphoJ (1.06d). The differences in wing characters between Caucasian and Italian queens were not found statistically significant ($P > 0.05$) except for width of right forewing ($P < 0.05$). Nevertheless, statistically significant differences were determined between two subspecies in all hind leg characters ($P < 0.05$). Stepwise discriminant analysis of standard morphometry dataset classified 89.8% of the queens correctly to their own groups, whereas 100.0% of the queens could be correctly classified to their own groups by discriminant analysis of geometric morphometry dataset. The results revealed that both standard and geometric morphometry could be used to discriminate the queens from different subspecies.

[Abstract:0736]

Selection Criteria of Climate Change Indicator Species of Insects in Agricultural Environment in Korea

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Climate change is the global phenomenon as well as the local environmental stressor. Especially Korea is in the hotspot of climate change of warming with more than 2 celius degrees over 100 years. Monitoring communities of climate sensitive species, such as insects, could enable scientists to develop indicators for climate change effects on biodiversity and help devise policies to protect it. Insects are good climate indicators as their development depends on temperature. From the monitoring data, community index such as community temperature index could provide some trend of changes, but not with clear biological correlation. Thus the indicator species are sought. In Korea, several different administration agencies provided the list of climate change indicator species. We analyzed those lists based on the taxonomic group, distribution characteristics, lifehistory traits, overwintering phenology as well as easiness of monitoring, taxonomy and handing, and its flagship values. Further implementations of the finding were discussed. 30 species of spiders, butterflies, beetles, bees and wasps, and plants were proposed.

[Abstract:0749]

The Effects of Wintering in Different Climatic Regions of Turkey on Wintering Ability of Caucasian Honey Bee (*Apis mellifera caucasica*) Colonies

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In Beekeeping, year-long processes consist of interdependent periods. Annual achievements of production, cultivation and maintenance are reached with correct definitions and works made in previous period. We should think these periods like the rings of a chain and undoubtedly the wintering stage is one of the most important parts among them. Geographical and topological properties of Turkey lead to alternating climate types of different properties, and among them there are major differences in terms of temperature, humidity, daily temperature changes etc. in winter period. In this study, Mersin which located in mediterranean climate region; Ordu which located in black sea climate region and Ankara which located in continental climate region, cities preferred and effect of these different region to wintering ability is investigated.

In this research, 3 level of city factor as Ankara, Ordu, Mersin and 2 level of altitude factor as city level and above city level were explored together with 7 replications. Data were evaluated by two-way ANOVA followed by Tukey's post hoc test. The percentage values were accordingly subjected to arc-sin transformation prior to statistical analysis. The results of ANOVA showed that City*Altitude interaction and main effect of Altitude factor is not significance on the wintering ability of caucasian honey bee (*Apis mellifera caucasica*) colonies ($p>0.05$). ANOVA also showed that main effect of city factor is significance ($p<0.001$). Grand means of altitude factor levels as 25.93 ± 1.78 for city level and 30.05 ± 1.72 for above city level. Grand means for level of city factor were calculated as Ankara: 35.85 ± 1.85 ; Ordu: 36.58 ± 2.23 ; Mersin: 11.55 ± 2.32 . Wintering abilities of Ankara and Ordu cities was higher than Mersin city ($p<0.05$). This article is based on the findings of the research, which was financially supported by TAGEM, with the project number of TAGEM/HAYSÜD/14/06/01/11.

[Abstract:0754]

Honey Bee (*Apis Mellifera* L.) Instrumental Insemination and Semen Storage

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A good colony control in honey bees is provided by good conditions and good spawning parent bees. Quality queen bee lays 1500-3000 eggs per day in the production season. Queen bee is mating with 7-15 male bees in the air. For this reason, isolated mating regions are formed or instrumental insemination techniques are used to control mating of the queen bee. Artificial insemination technique is used in pedigree breeding queen bee production and bee breeding work in the beekeeping in developed countries. Instrumental insemination technique is used in high yield lines of honey, american foulbrood, some other diseases, parasites and all hybrid bee farming studies. Such as the development of resistant lines against varroa destructor which is a common parasite species among honey bees, it is possible to determine the mother and father lines in breeding studies with instrumental insemination technique. Turkey possesses one of the most important bee gene centers in the world that has bee races (*A. m. anatoliaca*, *A. m. caucasica*, *A. m. carnica*, *A. m. syriaca* ve *A. m. meda*) and honey bee genotypes (Muğla, Yığılca, Trakya, Gökçeada, Karadeniz vb.). Despite the fact that sperm storage and genetic resources protection have been achieved in many other livestock all over the world, sperm storage studies in honey bees are only made in countries like the USA, Germany and Turkey in the world. Liquid nitrogen, cryoprotectant and diluents is used for honey bee sperm storage. In this review, instrumental insemination practices in honey bees and bees sperm storage will be given information about this subject in the world and in our country.

[Abstract:0777]

Genome-wide Scans Between Two Honeybee Populations Reveal Putative Signatures of Human-mediated Selection

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The domestication of the Western honeybee began at least 3,000 years ago. Today managed honeybees are mostly selected for specific characteristics suitable for apiculture such as docility, productivity and swarming behaviour. The European dark honeybee, *Apis mellifera mellifera*, has been selected by apiculturists for a few centuries on various characteristics, including colour, hair length and wing morphology. Using whole-genome sequence information, we investigate whether selection has left genomic signatures in two *A. m. mellifera* subpopulations (Switzerland: N=39 and France: N=17) with different applied breeding practices. Three different test statistics were calculated in windows of 2kb (fixation index (FST), cross-population extended haplotype homozygosity (XP-EHH) and cross-population composite likelihood ratio (XP-CLR)), and combined into a recently developed composite selection score (CSS). Using this approach, we could identify 6 significant selective sweeps distributed across 5 chromosomes covering 8 genes. These genes are associated with multiple molecular and biological functions, including regulation of transcription, receptor binding and signal transduction. Of particular interest is the strongest signal found on chromosome 1, which corresponds to *wnt4*. This gene affects wing vein patterns and abdominal phenotypes in *D. melanogaster*. *In Switzerland, A. m. mellifera has been intensely selected on wing veins for decades, especially the cubital index. Moreover, we find nearly fixed haplotypes in the genomic region of wnt4 in the Swiss population. The signal is therefore likely to be a good candidate for human mediated-selection arising from different applied breeding practices in the two managed populations.*

[Abstract:0786]

Determining the Differences of Learning Abilities and Behaviors Between the Three Honey Bee Subspecies

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Honey bee subspecies as Carniolan Honey Bee (*A. m. carnica*), Syrian Honey Bee (*A. m. syriaca*) and Caucasian Honey Bee (*A. m. caucasica*) found in Turkey. They are living in different environments in ages and they were adapted to their environments, then phenotypic differences were appeared in the evolutionary process. Besides to morphological differences, we are determining the differences in learning abilities and behavior between these three subspecies. To determine these differences, we are using three experiment setups. We are monitoring daily activities of honey bees and we are using electroshock and reversal learning experiments. First, in monitoring experiments, we measure the daily activity of honey bees in optimum conditions for 24 hours. Second, electroshock experiment is employed for to observe avoidance behavior and determine the learning abilities of honey bees with associative learning. Third, reversal learning task is applied, which is based on Pavlovian Conditioning and involves the adaptation of behavior according to changes in stimulus–reward contingencies. We are using two different odorants as conditional stimulus and observe reaction of the with proboscis extension reflex. To sum, we found differences between these three subspecies in their learning abilities and behaviors.

BEE HEALTH

[Abstract:0022]

Molecular Characterization and the Investigation of Important Honey Bee (*Apis Mellifera* L.) Viruses in Hakkari Province (Turkey) By Using RT-PCR

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The present study investigates the existence and prevalence of the infections of *Deformed wing virus* (DWV), *Black queen cell virus* (BQCV), *Acute bee paralysis virus* (ABPV), *Israeli acute paralysis virus* (IAPV), *Sacbrood virus* (SBV), *Kashmir bee virus* (KBV) and *Chronic bee paralysis virus* (CBPV) by RT-PCR method in Hakkari province of Turkey. Specific primers were designed for the genome of each virus in order to use for the molecular detection of these viruses. These seven viruses were investigated in 90 apiaries in total. KBV and IAPV could not be detected in any apiaries, the other five viruses' frequencies are varied: BQCV was detected in 32,2% of apiaries, DWV in 23,3%, SBV in 12,2%, CBPV in 8,8% and ABPV in 2,2%. The identification tests showed that many apiaries were infected with one or more viruses: 35.5% of apiaries were positive for a single infection, 20% a double infection and 1.1% a triple infection. In Hakkari province of Turkey, this is the first report for the five viruses. This is also the first record of SBV in Turkey. For each identified virus species, a virus isolate was selected randomly, and its partial genomes were characterized. For BQCV, ABPV and SBV partial coat protein (CP) codons and for DWV and CBPV partial RdRp codons were characterized, cloned and sequenced with the specific primers. As a result of blast analysis of NCBI database, the sequenced Hakkari's isolates of BQCV, DWV, SBV, CBPV and ABPV have been showed nucleic acid similarity as compared to the other regions in the world: 89-90%, 96-99%, 77-90%, 85-86% and 85-97% respectively.

[Abstract:0034]

Geographical Distribution and Molecular Detection of *Nosema Ceranae* from Indigenous Honey Bees of Saudi Arabia

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The aim of the study was to detect the infection level of honey bees with *Nosema apis* and/or *Nosema ceranae* using microscopic and molecular analysis from indigenous honeybee race of eight Saudi Arabian geographical regions. A detailed survey was conducted and fifty apiaries were chosen at random from these locations. Infection level were determined both by microscope and Multiplex-PCR and data was analyzed using bioinformatics tools and phylogenetic analysis. Result showed that *N. ceranae* was the only species infecting indigenous honeybee colonies in Saudi Arabia. As determined by microscope, *Nosema* spores were found to be in 20.59 % of total samples colonies, while 58% of the samples evaluated by PCR were found to be positive for *N. ceranae*, with the highest prevalence in Al-Bahah, a tropical wet and dry climatic region. Whereas low prevalence was found in the regions with hot arid climate. Honeybees from all eight locations surveyed were positive for *N. ceranae*. This is the first report about the *N. ceranae* detection, contamination level and distribution pattern in Saudi Arabia.

[Abstract:0066]

Use of Medicines Has Basic Thymol Against of *Varroa* Mite in Iran

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Researchers throughout the world still consider *Varroa destructor* to be one of the most important stresses on honey bee colonies around the world, continues to have its biology examined by researchers from many places.

There are three anti- *varroa* containing thymol and having a marketing authorization for the treatment of colonies against *varroa* in Iran: Apiguard® and Apilife Var®. Thymovar®. Since 2000 use has been made of Thymol, which is the component of Apilife Var® and Apiguard® as well as Thymovar®, and also studied many publication from around the world. Efficacy tests Several tests were conducted in different countries on these veterinary drugs. The ideal is to compare data carried out in parallel on different products. We consider only the tests that compare the two drugs based thymol. Many studies have been carried there are already several years. Efficacy loss problems may have changed the level of efficacy. The hive model and climate of the country in which the tests are carried out must be considered. Here they take the data from three trials in 2004 in the north, center and south of Italy in 2004 in two German cities and a last conducted in 2010 in Alsace (France) and in Iran in 2004, We can draw several conclusions from these trials. The Apiguard® presents the most variable and the lower efficacy results. There are big differences depending on achievement tests venues and effectiveness varies greatly according to the settlements. The differences are less marked between Thymovar® and Apilife Var® in trials in Italy Germany, and France, the tests more recently show better efficacy of Apilife Var®. This may be related to a loss of effectiveness of thymol. We take the data from several trials between 2000 to 2015 in the north, center and south of Iran and Afghanistan considered Thymovar® show better efficacy than Apiguard®.

We take the data from several trials between 2000 to 2015 in Iran showed efficacy against *Varroa destructor* with:

- Apiguard® between 50% to 80%

-Apilife Var® between 75 % to 92%

-Thymovar® between 80% to 94%

[Abstract:0067]

Honey Bee Gut an Unexpected Niche of Human Pathogens

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The honey bees (*Apis mellifera*) gut bacteria can be beneficial/pathogenic and therefore, play a key role for bee life and bee by-products. To study gut cultivable bacteria of honey bees, 30 honey bee samples were collected from district Kohat of Khyber Pakhtunkhwa Province as there is no information about the diversity of bee gut microbiota from Pakistan. Complete digestive system of the worker bee was dissected and processed for bacterial isolation. A total of two hundred and nineteen bacterial isolates were obtained and characterized using traditional and modern techniques. The 16S rDNA gene sequence comparison with the available NCBI database sequences further confirmed the characterizations of well-known human bacterial pathogen. Results revealed the occurrence of the following bacterial genera: *Enterococcus*, *Morganella*, *Bacillus*, *Shigella*, *Escherichia*, *Pseudomonas*, *Staphylococcus*, *Salmonella*, *Micrococcus*, *Sphingomonas* and *Ochrobactrum*. The bacteria *Shigella sonnei* and *Salmonella enterica* cause diseases in few species of animals including man are positively characterized. This work suggested that forager *Apis mellifera* gut acts as reservoir and potential vector of bacterial pathogens.

[Abstract:0068]

Alternative Control of Varroa Mites Using Formic Acid and Thymol in Africanized Honeybee Colonies

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The effectiveness of formic acid and thymol in the treatment of the mite *Varroa destructor* was evaluated from June to October (rainy season) in an apiary of 16 Africanized honeybee colonies located in Alajuela, Costa Rica. The apiary was randomly arranged in three groups A, B and C of eight, five and three colonies, respectively. The group A was treated with 150 g of formic acid at 65%, group B received two applications of 25 g of thymol and colonies of group C were used as a control. *Varroa* traps were used in the bottom board of the colonies to collect mites. After four weeks, all colonies were treated with four strips of flumethrin to kill the remaining mites and to assess the effectiveness of the products. The effectiveness of formic acid and thymol in the control of varroa mites was 94.7% and 96.9% respectively. In colonies treated with formic acid varroa mortality occurred mainly during the 72 hours after application, meanwhile in the group treated with thymol the mite mortality was observed one week after treatment. In conclusion, the effectiveness of formic acid and thymol in the control of varroa mites was significant, for this reason both products can be considered as an alternative control for the integrated management of varroa mites in Africanized bees.

[Abstract:0081]

Genetic Characterization of (*Varroa destructor*) (Family: Varroidae) Prevalent in Honeybees (*Apis mellifera*) in the Province of Aydın in Turkey

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The aim of the present study was to identify the haplotypes of the *Varroa destructor* mite which infects honeybees in the province of Aydın in Turkey, using two different modified techniques for the mitochondrial Cox1 gene of the mite.

In order to confirm the haplotype, two primers differing in their sequence i.e. (Solignac et al. 2005) as forward primer 5'-TACAAAGAGGGAAGAAGCAGCC-3' and reverse primer 5'-GCCCCCTATTCTTAATACATAGTGAAAATG-3' and (Strapazzon et al. 2009) with COXF primer [5'GG(A/G)GG(A/T)GA(C/T)CC(A/T)ATT(C/T)T(A/T)TATCAAC3'] and COXRa primer [5'GG(A/T)GACCTGT(A/TA(A/T)AATAGCAAATAC3'] were selected. Amplified DNA 376 bp in size was acquired using (Solignac et al. 2005) primers. SacI restriction enzyme was applied to the amplified products; however, this restriction enzyme did not cut the DNA.

Amplified DNA, 570 bp in size was obtained using (Strapazzon et al. 2009) primers. XhoI and SacI restriction enzymes were used for the amplified products. Although, the SacI restriction enzyme did not cut the DNA, the XhoI restriction enzyme cut the amplified DNA into two fragments (bands), with the sizes of 270 and 300 bp two bands 270 and 300 bp. While comparing the results, these bands were found specific for Korean haplotype of *V. destructor*. In conclusion, all of the 200 samples of *V. destructor* examined in this study were identified to be the Korean haplotype.

[Abstract:0083]

Mortality of Varroa Mites Using Formic Acid and Thymol in Capped Worker Brood Cells of Africanized Honey Bees

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The mortality of varroa mites was analyzed in capped worker brood cells by using formic acid and thymol in Africanized honeybee colonies. The apiary was located in Alajuela, Costa Rica, and was randomly divided in three groups A, B and C. Group A was treated with 150 g of formic acid at 65%, while group B received 2 applications of 25 g of thymol and colonies of group C were used as a control group. Mortality of the varroa's different stages was evaluated in capped worker brood cells of the three groups at 24 and 72 h after treatment by checking the pupa and the bottom of the cells for mites. Eighty-six percent of mite mortality occurred in worker capped brood cells in colonies treated with formic acid, while varroa mortality was less than 10% in capped cells of colonies treated with thymol and control group. In conclusion, high mortality of varroa mites was determined in capped worker brood cell after applying formic acid, while mortality was low in colonies treated with thymol and control group. The foregoing could imply a direct effect of formic acid over mites in capped brood cells.

[Abstract:0085]

Mineral Metabolism in the Body of Bee and Drone Brood with Varroatosis

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Varroatosis is an invasive disease that affects prepupae, pupa, adult worker bees, drones, queens. Reproduction and development of the parasite occurs inside the bee sealed cells either on worker bee pupa or drone but very seldom on the queen pupa. The female produces egg laying at the bottom of the cell or a little higher. Males and females develop from laid eggs. As a result of parasiting of Varroa mite on the pupae of drones the later reduce the amount of vital substances: proteins, carbohydrates, and the level of intermediate product exchange increases. This may cause a decrease in drone pupae resistance.

Our results indicate that in the mid-July the worker bees and their prepupae have not been infested with Varroa destructor mite while the invasion of adult drones was 45,7 ± 2,89 per cent, prepupae – 79,43 ± 5,34 per cent. The result of determining the level of mineral substances in the hemolymph of worker bee and drone prepupae showed that in the hemolymph of worker brood the level of potassium, calcium, magnesium and phosphorus is much lower than in the hemolymph of the drone brood. The amount of these elements in the hemolymph of infested drone prepupae decreases. The level of mineral substances is in the following ratio: K > Ca > Mg > P > Cu, drone prepupae: K Ca P Mg Cu, infested drone prepupae: K > Ca > Mg > P > Cu. The worker bees and their brood in the period of the highest honey collection in the Tyumen Region aren't infested with Varroa destructor mite, while the drones and their brood have a high infestation, it is due to the fact that the hemolymph of drones has highest nutritional value.

The mineral composition of worker bees and drone brood have different meanings. Thus, the amount of potassium, calcium, magnesium, and phosphorus in hemolymph of worker bee prepupae is low in comparison with the amount of copper is higher. It has been determined that the infested drone brood has reduced level of calcium, magnesium, phosphorus and increased copper level that is a consequence of metabolic disorders.

[Abstract:0124]

Infestation of *Varroa underwoodi* (Acari: Varroidae) in *Apis cerana* in Eastern and Northern China

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Varroa underwoodi is one of the four species in *Varroa* genus. Due to the low occurrence in honeybee colonies, knowledge on this *Varroa* species is very limited. Since it was first described from *Apis cerana* in Nepal in 1987, it has only further been reported from *A. cerana* in South Korea (Woo, 1992), from *A. cerana* and *A. mellifera* in Papua New Guinea, from *A. cerana* and *A. nigrocincta* in Indonesia (Anderson et al., 1997), and from *A. cerana* in southwestern China (Huang, 2004). From 2014 to May, 2017, we surveyed *V. underwoodi* infestation in nearly 100 colonies from 23 apiaries in China, by opening more than 32600 capped drone cells and 1300 capped worker cells. Infestation of *V. underwoodi* in drone cells was found in colonies of 4 apiaries, including 1 in Jilin province in northern China, 1 in Jiangxi province and 2 in Zhejiang province in eastern China. In total, 32 adult female *V. underwoodi* mites were collected. The infestation rate in capped drone cells in these four apiaries differed from 0.05% to 1.77%. The reproductive rate of these foundress mites varied from 14.29% to 50.00%. Mites from different localities had similar size in length and width, but the number of setae of these mites varied from 15 to 23. Phylogenetic analysis based on 821bp sequence of *cox1* gene and 818bp sequence of *cox3* gene divided these mites into two clusters corresponding to northern population and southern population. Our results show that the geographical distribution of *V. underwoodi* is much wider than previously reported.

[Abstract:0150]

The Prophylaxis of Major Bacterial Infections in the Apis Mellifera Carpathica Bee Through Honey, Pollen and Bee Bread Control

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For the purpose of controlling the evolution of major bacterial diseases in bees, which decimate bee colonies in Europe and Romania, respectively, we examined samples (honey, pollen and honeycombs) in the apicultural year 2016, from all over Romania. Sample collection and testing were done with the purpose to prevent the contamination of bee colonies with the etiological agents of major bacterial diseases, considering that worker bees and the food entering the hive (honey, pollen) represent the main contamination ways. The diagnosis method observed OIE regulations (2008) and was adapted in an original way in the Bee Pathology Laboratory in Bucharest. A total of 73 samples were examined, representing honey (51), honeycombs (6) and pollen/bee bread (16), from private apiaries all over the country, that presented depopulation without clinical evolution of contagious diseases in bees, and in which we diagnosed the presence of etiological agents of major bacterial bee diseases (36.98 %), while the rest of the samples were negative (63.02%). Of the 51 samples of honey that were examined, we identified 39.22% positive samples and 60.78% negative ones. Of the pollen samples that were examined, 31.25% were positive and 68.75% were negative, and the honeycombs samples showed 33.33% positive and 66.66% negative. Previous researches indicated that the positive samples (honey, pollen, bee bread), from apiaries in all the regions of the country, represented the basis for the prophylaxis of major bacterial diseases so that, by avoiding using them in bee nutrition, the evolution of major bee diseases did not confirm clinically or paraclinically in the following season (January-April 2017). Acknowledgements "This work was supported by a grant of the Romanian National Authority for Scientific Research, CNDI-UEFISCDI, project number PN 157/2014"

[Abstract:0152]

In Vitro Testing of the Efficiency of Antibacterial Synergic Combinations of Propolis Tincture and Selected Plant Extracts

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Apiculture worldwide faces serious bacterial diseases (American foulbrood, European foulbrood), present both in Europe and in our country, causing important economic losses, decrease in bee colonies' strength and lower productivity, respectively. In order to control major bacterial diseases in bees through noninvasive methods, that should not leave residues in the hive products, and avoid use of antibiotics (forbidden in the E.U.), we proposed testing new phytotherapeutic formulas with the purpose to obtain an efficient apiphytotherapeutic product. As result of biochemical tests (contents of essential oils, flavonoids, polyphenolic compounds) we selected a number of 6 plant extracts from local flora (*Ocimum basilicum*, *Melissa officinalis*, *Thymus serpyllum*, *Rosmarinum officinale*, *Artemisia absinthium*, *Origanum vulgare*). The "in vitro" testing of the antibacterial action was performed through the agar diffusion method seeded with *Paenibacillus larvae* ATCC 9545 846 TM reference strain, using standard disks (Ø 10 mm) impregnated with the obtained extracts. As a witness (positive and negative), we used standard micro tablets of tetracycline (1µg concentration), respectively alcohol and distilled water. The inhibition areas of the various combinations of plant extracts and propolis tincture ranged within 21–25 mm, as compared to the tetracycline positive witness (45 mm) and with the negative witness of alcohol and distilled water, respectively (0 mm). The most efficient proved to be the combination of propolis tincture and oregano extract (inhibition area of 25 mm), followed by the combinations with *Ocimum basilicum* and *Artemisia absinthium* extracts. In vitro testing of plant combinations with propolis tincture demonstrated the synergic effects of these combinations and enabled phytotherapeutic formulas (plant extracts and propolis tincture), with an antibacterial effect that may be used prophylactically to control major bacterial diseases in bees. Acknowledgements "This work was supported by a grant of the Romanian National Authority for Scientific Research, CNDI-UEFISCDI, project number PN 157/2014"

[Abstract:0158]

Evaluation Cases of Parasites and Viruses of Honeybees in Marmara Region of Turkey

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The objective of this study was to evaluate cases of important parasitic and viral diseases of Honeybees in Marmara Region of Turkey. Bee materials used in this study was selected from the samples submitted to Pendik Veterinary Control Institute. Marmara region is located in north west of Turkey. It is bordered by Greece and Aegean sea to the west, Bulgaria and the Black Sea to the North. Bees have been infested by parasites that are capable of spreading rapidly through the bee population. Varroasis and Nosemosis cause major losses to the beekeeping sector in this region. One of the serious problems caused by Varroa is the transmission of viruses to honey bees which cause deadly diseases. A total of 100 samples of dead bees were examined for parasitological analysis in the Parasitology Laboratory between 2012-2017. Varroasis and Nosemosis were detected in 47% and 56% of samples respectively. No *Tropilaelaps* mite and *Aethina tumida* were found in these samples. Multiplex RT-PCR assay was performed for detection of bee viruses in Viral Diagnostic Laboratory in 2017. Deformed Wing Virus (DWV), Black Queen Cell Virus (BQCV), Acute Bee Paralysis Virus (ABPV) and Sacbrood Bee Virus (SBV) were detected in samples during this period.

Bee population around the world is in decrease due to changes in habitat and diseases. Findings of this study may provide better-defined starting point for future studies of honeybee health and may help scientists and beekeepers to reduce mortality and economic losses caused by viral and parasitic diseases.

[Abstract:0161]

Morphological and Quantitative Study in Honeybees Larvae Healthy and Affected by the "River Disease" in Uruguay

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During bee development, different factors can cause irreversible damage to individuals. In the early stages of larval development in *Apis mellifera* bees, trophocytes and oenocytes are the main observed cells. River disease (RD) affects larval development by ingestion of honeydew excreted by a flatid of the genus Hemiptera. The objective of the present work was to analyze the morphological parameters of oenocytes and trophocytes in larvae affected by RD. In vitro-bred larvae were fed with healthy nectar (n = 5) and nectar of colonies affected by RD (RDN). The larvae (n = 5) were fixed and processed histologically. Longitudinal sections (5µm) of larvae were cut with microtome and 20 images per larvae were captured at 400 magnifications per image analysis with ImageJ software. The numbers of oenocytes and trophocytes were measured as well as the nuclear area and diameter. The results were expressed as mean ± s.e.m., and compared by ANOVA, considering P < 0.05. The oenocytes of the larvae fed with healthy nectar presented clear contours, acidophilic cytoplasm and euchromatin nuclei, whereas the oenocytes of the larvae fed RDN showed irregular appearance and loss of spherical form of their nucleus (P < 0.001). Histologically the trophocytes of the larvae fed with healthy nectar presented rounded form, lipid vacuoles, and euchromatin nucleus, whereas the trophocytes of the larvae fed with RDN showed lack of cell limits and less number of lipid vacuoles. The area and nuclear diameter of the trophocytes decreased significantly in the RDN-fed larvae compared to those receiving healthy nectar (P < 0.001). In conclusion, trophocytes, responsible for detoxification, were the cells most affected by RD, suggesting an attempt to compensate the damage of the affected larvae.

[Abstract:0171]

Chitomilan – Natural Immunomodulator for Honeybees

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The problem of colony losses and an immunodeficiency growth leads to the use of antibiotics. This causes a further degradation of the microbiome and the immunity of bees and getting low-quality honey. Feed additives may serve as an alternative to antibiotics. However, the majority of feed additives consist of amino acids, vitamins and salts, and they just compensate for bees a poor nutrition and inefficient in the norm. Other feed additives, stimulators, based on cobalt or selenium, are more effective, but the use of alien substances difficult to control, they can easily exceed the norm of the reaction and cause a waste of energy. In recent years, natural immunomodulators from products of a vital activity of honeybees appear. Their main task is to restore the immunity of bees to the optimum level. Their main advantage is naturalness: native bee's substances are utilized quickly after exposure. We have developed and conducted successful trials of immunomodulator Chitomilan based on a chitomelanin complex, the main component of a bee's integument. The preparation restores the bee's immune system to the norm. In addition to the main action, Chitomilan stimulates a hygienic behavior, cleanses a body of bees and honey from heavy metals and residues of chemicals, serves as a prebiotic, stimulates the formation of hemolymph cells that participate in healing integument damaged by the mite Varroa. Chitomilan is recommended in autumn for improving the wintering, in spring for the worker bees activation and the Queen's egg laying stimulation, for weak families feeding (an economic profitability of a weak family increases by 70-80%), to protect bees from poisoning. Chitomilan consists only of natural products of bees. Its components disposed of quickly after the target action. This ensures his safety and no residues in honey.

[Abstract:0173]

Immunotropic effect of spore-forming probiotics and chitosan on honey bee

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One of the main causes of bee colonies mass losses is the decrease in the bees resistance to various infectious diseases. Insecticides, primarily neonicotinoids are attributed to a number of factors that reduce the honey bee immunity. It is shown that probiotics and certain molecular forms of chitosan contribute to the restoration of the honey bee natural sustainability. At the same time, the various chitosan forms along with the antibacterial effect have a prebiotic effect for some microorganism species. This raises the question about the prospects of joint application of chitosans and probiotics recommended for beekeeping. The aim of the work was to analyze the effect of probiotic strains of the spore-forming bacterium *Bacillus subtilis* (Bashinkom) in combination with chitosan on the honey bee viability and individual immunity systems state. The previously detected immunosuppressive effect of imidacloprid sublethal doses on honey bee allowed us to apply this insecticide to simulate the state of honey bee immunodeficiency. Worker bees treatment was carried out per os diluting the preparations in sugar syrup. A preliminary assessment of worker bees survival showed that the probiotic optimally acts after preliminary treatment with chitosan. This experiment variant was further evaluated for the bees immune system components activity. The consistent effect of chitosan and probiotic caused an increase in the level of phenoloxidase and antioxidant enzymes activity in the intestine and hemolymph, as well as a significant increase of the vitellogenin and abecin gene expression level in the fat body. We have found that *B. subtilis* probiotic strains have an immunomodulating effect on the honey bee mitigating the negative effect of subsequent intoxication with imidacloprid, whereas the use of the probiotic in already held intoxication and reduced immunity only impairs the physiological state of the bees. Pretreatment with chitosan in combination with the probiotic 3 days before imidacloprid neurointoxication significantly increased the worker bees lifespan and had a compensatory effect on the abecin and vitellogenin gene expression level. The data obtained stipulate the appropriateness of sequentially processing of bee colonies with chitosan and probiotic based on *B. subtilis* before foraging in agroecosystems.

[Abstract:0190]

Neonicotinoids are the Threat to Honey Bee Health

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The action of neonicotinoids is referred to a number of factors that cause massive losses of bee colonies in different countries of the world. In this regard, the impact of imidacloprid low doses which do not cause direct mortality, but disrupt the development and behavior of bees is of particular concern. Complex investigations on the effect of neonicotinoid small doses on all individuals in honey bee colonies were practically not carried out. The maximum non-lethal dose of imidacloprid in our experiments was determined to be 5 ng / bee. The maximum lifespan of worker bees in laboratory cages at this concentration was 15 days. The toxic imidacloprid effect was associated with pathological changes in the fat body cells, a decrease in the intestine tone, and the accumulation of excess feces. The protective function of the intestinal wall is realized by changing the muscle tone, the reaction of the epithelium and the peritrophic membrane, the internal environment pH, and the intestinal enzymes activity. The data obtained show that even a single maximally tolerated imidacloprid dose causes a complex of changes in the bee intestine that make it difficult to exercise mechanical and physiological protection against pathogens. A decrease in the activity level of phenoloxidase and antioxidant enzymes in the hemolymph, the vitellogenin and antibacterial peptides gene expression level and other important protective blocks of the individual resistance of the bee were noted. The same internal problems arose in fetal and barren queens, as well as in drones. Decrease in copulatory functions and sperm pathological changes were observed in drones. The drone sperm can serve as an indicator of the colony state as a whole. In fetal queens at this dose, the reproductive system protection was functioning and the sperm in the spermatheca remained viable, but the gene expression and content of vitellogenin and antibacterial peptides decreased. When treated with this imidacloprid dose in the apiary conditions, we observed the same phenomena in worker bees, drones and queens. Although outwardly the colonies looked prosperous, grew offspring and foraged, the ability of fetal queens to lay eggs decreased and drones sperm was defective.

[Abstract:0198]

Sacbrood Virus of Apis Cerana in Korean Apiaries

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South Korea has over 38 million of managed honey bee (*Apis cerana*) colonies before 2009 years ago, which produce the highest quantity of honey in the Korea; however, almost colony (99%) were collapsed by Korean Sacbrood Virus (KSBV) in South Korea. Korean Sacbrood Virus (KSBV) is the pathogen of *A. cerana* Sacbrood disease, which poses a serious threat to honeybee *A. cerana*, and tends to cause bee colony and even the whole apiary collapse. Colony collapse of *A. cerana* was first reported on the Pyeong-Chang of the South Korea in 2009. Symptoms of KSBV include the rapid transmission of larval stage honeybees (*A. cerana*), many dead larvae found in the bottom of hive and comb. Honeybees (*A. cerana*) are a very important species because they provide a number of pollination services for various ecosystems in some provinces (ex. jeon-nam, jeon-buk province). They are also extremely important organisms within human society, both agriculturally and economically. The fact that a direct cause has been determined suggests that colony collapse is a complex problem with a combination of natural and anthropogenic factors. Possible instigators of colony collapse include: wax moth, viral and fungal diseases, increased population, decreased genetic diversity, climate changing and a variety of other factors. The interaction among these potential causes may be resulting in immunity loss for honeybees and the increased likelihood of collapse.

[Abstract:0205]

Investigation of Honey Bee Deaths in Adana Province and Surroundings

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This study was carried out to evaluate the honeybee deaths in Adana and its environs with the involvement of expert teams from Pendik Veterinary Control Institute and Adana Veterinary Control Institute. In general, beekeepers in Turkey want to transfer their bees to the south of the country in the winter season and maintain their bees running in the early spring. During the transition from winter to spring the notice was given that many colonies were poisoned because the colonies were weak and powerless at the same time exposed to chemical effects as a result of agricultural struggle.

Significant mortality rates of young honeybees were observed during the early spring of 2017 in the Mediterranean Coast of Turkey. Samples were taken from the bee-farm in which the bee deaths occurred in Adana and its surrounding. The material of this study was consisted of honeybee samples, soil, corn plants and corn seed. A total of 111 samples were investigated by the LC-MSMS and GC-MSMS analysis methods in Toxicology laboratory. 20 samples of dead bees from Center of Adana and Ceyhan, Seyhan, Yumurtalık districts were examined for parasitological and viral analysis.

Some pesticides groups as neonicotinids, organocarbamats, prethroids and some herbicides groups and fungicide effective drugs residues were found in these samples. Nosema spp. was detected in the 20 samples by native examination and staining methods. Deformed Wing Virus (DWV) was also detected in these materials using Multiplex RT-PCR assay.

[Abstract:0212]

Diagnosis and Prevalence of American Foulbrood Disease (*Paenibacillus larvae* subsp. *larvae*) in Honey Bee Colonies in Algeria

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The American foulbrood in one of the most serious diseases that may affect brood of larvae and pupae stages, which cause economic losses and biological hazards in a large beekeeping sector in several countries across the world in general and Algeria in particular. The causative organism is a Gram positive bacterium *Paenibacillus larvae*. The objective of this study was to determine the prevalence of this disease in some regions of Algeria. The diagnostic method used is based on sampling of honey bee and detection of bacteria using microbiological methods, microscopic and biochemical. The QIAamp DNA Mini kit is used to identify the DNA of *Paenibacillus larvae*. The study was conducted on 87 samples of adult honey bees of various origins, harvested directly from the hive in 2014 and from different parts of northern Algeria. The results of the research *Paenibacillus larvae* at our study have shown notable variability between samples of honey bee from different regions examined. Several factors may explain this variation in the prevalence of the disease. The average infection rate for all regions is 16%. American foulbrood is a serious disease that affects our bees. This bacterium is the second most serious threat after the mite *Varroa destructor*.

[Abstract:0213]

Occurrence of Deformed Wing Virus by PCR in Honey Bees Colonies in Southern Algeria

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Honey bees are threatened by many pathogens including honeybee viruses. Among these viruses, deformed wings virus (DWV), it is considered as one of the most prevalent viruses in honeybee colonies and it is directly related to weakening and losses of infected colonies.

The aim of this study was to determine the prevalence of this virus in some apiaries in southern Algeria and to highlight the relationship between mortalities of these colonies and the presence of the virus. Sampling was carried out in Djelfa, El Bayadh, Laghouat, and Ain seffra Bechar on bee colonies of *Apis mellifera intermissa* race. We collected 45 samples of adult honeybees, each sample represents one apiary with mortality rate is higher than 10%. For the detection of the virus RNA is extracted using the NucleoSpin® RNA II kit (ACHERY-NAGEL). Reverse transcription of RNA and DNA amplification is performed using a continuous process by the RT-PCR method with the RT-PCR Kit (Qiagen) according to manufacturer's recommendations. RT-PCR program comprises a reverse transcription step at 50 °C for 30 minutes, followed by an initial activation phase PCR at 95 °C for 15 minutes. This is followed by 40 cycles at 94 °C for 1 minute, at 55 °C for 1min, and 72 °C for 1 minute. An extension step at 72 °C for 10 minutes occurs. The products were visualized by electrophoresis in 0.6% (w / v) agarose gels. The results show a variation in the prevalence of the virus between apiaries and study areas. Apiaries the Bechar region recorded the highest rate of infection (45%). The least contaminated zone is that Djelfa with a rate of 25%. No correlation was detected between recorded deaths and prevalence of this virus. Other causes may be the source of the colonies marked losses in these regions.

[Abstract:0215]

First Molecular Detection of Lake Sinai Virus alongside with Detection of Sacbrood Virus and Deformed Wing Virus in the Algerian Honeybee: *Apis mellifera intermissa*

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Viruses are among the most dangerous pathogens affecting honeybees. In this study, we performed a screening of the most common viruses in *Apis mellifera intermissa*. Two surveys were done during 2013 and 2014. Asymptomatic hives of 18 apiaries from 12 geographical locations were sampled in the region of Annaba (36°54'0 N and 7°46'0 E), the extreme north-east of Algeria. An average of 30 honey bees were sampled from each hive and stored in 70% ethanol. PCRs were performed for virus detection. Results confirmed the presence of Sacbrood Virus and Deformed Wing Virus in Algeria and revealed for the first time the occurrence of Lake Sinai Virus. Acute Bee Paralysis Virus, Israeli Acute Paralysis Virus, Kashmir Bee Virus, Slow Bee Paralysis Virus and Chronic Bee Paralysis Virus were not detected during our screening. Our study confirms the global spreading of honeybee viruses. However, because sampled hives didn't display typical symptoms triggered by detected viruses, *A. mellifera intermissa* known for its cleaning behaviour seems to be well adapted to the worldwide sanitary situation and global warming.

[Abstract:0224]

Analysis of Israeli, Turkish, Cyprian, Tanzanian and New Zealand (Manuka) Honeys for Pyrrolizidine Alkaloids

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Pyrrolizidine alkaloids (PAs) are hepatotoxic secondary plant metabolites produced by a large number of plants from the Asteraceae, Boraginaceae and Fabaceae families. Although the Codex Alimentarius Commission has prepared recommendations in a Code of Practice on "Management of the presence of PA-containing plants", no legal limits currently exist for PAs in food products. Within the European Union, the general recommendation is to follow the "ALARA principle": as low as reasonably achievable.

Honey may contain PAs and thus may pose a potential health risk for consumers. It seems that the level of contamination depends on the geographical and botanical origin of the honey. Israel has four different geographical zones, and the country's climate ranges from semi-arid to temperate to subtropical. We expanded the study to several other countries in three continents for the presence of PAs in honey, covering different climatological and geographical zones. We analysed 81 honey samples collected during 2013 and 2015. The PA concentration of the honeys was determined by target analysis using LC-MS/MS. The samples were analysed for the presence of 70 different PAs, covering senecionine-, lycopsamine-, echimidine- and heliotrine-type PAs, and including free bases and N-oxides. The limit of quantitation (LOQ) for individual PAs ranged from 0.3 µg/kg to 1 µg/kg.

The mean PAs concentration was 45.7 µg/kg for Israeli honeys (n=33), 5.5 µg/kg for Turkish (n=28), 1118.3 µg/kg for Cyprian (n=7), 13.7 µg/kg for Tanzanian (n=11) and 15 µg/kg for Manuka honey (n=2). The highest PA concentration (2147 µg/kg) was found in a honey from Cyprus. In all honeys the free base forms of the PAs dominated; PA-N-oxides on average only contributed 3% to the total PA content.

Heliotrine-type PAs were abundant in most countries and geographic regions, although lycopsamine-type PAs were more dominant in Tanzanian and Turkish honeys and also in Manuka honey. Turkish honey contained more echimidine-type PAs. Senecionine-type PAs were mostly found in honey from the southern part of Israel and less in honeys from the central and northern regions of Israel. This probably reflects the different botanical settings of the central and the southern climate regions.

[Abstract:0230]

Changes in Expression of Cu, Zn Superoxide Dismutase (SOD1) in *Aphis Mellifera* Larvae in Response to Temperature Stress

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A change in climatic conditions due to global warming could increase external stress on honeybees and have an impact on the survival of these ecotypes or of honey bee species that are closely associated with their environment. One of the climate conditions, temperature affect various aspects such as life span, immunity and behavior. For example, as the honeybee brood is extremely stenothermic, accurate temperature regulation is indispensable for its proper development. Also, it is known that temperature stress is a key mediator in reactive oxygen species (ROS) formation. All organism including insects have evolved many defences to protect themselves from the harmful influences of reactive oxygen species which implicates in mutation and longevity. Many studies have investigated the importance Cu-Zn SOD (SOD1), which reduces such damage by responding to oxidative stress and have been shown to protect cells from reactive oxygen species. Therefore, the purpose of this study were to analyzed the gene expression of superoxide dismutase of honeybee larvae (*Apis mellifera*) in vivo by temperature stress.

[Abstract:0231]

Impact of two Acaricides Fluvalinate and Oxalic Acid on the Acetylcholinesterase and Glutathione S-Transferase Activities in *Apis Mellifera Intermissa* (Hymenoptera, Apidae)

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"Honey bees, *Apis mellifera* L. (Hymenoptera, Apidae), are ecologically and economically important insects. They ensure the pollination of many wild flowers, and thus contributing to plant biodiversity. The economic value of honey bees results not only from the hive products (honey, royal jelly, propolis and wax) but also from pollinating activity on crop plants. Honey bee colonies are host to a variety of parasites that can seriously affect their growth and survival. *Varroa destructor* (Acari, Varroidae), is the most serious parasitic mite of honey bees worldwide that influences the development and performance of colonies. Early control of the mite is necessary to prevent bee colonies from dying of secondary infections. Several chemical substances were used to reduce or eliminate the damages caused by *V. destructor*. The objective of the present study was to determine possible negative effects of two acaricides fluvalinate, a synthetic compound, and oxalic acid, a natural substance by measuring two biomarkers, acetylcholinesterase (AChE) and glutathione S-transferases (GSTs) activities in newly emerged workers bees, nurses and foragers of *A. mellifera intermissa*. Two groups of five hives each were treated with these acaricides and one group was left as control. Data showed that fluvalinate led to increase GST activity and decrease AChE activity in emerged and nurse bees as compared to controls. In the forager bees, the enzymatic activities were similar in all groups of honey bees. However, oxalic acid has no significant effect on AChE and GST activities in the emerged, nurse and forager bees."

[Abstract:0233]

Sublethal Effects of the Neonicotinoid Insecticide Thiamethoxam on the Transcriptome of the Honey Bees, *Apis mellifera* (Hymenoptera, Apidae)

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Neonicotinoid insecticides are now the most widely used insecticides in the world. Previous studies have indicated that sublethal doses of neonicotinoids impair learning, memory capacity, foraging and immunocompetence in honey bees. Despite these, few studies have been carried out on the molecular effects of neonicotinoids. In this study, we focus on the second-generation neonicotinoid thiamethoxam, which is currently widely used in agriculture to protect crops. Using high-throughput RNA-Seq, we investigated the transcriptome profile of honey bees after subchronic exposure to 10 ppb thiamethoxam over 10 days. In total, 609 differentially-expressed genes (DEGs) were identified, of which 225 were up-regulated and 384 were down-regulated. Several genes, including vitellogenin, CSP3, defensin-1, Mrjp and Cyp6as5 were selected and further validated using real-time quantitative PCR (qPCR) assays. The functions of some DEGs were identified, and GO enrichment analysis showed that the enriched DEGs were mainly linked to metabolism, biosynthesis and translation. KEGG pathway analysis showed that thiamethoxam affected biological processes including ribosomes, the oxidative phosphorylation pathway, tyrosine metabolism pathway, pentose and glucuronate interconversions and drug metabolism. Overall, our results provide a basis for understanding the molecular mechanisms of the complex interactions between neonicotinoid insecticides and honey bees.

[Abstract:0234]

Enhanced of the CBPV Level in Honeybee Exposed Chronically to Environmental Imidacloprid

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Honey bee plays a vital role in pollination for plants and crops, especially for wild plants in mountain area in China. However, there are increasing reports about the large number of honey bee dead or unable to forage in many apiaries. Although a variety of emergent microbial pathogens were thought to be impact to honeybee colony losses, little is known about the interaction between viruses and environmental stressors, such as pesticides. To understand better the causes, we collected samples from several provinces and to screen the 8 common viruses and imidacloprid. The results shown that samples were widespread infected by CBPV as well as imidacloprid from environment. To confirm whether imidacloprid can elevate the level of CBPV under the natural condition, we infected healthy bee samples with crude CBPV at low level and then feed the imidacloprid, and found that imidacloprid can enhance the level of CBPV of honeybee. These indicated that pesticides from environment have impacts on honey bee healthy in a long term.

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[Abstract:0242]

First Detection of *Nosema Ceranae* in Honey Bee Colonies in Georgia

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The first detection of *Nosema* species in honey bee and evaluation of parasite spore load on the apiary level has been executed in two regions of Georgia. The regions have been differing mainly in pesticide use pattern for decades: pesticide free and massively treated agricultural fields. Adult bees of different ages were collected from the commercially managed honeybee colonies and analyzed for the *Nosema* spore load twice: late autumn and early spring, using phase contrast microscopy. In total, 200 colonies were sampled.

The employed standard molecular detection method of the *Nosema* species has revealed *Nosema ceranae* as causative agent. No associations have been found between the spore load of *N. ceranae* and the loss rates of honey bee colonies, during winter 2016/17. However, tenfold increase of the *Nosema* spore load per sample (colony) was noted in the samples from the region with heavily treated agricultural fields, contrarily to the samples from pesticide free space, where spore load remains the same. In the same time significantly higher proportion of the *Nosema* positive colonies had been noted during the study of spring samples (67% VS 44%) solely in the pesticide free region. The most likely explanation for the differences in results can be divergent agricultural practice of the pesticide use, indirectly affecting the honeybee health; therefore, further sampling and full year monitoring will be conducted to check the validity of this hypothesis.

[Abstract:0256]

Methods of Protecting Honeycombs Against Wax Moth

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Ltd "Demetra" Beekeepers-researchers group

Beekeepers-researchers group of "Demetra" LTD (Georgia) has developed two environmentally friendly methods of protecting honeycombs: to influence on spare honeycombs kept in hives with air heated at $47 \pm 1^\circ\text{C}$ (patent for an invention #6265, A01K51/00, 2015); by processing in freezer. The authors started to implement the first method at the end of the active season (September) in conditions favorable to organized hatching of moth larvae ($25-30^\circ\text{C}$). The first processing at 47°C was done on the 5th day from the beginning of the experiment in accordance with O. Grobov (1987). It turned out that only larvae are killed at this temperature, which is why the honeycombs were repeatedly processed on the 8th day. Thereafter, the processed honeycombs were placed in the biological thermostat for 20 days at 27°C , but the appearance of moth larvae was not observed. The total duration of treatment at $47 \pm 1^\circ\text{C}$ was not more than 30 minutes. The circuit of the equipment required for the process included calorifier (was placed on the underside of hive blocks), air collector (roof) and ventilator between them. Further protection against moth was continued by isolating blocks with wire mesh from the bottom and top.

It is known that all forms of moth (egg, larva and adult) die at $-12-15^\circ\text{C}$ (Tskvetkova, 1949; Shimanuki, 2010). We have identified the effectiveness of low-temperature processing, with different durations 1-2.5 hour. The honeycombs to be treated were placed in metal containers and then in freezer under the temperature mode, that is already set. After treatment the honeycombs were placed in hive blocks. The time spent on processing was recorded after setting the desired temperature. Internal forced ventilation of the air masses was not carried out in the freezer, which, in our opinion, would accelerate ordered decrease of temperature in containers with honeycombs. Sterilization of all forms of moth was achieved within 90 minutes (min. time).

Both methods are safe in terms of environmental cleanliness, but labor costs are clearly increasing when using freezer as a result of moving to hives block after putting honeycombs in metal containers and treatment, but the processing is done only once, unlike the first way.

[Abstract:0258]

Development of Detection Method Using Ultra-rapid PCR and DNA-chip Against 11 Major Pathogens in Honeybee

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We developed multiple detection methods using ultra-rapid PCR and DNA-chip against 11 major pathogens of honeybee. The 11 kinds of major infectious pathogens in honeybee included Black queen cell virus (BQCV), Chronic bee paralysis virus (CBPV), Deformed wing virus (DWV), Israel acute paralysis virus (IAPV), Sacbrood virus (SBV), Korean sacbrood virus (KSBV), *Paenibacillus larvae*, *Melissococcus plutonius*, *Ascosphaera apis*, *Aspergillus flavus*, *Nosema apis* and *Nosema ceranae*. The developed PCR-chip based ultra-rapid PCR showed successful amplification for all 11 major pathogens in the presence of more than 10^2 molecules. In the case of the lower template, each detection was possible on the Tm value and the specially designed DNA-chip in addition to the fluorescence graph. The time required to confirm the amplification (Ct-time) was about 10 minutes and it took about 20 minutes including reverse transcription for virulent pathogens. These detection methods are capable of highly rapid and sensitive testing by combining ultra-rapid PCR and DNA-chip against honeybee pathogens.

[Abstract:0260]

Evaluation of Honeybee Losses in Terms of Diseases in Turkey

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Before the season of 2017, from the end of winter, there was a high level of honeybee losses throughout Turkey. Losses have reached up nearly 80% of hives in some apiaries, but generally between 25%-75%. These losses have not been seen since the year 2010 when huge numbers of colonies have lost especially in South part of Turkey. With the request of Beekeepers Central Association of Turkey, a group of scientist, mostly veterinarian, have investigated the reasons for those losses. The investigation was conducted in different regions of Turkey with the guidance of local association chiefs. As a result of research, losses did not link up to a unique reason. Possibly, there were plural reasons responsible for the losses that one of them was widespread diseases like Varroosis and Nosemosis. Laboratory investigations and questionnaires have shown that there is a big problem about the treatment/control of bee diseases, especially with those two. The level of consciousness about the struggle against bee diseases/pests should be increased with the education of beekeepers locally and nationally. These reasons of honeybee losses and solution methods are discussed in this presentation.

[Abstract:0271]

Honeybee Health Status in Algeria

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Declines of honeybees and other pollinator populations in many regions of the world are of concern because of their critical role for crop production and biodiversity maintenance. Multiple factors including diseases and parasites play a role in causing these declines. As little data is available concerning the status of honeybee health in Africa, a screening of pathogens and viruses was done for the native subspecies of Algeria in northern Africa: *Apis mellifera intermissa* and *Apis mellifera sahariensis*. This review synthesizes the works on honeybees sampled of more than 242 colonies from different regions in the north and the south of Algeria over a period of three years (2012-2014). We screened for mites (*Varroa destructor*, *Acarapis woodi*); microsporidia (*Nosema ceranae*, *Nosema apis*, *Nosema bombi*); protozoa (*Apicystis bombi*, *Crithidia mellificae*) and bacterial (*Paenibacillus larvae*, *Melissococcus plutonius*) pathogens and viruses [Deformed Wing Virus (DWV); Acute Bee Paralysis Virus (ABPV); Israeli Acute Paralysis Virus (IAPV); Kashmir Bee Virus (KBV), Sacbrood Virus (SBV), Lake Sinai Virus (LSV), Slow Bee Paralysis Virus (SBPV), Chronic Bee Paralysis Virus (CBPV), Black Queen Cell Virus (BQCV), Varroa Destructor Virus (VDV-1)]. The studies in *A. m. intermissa* and *A. m. sahariensis*, subspecies of *A. mellifera*, adapted to a hot climate, revealed the presence of *V. destructor*, *N. ceranae*, *P. larvae*, *A. bombi*, *C. mellificae*. Eight out the ten viruses studied were detected (DWV, ABPV, IAPV, SBV, LSV, SBPV, CBPV, BQCV). In addition, a parasitism of a phorid flies species: *Megaselia scalaris* and *Senotainia tricusps* (Diptera: Phoridae) was reported in honeybees and we found DWV to be present in adult flies of *M. scalaris* and actively replicating in the fly larvae. Despite the presence of multiple virus infections and pathogens in the colonies screened, these colonies showed no obvious clinical signs of diseases and colony losses were low in Algeria. It was hypothesized that viruses display a low virulence in our country and therefore do not have a strong impact on colony health or that the native subspecies are less sensitive. We think these data will contribute to the growing knowledge concerning bee pathogens and their global spread in different climate regions.

[Abstract:0300]

A Forensic Case: The Role of Hive Robbery in Disease Dissemination

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Bee diseases are spread according to the type of the disease, the mode of action and the modes of transport. Diseases that spread by natural means can sometimes be transferred to different bee colonies with the wrong techniques of beekeepers. Among these techniques are found the absence of clean apiaries and the usage of non-sterile hand tools between hives. Apart from all known transmission routes, the role of a forensic event in Cyprus in the spread of bee diseases has been evaluated in this study.

It has been reported since 2011 that bee hives have been widely stolen, especially in the north-eastern part of Cyprus. The person who stolen 11 beehives each time was searched by judicial authorities. The person caught incidentally in 2016 and more than 400 empty hives and 100 hives with bees were found during the search of his house. When the status of the bee colonies in the hives is assessed in police custody; it has been found that many hives belong to different people and are stolen at different times.

Since there is no sign of foulbrood in the hives, adult bee samples were taken from each hive and the intestinal contents were evaluated in the laboratory and the presence of *Nosema* species was investigated. Within this scope; The *Nosema* status of each hive has been determined. As a result of the study, *Nosema ceranae* was microscopically detected in all hives. There was a difference between the densities of *Nosema* spores in the hives. The fact that the amount of *Nosema* in the latest stolen hives is low suggests that every hive brought to the apiary is becomes in contact with the pre-existing disease. Thus, it has been revealed by a forensic case that disease agents between hives can be easily transferred in apiaries

[Abstract:0310]

Stress Responses of Honey Bees to Organic Acid and Essential Oil Treatments Against Varroa Mites

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The aim of this study was to observe and examine the impact of natural medicines such as formic acid, oxalic acid, thymol and menthol, which are recently used as an alternative treatment for honey bee Varroa, on HSP 70 results considering the measures on brain tissues of bees. For this purpose five different treatment groups were created containing various concentrations and administrations of formic and oxalic acid and thymol-menthol mixture. Also in this study, positive (untreated) and negative controls were added. Thus study was performed with a total of seven groups. In the study, it has been found that in the groups which are exposed to varroa treatment by using natural substances, HSP 70 results have been observed to be lower than the results in non-treated groups. On the other hand, among the treated groups, in the ones that are exposed to thymol-menthol mixture, HSP 70 results have appeared to be the lowest. It has been concluded that considering the bees' comfort, it would be more adequate and beneficial to prefer natural medicines against varroa that leads to lower HSP 70 results which are the molecular determinants of stress.

[Abstract:0351]

Aspects of Pollen Sources Used in Supplementary Feeds and the Presence of Etiological Agents of Mycosis and Nosemosis

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The importance of mycoses in bee health and their implication in agricultural crops pollination is very well known. Recent bibliographic references demonstrated the classification of nosema etiological agents (*Nosema* spp) as parasitoses caused by micelles. The purpose of the study consists in highlighting the importance of mycoses control through laboratory testing of samples of pollen (from own apiaries, imports, exchanges between beekeepers) used in the supplementary feeding of bees, as an important prophylaxis method. We collected and examined in the Bee Pathology Laboratory in Bucharest a number of 34 pollen samples from 17 apiaries, from 275 bee colonies, respectively. The main method for pollen testing was direct microscopy and samples colored typically for mycoses. The laboratory test results on the pollen samples were positive for mycoses etiological agents, respectively of nosemosis (64.71 %), the rest being negative (35.29 %). Laboratory testing for the positive samples showed the presence of mycoses spores (35.39 %), nosemosis (29.21 %) and micelles spores and nosema (35.40 %). This proves that etiological agents of mycoses and nosemosis were found in over 70 % of positive samples, and for *Nosema* spp. in over 29 % of samples. The presence of etiological agents may be a real danger for bee colonies' health on a long term so that microscopic laboratory examination of pollen samples is recommended in the prophylaxis of mycoses and nosemosis, respectively, in bee colonies. Acknowledgements "This work was supported by a grant of the Romanian National Authority for Scientific Research, CNDS-UEFISCDI, project number PN 157/2014"

[Abstract:0379]

Effects on Biochemical Biomarkers of Honeybees (*Apis mellifera intermissa*) After Exposure to Titanium Dioxide

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The honeybee is among most important pollinators threatened by environmental pollution, pest control and products of nanotechnologies. The aim of the current study was an analysis of the neurotoxic potential of ingested titanium dioxide (TiO₂) on *Apis mellifera intermissa*. We analyzed the activities of a stress-related enzyme glutathione S-transferase (GST), and the neurotoxicity biomarker acetylcholinesterase (AChE). As results, monitoring of biochemical parameters showed a sizeable stimulating protein (Synthesis) associated with stimulation of GST activity parallel to a decrease in the average rate of GSH, but it occurs only at the highest tested concentrations.

Here we provide evidence that TiO₂ has a neurotoxic potential and thus might contribute to colony survival. Based on our findings we conclude that the increase in GST observed associated with inhibition of acetylcholinesterase activity could be used as biomarkers of toxicity and the potential use of titanium dioxide (TiO₂) in agriculture is not safe for honeybees at the tested concentrations.

[Abstract:0401]

Differential Responses of Honey Bee Subspecies to *Nosema ceranae* Infection

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As one of the World's most important centers of apiculture, Turkey harbors five subspecies of *Apis mellifera* L., approximately 20% of the honey bee subspecies in the world. In this study we addressed the immune defence reactions, locomotor activity differences of five honey bee subspecies upon *N. ceranae* infection. As a parameter for immune strength, the increase in the production of antimicrobial peptides (defensin, hymenoptaecin, apidaecin and abaecin) was investigated for each subspecies as an indication for active humoral immune system. Subspecies included in the study showed variation in the ability to generate antimicrobial peptides as well as eater and vitellogenin. The role of genetic diversity in decreasing the pathology and failure of the colonies against the diseases in honey bees were suggested in many studies. Thus determination of immune responses across diverse honey bee genotypes may provide preliminary data and useful genetic information in this research field for future preservation and breeding studies of certain subspecies.

[Abstract:0425]

Histochemical Observations of Nosemosis in Honey Bee Midgut

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Nosemosis is a serious parasitic disease of adult honey bees (*Apis mellifera*) caused by *Nosema apis* and *Nosema ceranae*. Bees are infected orally by food contaminated with spores. In order to grow and develop normally, honeybees must obtain sufficient amount of protein through food. Pathological changes of midgut mucosa cause digestive and metabolic disorders.

In this study we described the histological characteristics as well as the content and distribution of mucosubstances in the midgut mucosa of the honeybee from Yenimahalle/Ankara. Tissue samples were taken from healthy and infected workers. To extract the midgut, a larger pair of forceps was used to hold the head and chest of bee, and a smaller pair of forceps to hold the top of the last abdominal segment and carefully pull out the intestines. The samples were fixed in a 4% formaldehyde solution, embedded in paraffin and cut with a microtome to 5 µm thick sections. Slides were stained with the Mallory's trichrome stain for revealing general morphological and for describing neutral mucosubstances, acid and sulphate mucosubstances and metachromasia we used the Periodic Acid-Schiff Reaction (PAS), Alcian blue and Toluidine blue (TB). Slides were examined with a Leica DM2500 light microscope. All images were captured with a digital camera (Leica DFC450).

Due to invasion *Nosema* spores in midgut mucosa, we observed degenerative and lytic processes occurring within invaded cells, and due to an increase in osmotic pressure, cell membranes were burst and destroyed. Analysis of the midgut epithelium revealed that some cells were with invisible nuclei, the cytoplasm of these cells was densely granulated with vacuoles of various sizes, while cell boundaries were not clearly marked and most cell membranes had been degraded. Histochemical analysis revealed an decrease in the production of mucosubstances with carboxylic groups and rich in sialic acid. Nosematosis inhibits production and secretion of mucous from midgut epithelium at a certain level and also loss of epithelial integrity. Our results were not sufficient to explain which mechanisms are involved on that reduction of secretion. However different hypotheses could be postulated such as nutrient-blocking effect of Nosemosis and lysis of infected epithelial cells.

[Abstract:0441]

Molecular survey of Paenibacillus Larvae the Causative Agent of American Foulbrood in China

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American Foulbrood disease (AFB) is one of the most distractive diseases of honey bees in the world. Recent study indicated that the virulence of AFB is genotypic based. Therefore investigating the genotype of *Paenibacillus* larvae will be of great importance for developing an effective strategy for managing and controlling this disease. Genotypic information of *P.* larvae worldwide is few and almost absent from China. Here we conducted the first molecular survey on the prevalence and distribution of AFB in China. Using, 4 pairs of primers and sequencing of the 16S rRNA gene of 23 samples of honey bee colonies collected from 7 provinces, we isolated and characterised the *P.* larvae from infected honey bee colonies in China. The prevalence, however, is appeared to be relatively low among the 7 provinces, only 4.3% of the inspected apiaries (1 out of 23) were found to be infested with AFB. Sequencing analyses indicated that the isolated bacteria are close related to *P.* larvae strain PL86. Moreover the isolated *P.* larvae showed typical phenotypic and genotypic characters to ERIC I. Although we detected only one genotype (ERIC I) we do not exclude the finding of other genotype. Therefore further genotypic investigation is needed.

[Abstract:0450]

Antimicrobial Activity of Lebanese Propolis Ethanolic Extracts Against *P. Larvae* and AFB Control

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Treatment of bee diseases such as American foulbrood (AFB) by antibiotics is linked to economic problems as well as human and bee health related hazards. Indeed, widespread use and misuse of antibiotics results in the presence of their residues in the products leading to a risk on the consumer's health as well as to economic problems regarding commercial exchanges between countries of bees' products. Moreover, use of antibiotics will definitively contribute to the development of antibiotic resistance leading to the wide spread of bee diseases. The aim of this work is to seek natural alternatives to antibiotics that are adapted to the Lebanese conditions for the treatment of the AFB. Use of propolis as a natural alternative to antibiotics is proved by several authors. However, the translation of these studies findings into the field practice is limited by the composition of these products, which varies from one region to another according to the climatic changes (sun, temperature, etc.) and the nature of the soil which affects the plants from which they are extracted. Hence the importance of studying the antibacterial effect of several propolis ethanolic extracts (PEE) produced in many areas of Lebanon against *P. Larvae* and their potential for the control of AFB.

The methodology of the work is based on *in vivo* and *in vitro* experiments. For this purpose, propolis is harvested from 4 different Lebanese areas. In vitro activity of PEE against *P. larvae* isolates is evaluated by the dilution method and the minimum inhibitory concentrations (MIC) are determined. Toxicity for honeybees is evaluated by oral administration of PEE and its lethal concentration 50 (LC50) was assessed.

The expected results (in progress during this month) will hopefully enable us to find a treatment with natural products of the AFB adapted to Lebanese and the area conditions.

The applied interest of this research topic concerns:

- Consumer health by producing honey without residues of antibiotics.
- The economy of the apiculture sector by producing honey without antibiotics suitable for export.
- the health of bees by limiting the development of disease resistance to antibiotics.

[Abstract:0464]

The Effect of Imidacloprid on the Length of Life of Honeybee Larva

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Social insects live by storing and transporting the food they collect to their nests and by carrying out a number of activities (feeding the baby, feeding the winter food, etc.). Honey-bees also bring their food to their hives, so they can feed their young offspring to continue their generations. The nectar, pollen, propolis and water are necessary for the survival of young bees and larva in hive. In the study, Anatolian bee and imidacloprid active pesticide from Neonicotinoid group were used. The commonly used imidacloprid dose and the dose prepared by diluting this dose by %50 (20-10-5-2,5-1,25-0,625-0,312-0,156-0,078-0,039-0,019-0,0097 ml/100-l-water) were given to larva in the form of 2 molar syrup and were given 4 microliter. In the end of the study, among the bees that received the different doses of imidacloprid the larva that were given 20, 10 and 5 ml/100-l-water dose died and that is %100 of the entire larva. %92 of 2,5 ml/100-l-water dose given larva died whereas %2 of them became pupa, yet they couldn't make it out of the pupa. %86 of 1,25 ml/100-l-water dose given larva died whereas %6 of them became pupa, yet none made it out of the pupa. %78 of 0,625 ml/100-l-water dose given larva died whereas %16 of them became pupa and %4 of these pupas were able to become mature. %72 of 0,312 ml/100-l-water dose given larva died whereas %18 of them became pupa and %14 of these pupas were able to become mature. %54 of 0,156 ml/100-l-water dose given larva died whereas %34 of them became pupa and %24 of these pupas were able to become mature. %40 of 0,078 ml/100-l-water dose given larva died whereas %48 of them became pupa and %42 of these pupas were able to become mature. %14 of 0,039 ml/100-l-water dose given larva died whereas %68 of them became pupa and %58 of these pupas were able to become mature. %4 of 0,019 ml/100-l-water dose given larva died whereas %80 of them became pupa and %72 of these pupas were able to become mature. %100 of 0,0097 ml/100-l-water dose given ones and control group bees became pupa and all of them became mature.

[Abstract:0468]

Does Imidacloprid Prevent the Honey Bees from Getting Direction?

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In order to prevent crop losses in ever-diminishing agricultural areas, use of pesticides against agents damaging agricultural products increase. Although the pesticides used prevent the loss of crops in the short run, they also cause the decrease or disappearance of useful insects and pollutants which are important for our future. In this study, imidacloprid active pesticide from neonicotinoid group and Anatolian honey-bees *Apis mellifera anatoliaca* were used. In the study, 10 ml/100-L-water dose of imidacloprid and 6 separate doses (10-5-2,5-1,25-0,625-0,312) prepared by diluting this dose by %50 were used in forms of 2 molar syrup. The hives used in the experiment were separated from the bee place and brought to an open land and each hive was painted with different colors. The worker bees in the hive were painted in the color of the hive with water-insoluble dyes. Carnation-scented syrup was put 10, 50 and 100 ahead of the hives and from those that came, younger field bees were captured. The captured bees were kept in the fridge for 3-4 minutes in order to make them faint. The color of their hives was marked by coloring their abdomen with the color determined for each dose. The bees that came to themselves were kept hungry for an hour and then each dose was prepared as 5 microliter 2M syrup and was given to the bees. They, then were brought to where they were captured and set free. 5 microliter 2M drug-free syrup was given to control bees.

At the end study, after 1 hour %69,33 of control group bees came back whereas %25,11 of drug given bees came back.

At the end of the first day, %84 of control bees and %32,88 of drug given bees came back to their hive. At the end of the second day, %88 of control group bees came back while %36,44 of drug given bees came back to their hive. 1 hour after drug application, all of the control group bees returned to their hives whereas %10,44 of drug given bees were confused with their hive. At the end of the day, %0,22 of the control group bees were confused with their hive and %8,66 of drug given bees were confused with their hive.

[Abstract:0489]

Multi-stakeholder Platforms for Promoting the Apiculture Sector in Africa: Continental and Country Experiences and Learning

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The African Union InterAfrican Bureau of Animal Resources (AU-IBAR) and the International Centre for Insect Ecology and Physiology (ICIPE) are jointly implementing a Bee Health Project. The Project aims to enhance the contribution of bees and other pollinators to food security and improved livelihoods in Africa. The Project focuses on actions that contribute to strengthening the institutional environment for the health of bees and their colonies. The health thrust is an entry point for improving honey production and market access, and for promoting pollination services. Central to the actions was the need to facilitate mobilization and coordination of multiple stakeholders in the apiculture sector. The establishment of a continental African Apiculture Platform (AAP) drew on the convening mandate of the African Union to bring the public sector, beekeeper institutions, private sector and volunteer sector onto one table. The AAP availed opportunity for dialogue, policy engagement and agenda setting. The Working Groups of the AAP bring on board specialized institutions and experts key to enhancing the knowledge and evidence based decision making of the platform. The Platform has contributed to raising awareness of the sector precipitating a change in the institutional framework in some countries.

Recognizing the impact of the AAP, stakeholders recommended the establishment of mirror structures at country level or strengthening of existing structures. The process was undertaken in over thirty countries guided by principles, within a framework that took cognizance of the unique situations in each country. The process revealed broad categories of countries ranging from those where beekeeping was an ancient occupation, with a wealth of indigenous knowledge through to those where the sector is almost non-existent, its development curtailed by deeply ingrained traditional beliefs. In a few countries it has evolved into a business that earns forex. In most countries it is still viewed as an alternative livelihood for rural populations. This paper examines the process, challenges, learning and achievements, the opportunities that emerged. This paper provides case studies on the level of implement of action plans, and approaches countries took to harness the platform and embed sustainability.

[Abstract:0491]

Investigation and Identification of Deformed Wing Virus (DWV) in Diseased Apiaries in Iran by RT-PCR

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Among the viruses infecting honey bees, deformed wing virus (DWV) is known to induce significant losses in honey bee colonies. DWV is a single stranded RNA virus. Since the discovery of DWV in bees with deformed wings, evidence has been accumulated that the virus is closely associated with *V. destructor*. The virus is widely distributed and prevalent in colonies infested by the mite. Using RT-PCR based assays, the virus infections in honey bees can be detected and quantified in a rapid and accurate manner. Infected honeybees from colonies suffering with symptoms of depopulation, sudden collapse, paralysis, and varroa infestation, used in this study, originated from 23 provinces of Iran. Bee samples were collected between July - September 2011 and 2012. Altogether, samples from 156 apiaries were collected and submitted for virus screening. From each apiary, 100-500 adult worker bees were sampled. RNA extraction and RT-PCR were performed with QIAGEN kits. The primers lead to a fragment of 434 bp. The PCR products were electrophoresed in a 1.2 % agarose gel (stained with ethidium bromide). Following the RT-PCR reaction with the specific primers, out of the 156 apiaries examined, 34 (21.8 %) were infected with DWV. This is the first study of DWV detection in Iranian apiaries. We have looked into the occurrence of the DWV and identified differences in the distribution of the virus in the collected samples from different geographic regions of Iran. The spread of *V. destructor* has been implicated in a dramatic increase in the prevalence of DWV and it is likely that this virus will become predominant in infested areas. The role of *V. destructor* in DWV transmission and the appearance of wing deformities in newly emerged bees also deserve more intensive investigation.

[Abstract:0497]

Investigation and Identification of Kashmir Bee Virus (KBV) in Diseased Apiaries in Iran by RT-PCR

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Kashmir bee virus, a small (particle diameter 30 nm) single-stranded RNA cricket-paralysis-like virus that has recently been assigned to the genus Cripavirus in the family Dicistroviridae. The evidence has been shown that the virus is associated with *V. destructor*. The virus is frequently distributed and prevalent in colonies infested by the mite. Using RT-PCR based assays, the virus infections in honey bees can be detected and quantified in a rapid and accurate manner. Infected honeybees from colonies suffering with symptoms of depopulation, sudden collapse, paralysis, and varroa infestation, used in this study, originated from 23 provinces of Iran. Bee samples were collected between July - September 2011 and 2012. Altogether, samples from 156 apiaries were collected and submitted for virus screening. From each apiary, 100-500 adult worker bees were sampled. RNA extraction and RT-PCR were performed with QIAGEN kits. The primers lead to a fragment of 395 bp. The PCR products were electrophoresed in a 1.2 % agarose gel (stained with ethidium bromide). Following the RT-PCR reaction with the specific primers, out of the 156 apiaries examined, 7 (4.5 %) were infected with KBV. This is the first study of KBV detection in Iranian apiaries. We have looked into the occurrence of the KBV and identified differences in the distribution of the virus in the collected samples from different geographic regions of Iran. The spread of *V. destructor* has been implicated in a dramatic increase in the prevalence of KBV. The role of *V. destructor* in KBV transmission also deserve more intensive investigation.

[Abstract:0514]

Sensitivity of *Nosema ceranae* Spores to Organic Acids

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Nosema apis and *Nosema ceranae* are two microsporidian parasites attacking midgut of adult bees. This work was aimed at testing sensitivity of *N. ceranae* spores to treatment with organic acids. There is a lot of disinfection measures recommended to sanitize beehive equipment from *N. apis* spores, but the information concerning *N. ceranae*, which currently dominates *N. apis* in many areas, are still scarce. Spores were isolated from naturally infected bees with the use of gradient centrifugation on Percoll and identified by PCR as *N. ceranae*. Spore suspension was pipetted onto the glass Petri dishes and let air dry. Following experimental groups were established: Group 1: dishes inserted into an empty beehive and treated with oxalic acid applied by sublimation; Group 2: dishes inserted into an empty beehive and treated by evaporation of glacial acetic acid. Third set of dishes (Group 3) served as a control. Group 4: dishes inserted into the colonies treated by evaporation of 85% formic acid for four days; Group 5: dishes inserted into the colonies treated by evaporation of 65% formic acid for 21 days; Group 6: control dishes inserted into untreated colonies. After the exposure, dishes with spores were removed from the beehives and the spores were washed off the surface with PBS. Then, spores were stained with 0.01% propidium iodide and their viability was analyzed on FACScalibur flow cytometer. The strongest effect was observed in glacial acetic acid (63% of killed spores after 72h exposure), while oxalic acid devitalized 27% of spores in 72 h. Effect of formic acid was dependent rather on concentration than on exposure length. Four day treatment with 85% formic acid devitalized 25% spores, while 21 day exposure to 65% formic acid had no significant effect. In conclusion, all organic acids exerted devitalizing effect, but none of them was effective enough to completely sanitize beehive environment from *N. ceranae* spores. The only treatment which completely devitalized *N. ceranae* spores was heat inactivation (95°C for 30 minutes).

This work was supported by IGA VFU Brno, grant No 217/2017/FVHE.

[Abstract:0547]

Investigation of the Level of Contamination in the Colonies Completing of the Varroa Struggle in the Eastern Black Sea Region

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In this study, the Eastern Black Sea region in spring and autumn 2014 in the colony in the company has completed the fight against varroa. Varroa infestation rate in the detection, identification of approaches to the issue of beekeepers and was carried out to develop the solution method. In the study, the Eastern Black Sea region constituting 7 provinces (Ordu, Giresun, Trabzon, Rize, Artvin, Bayburt and Gümüşhane) located 50 and over Beekeeping registration system with colonies 209 was collected bees from the beekeeping business. The counting result of Artvin 39 amitraz, 3 formic acid, 16 flumethrin; 6 thymol, 4 coumaphos drug active substance is used. Bayburt 25 amitraz, coumaphos one active substance has been used medicines. Giresun 28 amitraz, 4 formic acid, 12 flumethrin, 7 oxalic acid, 11 coumaphos was used 1 thymol and 10 unlicensed drugs. Gümüşhane 19 amitraz, 1 formic acid, 9 flumethrin was used thymol 2 and 3 unlicensed drugs. Ordu 126 amitraz, coumaphos 30, 5 formic acid, 27 flumethrin, 1 thymol, 1 natural struggle, 1 disinfectant and 39 have been identified as an unlicensed drug use.

[Abstract:0559]

Epormenis cestri (Hemiptera, Flatidae) Secretions in Sebastiania Schottiana Trees Cause Mass Death of Honey-bees Larvae in Uruguay

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In Uruguay, since more than 60 years ago, sporadic cases of massive honeybee's larvae mortality are reported in December to February in colonies located closed to waterways with abundant riparian vegetation. This odd phenomenon from environmental origin is called "River disease" by the beekeepers. It can lead to the colony loss by depopulation. The aim of this study was to detect the causative agent of larvae death. For this, different experiments and analyzes were performed using diseased apiaries located between two important water courses. It was found that 1 day old larvae were the most susceptible and that substances that killed the larvae were present in the nectar and not in the pollen. The palynological analysis of samples of nectar showed that bees collect this resource from botanical species commonly visited by bees in the country. However, abundant fungi spores and conidia were found, which indicates that the bees also collected honeydews. In the riparian vegetation, bees were observed collecting the secretions of the planthopper *Epormenis cestri* in the *Sebastiania schottiana* trees. It was found that the mortality period of larvae overlaps with that of the presence of *E. cestri*. To confirm that secretions of *E. cestri* are the cause of the River disease, larvae were maintained in the laboratory, and nectar from healthy colonies, nectar from diseased colonies, and secretions of *E. cestri* were included separately in the diet. The mortality of the larvae that received nectar from colonies with River disease and the larvae that received secretions of *E. cestri* was higher than the mortality of those receiving nectar from healthy colonies. This is the first case observed of honeydew that causes mass mortality of larvae in honeybees.

[Abstract:0585]

Polyvar® Yellow (flumethrin 275 mg bee-hive strips) for the Treatment of Varroosis in Honey Bees Caused by Flumethrin-sensitive Varroa Destructor Mites – field Evaluations

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A controlled, randomised and partly-blinded multicentre field study was conducted at 11 apiaries in Germany, Hungary, Spain and the Netherlands, to evaluate the efficacy and safety of PolyVar® Yellow in *A. mellifera* under field conditions. In total, 277 honey bee colonies received a late summer/ autumn treatment either with PolyVar® Yellow (applied at the hive entrance) for 92 to 122 days, or a positive control product (Bayvarol® strips for in-hive use, safety evaluation only) for 42±3 days. At the end of the treatment with PolyVar® Yellow a follow-up treatment with coumaphos (Perizin®) was applied to both groups. Dead mites were counted in suitable intervals until day 7 after reference treatment. One study site was excluded from the efficacy evaluation due to reduced sensitivity / resistance of the varroa population to pyrethroids. After treatment, the colonies were examined at different times during the study until the following summer. Honey and wax samples were collected from all colonies treated with PolyVar® Yellow in the following honey season and pooled per apiary to evaluate potential residues.

In total, 150 adequately infected colonies treated according to the protocol and current recommendations were included in the efficacy calculation. For PolyVar® Yellow the percent mite reduction was 98.2%. For none of the safety parameters a significant difference between the two groups was observed. Concentration of flumethrin in honey samples was below the limit of quantitation of 0.003 mg/kg at all 11 apiaries, its concentration in the wax samples was below the level of quantification (0.025 mg/kg) in 8 of the 11 apiaries. Concentrations of flumethrin between 0.072 and 0.119 mg/kg were found in two wax samples from Germany and one sample from the Netherlands. Based on an acceptable daily intake (ADI) for flumethrin of 0.0018 mg/kg these concentrations are considered safe.

Thus, efficacy and safety of PolyVar® Yellow in the treatment of varroosis in honeybees caused by flumethrin-sensitive *Varroa destructor* was demonstrated under field conditions. PolyVar® Yellow is considered an innovative tool for the implementation of an integrated Varroa control program which should consider the rotational use of different medications and methods.

[Abstract:0593]

Pathways of Dispersion of RNA Viruses that Affect Honey Bees

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Honey bees and wild pollinators, contribute to the pollination of natural and industrialized crops. Recently, multiple cases of depopulation of bee colonies have been detected at the end of winter. Different factors seem to contribute to these reduction of bee populations, such as several pathogens, changes or losses of their ecosystem, and the use of agrochemicals. All these factors alter the defense mechanisms of the immune system, and the viruses circulating take advantage of this situation in the colony generating disease.

The objective of this work was to study the possible routes of viral dispersion in colonies of honey bees.

We used 25 bee colonies that were not treated for *V. destructor* in the last year. After a year without acaricide treatment, in summer of 2015 the presence of *V. destructor* was quantified, samples of bees and mites were collected and the colonies were treated with commercial acaricides. Three samples were then taken in the autumn and winter of 2015 and summer of 2016. An mPCR RT was performed with bees and mites collected to detect 7 viruses. In the 4 sampling periods, 2 wild pollinator specimens (*Bombus atratus* and *Xylocopa augusti*) were also sampled. At the beginning of the trail 100% of the hives had *V. destructor* (mean infestation level 11.85%). In autumn, after treatment with coumaphos, 10% of the hives were infested (3% of infestation level), in winter mites were not detected. In summer of 2016 60% of hives were detected with a mean infestation of 1.03%. Presence of viral agents in samples fluctuated independently of the amount of mites recorded. In wild pollinators SVB, BQCV and DWV were detected.

We concluded that there is a relationship between the mite and the presence of certain viruses such as DWV or CBPV. Mites and pollinators could explain the fluctuation of some viruses. However, other viruses such as ABPV or BQCV were not detected in varroa or wild pollinators, increased their incidence in the absence of these possible vectors.

The study and understanding of the viral dispersion mechanisms in hives would allow us to designing alternatives for viral management.

[Abstract:0594]

Polyvar Yellow® (flumethrin 275 mg bee-hive strips) for the Treatment of Varroosis in Honey bees Caused by Flumethrin-Sensitive Varroa Destructor Mites – General Evaluations

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Varroa destructor and varroa-transmitted viruses are considered the biggest threat for beekeeping with *Apis mellifera*. Available products so far do not cover the complete period between end of nectar flow and end of flight activity towards winter so that significant re-infestation can occur despite of a successful Varroa treatment in late summer / autumn. PolyVar Yellow® (Flumethrin 275 mg beehive strips) was developed for a treatment duration of up to four months. The strips are applied at the hive entrance and have holes through which the bees enter and leave the hive. Different laboratory experiments investigated exposure of single bees to flumethrin by direct and indirect contact with the product using HPLC-MS/MS. Mean amounts of directly exposed bees passing through the holes were 7 ng flumethrin / bee. After 6 hours of social contact of exposed bees and non-exposed bees mean amounts of 0.59 ng/bee were measured in exposed and 0.34 ng/bee in non-exposed bees with no statistically significant differences between the groups. Thus, flumethrin appeared to be quickly distributed by social contact.

A controlled, randomized and partially blinded study was conducted to evaluate safety and efficacy of the product on the colony level. Three groups of ten colonies received a treatment with the test product for 116 days, a positive control product (Bayvarol® strips for in-hive use) for 42 days (safety evaluation only) or remained untreated as a negative control. A follow-up treatment was applied to all three groups on day 117 using coumafos (Perizin®). Dead mites were counted up to 2 weeks after application of the follow-up treatment. The safety evaluation comprised counting of dead bees using dead bee traps and colony examinations which extended into the following summer season. Mite count reduction after treatment was 99.9% and superiority over the untreated control was demonstrated. Safety was confirmed by high survival, lower numbers of dead bees of treated groups compared to the untreated control, and no differences in colony development that were considered clinically relevant. Thus, exposure of bees to flumethrin only at the beehive entrance using Polyvar yellow resulted in successful and safe treatment of honeybee colonies.

[Abstract:0608]

Sterilization with Gamma Irradiation and Dry-hot Air of Spores of *Paenibacillus* Larvae in Wax

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Honey bees (*Apis mellifera*) are among the most important livestock due to their role in pollination of many crops, fruits, and wild flowers. American foulbrood (AFB) is among the economically most important honeybee diseases. In the study, the effect of gamma irradiation and dry hot air sterilization on the viability of *P. larvae* spores can be found in wax was studied. Honey wax samples infected with two different *P. larvae* strain spores are sterilized with dry air (pastry oven, 115 ° C, 45 min) and three doses of gamma radiation (12, 25 and 40 kGy). Dry-hot air and 12 kGy gamma irradiation was inadequate for sterilization *P. larvae*. 25 kGy and 40 kGy gamma irradiation were effective. It has been determined that the tolerance of different biotypic spores of *P. larvae* strains to sterilization processes is partially variable. For this reason, it was concluded that the spores of *P. larva* strains and their different concentrations should be tested. It was also observed that color change occurred in the samples of honey wax exposed to gamma rays. It is also necessary to investigate the effect of irradiation on the chemistry of honey bees.

[Abstract:0609]

Effects of "in vitro" Exposure of Pesticides on Honey Bee Drone's Semen Quality

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Honeybee "*Apis mellifera* L" reproduction is polyandrous; the queen obtains millions of sperm by mating with several drones. Recently, fertility problems of honey bee queen are reported. Pesticides can be the cause of this failure related to the drone's semen quality. The aim of this study is to determinate the effect of an acute "in vitro" exposure of fipronil, ethiprol, imidacloprod, thiamethoxam, cypermethrin and coumaphos at different concentrations from 0,1µM to 100µM on the drone semen quality. Results showed that fipronil, imidacloprod, ethiprole and thiametoxam decrease sperm viability. An increase in the adenosine triphosphate (ATP) rate in sperm exposed to all molecules is noted. Sperm exposed to thiamethoxam and ethiprole showed a low rate of reactive oxygen species (ROS) compared to control and a low malondialdehyde (MDA) concentration at 10 µM while sperm exposed to cypermethrin and coumaphos had a high rate of MDA without difference in ROS rate. MDA levels and ROS found in exposed sperm could lead to dysfunction of organelles such as mitochondria and could subsequently affect egg fertilization. Thus the exposure of sperm to pesticides "in vitro" affects drones semen quality which might be at the origin of fertility disorders in honeybee queens.

[Abstract:0618]

Effects of Sublethal Exposure to Imidacloprid, and "Nosema ceranae" Infection on Survival and on Individual Immunity in Honey Bees ("Apis mellifera")

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The decline of the European honeybee, "Apis mellifera", is a global concern. Several factors appear as potential causes and it is believed that a combination of these factors contributes to honeybee loss. One of these factors is the unintentional exposure to pesticides, imidacloprid being one of the most toxic pesticides, applied to agricultural crops. On the other hand, one of the most important pathogens associated with honeybee loss described is "Nosema ceranae", an intracellular obligate spore-forming pathogen, which decreases the half-life of bees. This work aimed was to evaluate "in vitro" the sub-lethal effect of imidacloprid on "N. ceranae" infection and on individual immune systems in honeybees challenged by both factors separately or combined. The "N. ceranae" infection was significantly increased by the pesticide. After exposition to sub-lethal doses of imidacloprid, a higher mortality was observed in bees exposed to the pesticide and "N. ceranae" than in bees infected only. The higher susceptibility to pathogen with increased honeybee mortality due to pesticide exposure appears to be strongly linked to down regulation of abaecin, defensin-2, and hymenoptaecin genes. This is the first work that establishes the close relationship between pesticide effect and expression of genes related to the individual immune system.

[Abstract:0631]

Behavioural Resistance of Bees is Related to Tolerance to Varroa Destructor and DWV Infection Level in Uruguay

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Varroa destructor is the major threat that affects honey bee colonies worldwide. In Uruguay, two contrasting scenarios are found, bee populations located in the South-West of the country are susceptible to the mite (S), collapsing if they are not chemically treated, while bee populations located in the East are tolerant (T), being able to survive without miticide treatment. The aim of this study was to compare the host-parasite interaction in those populations and identify potential factors involved in the tolerance to the mite. One experimental apiary was located in each region, with susceptible or tolerant bee populations (S, N=23 colonies, T, N=21 colonies). No miticide treatment was applied in any of the colonies. In autumn, V. destructor parasitism level was higher in susceptible colonies than in tolerant colonies. No genetic differences were found in V. destructor populations from both regions, all of them belong to the K-haplotype. Regarding to the bee response against the mite, susceptible colonies showed lower grooming (percentage of damaged mites) and lower hygienic behavior than tolerant colonies. Both bees and mites populations were infected by ABPV, BQCV, DWV and SBV; although DWV infection level was significantly higher in bees from susceptible colonies, compared to resistant colonies. Finally, in winter all susceptible colonies died while only 9% of tolerant colonies died. Those results suggest that resistant behaviour is involved in differential tolerance to V. destructor and DWV infection level, as in subsequent colony loss.

[Abstract:0634]

The role of Phoridae Species in Honey Bee Health

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Phoridae, a large family of the Diptera order, have the capacity to colonize different ecological niches. Phoridae acts as mycetophagous, phytophagous and scavenger, affecting organisms such as humans, plants and animals including insects. Many species are associated with Hymenoptera, of which they are kleptoparasites in bee nests, parasitoids, and predators towards brood and adults. For honey bees, Phoridae were identified as the cause of serious infestations of *Apis mellifera* colonies in different countries. *Apocephalus borealis*, a species of phorid fly, was recorded as a parasite of honey bee colonies in Belgium and in colonies in the USA which were also infected with the Deformed Wing Virus (DWV). Another species of phorids, *Megaselia rufipes*, already reported on dead honey bees, has been identified in Italy as a facultative parasite of honey bees with deformed wings attributable to DWV. *Megaselia scalaris*, commonly widespread on pollen stocks and debris in beehives, was previously found in dead honey bees in Spain and Brazil. Recently, a screening conducted in Algeria in healthy honey bees (*Apis mellifera intermissa*), showed significant prevalence of *M. scalaris*. In addition, DWV is reported to be present in adult flies and actively replicating in this fly larva. In general, phorid flies can so act as DWV vector. *M. scalaris* was also found in honey bees captured at the entrance of beehives and by light traps in Central Italy. These findings make the Phoridae a family of growing interest in the comprehensive studies carried out around the world to give answers to the colony collapse disorder and more generally to honey bee health. Aside from honey bees, the broad host range of these phorid flies also makes them a considerable danger to wild bees. Further research is needed on the role of this fly family in honey bee health.

[Abstract:0650]

Preclinic Indicators at the Apiary Level to Prevent Honeybee Diseases

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The spread of honeybee pests and diseases is a critical threat to viability and productivity of the European beekeeping sector in the globalization "era". The increase in colony losses can affect pollination service and environmental biodiversity granted by honeybees and the beekeeping economy. Bee health care and diseases prevention systems have motivated different sanitary approaches in beekeeping. "Preclinic indicators" are of essential importance in the management and prevention of diseases, like it already happens in the livestock systems of many animal species. Preclinic indicators as essential part of the Good Beekeeping Practices (GBP) allow to diagnose bee diseases before symptoms appear. Therefore, chemical treatments can be reduced in order to avoid the risk of residues in the final honeybee products. Diseases may be prevented by identifying innovative laboratory diagnostic methods and matrices from the hive (e.g. combs, comb swabs, bottom hive debris or powder sugar, etc). In fact, the use of new diagnostic methods such as biomechanical and biomolecular techniques can be developed as an early laboratory or field diagnosis (e.g. AFB or EFB preclinic diagnosis from powder sugar or SHB preclinic diagnosis from bottom hive debris by Real-time PCR). Prevention practices through this new approach represents an opportunity to ensure improving honeybee health and consequently increase the profitability of the beekeeping sector.

[Abstract:0664]

Risk Factors Associated with the Occurrence of Nosemosis (*Nosema* spp.) in the South of Buenos Aires, Argentina

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Beekeeping is an important economic activity in Villarino and Patagones, in the south of Buenos Aires Province. However, honey production was reduced in the last 20 years. Nosemosis disease is one of the major sanitary problem linked to colony losses and reduced honey production. The objective of our work was to identify the risk factors associated with the occurrence of Nosemosis based on an epidemiological study. Potential explanatory variables were obtained from a checklist questionnaire answered by the beekeepers (n=27) in order to gather information about commonly performed management practices and the environment where the colonies were placed. Within each apiary, a minimum of six colonies or 10% of the total colonies were randomly selected to evaluate *Nosema* spp. sporulation level (abundance of *Nosema* spp.) and *V. destructor* infestation level in autumn (O2015) and spring (P2015) of 2015 and autumn 2016 (O2016) (n=207).

A single variable analysis with apiary as random effect was conducted for selecting explanatory variables potentially associated with the log10 of *Nosema* spores/ bee. Variables with a p-value ≤ 0.20 were selected for a subsequent multivariable analysis. Multivariable logistic regression analyzes with apiary as random effect were performed using a generalized linear mixed model (GLMM) to evaluate the effect of the selected explanatory variables.

In the single variable analysis in O2015 and O2016 the frequency of queen replacement in the apiary and old combs replacement per colony per year (P=0,18 and P=0,13) selected, but in the final model, this variables were not significantly associated with the occurrence of Nosemosis. In P2015 and O2016, the infestation with *Varroa* (P=0,028, P=0,011) was associated with the occurrence of Nosemosis.

An efficient control of Varroosis in autumn, and practices like queen replacement every two years and three comb replacement per colony per year, could be considered as protection factors for the occurrence of Nosemosis.

[Abstract:0673]

Histological Changes in Honey Bees (*Apis mellifera intermissa*) Midgut After Exposure to Titanium Dioxide TiO2

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The amount of nanomaterials produced annually is constantly increasing and this trend may result in strong concentrations of manufactured nanoparticles in air, water, soils. Among the manufactured nanoparticles, titanium dioxide nanoparticles (TiO2) have been produced massively for their photocatalytic properties and UV absorption ability. Honeybees need to have special concern due to their crucial role in pollination. This study focuses on the assessment of the impact of titanium dioxide nanoparticles (TiO2), on histological structure of honey bees (*Apis mellifera intermissa*) midgut after exposure (24h, 48h and 72h) to titanium dioxide TiO2. Pathological repercussions of topical application were observed in the midgut of honeybees. After 24 h, there were severe alterations in the midgut, epithelial layer while by 48 h there was clearly seen degeneration of the midgut epithelium. Irreversible lesions appeared at 48h with increased cellular damage after 72 h after the application of the treatment as compared to untreated ones. Finally, we can conclude that the effect of the titanium dioxide nanoparticles (TiO2) continues after initial contact and causes permanent lesions in digestive organs.

[Abstract:0674]

Comparison of the Effectiveness and Sensitivity of the Sugar Shake Method to Detect Phoretic Varroa Mites (*Varroa destructor*) Versus the Goal Standard Method of Soapy Water Washing

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The varroa mite (*Varroa destructor*) infestation levels can be assessed at an apiary using different methods. In Chile, the most common methods are the soapy solution (soapy water washing method) and the icing sugar (sugar shake method). Both methods have been shown to be effective. In the last few years chilean beekeepers began using the sugar shake method instead of the soapy water method because it doesn't harm the honeybees (*Apis mellifera*). However, it is unclear whether the effectiveness and sensitivity of the sugar shake method is similar to the soapy water washing method to detect phoretic mites in adult bees or if the infestation level (low, medium or high) has an influence over the effectiveness and sensitivity of this method to detect phoretic mites. The aim of this study was to determine the effectiveness and sensitivity of the sugar shake method to remove phoretic mites compared to the standard method, the "soapy water washing", and also to compare the effectiveness and sensitivity of the sugar shake method to remove phoretic mites when the infestation levels in adult bees were low, medium or high. Results show that the effectiveness of the sugar shake method to remove phoretic mites is less than the soapy water washing but the difference in sensitivity is not significant. However, it's important to note that the infestation level of *Varroa destructor* is an important factor which affects the effectiveness and sensitivity of this method, being less effective and sensitive at low infestation levels.

[Abstract:0675]

Effectiveness of Oxalic Acid Trickling Treatment For Varroa Mite (*Varroa Destructor*) Using Seasonal Brood Interruption By Caging of the Honeybee Queen (*Apis Mellifera*) in the Central Zone Of Chile

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The presence and increase of the populations of varroa mite (*Varroa destructor*) during long reproductive seasons are one of the most difficult problems for beekeepers worldwide. This is of particular importance in Chile, where the presence of honeybee brood (*Apis mellifera*) can very well last until the middle of autumn, even when the nectar flow has had a considerable reduction. Thus, favoring the reproductive cycle of the mite, being detrimental for the honeybee colony and also, reducing its possibilities of surviving the winter. Since it's impossible to eradicate this ectoparasite, it's fundamental to keep the infestation levels to a minimum as to avoid colony losses. A fast method to reduce varroa could be done by interrupting the seasonal brood cycle since all mites would be forced into the phoretic stage and therefore, more vulnerable to varroacides treatments. In Chile, beekeepers haven't used this method to control the infestation levels of varroa mite but it could be an easy and effective method to keep it to a minimum. This study assessed the effectiveness of brood interruption by caging of the honeybee queen as a means to reduce the number of mites in reproductive phase, and thus target the phoretic stage with an organic treatment for varroa mite control right after the interruption period, such as oxalic acid. Furthermore, this study compared two methods of oxalic acid application: oxalic acid trickling and home-made grey board strips impregnated with oxalic acid, the latter being one of the most used treatment in the last two years by chilean beekeepers.

[Abstract:0677]

Natural Varroa Tolerance in Honeybee Stocks from a Temperate Region of Argentina

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Selective breeding of honeybees for tolerance to Varroosis is one of the most important challenges to keep Varroa destructor populations at low densities without the use of chemical control. Since 1992, the honey bee breeding program (MeGA) has been working on the selection of genetic resources to improve apiculture in Argentina. In this frame, during 2007, a Network of Varroa Tolerance was organized to evaluate and select bee colonies with natural tolerance to the mite Varroa destructor. Five nodes initially started working with honeybee stocks specifically adapted to each eco-climatic region, covering the different environments of Argentina. In this work, we show the results obtained in a node of this network located in temperate climate (Hilario Ascasubi, Buenos Aires, 39°23'32"S y 62°37'42"O). During 2013, one apiary was established for the evaluation of Local (LS) and Hygienic Behavior-selected (HBS) bee stocks. Colonies were maintained without acaricide application for Varroa control. As first approach for this evaluation, three major aspects of the beehive were periodically monitored for all stocks: phoretic Varroa (PV); bee population status [calculated as hive frames covered by adult bees (BPA), broods (BPB)] and honey production. In addition, each stock was genetically characterized using mitochondrial markers.

From a total of 46 colonies, 14 beehives survived the first seasonal cycle (4LS and 10HBS) with an average PV% of 14.88%±8.27 and 7.77±4.51 respectively. These colonies were considered for the second seasonal cycle without acaricide treatment. All colonies evaluated presented European haplotypes (C1 and C2J). The 14 surviving HBS hives were multiplied and monitored. During the last year they showed good biological and productive parameters: 2,23±1,36PV%, on autumn; 6,5±1,9BPA; 2,95±1,08BPB, at the begging of spring; and 29.73±15,61kg of honey (regional yield was 25kg). According to these parameters, 3HBS hives were selected and multiplied during the last spring. Currently, 20 bee hives are under evaluation and characterization in order to be multiplied during next spring, providing promising genetic resources adapted to temperate climate to the MeGA with valuable characteristics to be also evaluated in other nodes of the network of Varroa Tolerance, providing renewed genetic stocks to improve commercial apiculture in the country.

[Abstract:0681]

Optimization of HopGuard Application to Control Varroa Mites in Honey Bees

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Recently, honey bee health in Canada and other countries around the world has been challenged. Beekeepers have been reporting higher than normal losses of bee colonies. These reported losses are double the normal long term loss (15%). One of the main underlined causes of colony losses is the failure of Varroa treatments due to the spread of treatment-resistant Varroa mites. In order to manage miticides' resistance and provide more tools for varroa control, this study evaluated the efficacy of HopGuard for varroa control. Our studies were designed to test a new substrate of HopGuard strips, determine the effective dose, and finding the mode of action. A new corrugated cardboard, mylar-backed strip replaced the cardboard strip. Each strip of HopGuard2 contained 4.0 grams of potassium salts of hop beta acids. Field testing the efficacy of HopGuard2 applied as the following; one application, two applications at 10 day interval, three applications at 10 day interval, three applications of HopGuard1 at 5 day interval and control. The reported efficacy was 80.0%±10.7%, 97.0±1.4, 98.5±0.7, 93.7±4.0 and 22.0±4.0, respectively. In the second experiment the following dosages (0.5 strip, 1 strip, 1.5 strips and 2 strips per 5 frames of bees applied once and 2 times at 10 days intervals were tested. Results showed that the application of 1 strip per 5 frames of bees provided the highest efficacy 79%. In order to understand the mode of action, HopGuard 2 strips were placed in an incubator at 25 °C for 3 and 5 days. In comparison among, dried strips and strips caged in a screened box placed in bee colonies, applied strips, only bees exposed to HopGuard strips showed 56.7% efficacy. These results showed that bees had to contact the HopGuard material on the strips to kill mites. In general based on these experiments it can be concluded that the new corrugated strips (HopGuard2) are effective when applied twice 10 days apart. The efficacy is ranged between 67-98.5% based on the brood presence. In brood less period HopGuard2 can be highly effective against Varroa mites. There were no side effects on honey bees during testing HopGuard.

[Abstract:0682]

The Influence of Deformed Wing Virus (Dwv) on Honey Bee Larvae

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Deformed wing virus (DWV) is one of the most common honey bee viruses, which highly prevalence in the population of honey bee (*Apis mellifera*). DWV usually causes the deformed wing symptom in the infected adults with the infestation of Varroa mite. However, it is little known that the influence of DWV in honey bee larvae. To better understand the pathogenesis of DWV in the larval stage, we established the artificial larval rearing and DWV infection system. The copy number of DWV viral suspension was determined by real-time quantitative RT-PCR. The 3-day-old larvae were inoculated with 9×10^{10} viral copies. Larval mortality rate and viral replication were recorded. From our data, the infected group showed higher mortality rate after 9 days post inoculation (d.p.i.) and significantly increased to 12 d.p.i. The viral copies of infected larvae were higher than that of the control group and gradually increased from 3 to 9 d.p.i. Moreover, the percentage of deformed bees in the infected group was higher than that in the control group. These results suggested that DWV infection in larval stage may not only has pathogenesis to honey bee larvae but also affect the expression of development-related genes and then resulted in the deformed symptom. This speculation will be further clarified in the future by transcriptome analysis.

[Abstract:0685]

From Hives to Table; Determination of Parasitologic, Microbiologic and Virologic Factors that Threat Honey, Honey Bee and Public Health

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Honey is evaluated as a very important and superior human nutrient because of its easy digestibility, ingredients and medical benefits. In spite of honey includes a plenty of bioactive antimicrobial components, hydrogen peroxide for antimicrobial activity can not be sufficiently produced because of low water activity and this situation revives the existence risks of food and/or bee originated pathogens and fungal agents in honey. There are a lot of studies about antimicrobial and bacteriostatic effects of honey. However the studies about growing profile of foodborne and bee originated pathogens and fungal agents in honey and the initial flora of honey are very limited. To determine the infection and infestation agents in honey became very important for consumers' health and preventive medicine because of because of primary and secondary contamination sources, environmental factors and developing of resistant pathogens / mycotic agents.

In this study it was explored the presence of different microbiological and parasitological parameters (Plate count, total coliform group bacteria count, *Escherichia coli*, *Staphylococcus aureus*, *Ascosphaera apis*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Penicillium larvae*, *Melissococcus pluton*, *Nosema* spp., *Varroa* spp., Acute Honey Bee Paralysis Virus, Black Queen Virus and Sacbrood Virus) in honey samples provided from various districts North Marmara and West Blacksea region (Edirne, Kırklareli, Tekirdağ, İstanbul, Kocaeli, Sakarya, Düzce, Bolu, Zonguldak and Bartın). Binary significance correlations among all the microbiological parameters were exposed while there were not any binary significance relations among the parasitological parameter analyzed. According to the results of the study it was concluded that continuous inspection of the hives by specialized veterinarians, correct hive transportation applications, interactive education programs to the producers that would be given by related official institutions would be very important to prevent the colony losses and to provide qualified honey. It is also thought that aforementioned prevention applications would also increase the honey production capacity for both internal market and exportation of our country, which is one of the important honey producer countries of the world.

[Abstract:0697]

Lippia Alba Essential Oil as Potential Control Agents of Chalkbrood

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Chalkbrood is a fungal infection of *Apis mellifera* caused by *Ascosphaera apis*. A total of 48 isolates of *A. apis* obtained from honeybee larvae from Argentina and Chile were studied. We used the agar diffusion method to determine the minimal inhibitory concentration (MIC) of essential oils (range 50-1600 µg/mL) obtained from *L. alba* (Verbenaceae) carvone and linalol chemotypes. Controls: 50% sucrose-water, diluent (2.5% propylene glycol) and ketoconazole (effectiveness) (1 mg/mL). The inoculum was made from cultures of *A. apis* left 7-10 days, at 35 °C in agar MY20. Holes of 7 mm in diameter were made in the agar plates with *A. apis* cultures. Then, the inocula were placed in the agar plates containing MY20, essential oils and the diluent. The plates were incubated at 35 °C in the dark, and read every 24 h up to 144 h. Visual reading was measured with a ruler. The results were analyzed using ANOVA and Tuckey ($p \leq 0.05$). The identification of the essential oils was performed by GC-MS. The Median Lethal Dose (LD50) was determined in adult bees. Concentrations were expressed in micrograms of active principle per bee (µg p.a./bee). *L. alba* carvone and linalol were evaluated at concentrations 2-64 (µg p.a./bee), dimethoate (toxic control) at 0.02-0.64 (µg p.a./bee) and diluent control (2.5% alcohol). The adult bee mortality was determined at 24, 48, 72 h. The LD50 was performed with PROBIT. The components identified were *L. alba* carvone (35.3% limonene and 29.9% carvone) and linalol (41.4% linalol and 19.4%, 1.8 cineol). The CIM50 of *L. alba* carvone and linalol were 800 and 1600 µg/mL, respectively. Significant differences were observed among the isolates, essential oils and concentrations ($p \leq 0.0000$) at 72 and 144 h. The carvone chemotype was more effective than linalool. The LD50 of dimethoate was 0.28-0.13 µg p.a./bee, considered normal for "highly toxic" products. The essential oil of *L. alba* carvone and linalool resulted "virtually non-toxic" at 24, 48 and 72 h. This study might be a starting point for future researches of *L. alba* essential oils, as they offer a good alternative in the control of chalkbrood.

[Abstract:0705]

Sensitivity of Bees "Apis mellifera" Adansonii to a Fungicide Commonly Used in Benin

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Crop protection against pests and safeguarding of the auxiliaries of cultures requires sustainable use of pesticides. Uncontrolled use of pesticides leads to the mortality of these auxiliaries which are essential for a sustainable plant production. The objective was to study the toxicity to bee *Apis mellifera* adansonii of the fungicide Banko-plus containing 550g.L⁻¹ of Chlorothalonil + 100g.L⁻¹ of Carbendazine used in crop protection market-gardening and cotton cultivation in Benin. The comparison of the fungicide toxicity was then made with an insecticide Cypadem containing 36g cypermethrine + 400g of dimethoate per Liter. Bees were collected from hives located at Ganou (Parakou, Benin) and transported to the laboratory. Ten doses of the different active ingredients of the pesticides were used. Doses varied from 0.0065.10³ to 3.2.10³ nanogram (ng) per bee for the fungicide Banko Plus and 0.00436.10³ to 1.31.10³ ng per bee for the insecticide Cypadem. Each treatment included three replications consisting of 25 bees. Bees were anaesthetized with ether before treatment. Observations were made at 2h, 10h, 18h, 24h, 36h, 48h and 60h after the test. Results have shown that, two hours after the test, all the fungicide doses have shown less than 20 %, mortality of bees whereas doses higher than 0.021.10³ ng per bee (100 ppm) of the insecticide Cypadem have induced more than 70 % of mortality. Results indicated that 24 hours after, a mortality rate reaching 85 % was observed with doses higher than 0.218.10³ ng per bee of the fungicide. Except the lowest dose of the insecticide cypadem (10 ppm), all the other doses indicated 100 % mortality of the bees, 24 hours after. These results showed that fungicides are also toxic to bees. It is necessary to educate users on the judicious manipulation of fungicides and popularize good agricultural practices.

[Abstract:0706]

Parasites and Predators of Honey Bees "*Apis mellifera*" *Adansonii* in Benin

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The objective of this study was to identify parasites and predators of bees in the context of bee diversity preservation. Bees were sampled from thirty (30) beehives belonging to the three climatic zones. In each study apiary, two to three hives were examined and 100 to 300 bees were collected in small bottle containing 70% ethanol. Thereafter, the hives were examined for the presence or absence of parasites and predators. The results showed that the major pests and predators recorded were as followed: "*Varroa destructor*" (Anderson & Trueman, 2000). It has a double effect because of its parasitic predation and infectious contamination. "*Aethina tumida*" (Murray 1867) or the small hive beetle was the second by importance. Then, followed, "*Galleria Mellonella*" (Linnaeus, 1758) and "*Achroea grisella*" (Fabricius, 1794). These are Lepidoptera whose larvae attack only the bee brood, but very rapidly depreciating products of the hive. "*Braula coeca*" Nitzsch, 1818 (Insecta: Diptera: Braulidae) is a tiny, blind and wingless fly that lives in commensal on the bee. It is recognized as important vector viral diseases on bees. "*Tropilaelaps clareae*" Delfinado and Baker, 1962 (Acari: Mesostigmata: Laelapidae) are very small parasitic mites on bees in the hives and "*Acarapis woodi*", which is a specific parasite, living in the trachea of the bee. Their damages are important and can be the source of desertion from the hives. Finally, "*Apocephalus*" sp. (Mesophora: Diptera) were also recorded as bee parasites in the hive in Benin. They are recognized as parasite of adult bees. This checklist, far from being exhaustive, showed that bees are threatened by many enemies. All visited apiaries were submitted to one or more parasites and predators at a time. Measures should be taken for the safeguarding of the bees.

[Abstract:0723]

Bees' Needs and Functions for Nutrition

Linyu Tang

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I have devoted myself to apiculture for over 50 years. For many years have I studied bees' needs for nutrition. Nowadays white sugar is used as the main ingredients for bee mating in the bee industry. As a result, it leads to malnutrition. Weak immunity is the main cause of the disease. I have solved the problem of malnutrition at different stages during the period of bee breeding by supplementing protein, vitamins, glucose with nutrient ingredients and artificial pollen. I have gained some successful experience of adding nutrition to bees in order to reinforce the bee swarm and resist all different kinds of disease. In 2006, CCD showed in U.S which also affected my region too. Many bees on the apiary disappeared and died. However, this disease on my apiary was cured after using nutrient ingredients I have made. I have produced pollution-free and pure honey products through years of study, observation and careful management. Instead of using medicine, I have supplemented much protein, vitamins, glucose to the bees by using the nutrient ingredients I have made and artificial pollen. In this way have I reinforced the bee swarm and resisted the diseases.

[Abstract:0762]

Traditional Methods of Comat with *Vespa* Spp (Hymenoptera, Vespidae) in Turkey

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Hornets (*Vespa* spp. Hymenoptera; Vespidae) are recognized as serious predators of honeybees. Many species of Vespidae are serious enemies of honeybees and causing considerable damage. Although *Vespa orientalis* and *Vespa crabro* are found in Turkey, *V. crabro* is the most common species. It is visible in almost all regions of our country. The hornets grab the adult honeybees in front of the hive and they kill to eat the honey in their stomach or to provide food for their larva. Among our producers several methods have been developed to combat these harmful insects. One of method is orange soda. In this method, orange soda, which is sold on the market, is taken and its pet bottle is emptied. And then, bottle is holed that above 10 cm from the bottom so that the insects can enter its in. About one cup of orange soda is poured in the bottle and the cover is closed. The bottles that prepared in this way are placed around the honeybee hives. Bottles are cleaned every 3-5 days, and orange soda is added again. Another interesting method is poisoning of hornets. The hornets are captured with the help of a trap. But they are not killed. Powdered insecticide is poured onto the caught hornets by means of a tool such as salting. Then, they are released. The contaminated hornets will go straight to their nests and in order to naturally clean in their nests. So, dust insecticides will be scattered to the surface on the nests. In last method used in Malatya region of our country, a toxic insecticide for hornets (odorless) is injected into the spleen. So that cats and dogs cannot reach it, this spleen is hung on the trees close to the apiary. A few days later it is expressed that the hornest colony is out.

[Abstract:0770]

Construction and Design of Avrin Oxalic Acid Aerator

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Varroa mite is considered one of the most dangerous pest of bees, and beekeepers also imposes heavy losses annually because of that. there are many methods and drugs to combat this pest in the markets, but these drugs are costly for beekeepers and can be dangerous for bees and agriculture products. So,we tried the most effective and safest treatment and the most economical way, and this method is the use of a Oxalic acid aerator. After a year of development and testing in apiary, this device was designed and built, it is designed with a 2 liter tank for pouring oxalic acid in it(35 grams in a liter of distilled water,(with this amount of the combination 50 hives can be pesticide).The fountain source acts as a pump and guides wind and oxalic acid to the element that works with mobile gas cylinders.in this part water evaporates faster than acid(acid evaporation temperature is about 300 to 350 degrees. F). After evaporation, the white smoke comes out of the pipe system, which is used for removing ticks.fumigation time is 6 seconds per ten- frame hive.it has a light weight and fumigation is more than other similar devices, and it's torch is able to withstand a high wind flow. the results obtained after the removal in this method is satisfactory.after a few days the hives were tested again to ensure with chemical strip, and no mite was observed.The other and important advantage about this device is the reasonable price for all the beekeepers.

In tests carried out in the Azerbaijan region in April, July and late September,the result of the test on 20 beehives floor open on equal terms and with the use of two types of devices(sublimation apparatus dry oxalic acid and oxalic acid aerator) showed that the loss with oxalic acid aerator was better than dry sublimation,so that the mites falling after that time (12 to 24) was completely evident. Due to a combination of water,vapor from the device learns all the space hive, and more durable in comparison with smoke sublimation of oxalic acid.So the loss is more ticks. During using this system no damage or any undesirable effects was observed on hives. this method is quite healthy and organic to fight varroa mite.

[Abstract:0780]

Prevention Strategy Against Aethina Tumide Murray in the Province of Chaco – Argentina

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The Small Beehive Beetle (PEC), *Aethina tumida* Murray a coleopteran native to southern Africa, which has not been detected in the Argentine Republic. Given the confirmation of the first focus in Brazil in early 2016, different government departments of Argentina designed an intervention strategy to minimize the adverse impact of potential entry to the Argentine territory. The Workshop on the small hive Beetle was held in Costa Rica and organized by the Latin American and Caribbean Network of PROAPI (REDLAC), together with SENASA of Costa RICA.

The Ministry of Agroindustry (MinAgro),the National Health Service and Food Quality (Senasa) and the National Institute of Agricultural Technology (INTA) developed different activities of sensitization, training, with all the actors of the beekeeping chain and in different places inthe national territory.

The province of Chaco is located in northeastern Argentina bordering on the east with Paraguay and approximately 1000 kilometers from the foci officially detected in Brazil. It has 95,000 beehives, 1500 beekeepers and 21 producer organizations with a honey production of approximately 1200TN per year.

In 2017, in order to complement the official actions of the Sanitary Service, the technical team of the Chaco Apiculture Plan puts in operation a network of 17 active monitoring apiaries, distributed throughout the province, which are monitored by 17 technicians of the Beekeeping Program of Chaco, with a monthly frequency, using a pre-established inspection protocol with the sanitary authorities of the country. This technical team has carried out trainings with the National Sanitary authorities and carried out tasks of sensitization to the apicultural producers on the importance of the notification of possible appearances.

Thanks to this network, it will be possible to detect, focus and take the necessary quarantine measures to eliminate the possible occurrence of PEC in the territory.

BEEKEEPING ECONOMY

[Abstract:0017]

Challenge and Opportunity of Honey and Bees-Wax Processing Industry in Ethiopia

Hana Tadesse Kebede

Hana tadesse

The major objective of this study was to assess the challenges, opportunities and future prospects of honey and bees-wax processing. The results of this study indicated that honey and bees-wax processing is one of the most important income generating activities besides other agricultural activities. Based on the result of this study, it was found that Ethiopia has untapped potential honey and bees wax processing industry development. Huge expansion of protected area, high potential of honey and bees wax production, tax holiday for three up to five years, potential market demand and good governance were the major opportunities of honey and bees wax processing in the country. On the other hand the major challenges that hinder the untapped potential of honey and bees-wax processing were no residue monitoring laboratory, lacks of skilled manpower in honey & bees-wax processing industry, agro chemical poisoning, pests and predators, quality packaging equipment material unavailability and lack of honey storage facilities. In order to avoid and come up to the success in honey and bees-wax processing activities efforts should be geared to alleviate the main constraints that hindered honey and bees-wax processing industry development of the country. Therefore, there is a great need of attentions in policy of conservation of existing vegetation, integrating bee keeping with agro-forestry and crop production, establishment of accredited laboratory, branding of Ethiopian honey and bees wax and quality packaging equipment manufacturing.

[Abstract:0025]

Other Bee Products and Technologies for Investment in Ethiopia: Underutilized Opportunities for Development

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Ethiopia is blessed with numerous types of wild honey bees which can produce huge amount of honey and other products. Owing to its varied ecological and climatic conditions, Ethiopia is home to some of the most diverse flora and fauna. There is an ancient tradition for beekeeping in Ethiopia that stretches back into the millennia of the country's early history. However, despite its long history, beekeeping in Ethiopia is still at its infant stage. Ethiopia on the average produced about 43,373 metric tones of crude honey per year between 2009-2012 which accounts only 8% of its potential and shares 23.5% of Africa and only 2.35% of world's honey production. This ranks Ethiopia 1st in Africa and 10th in the world. Even from this volume, the amount used for direct consumption and export is less than 20% and the rest of the balance is for local honey wine making (Tej). The production and marketing of bee wax is also goes parallel to honey production and processing. The other problem of Ethiopian apiculture sector is production of only honey and bee wax no other products. However, to develop the sector, there are still different opportunities in the country for new investment. The major intervention area open for investment is on niche bee products such as propolis, bee venom, royal jelly production and processing. On the other hand, packing materials are not produced in the country which affect competitiveness in the global market this also be another virgin business area. Colony supply by introducing queen rearing technique as a business is also another opportunity. Last but not list is investing on beehives and processing equipments accessories which is already import dependent and establishment of modern laboratory facilities and services which identified as potential investment areas in addition to the existing investments on production and processing of honey and bee wax.

[Abstract:0194]

Evaluation of the Economical Aspects of Iranian Beekeeping

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Beekeeping is an important area of economic activity in Iran. On the one hand, it supplies honeybee products, valued for their nutritional and health promoting properties. On the other hand, it impacts biodiversity of natural environment and ensures appropriate harvests of entomophilous plants. The purpose of this research was to evaluate the beekeeping sector in Iran. The research material was obtained from Iranian Agricultural statistics. At the end of October 2015, 6693937 honeybee colonies were present in Iran. In comparison with end of October 2005 that honeybee colonies were 2825462, there is approximately 137 percent increase in honeybee colonies number. These colony numbers have changed significantly over past several years. Shift in the number of honeybee colonies had a direct relationship to the changes in the number of apiaries. Some changes occurred also in size structure of apiaries. In 2015, honey production was about 77 thousand tones that was increased by 56 percent in comparison with 2005 (34 thousand tones). In 2015, an average yield from a honeybee colony in the apiaries was 11.5 kg and in 2005 was 12 kg that approximately was the same. In 2015, the number of traditional bee hives were 262313 in comparison with 2005 (332517) have decreased. Obtained data showed that honey production has not increased as honeybee colonies did, so that may be it due to increasing in sugar price in past several years.

[Abstract:0263]

The Contribution of Bees on Turkey Economy

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Agriculture, which constitutes 7 % of Turkey Gross Domestic Product, contributes to the economy in many ways as food, employment and industrial raw material. There is also share of apicultural activities on this contribution. Apiculture can be a means of existence for families who have little land or without land due to not directly depending on the land. It is known that there are 7.90 million beehives in 84.047 farms which makes apiculture in Turkey. On these farms, 105.727 tons of honey and 4.440 tons of beeswax were produced in 2016. With these production values, Turkey is one of the first three countries in the world. The contribution of apiculture to the country's economy as honey and beeswax is 1.971 billion Turkish Liras (TL) (about 563 million ₺). Honey and beeswax are among animal products which have the highest unit price, although their shares in market value are low (4%). Economic return of bees is not limited with bee products. There are 124 herbal products which are evaluated by Turkey Statistical Institute (TURKSTAT). TURKSTAT explained that the total value of herbal production in Turkey was 119 billion TL (approximately 34 million ₺) and its market value was 99.4 billion TL (~ 28.4 billion ₺) in 2016. Amount 80 % of these products need to bees for pollination. But 17.5 % of them are products as leafy vegetables and potato and need to bees for only level of obtaining to seed. According to the evaluation, it can be stated that bees have the share between approximately 77.6 billion and 94.04 billion TL in total herbal production value of Turkey. In addition, it is seen that the production values of the products which depend on pollinator are at least 2 times higher than that of the products not to need to pollinator in comparison their prices per kilo.

In fact, the contribution of bee to the economy is not only limited agricultural ecosystems, but also bees are among the most important elements of other many ecosystems from tropical forests to deserts and their contribution is invaluable.

[Abstract:0265]

A New Approach to the Development of Beekeeping in Russia

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In Russia, currently around 90% of bee colonies are kept in private subsidiary farms (private form of ownership). Of these, around half are kept in small amateur apiaries. The rest are kept in private farms, among 70-120 bee colonies. The latter are the ones that produce the bulk of marketable honey and other bee products.

The potential for honey production in Russia allows for a large increase in the number of bee colonies.

The main problem when expanding apiaries is a lack of domestic funding for one-off increases in the number of bee colonies, as well as the adjustment accordingly of the material resources.

Existing bank credit facilities are not adapted to smaller forms of agricultural production and do not take into account their specifics.

"The Family Farm of Anopchenko", with cooperation of the Regional Public Organization "Beekeepers of Bashkortostan", the laboratory of biochemistry of insect adaptability IBG USC RAS, and other individuals, have developed an investment project involving three levels of investment:

- Amateur apiary;
- Professional apiary;
- Industrial apiary.

Applicants for investment are offered the maximum availability of services and means of production:

- The main materials for production (hives, frames, bee packages...);
- Services for extracting, storing, sale of honey and organisation of wintering for bee colonies;
- Analysis of external components (breed of the apiary, veterinary situation, honey base) and recommendations for the development of technology for the production of honey and other bee products.

[Abstract:0277]

Financing (promotion, Fee, Productivity and Added Value)

Kodjo Logou Agossou

Organisation pour la promotion des arts apicole et sylvicole (opaas)

If the opportunity is offered to speak to the financing in beekeeping I will dwell readily on projects of the kind of income-generating activity. For such cases, the word funding refers to two questions:

- What condition(s) must meet a business plan of goods and/or services of bee-keeping to deserve a financial support?
- What is the judicious mode of financing of such a project?

A business plan of goods and/or services the apiculture must clearly establish the feasibility of the initiative, this from gradually from two series of studies. The first describes on the one hand the market, the appropriate human resources, the factors of production, the environmental parameters both biological and abiotic compatible and other parts of the production processes, administration and evaluation in a schedule type Gantt chart. The second will deduct the financial analysis containing the Budget, the balance sheet at the opening, the accounts of farms forecasts for five exercises at least in which the unit selling price of the property and/or the service is at least 108% of the total cost per unit of production, the values of the threshold of profitability in cash and in currency and the cash plan forecast.

The financing of such a project will be in two time:

- An experimental funding, on three exercises, a sample of the project covering 15% to 20% of the direct costs of more global the entire judicious use of fixed charges. Has the assistance of a coefficient we feel the revenue equivalent to the total load for each fiscal year in normal time; and it will calculate as well easily the profits.

The projects that will realize a net profit of positive operations no later than the end of the third financial year will be declared viable likely therefore to be self-financing.

- a final funding in full must be granted from the fourth fiscal year to projects of the category above..

That this is the sample or the project in its entirety the social capital would be supported at a height of 30% by the applicant of 70% by the partner./.

[Abstract:0335]

Presenting Practical Work with Children in Slovenian Beekeeping Circles

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Slovenia has centuries-old beekeeping tradition. Among others, many beekeepers helped with that – tutors have passed down beekeeping knowledge from the older to the younger generation. Beekeeping circles are one of the methods of intergenerational knowledge transfer. In Slovenia, they have existed at elementary and high schools and at certain beekeeping societies for more than five decades. In 2017, there are more than 170 active beekeeping circles in Slovenia and there are more than 2.500 children participating in them. The main purpose of beekeeping circles is raising children's awareness of the importance of beekeeping and the ecosystem role of bees. They help children gain a positive attitude towards the environment and bee preservation while getting familiar with hive products and their benefits. Through familiarizing themselves with beekeeping practice, some children start keeping bees in their school years while for others the memories of the magic of bees bring them to beekeeping in adulthood. Beekeeping circles are volunteer-based; in the last decade, they are coordinated by the Public Extension Service on Beekeeping of the Slovenian Beekeepers' Association and they receive teaching aids and materials. The basis for uniform functioning is the 40-hour curriculum with the textbook and workbook titled "The Bee Introduces Itself", an interactive e-version of which also exists. There is also a website for beekeeping circles with computer presentations. The circles receive beekeeping consumables, equipment and a protective suit. We also have special teaching aids; so-called picture combs (real-size models of a bee colony on combs). Work takes place in classrooms in the form of teaching or practical work and observing (observation beehive, picture combs), at an apiary etc. Beekeeping circle tutors are mainly experienced beekeepers or teachers, many times both. At least twice a year, the Slovenian Beekeepers' Association organises a meeting with them; there the tutors find out what's new and make suggestions on how to improve work. At the meeting, educational training is also organised. National competition for young beekeepers is organised once a year, each time in a different town, with up to 550 participants.

[Abstract:0412]

Becoming a Beekeeper, How Smooth is the Road?

Stuart Anderson

Beeinventive

Two decades ago many experts expressed concerns at the declining numbers of beekeepers in most countries. There were fears that the skills and knowledge of bee husbandry were being lost. In recent years the numbers of beekeepers have risen dramatically however little is known about what, if any, barriers they face in learning the skills and art of beekeeping.

One significant factor in the rise in the number of beekeepers has been the Flow Hive. This invention allows beekeepers to harvest honey without opening the hive therefore saving significant effort and time. Of course while harvesting is easier, the skills and knowledge in keeping the colony healthy remain the same. Significant training and education is needed to become skilled in the art.

In two years, 45,000 people in 120 countries have bought Flow hives and approximately half of these have not kept bees before. In this talk Stuart Anderson, the co-inventor of the Flow Hive will describe through stories, work with beekeeping clubs and statistics gained from customer surveys the quality of help that these aspiring beekeepers have had as well as the hurdles they have faced in becoming capable. This talk will interest anyone who is involved in education and support of new beekeepers as well as those who believe that the world needs more competent apiarists.

[Abstract:0448]

The Importance Beekeeping and Honey Production for Bingöl and the Regional Economy

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Beekeeping is one of the potential locomotive sectors of the Bingöl economy. In addition to technical, academic and theoretical studies such as queen bee, vegetation, flower species and bee diseases, the contribution of the development and transformation of this sector to the people of the region and to the development of the province is also very important. The purpose of this study is to analyze the potential economic impacts of honey production and, more generally, the beekeeping industry's contributions to the growth and development of Bingöl province. In the present case, besides the problems like honey quality and diseases, especially the low added value of honey production is a reminder. At this point, the important issue of certification and branding is at stake. On the other hand, honey is a strategic issue that should not be overlooked in many respects. Beekeeping products such as honey are very beneficial for health as well, and it therefore requires a constant increase in demand. But more importantly, honey is very important for the Bingöl economy, in terms of creating the added value creation process, raising income and creating employment. This project is primarily concerned with attracting beekeeping and the economic magnitude of honey production in the current situation. In the longer term, the analysis of social and economic values and economic impacts of honey and beekeeping on the provincial economy. For this purpose, the study aims to provide medium and long term projections and impact analysis.

[Abstract:0510]

Estimation of the Factors Affecting Profitability of Beekeeping Enterprises with Path Analysis Approach

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In inferential statistics, relations between variables are generally examined as linear and nonlinear relations. Accordingly, when the relations between variables are analyzed, firstly the direction and strength of this relation, and then the mathematical pattern of this relation are determined. Correlation analysis is used to determine the direction and strength of the relationship, and mathematical modeling is performed using regression analysis. However, classical regression and correlation analysis are insufficient to show indirect and direct relationships between variables. In such cases, the importance and the magnitude of indirect and direct relationships between variables can be predicted with path analysis. Therefore, the purpose of path analysis is to predict and deduce the importance and magnitude of assumed causal relation between variables.

The purpose of this study was to determine the factors affecting the profitability of beekeeping enterprises and the relation between these factors by using path analysis, and also to create the path diagram which explains the relation between the dependent variable and the independent variables. A path model was established by determining indirect and direct effects of various factors that considered to affect profitability in beekeeping enterprises. As a result of the analysis, marketing cost was determined as the most important measure in estimating the profitability of beekeeping enterprises. In conclusion, path analysis provides convenience in practice as it allows to examine the direct and indirect effects of the relationships between dependent and independent variables.

[Abstract:0513]

Production and Market Analysis of Honey and Other Honey Bee Products in the Republic of Macedonia

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The goal of this research was the production and market analysis of honey and other honey bee products in the Republic of Macedonia. The analysis was made based on the official data for honey production according to the FAO (<http://www.fao.org>), State Statistical Office of the Republic of Macedonia (www.stat.gov.mk), Food and Veterinary Agency of the Republic of Macedonia (<http://www.fva.gov.mk>) and data from anonymous questioners (n=150) intended for the beekeepers. Official data for honey production in the Republic of Macedonia according to FAO are from 1992. In the period from 1992 to 2015, unlike the global trend, honey production in the Republic of Macedonia notice oscillation (from 1608 t in 1992 to 603 t in 2012). In this period the number of honey bee colonies oscillated from 77.600 in 1992 to 53.439 in 2009, with an average of 14 kg honey yield per colony. The produced honey in general is sold on the domestic market, mainly by door to door sale, sale on the green markets (retailing) and sale to honey buyers (wholesale). The average honey price in retailing is 5.7 EUR/kg, and in wholesale around 3.7 EUR/kg. There are 7 registered facilities for production, processing, manipulation, purchase and packing of honey. These facilities are also honey importers and exporters.

The analysis of the production and market of the other honey bee products in the Republic of Macedonia was made based on the data from the survey questioners. This data showed that from the involved beekeepers 72 % produce beeswax, 32 % produce pollen, 26 % produce royal jelly, 60 % produce propolis and that none of them produce honey bee venom.

According to the data obtained from the survey in the Republic of Macedonia, annually 10 t beeswax, around 2.5 t pollen, 100 kg royal jelly and 1.5 t propolis are been produced.

The price of this products goes from 2.4 to 5.7 EUR/g for royal jelly, average of 26 EUR/kg for pollen, average of 37.4 EUR/kg for propolis, 5.7 to 6.5 EUR/kg for raw beeswax and 9.7 EUR/kg for beeswax foundations.

[Abstract:0560]

GI Honey - The Sweet Taste of Geography

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In 2011, Italian beekeepers in the mountainous region of Belluno obtained official recognition of the connection between the quality of their honey and the local flora and the local honey production processes. The official recognition came from the European Commission in the form of Protected Geographical Indication (PGI). Since then the market price of the six local Belluno honeys have increased 50% and the Belluno name is now associated with quality honey, just like consumers associate the regions of Champagne, Parma and Modena for their quality beverage and food products. Across Europe, 31 honey associations have obtained PGI or Protected Denomination of Origin (PDO) for their honey, based on process and product quality standards formulated by the beekeepers themselves. With the European PDO or PGI labels on their products, the beekeepers aim to protect their brands and access premium priced markets, with varying success. This study assesses the European PGI/PDO honeys and identifies and discusses the requirements for and the challenges, costs and benefits of registering honey products with either of the Geographical Indication (GI) schemes. The results show increasingly detailed process and product descriptions in the GI standards and cost-benefit ratios of the entire process that are not always mimicking the experiences of the Belluno beekeepers. However, with increasing consumer interest for quality and certified honey, e.g. a five-fold increase in organic honey sales in the EU during an 8-year period, origin oriented quality labels adds a competitive parameter in the increasingly globalized honey markets.

[Abstract:0580]

Sentinel Hives - Know When to Move your Bees!

Huw Evans¹, Scott Crisp²

¹arnia Ltd

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A remote hive monitoring system can help provide answers to many important questions migratory beekeepers face, helping improve both efficiency and productivity. When to move the bees? Is there forage for the bees when they arrive? When will the nectar flow start? Or, possibly more importantly, has the nectar flow finished and the bees have started consuming the crop?

The system provides a user interface displaying the current location of each load in a single map view; whether they are currently gaining or losing weight, if full flow is on or off and if the bees are running low on stores during the winter months. A summary of each load's current yield and adjusted productivity is also available along with the historic, current and predicted weather conditions at that site. More detailed data such as daily flight profiles are also available to aid site evaluation and queen selection.

Not only can the system track the load's movements throughout the season, the GPS location offers traceability, information that can be presented to the end user via a QR code on the label of the product. Staff can be tracked in real time on the same map view as they move from one apiary to the next. In areas without cellular coverage satellite communication is used, which can double up as an essential life line for staff on site or enroute.

This approach is particularly valuable when there is a high value crop and access is difficult. In this presentation we present a case study of how the remote monitoring system was used by a Manuka honey producer in New Zealand. With no road access the hives are flown to the destination by helicopter. Remote access to weight data resulted in a substantial increase in productivity.

[Abstract:0639]

Does propolis production in Turkey meet the consumer demand?

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Honey is ranked first when the production and consumption potential of bee products in our country is examined. When it comes to the propolis production, it is not intensively produced due to both unconscious apiculture and lack of knowledge of its importance. This study addresses to what extent propolis produced in Turkey meets the demand of the consumer. Despite being the second largest honey producer after China, Turkey has fallen quite insufficient in propolis production. With the increased attention to the alternative medicine to enhance the quality of life, propolis has also attracted attention and demand in recent years. Propolis is, however, generally imported to meet the demand as its production is yet to be adequate. A large amount of propolis is imported to Turkey, the second largest honey producer in the world, from Japan, Brazil and China. Propolis production covers a rather narrow area and is conducted individually because honey production has been concentrated on in general in Turkey. Turkish beekeepers do not produce propolis for reasons such as insufficient level of marketing network and its underrated economic value; they even throw away the propolis present in beehives as they are not aware of its significance.

A rich content in propolis like in honey is an expected consequence in Turkey which has a diversified floristic structure due to variations such as climate, geographic structure, temperature and elevation. It has been discovered that propolis in Turkey has a rich chemical content. Nevertheless, the difficulty of land studies and insufficient study budgets hinder valuable information obtained in Turkey from being practically used. Lack of practical briefings prevents beekeepers from turning to propolis production. For those reasons, it is of great importance to identify chemical compounds and biological activities of Turkish propolis to encourage beekeepers and to conduct works for commercial production accordingly.

[Abstract:0701]

Beekeeping of Russia

Liliia Aleksandrovna Burmistrova, Larisa Vsevolodovna Prokofyeva, Yuri Victorovich Dokukin, Vyacheslav Ivanovich Lebedev

Federal State Budgetary Academic Institution "Research Institute of Beekeeping"

Russia has favorable natural and climatic conditions for the development of beekeeping, the honey reserve available to bees is estimated at 5 million tons within the country, which makes it possible to double the number of bee colonies and honey production, ensure full pollination of entomophilic crops and raise the level of annual honey consumption to 1 kg per capita.

From year to year the number of bee colonies increases along with the increase of bee colonies productivity.

Privolzhsky and Central Federal Districts are the leaders in honey production in the Russian Federation having more than half of the national production. In the Southern Federal District about 15 % are produced, in Siberia - almost 12 %, in the Far East - 10.5 %, in the North Caucasus - 4.5 %, in the Urals and North-West Federal Districts - about 4 % of the total honey production in the country. The share of Crimea is only 3 %. In terms of honey production per capita Russia is superior to China, India, Brazil, the United States and other comparable beekeeping countries. According to per capita consumption of honey (0.5 kg per year), we are only slightly behind the USA, Germany and other economically developed countries. Different natural and climatic and health conditions of the country determined various honey collections, which on average are 20-28 kg per bee family a year. It should be noted that economic reforms in the country as a whole had some positive effect on the dynamics of market honey production. If in the pre-perestroika period this figure in Russia was not more than 50 thousand tons, then in 2013-2015 it on average exceeded 70 thousand tons, i.e. increased by 40 %. This happened due to the increase in the share of household beekeeping both in the number of bee colonies and in the production of beekeeping products. According to the latest data, the household sector in these indicators increased up to 93 %.

For later successful development of beekeeping in the country it is necessary to adopt the law on beekeeping and the corresponding bylaws.

[Abstract:0742]

Apicultural Statistics Yearbook of China (2016)

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China is the largest beekeeping country in the world. Chinese president and government pay attention on honeybee. Especially, during the 12th Five-Year, government provided a powerful support not only on policies but also on project and technology funds to promote the healthy and sustainable development of apicultural industry. 2016, Chinese Apicultural Statistics Yearbook shows the detail of apiculture. Nowadays there are more than 10 million honeybee colonies in the whole country, about one eighth of the world. The total output of honey for the whole nation was over 470,000 tons, royal jelly was 3000 tons, beeswax was 6000 tons, pollen was 4000 tons, propolis was 350 tons, drone and some larvae, ranking first in the world. For the exports, honey was 144,800t, an increase of 11.56%; royal jelly 1,500t, up 7.1% YOY; bee pollen 2,269.425t, up 25.25% and the beeswax was 1,0352t. In addition, the paper will also show the achievements in scientific research in China.

[Abstract:0755]

Premium Pricing for Honey Bee Disease Insurance

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The importance of bee farming is widely known in agriculture, especially for the purpose of crop pollination management and bee product production. Starting a beekeeping operation involves investment for establishing and sustaining bee colonies and equipment. However, there is an arising problem concerning bee health, which in the worst case scenario a whole bee colony may collapse. Bee diseases can lead to economic losses. The Philippine Crop Insurance Corporation (PCIC) does not have an insurance for the bee industry making this research to focus on the formulation of a model that will compute for the acceptable premium and capital. We incorporate a dynamical system model of bee disease epidemics into an actuarial model for premium pricing. We consider insurer's ruin, investment rates, risk pooling, and economy-of-scale (in terms of number of colonies insured) in our model. Our simulation results show that even a small cooperative can make a business out of this insurance product.

BEEKEEPING FOR RURAL DEVELOPMENT

[Abstract:0053]

Introducing Kenya Top-Bar Beehives for Income Generation among Beekeepers in Kaltungo Local Government Area, Gombe State, Nigeria

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In an attempt to empower the larger chunk of Nigerians, the Federal Government of Nigeria (FGN) initiated massive campaigns and policies in recent years to empower farmers and modernise agriculture as the major employer of labour in rural settings. This is mainly to encourage farmers abandon their traditional methods for new technologies which improve productivity. It is in this light, that this study introduced improved method (Kenya Top-bar) of beekeeping as a comparative measure against traditional beehives to increase beekeepers' productivity in Kaltungo Local Government Area (LGAs) of Gombe State, Nigeria, and by extension the whole State. A total of 18 traditional beekeepers using 180 Local Beehives (LBs) were purposely selected to serve as agents of technology transfer in the area, and three (3) standard Kenya Top-Bar Hives (KTBH) were used for demonstration purposes for one cropping season. Descriptive statistics and Net Farm Income (NFI) were applied in the analysis of data with regards to yield and profitability. Results revealed that majority (83.00%) of the apiarists were males within the age range of 40-50 years that were married (78.00%), with a larger proportion (44.00%) having secondary education. Comparatively, a total of 37,800 was realised as NFI for KTBH against 18,300 for LBs. Major constraints experienced were beehives vandalisation/theft (100%) and low extension services (100%), among others. It's therefore, concluded that the KTBH yielded more profit than the LBs. Based on the findings, it's strongly recommended that massive enlightenment on improved methods of keeping bees be staged at various LGAs in the State as measure for income generation, and very stringent laws be passed by lawmakers against beehives theft and/or vandalisation to curb the menace in the area, among many.

[Abstract:0095]

Improving Small-scale Timber Quality and Production Yields Through Honey Production as an Alternate Cashflow Source www.africanhoneybee.co.za

Guy Stubbs

African Honey Bee

African Honey Bee is a Christian Social Enterprise established in South Africa to alleviate poverty in poor rural communities. African Honey Bee facilitates learning about honey production and then partners with the beekeepers to provide access to markets, ongoing support and a share in the value chain through microfranchising. In Northern KwaZulu-Natal, African Honey Bee works with many small-scale eucalyptus growers, who farm with an average of 1.5 ha of trees on their own plots. Ideally, if the trees are harvested at 8 years, they fetch a good price as pulp timber. Chadwick (2016) has calculated that the growth spurt of the trees that takes place between the 4th and 8th year of a tree's life, trebles the quality and quantity of pulp. She concludes that the optimum age to harvest the trees is 8 years. With limited resources and extreme poverty (> \$30 pm per person), small-scale timber growers are often forced to harvest trees early for cash flow requirements. For example, many growers in the Sokhulu area harvested their 4-year-old trees to pay for school costs in January 2017.

African Honey Bee is now helping these small-scale timber growers generate an additional income from honey, poultry and vegetables. Where small-scale timber producers can supplement their cashflow from alternative sources, they can leave their tree harvesting until the trees are 8 years - to derive maximum benefit. The small-scale timber growers mostly farm with *Eucalyptus grandis* subspecies, which are good bee plants. Beekeeping is therefore a viable option for these farmers. Unfortunately, the season is spread out over a year, so income from honey is limited to once annually. For this reason, African Honey bee also helps the small-scale timber growers generate income from small-scale poultry and vegetable farming, which they can supplement their weekly and monthly cashflows from.

A primary advantage to the small-scale timber growers is that they can position their apiaries within their yards to provide protection for their hives from vandals and thieves. In Northern KwaZulu-Natal, herdboys see bee nests as public property that can be robbed by anyone brave enough to do so.

[Abstract:0107]

How Beekeeping in Arasbaran Forests Helps to Develop the Forest Villages?

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Forests are considered as one of important food source of honey bee. Flowers of forest trees provide subsistence for honey bees and the trees physically provide shelter for a swarm or bee hive. Arasbaran forests is located in northwest of Iran at the border of Azerbaijan with an area about 163000 hectare. Rich flora and climatic conditions has provided suitable situations for beekeeping. Hence, this research will focus on the Arasbaran forests potentials for beekeeping, share of beekeeping income in total household income, analysis of strengths, weaknesses, opportunities and threatens, and finally giving strategies for the development of this industry. Beekeepers was identified by Rapid Rural Appraisal at the Arasbaran forests. Data were collected by semi-structured interviews and direct observations. About 800 species of plants, shrubs, and trees were found at Arasbaran forests. This rich flora seems to have a high quality pasture in the nectar production. The average honey production per hive was 24 kg. The share of annual beekeeping income in the total household income was 62 percent. The major problems of beekeepers were lack of processing factories, lack of proper markets, importing honey from foreign countries, lack of governmental supports, and road construction for making access of tourists for direct selling of honey. Because of high biodiversity and high altitude changes (between 400 to 2800 m a.s.l), there has been found trees and plants with flowering period during spring and summer. Also due to high humidity of the region, potential of nectar production in plants is high. It can be mentioned that Arasbaran forests has high potential for the beekeeping industry.

[Abstract:0274]

Pests of the African Honey Bee *Apis Mellifera Scutellata* Lepeletier in Zimbabwe and Namibia

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Honey, produced by the African bee, *Apis mellifera scutellata*, is an important source of nutrition and income for the resource -limited rural communities. Additionally, the African bee provides critical pollination services to agriculture and forestry. In this study baseline surveys for African bee pests were conducted in Zimbabwe and in Namibia. The study confirmed the presence in both countries, of *Varroa destructor*, the most destructive pest of honeybees in the world. The study also revealed the occurrence of other African bee pests in Zimbabwe, including the bee pirate (*Palarus latifrons*), the greater wax moth (*Galleria mellonella*), the small hive beetle (*Aethina tumida*) and several ant species. The bacterium, *Melissococcus plutonis*, the causative agent of European Foulbrood was isolated from some of the samples. The study also showed that many of the beekeepers are not managing their colonies and are not aware of the potential negative impacts of pests and diseases to bee health and honey production. One of the main factors contributing to the lack of information on bee pests is the use of traditional log and/or bark hives by most beekeepers, which are difficult to inspect. It is recommended that these emerging beekeepers be trained in hive management and that they adopt the use of modern hives such as the Kenya top bar and Langstroth, which are easy to inspect. It is also recommended that comprehensive honey bee pest and disease surveys be conducted in Zimbabwe and Namibia, and in other SADC countries in order to generate inventories for not only pest management but also to facilitate trade in African bees and their products. OIE regulations should also be fully adopted and implemented in the region for the control of bee pests and diseases, and the safe international trade of bees and bee products. The study provides valuable information for improved beekeeping thereby ensuring that more benefits in terms of honey and pollination services, accrue to farmers. The benefits will in turn enhance livelihoods especially for the rural communities.

[Abstract:0286]

Using Bio-mass and Bio-gas Technology Energy System in Rural Farm Settlement Areas to Protect Local Bees

Fatai Hamzat Adeshina

A and shine international limited, abuja nigeria

This is a complete compact automated power-generating solution that converts wooden and waste (wooden chips, charcoal, grass, corn cobs, animal and man waste, plastics) biomass to electricity with good return on investment. In several Africa Countries, preparation planting on farmland is usually preceded by bush clearing, bush burning, and burning off left-over crop stumps from previous farming season plantings. These activities not only affect the swarming of the local bees that also takes place about the same period, but also causes Colony Collapse Disorder of the bees in the farm settlement areas. Also in African countries, several rural settlement areas have become dump sites for refuse collected from urban cities causing serious environmental pollution to settlers and to the bee colonies in the area. 60% of total population of many countries in Africa live in the rural areas and 90% of the rural settlers rely on farming for subsistence living. Over 70% of major crops consumed in many cities and rural areas rely on bee pollination to produce seeds after seeds. Preparation to planting activities by burning, and pollution from refuse dumps in the rural areas can be converted to improve the living conditions of rural settlers through the use of "bio-mass and bio-gas energy system that converts these farm dry stumps, wood and refuse materials into renewable energy to also provide power generation to the rural areas. An empowered rural sector will create economic sufficiency and also stem the drift of viable manpower from farm settlement areas to the cities which might compound the current issues of unemployment, overcrowding and insecure urban areas.

Electric energy needed to power several cottage farm product industries in a sustainable manner has inexhaustible fuel source within reach in every rural community to provide a pollution free environment that not only affect health of man but could also cause drift and Colony Collapse Disorder of the bees.

[Abstract:0371]

Development of a Methodology for Assessing the Sustainability of Lavallega Beekeepers

Rosana Jacqueline Diaz

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In a context of constant changes at the climate, social, technological, economic and political levels, beekeepers have seen over recent years how environment have been degraded, not finding enough alternatives to reverse this situation. In this framework, the study presented here aims at defining and characterizing Lavallega's beekeepers and developing a methodology to assess the sustainability of agroecosystems through sustainability indicators. Field work began in July 2008 and lasted until December 2009. The sequence of this study was: 1) Literature review 2) Field work and situation analysis 3) Study of the database of national register of hive owners 4) Preparation, implementation and analysis of a survey of beekeepers 5) Implementation and analysis of eight in-depth interviews with key informants 6) Workshop with local and national actors to develop indicators 7) Data validation in situ. Three types of Lavallega beekeepers were identified and fourteen indicators developed to measure the sustainability of beekeepers. Of these six were environmental indicators, five production indicators and three social indicators.

[Abstract:0399]

Consumers of Honey in Morocco: Motives, Attitudes and Purchasing habits

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Nowadays it is extremely important for agricultural production, food industry and trading to follow the continuously changing consumer behavior. The objective of this study was to identify the motives, attitudes and buying habits of consumers of honey in Morocco. A questionnaire survey was conducted in 2017 (December–march) among Moroccan consumers from eleven regions and it was completed by 200 respondents. A deeper analysis of the results of the survey leads to suggest that the majority of consumers eat honey only occasionally and not regularly. The floral origin and taste of honey is considered as very important product features. Most people buy honey from beekeepers; special markets were named on the second place and markets on the third place. According to the respondents, their major motives for purchasing and consuming honey were to use it as food, medicine, a sweetener, or for other uses, and the breakfast seems to be the most favorable time to consume honey. The preferences of these consumers are based on creamy but spreadable honey packaged in glass jars. Most of people surveyed do not know about other apiary products such as bee propolis. The information provided in this article makes clear the need of Moroccan consumer for knowing the several benefits of honey like its health prevention ability in order to increase his consumption.

[Abstract:0411]

The Beekeeping and the Associativity, Like a Strategy for the Rural Development of Colombia

Ramon Galvis

Asociación de apicultores y criadores de abejas de Boyacá ASOAPIBOY

The Association of bee-keepers and breeders of bees of Boyacá ASOAPIBOY with their origin in the Republic of Colombia, it is an organization with more than 15 years of legal life, account with 25 partners, that produce on average 10 tons of pollen high Andean, 10 tonnes of honey special multiflorales, and half a ton of sweet honeydew of oak (*Quercus Humdboltii*) endemic tree of the highlands of the Andes. The work of this organization, has the support of institutions of higher education as the National University of Colombia, which has allowed by means of projects financed by the NATIONAL DEPARTMENT OF SCIENCES OF COLOMBIA - COLCIENCIAS, the study of the beekeeping flora, the analysis physical, chemical and microbiological tests of the honey, pollen and propolis of Boyacá, has been a strategy to seek to obtain the ORIGIN DESIGNATION, the project has already executed of elaboration of fermented beverages, the Hidromiel to base of the sweet honeydew of oak that has many benefits taste and that it is a viable alternative for the transformation of beekeeping products, and the more recent work and perhaps more importantly, the DEHYDRATED pollen with the Use of solar energy.

On the other hand and in an effort to the protection of the endemic forests of *Quercus Humdboltii*, ASOAPIBOY has worked in conjunction with the Department for Social Prosperity of Colombia DPS and with organizations of persons peasants of the region, to find strategies that allow to prevent deforestation with the deployment of hives within the forest and that long-term enable the farmer to acquire other income for its economy.

ASOAPIBOY has worked with full responsibility, speed and appropriation by the work beekeeping, with a philosophy of sustainability, seeking the rejection of the pesticides and in defense of all pollinators, this organization is emerging as a pioneer organization in Science, Technology and Innovation for sustainable rural development from bees and beekeeping. ASOAPIBOY is by nature conservation and defense of the bees and the biodiversity of Colombia.

[Abstract:0453]

Lessons from the Field: Building from Field Experience to Improve Support for Beekeeping in Kenya and Uganda

Thomas Carroll, Christopher Davey, Fredrick Otieno Odera

African Beekeeping Resource Centre

Despite innumerable projects to support the development of beekeeping in East Africa over the past 50 years and in recent years the supply of thousands of 'modern' beehives, beekeeping has not developed as expected. Current honey production levels in both Kenya and Uganda are only a fraction of their potential and traditional beekeeping still dominates. To examine the reality of beekeeping under field conditions, during 2015/2016 a sample of 53 of the best beekeepers were interviewed in depth on-farm. In addition the legacy of 12 beekeeping projects was examined and key stakeholders consulted. Our examination of the field lessons indicate that those promoting beekeeping often lack the technical capacity to impart essential skills, resulting in training which is classroom based and impractical. There is often an excessive focus on the provision of hardware - in particular, the provision of expensive frame hives. We found however that even those identified as the best beekeepers were typically managing frame hives as they would much cheaper traditional hives, negating any benefits from the more intricate design of the frame hive. We also found that there is inadequate emphasis on access to protective equipment such as beesuits and smokers, essential when dealing with defensive African bees. Despite these inadequacies successive beekeeping projects appear not to have learned lessons from preceding interventions, perhaps because lessons learned are not readily accessible. To achieve beekeeping's potential and to improve the livelihoods of poor rural communities in Kenya and Uganda we make a number of key recommendations. These include: a beekeeping data-base for each country (which documents the outcomes of beekeeping interventions); a shift away from a focus on supplying modern frame hives towards building appropriate practical husbandry skills; the need to target hive productivity rather than just increasing hive numbers; ensuring beekeepers have adequate access to protective equipment; recognising the different races of bees across the region, and tailoring husbandry training to reflect their varying characteristics; and recognising the existing skills of and methods used by experienced traditional beekeepers. We must also acknowledge the risks in keeping very defensive bees, and address this during training.

[Abstract:0476]

A New Employment for the Women from Ordu; the Training on the Production of Royal Jelly

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In this sense, it was aimed in this project to contribute to the new employment areas, self-reliance, job security, the high-food-ingredient food production. The project was carried out by 20 housewives at the apiary of Ordu Apiculture Research Institution. The names of 20 female apiarists whom the training will be provided in the project (the voluntary housewives who remain at home and are curious about the production of royal jelly) were determined and the theoretical and practical training on the production of royal jelly were given for a month. This one-month training and the production activities were done in our colonies at the institution's apiary. 100 pieces of the colonies in total were assigned as five for each colony to each of the women, and they are provided to do the production. The budding is done three times in a week, each of the female apiarists did 10-frame larva transfer in total with the use of 2 transfer frames to each of initiators (45 thimbles x 10 frames = 450 larva transfers for each of the frame, for each of the phases in total; 450 transfers x 20 female apiarists = 9000 larva transfers). Thus, 20 female apiarists did 108000 buddings (27000x4=108000) for 4 weeks in total as 27000 buddings (9000x3=27000) for each week. The royal jelly which was obtained from the colonies in each of the harvest was put into the dark-coloured bottles separately by the woody spoon, and it was kept in a deepfreeze. 1,5 royal jelly production was done by our female apiarists at the end of the project. With this project which was done, 20 female apiarists were incited to establish their own job, their self-reliance increased, the active usage of our other sources except from nut and honey was provided, and a new job employment for our women was created. It was seen that this project with high income would be a role model to our women especially from our province and in the other provinces and to the sectors.

[Abstract:0515]

Traditional Forestry and Beekeeping in Balkan History: Modern and Historical Roles of Landscape Architecture, Bee Boles and Skeps

Megan Colleen Mcshane, Marshall Sherman Nathanson
Florida Gulf Coast University

Fig and pomegranate motifs in textiles from the extended period of the 16th century represent the first accounts of international trade. The territory of Bosnia Herzegovina hosts fig and pomegranate cultivars that have contributed to the natural history and material culture of pollinator plant interactions in the Balkan region. *Ficus carica* and *Punica granatum* traveled the Silk Road and dispersed through the Ottoman and Venetian shipping routes in solidarity with critical pollinators and traditional beekeeping methods. We will follow this historical background through published accounts of travellers in the region and compare them to the current state of spontaneous or planned hybridization, as these species are essential for the global trade in fruit growing of autochthonous cultivars. In the 20th century, great attention has been paid to the formation of nurseries and agricultural schools where orchards form repositories of viable genetic material. Employing autochthonous fruit cultivars revitalizes ecological health while establishing habitat for endemic pollinators. Thus, this study also investigates landscape architecture as a vector for environmental restoration, climate resilience, and transitional economies. Increasingly, with the global crisis in beehive health, pollinator plant interactions are essential to understanding the synergy between bees and food production. As the long history of apiary operations in the Balkans has maintained its identity through the culture of fruit growing on a local scale, rather than on a large industrial scale, as in the case of the United States, we will compare case studies between the two regions.

[Abstract:0531]

Beekeeping through a Social Business Modal

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Golden Bees Ltd

Golden Bees Ltd is a Social Business that focuses on beekeeping through smallholder beekeepers in Uganda. Currently working with over 2000 smallholder beekeepers with a target of increasing the number to 5000 by 2018. We have seen production increase from our small scale beekeepers of-course coupled with an increase in investment by the smallholder beekeepers themselves. In Uganda production is a major issue and we as private sector recognised if we don't tackle the issue head on directly with the beekeepers we would not see any progress.

Mapped identified honey producing areas and beekeepers then carried out systematic interventions towards stimulating production as follows;

1. Training beekeepers in beekeeping best practices (transferred skill) and making of low cost transitional top bar hives (Stimulate local investment).
2. Extended extension and technical expertise as per individual beekeeper.
3. Used information Technology to capture all our beekeepers and track them and use of mobile money for payments. However need to employ extension staff to strengthen system. Encourage the use of mobile phones through our Honey for Phone promotion.
4. Setup honey shops that sell our products locally to sustain business and act as collection points during harvest season. In future to setup Apiaries as demos.
5. Developing a Tourist inclined market along the Honey trail (forest-Gorilla Certified) with traceability element to the smallholder however need to learn more on traceability.
6. Succeeded to do our 1st export shipment of bees wax to Japan and are diversifying in other bee products like propolis and bee Venom.

[Abstract:0584]

Integrating Beekeeping into Conservation Activities and Projects; a case study of Beekeeping Enterprise in Jos Wild Life Park, Plateau State, Nigeria

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The SDG goal 12 is to achieve sustainability in production and consumption patterns in global ecosystems. Conservation is the sustainable use and protection of natural resources in these ecosystems. Apiculture is the science of the interaction of honeybees (*apis mellifera*), stingless bees, (*melliponea beachei*) and bumblebees (*bombus terrastris*) with the environment and how such interaction benefits man. One of these interactions is the activity of pollination carried out by bees in the wild. The symbiotic relationship between bees and plants is one of the most efficient sustainable production and consumption patterns in our ecosystem.

The relevance of Beekeeping in conservation Beekeeping fulfils key components of Nigeria's national Environmental policy; conceptual framework, strategies for implementation, and 8 sections of the policy that refer to Wildlife & Forestry, Tourism & Environmental Protection The benefits of Beekeeping address key components of SDG 3,4,5,8,12 & 15. Bees as food producing animals are also critical to food security and deserve to be conserved.

Modus Operandi The Jos Wild Life Park is a conservation project under the management of Plateau State Tourism Corporation Apis Interactive Network Limited is an Apiculture Consulting & Beekeeping Enterprise involved in the Industry value chain and runs her operations in the Park. The activities include management of 234 productive bee hives, eco-tourism activities, training and capacity building, Apitherapy services and youth development internship collaboration. The honeybee population sustains the survival of many strategic plant species in the Park; wild daisy, water hyacinth, acacia, shea butter & eucalyptus.

Justification Beekeeping sustains animal bio-diversity, mitigates vegetation loss, sustains plant diversity, sustains human health, generates revenue from ecotourism and strengthens educational values. Beekeeping possesses potential to halt and reverse deforestation rates by up to 25% within 5 years, reduce National rural unemployment by 5%, and improve eco-diversity percentages. **Conclusion** Nigeria's deforestation rates are one of the worst in the world. By implication, eco-diversity balance is threatened. Integrating Apiculture Science & Beekeeping bio-technology is a critical intervention that should be vigorously pursued to feature as a fundamental conservation activity.

[Abstract:0627]

Climate Change Effects on Granulation of Honey as it Affects its Marketability: a Case Study at Ile-Ife, Osun State, Nigeria

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Recently, the campaign for natural sweetener, honey, is on the high side in Nigeria probably because of its medicinal importance or its cultural uses among Nigerians. Based on the percentage of fructose and moisture content, honey can come out either as granulated or non-granulated. However, buyers prefer to buy non-granulated honey as they perceive granulated honey as adulterated. This portends fear to many local beekeepers because most of them have never experienced such a scenario and this raised so many questions. We carried out our studies in Ile-Ife, Nigeria among beekeepers who experienced honey granulation due to the harsh weather in 2015/2016. In addition, few local beekeepers from Ogun, Oyo, Kwara, Ondo and Ekiti were selected and questionnaires were administered. The results show that there was no market value for granulated honey in Nigeria because buyers believed that the local beekeepers must have added sugar, which eventually caused the honey, granulate. During this period of change in climate condition over 85% of the honey harvested were crystallized. In contrast, less than 10% of honey harvested in 2016/2017 was granulated.

[Abstract:0639]

Does propolis production in Turkey meet the consumer demand?

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Honey is ranked first when the production and consumption potential of bee products in our country is examined. When it comes to the propolis production, it is not intensively produced due to both unconscious apiculture and lack of knowledge of its importance. This study addresses to what extent propolis produced in Turkey meets the demand of the consumer. Despite being the second largest honey producer after China, Turkey has fallen quite insufficient in propolis production. With the increased attention to the alternative medicine to enhance the quality of life, propolis has also attracted attention and demand in recent years. Propolis is, however, generally imported to meet the demand as its production is yet to be adequate. A large amount of propolis is imported to Turkey, the second largest honey producer in the world, from Japan, Brazil and China. Propolis production covers a rather narrow area and is conducted individually because honey production has been concentrated on in general in Turkey. Turkish beekeepers do not produce propolis for reasons such as insufficient level of marketing network and its underrated economic value; they even throw away the propolis present in beehives as they are not aware of its significance. A rich content in propolis like in honey is an expected consequence in Turkey which has a diversified floristic structure due to variations such as climate, geographic structure, temperature and elevation. It has been discovered that propolis in Turkey has a rich chemical content. Nevertheless, the difficulty of land studies and insufficient study budgets hinder valuable information obtained in Turkey from being practically used. Lack of practical briefings prevents beekeepers from turning to propolis production. For those reasons, it is of great importance to identify chemical compounds and biological activities of Turkish propolis to encourage beekeepers and to conduct works for commercial production accordingly.

[Abstract:0656]

Kakpakov Vitaliy Tuyakovich - Scientist and Beekeeper from the Altai Mountains

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This article is a breve biography of a man from Altai Mountains who loved bees, loved all the living creatures and devoted his whole life to this love - and so he was able to convey a part of this passion to the next generations - biology doctor Kakpakov Vitaliy Tuyakovich. He has done the way from an assistant in the Gorno-Altai Pedagogical Institute to an Academician of the Russian Academy of Natural Sciences. V. Kakpakov was the first in the world who obtained a permanent line of *Drosophila* embryonic cells, this work was awarded in 1969 by the prestigious scientific award named after I.V. Kurchatov. V. Kakpakov is the author of the vitamin-ecdystyrene stimulator of bees (VESP), and of the cryobiological technology of preserving the gene pool of honey bees and fish, of the nutrient medium C46 for cultivation of invertebrate animals, the creator of the All-Russian specialized collection of permanent invertebrate cell lines (VSKPLKB, intl.code – WIEW). He was a member of the All-Russian Organizing Committee of the Workshops on the Conservation of Genetic Resources, the European Society of Tissue Cultures, the member and chairman of the section of Biotechnological Foundations of Beekeeping of the Moscow Society of Nature Investigators (MOIP), the author of more than 350 published works, 5 copyright certificates of the USSR and 2 patents of the Russian Federation.

The author tells a story of meeting him and learning of him, and how that friendship influed into her life and her choice of the scientific field and the practical work. The crisis of modern beekeeping can be associated not only with the use of pesticides, poisons, artificial feed, GMOs and other technical factors, but also with the anthropogenic factor of loss of the connection between generations. Learning from the life of such people like V. T. Kakpakov is necessary for the next generation of indigenous nations like of the Altai Republic.

[Abstract:0667]

Reducing the Cost of Beehive Construction and Improving Their Efficiency Through Knock- Down Metal Beehive Framework Systems

Abraham Addo Ansah Allotey

FORESTRY COMMISSION / ALLOTEY HONEY BEE FARMS

Wood is the main material for beehive construction which is major cost in bee keeping projects. Composite materials using metal and any appropriate material could be combined to give low cost hive. This research investigated composite based materials for bee hive construction using a metal framework system to reduce cost and improve the efficiencies of beehives.

MATERIALS AND METHODS

1. 2.5cm rectangular- shaped square pipe of dimension 53.5 by 34cm with one of the length wise portion removed. –(A)
2. metal pipes similar to the above but with dimension 49.5 by 29.5cm –(B)
3. 2, 8, 60 cm long 2.5cm square pipe.
4. flat metal and U-shaped angle iron
5. Bolt and nut
6. 1.5mm metal plate
7. 3/4inch metal bar
8. U-shaped 1.5cm thick metal plate

METHODS

It will involve the construction of the width sides of the hive to be joined by four cross bars. Two each at the base and tops of both front and back of the hive.

Side width construction

'B' is inserted into 'A' leaving a 2cm spacing between the bases of 'A' and 'B' and along their heights. The U-shaped metal bar is inverted and welded at the top spaces between the height's of 'A' and 'B' lengths but 4cm below. Two 8cm long pipes are attached to the top lengths of the 'A' pipes unto which also angle irons are fixed

Top cross bar construction

Two U-shaped ¾ metal bars are inverted fixed between and at the ends of the 60cm long 1.5mm plate of width 6 and 8cm with an angle iron fixed at its end.

As the cross bars are held in place by the bolt and nuts, a frame work is formed with empty spaces that needs to be filled with various materials such as raffia and bamboo strips, scrap wood, Styrofoam, perforated plastics boards, cardboards, grasses, tree branches etc to form the hive's body.

Conclusion

The beehive metal framework system formed will enable all beehives to be constructed cheaply and other appropriate materials used as beehive body

[Abstract:0668]

Establishing Honey Forests and Beekeeping

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To promote the beekeeping sector, General Directorate of Forestry took some measures by framing vegetation suitable for beekeeping, making functional management plans to serve beekeepers and also establishing “honey forests”. According to 170th article in our Constitution, it is mandatory that villages which are in and around the forested areas need to be promoted in any way possible. Also in 2008, 4th article of Forest Management Regulation decides to leave some of the forested areas only to produce honey. Another memorandum come out in 2010 “Promoting the Beekeeping” by the General Directorate of Forestry. Finally in 2013, honey forests were started to establish after preparing the “Action Plan of Honey Forest”.

In this study we examined the beekeeping activities which are among the solutions to balance between the endless necessities and scarce resources. We studied the honey forests spreaded out the country to provide food security and employment for rural development. Using the point coordinates and GIS applications all of the 344 honey forests which established until today are mapped. The questions answered and some suggestions made with this study are; what are the criteria to establish those forests, which species are used, who are the beneficiaries, how can we draw the most advantages from those forests, what are the objectives and which ones are reached until today.

[Abstract:0671]

Tree Bracket Fixing Beehive(s) on or Between the Three Trunks – The Case of Tree Bracket

Abraham Addo Ansah Allotey

Abraham addo- ansah allotey

INTRODUCTION:

Integration of bee keeping in plantations could provide the needed income to manage the plantations,

The purpose of this technological research is to develop a tree bracket that will ensure the fixing of hives, both in group or individual between trees or on trees respectively.

MATERIALS-METHODS:

1. 4 pieces of 60cm long 2.5 (11) diameter round pipe – A
2. 1.5 inches round pipe – 10pieces of length 5cm with drilled holes for 13 bolt & nut – B
3. An omega shaped round 11 (2.5cm diameter)pipe with varying diameter to fix onto the trunks of specific trees. Pre drilled holes are placed at the curvation of the omega shaped pipes which will fix wall nails into the tree trunk – C
4. 4-5 inches wall nails
5. 30 and 45cm long 1 inch round pipe with pre drilled holes at 5cm of both pipe ends – D

METHODS:

The 1.5 inches round pipes are welded at about 5cm from both ends of the “A” pipe at 90 and 180 to the orientation of the pipes.

The A pipes are placed at 45° inclination to the tree’s orientation with the ‘C’ pipes being fixed to the ‘A’ pipe at both the top and down and also at both sides of the tree with bolts and nuts. The ‘C’ pipes are held to the tree by the wall nails. The ‘D’ pipes are fixed into the ‘A’ pipes such that the ‘D’ pipes looks like an out stretched arm for the placement of beehives

CONCLUSION:

The tree brackets enable beehive(s) to be mounted high in trees. In fire prone areas, the hive could be covered with metal roofing sheets or are placed in metre drums to protect the hives from the fires.

[Abstract:0707]

Perception and Coping Strategies of Beekeepers to the Effects of Climate Change in DJIDJA and ZOGBODOMEY South of Benin (West Africa)

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The consequences of climate change are saving no sector of agriculture. They both affect the beekeeping sector. This study, carried out in the municipalities of Djidja and Zogbodomey South of Benin, aimed at analyzing beekeepers' perception of the effects of climate change and to investigate their adaptation strategies. For this purpose, data were collected by using a questionnaire with a sampling of one hundred and ten (110) beekeepers randomly selected in three representative villages of the study area. Data on the socio-economic characteristics of the households of beekeepers, their perception of the effects of climate change, as well as adaptation strategies were collected. Statistical analyses using R version 3.1.2 software showed that in the two municipalities, the increase in temperature and decrease in precipitation were the main manifestations of climate change perceived by beekeepers. The study revealed that, beekeepers adapted through six (06) important measures. These were: bee species diversification, changing of the apiaries sites, the diversification of the types of hive, modification of beekeeping techniques, changing of the periods of operations and at last praying. Moreover, the most affected beekeepers are considering the passage of beekeeping to the hunt for honey and for some, a change of activity. From the results of this study, new actions in favor of beekeeping are useful in order to allow this activity to play a leading role in the improvement of agricultural production and the reduction of poverty

[Abstract:0722]

Beekeeping in Jordan, problems and prospects

Mohammad Alrababah, Mohammad Alhamad, Ahmad Bdour

Jordan University of Science and Technology

Jordan beekeeping sector, although ancient, is still emerging and is trying to capitalize on the available opportunities. Beekeeping sector in Jordan is 85% rural activity performed by low income families with several problems. Jordan biogeographic characteristics hold a great promise to beekeeping but still underutilized. This presentation will focus on the results of two questionnaires targeting the major aspects of beekeeping in Jordan, the problems and the prospects for the future. The presentation will focus on the major obstacle for beekeeping. Honey quality and marketing, knowledge based beekeeping and awareness programs and the best practices. Finally, the presentation will focus on the prospects for beekeeping in Jordan capitalizing on many important aspects such as the presence of four biogeographical regions and temperate climate with large number of flowering plants most of which are aromatic and medicinal plants. The results of the questionnaires revealed that only 5.7% of beekeepers are professional beekeepers. The results showed that most beekeepers are practicing beekeeping without any formal training resulting in major problems related to management issues. Diseases and pest control, feeding, queen rearing, marketing, and many more practices are done without any scientific background resulting in mismanagement.

[Abstract:0779]

A Case Study on Honey Plant Species Selection and Bee Hive Location for Multi-functional Apicultural Forest

Dongyun Kang, Joosang Chung

Seoul National University, Department: Department of Forest sciences

This study conducted a suitability analysis on selecting honey plant species and location of bee hives for multi-functional apiculture complex (located in Gangwon-province in Korea) which to produce not only honey products, but also forest by-products and provide the opportunity of eco-tourism. In order to firstly identify honey plant species that are physiologically suitable for the area, information regarding vegetation composition, and geographic and climatic characteristics of the area were obtained through field survey. In addition, professional beekeepers' preference on honey plants were also considered in this process. The identified species were then analyzed in regards with flowering period, availability of forest by-products and flower colors for maximized annual honey extraction period, profitability and landscape aesthetics. In terms of selecting the location of bee hives, factors that affect bee rearing such as 'altitude', 'slope', 'aspect', 'distance to road', 'distance to water' were considered. Each factor was then weighed differently according to its impact on bee's ecology based on literature review and experts' opinion. As a result, 15 honey plant species for the maximized duration of honey extraction, 10 honey plant species for forest by-products, and 15 herbaceous species were selected.

BEEKEEPING TECHNOLOGY AND QUALITY

[Abstract:0037]

The Characterization of Blossom Honey from Two Provinces of Pakistan

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The aim of this study sought to characterize the quality parameters and discriminative properties of 15 different blossom honeys collected from collected from eleven locations in the Punjab and Khyber Pakhtunkhwa (KPK) provinces of Pakistan.. Previous work has mainly focused on a few samples from specific locality. Mean values for physicochemical parameters (i.e., moisture, water activity, free acidity, pH, electric conductivity, diastase activity, total acidity, ash, total protein, hydroxymethylfurfural, fructose, glucose, sucrose, maltose, raffinose, reducing sugars, total sugars, and fructose/glucose ratio) were 18.09%, 0.57, 13.52 mEq kg⁻¹, 4.27, 414.41 μS cm⁻¹, 10.56 DN, 26.80 mEq kg⁻¹, 0.15%, 313.30 mg 100 g⁻¹, 15.39 mg kg⁻¹, 35.49%, 30.77%, 4.41%, 2.12%, 0.11%, 66.25%, 72.88%, and 1.16, respectively. The sucrose content was slightly high in three honeys. In general, all of the remaining honey samples met the criteria for international honey standards. This is the first study of the characterization of these uni floral honey from Pakistan

[Abstract:0061]

Characterization of wild Bush (*Plectranthus Rugosus*) Honey Produced in Kashmir Valley Based on Physicochemical Parameters, Antioxidant Properties and Volatile Compounds

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The objective of the present study was to characterize high altitude Indian wild bush honey (*Prugosus*; local name-“Solai”) based on physicochemical parameters, mineral content antioxidant properties and volatile compounds. The results showed that the honey samples analyzed, met the standard quality criteria set by the Codex alimentarius commission and European Union. The results showed that glucose (31.21%) and fructose (38.87%) were the dominant sugars with low concentration of disaccharides and trisaccharides. The presence of sugars in the analyzed honey samples was further confirmed by obtaining a band from 1400–750cm⁻¹ that corresponds to the most sensitive absorption region of the sugars using FTIR-ATR. Among the minerals, potassium (638.96 mg/kg) was the most predominant mineral followed by calcium (136.23 mg/kg), sodium (36.61 mg/kg) and phosphorus (32.85 mg/kg) in studied honey samples. Six phenolic acids (gallic acid, caffeic acid, chlorogenic acid, p-coumaric acid, ellagic acid and ferulic acid) and seven flavonoids (myriceten, naringenin, kaempferol, pinocembrin, chrysin, apigenin and quercetin) were identified in wild bush honey samples. The result for total phenolic content (43.99 mg GAE/100g), total flavonoid content (10.02 mg QE/100g) and DPPH activity (59.29%) revealed that wild honey from Kashmir valley possessed high antioxidant activity. Sixteen volatiles, particularly aldehydes, esters, ketones, organic acids, hydrocarbons and alcohols were detected in all wild bush honey samples. Some volatile compounds present in wild bush honey have also been detected in the respective floral origin of *Prugosus*, thus could be used as chemical markers in defining a given honey to its floral origin. Results showed unique floral markers to authenticate the botanical origin of wild bush honey samples allowing their marketing as monofloral rather than generic honey.

[Abstract:0070]

Suitability of Heat Treated Wood as Raw Material for Beehive

Bilgin İçel, Mustafa Yalçınkaya, Yasemin Şimşek

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Beekeeping, as a tradition of Anatolian people, has been practiced popularly in Turkey since ancient civilizations. Wood is the most important raw material for bee hives. As a biological material, instability under changing moisture conditions and biodegradability are significant disadvantages of the material. Therefore, many hive manufacturers and users generally apply chemical treatments on surface of wooden hives (ie: Oily dye, wood protectors, water repellent etc.). There are different research reporting negative effects of these chemicals on bees and honey. Heat treatment is one of the wood modification methods applied to improve the dimensional stability and durability of the material. Because there is no chemical application during the process, heat-treating wood is generally considered an eco-friendly method. The purpose of this study was to evaluate suitability of heat-treated wood for bee hives. Langstroth type beehives were constructed of heat-treated (HT) Scotch pine wood and controls made of untreated wood of the same wood species. The two types of hives were compared in terms of internal humidity and temperature differences. Additionally their resistance to biotic and abiotic factors and bee colony behavior observed visually for 10 months for a project (TUBİTAK 1919B011501220). Beehives transferred to the Pişkidağ village of Üzümlü district in Erzincan and placed next to the hives of a bee grower. All beehives were transported to Erdemli district of Mersin for wintering. The temperature and humidity measurements were taken twice a month periodically at the first and last week of each month from July 2015 to April 2016. Relative humidity of HT hives were found generally 1% -2% lower than control hives. Although the average inner temperature of HT hives (24.8 °C) and control hives (25 °C) were very close, internal temperature of HT hives measured 0.5° C, 0.8 °C and 0.3 °C lower than control hives for summer, fall and winter months respectively. Interestingly inner temperature of HT hives were 0.7 °C higher for spring months. We did not observe any disturbing effect of heat treated wood on bee colony. We also did not observe any sign of biological attack on HT hives during the project

[Abstract:0071]

Physicochemical Characterization and Biological Activity of a Propolis from San Mateo, Boyacá, Colombia

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A physicochemical characterization of a propolis sample from San Mateo, Boyacá Colombia, was carried out. In order to evaluate its quality, many parameters were determined and compared with Brazilian and Argentinian regulations. From this analysis, It was found that the propolis sample fulfills satisfactorily all the parameters evaluated except, resin content and extractable matter in hexane. However, similar results were found when our results were compared with different Colombian ethanolic extracts from propolis (EEP) previously evaluated. Additionally, the evaluation of the biological activity of the EEP was carried out. Preliminary antimicrobial activity against *E. faecalis*, *S. aureus*, *S. mutans*, *E. coli*, *S. typhimurium*, *P. aeruginosa* and *K. pneumoniae* was tested by agar diffusion method. Chloroform fraction of EEP had the highest activity against Gram (+) and Gram (-) bacteria. In addition, a bioautography test against was performed concluding that chloroform fraction had many compounds with antibacterial activity against *P. aeruginosa* y *K. pneumoniae*. The half inhibitory concentration (IC50) was determined by microdilution method with TTC (2,3,5-triphenyltetrazolium chloride).The lowest IC50 values were shown against *P. aeruginosa* and *S. aureus* strains. On the other hand, the antioxidant activity was evaluated by the DPPH and ABTS methods. High DPPH and ABTS radical inhibition was observed with EEP, expressed in Trolox equivalents per gram of sample (µmol TE/g sample). Finally, a preliminary chemical analysis was performed, concluding that the propolis from San Mateo-Boyacá contains large amounts of terpenes and steroids; besides phenolic compounds, including various types of flavonoids. From GC-MS analysis, fatty acids such as palmitic and oleic acid were identified as major compounds. Our results contribute to the characterization of a Colombian propolis sample. More studies are needed with the aim to create a national regulation according to the specific features of Colombian propolis. Additionally, and taking into account that chemical composition and biological activity of propolis varies depending of geographical location and the flora around the hive, this kind of studies would allow to find new properties for Colombian propolis helping to grow local beekeeping industry.

[Abstract:0072]

Monitoring Colony Activity with Temperature Sensors: a Research Agenda

Franklyn Linton

Retired

An array of temperature sensors embedded in a beehive can detect and report the amount of brood and the size of the winter cluster. Many other colony activities may also be detected by their effects on temperature. Questions regarding sensor density, placement, and sampling frequency are, however, open questions, and research is needed to determine them.

Placement: Are sensors best placed within combs, between combs, or between boxes?

Density: How many sensors per 1000 cc of hive volume are sufficient for detecting the various colony activities?

Frequency: How frequently need the temperatures be sampled, be reported?

The following events are hypothesized to be detectable by their effects on temperature:

Brood

1. Brood volume: The precise edges or boundaries of the brood areas
2. The rate and place of egg laying
3. Distinguish between brood and winter cluster, start of spring laying, fall shut down
4. Distinguish among the presence of eggs, larvae, or pupae (temperature plus date/time required)
5. Drone comb; when to remove it to reduce Varroa mites
6. Brood cooling
7. Swarm preparation (queen shutdown)

Queen

8. A fine-grained understanding of queen behavior
9. Queen mating quality (rate of laying)
10. Acceptance of new queens (start of laying)
11. Possibly: Presence of queen cells

Flight

12. Queen mating flights: warm-up, departure, return
13. Orientation flights: warm-up, departure, return
14. Swarms: warm-up, departure
15. Swarm arrival at bait hive

Colony activity & etc.

16. Winter cluster: edge, center, movement, starvation...
17. Presence of robbing
18. Drawing comb/festooning
19. Fermenting pollen or ripening bee bread
20. Ripening honey, capped honey
21. Foundation and empty cells or comb
22. Possibly: Bearding at entrance

This is a remarkable number of possibilities. Research is needed to determine whether each can be detected and if so, the sensor density, placement, and sampling frequency required for their detection.

These events, when compared with optimal colony behaviors for a given time and place, will provide beekeepers with detailed health and productivity information.

[Abstract:0089]

Heavy Metal Contents in Thai Honey

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This study was to determine the heavy metal contents in 57 Thai honey samples from different botanical origins and regions of Thailand and was identified by inductively coupled plasma-optical emission spectrometry (ICP-OES). The results showed that the levels of arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb) in the honey samples were <0.006-0.075 mg/kg, <0.001-0.015 mg/kg, 0.009-0.489 mg/kg, 0.025-30.349 mg/kg and 0.005-0.215 mg/kg, respectively. The average Ni level was significantly higher than the levels of the other heavy metals in different honey sources ($p < 0.05$). The Pb concentration in the longan honey from Chiang Mai Province was the only heavy metal that was significantly higher than the longan honey from Lamphun Province ($p < 0.05$). The honey from the northern Thailand had significantly higher heavy metal contents than other regions ($p < 0.05$). However, the Thai natural honey approved the standard for Thai food containing contaminants, as well as the Codex Alimentarius standards, and is a safe food for consumption. The concentration of these components was very low in honey samples; thus the ingesting of these honeys does not current a problem for human health.

[Abstract:0100]

Indian Thyme (Ajwain) Honey – A New Blossom Amber Honey from India

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The objective of the present study was to characterize a newly developed Indian Thyme (Ajwain) Honey (692 samples collected over a period of 5 years) produced from nectar of a strongly flavored annual spice herb commonly known as Ajwain (Bishop's weed; *Trachyspermum ammi*; Apiaceae), based on pollen profiles, sugar analysis, stable carbon isotope analysis (EA-IRMS; EA/LC-IRMS) and physico-chemical parameters. Indian Thyme (Ajwain) Honey was categorized as monofloral honey due to the large abundance of *Trachyspermum ammi* pollen grains (70 to 97%). The other main pollen types associated with late Ajwain honey production are Brassica, Aster, Prosopis spec. and Poaceae etc. The Amber color (70-110 mm Pfund), liquid consistency with high diastase activity (23.2-29.3DZ), F/G (1.30-1.59) specific gravity (1.41), Electrical conductivity (0.30-0.41mS/cm) and pH (4.14- 4.79) were the main physico-chemical parameters of Indian Thyme Honey. Sugar analysis confirmed that fructose (38.10-44.50%) was the dominating sugar with comparatively low concentration of glucose (27.60-35.30%), sucrose (0.0-2.40%), maltose (0.0-2.0%) and turanose (0.5-1.2%). The HMF content was varied from 0.0-5mg/kg. Stable carbon isotope methods (C4/C3 Sugars) were used to establish authentic isotopic values for each constituent of Indian Thyme Honey and were as Protein -24.00 to -26.90‰, Honey/ Fructose/ Glucose/ Disaccharides -23.30 to -26.11‰, $\delta^{13}\text{C}$ (F-G) -0.47 to 0.28‰; $\delta^{13}\text{C}$ (max.) 0.88 to -1.19‰, C4 Sugar: 0.0-3.6‰; Disaccharides: 4.8-7.1‰, Trisaccharides: n.d.($<0.7\%$); Oligosaccharides: n.d. All purity parameters i.e. $\delta^{13}\text{C}$ (F-G, $\pm 1.0\%$), $\delta^{13}\text{C}$ (max. $\pm 2.1\%$) and oligosaccharides ($<0.7\%$) were in safe range with all δ values in narrow range of $\delta \pm 3.60\%$. These parameters were helpful in establishing authentication of Indian Thyme Honey. A direct co-relation was also established between F/G, Color and *Trachyspermum* pollen grains count. Overall, 82% of the samples had color above 80mm while 18% between 70 to 80mm. Further, all samples could be grouped on the basis of F/G as 1.41-1.59 (13.3%), 1.30-1.40 (80.6%) and 1.21-1.29 (6.1%). *Trachyspermum* pollen grains count was in the range of 80-97% for samples having F/G 1.30 to 1.59 while 60-75% for samples having F/G 1.21 to 1.29.

[Abstract:0106]

Palynological and Physicochemical Composition of Algerian Honey

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In Algeria, honey is considered not only as a natural and noble excellent food, but also as a drug with an extraordinary therapeutic value. The botanical origin seems to have a primary interest in the Algerian consumer. Palynological and physicochemical studies of 32 samples harvested from Blida (North-central Algeria) and from Laghouat (Southern-central Algeria) were performed. Our goal is to determine and compare the commercial value of honey in both regions through the following parameters; the quality and quantity of the pollen grains contained in the samples, water content, electrical conductivity, acidity (free and combined total), pH, sugars (total sugars, fructose, glucose, sucrose and the sum of fructose, and glucose), glucose/water ratio, hydroxymethylfurfural, proteins and color. Results of the analysis showed that pollen honeys from Blida contain 92 pollen types belonging to 48 botanical families, the most important are Asteraceae, Brassicaceae, Fabaceae, Oleaceae, Salicaceae and Apiaceae, in which nine samples are monofloral (*Eucalyptus* and *Citrus*). On the other hand, Laghouat honeys contain 85 pollen types belonging to 45 botanical families; the most important are Fabaceae, Asteraceae and Brassicaceae, where eleven samples are monofloral (*Peganum harmala*, *Ziziphus lotus*, *Euphorbia* sp., *Punica granatum* and *Echium* sp.). The results of the physico-chemical analysis allow that 90.79% of the samples have a high quality and are in compliance with Codex Alimentarius standards and European standards.

[Abstract:0117]

Good Management Practices to Keep the Queen Bee at the Brood Chamber without Using Queen Excluder in Honeybee (*Apis mellifera adansonii*) Field Management

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The best management practices for effective utilization and to harness the products and services from honeybees remain the “Natural Management”- where the honeybees are studied and their needs and working principles well understood for the good of the bees, beekeepers and other farmers. These natural management practices should be adopted for sustainability of the bees instead of using some man-made equipment to decide their mode of operation.

Queen excluder, as the name implies is man-made (metallic, plastic or wooden) equipment used to restrict or decide the movement of the queen bee in her colony. It may be placed between the brood chamber and honey super of some hives (with bee space) to stop the queen from moving into the honey super or could be used to confine the queen in a particular area during queen rearing. It could also be placed between the brood chamber and floor board for swarm control among other uses.

But there are a lot of controversies and arguments among professional beekeepers whether or not to use queen excluder for honeybee management. Questions like “Is there any queen excluder in natural hives in our forests?” always come up. The argument continues that engorged bees are bigger and so will not fit through the carefully measured slots of the excluder. This follows that a good deal of honey is prevented from entering the super, thus the term “Honey excluder”.

This presentation details some field management procedures/practices we have developed and adopted which obviously avoid problems that queen excluders are designed to eliminate, such as presence of either broods or queen being present in honey supers removed for extraction. It unveils the determinant factors for queen movement and her preference which MUST be made available for her in any hive area the beekeeper wishes the queen to stay. This will help beekeepers to keep broods out of honey supers, control swarm and retain the queen in a desired area without queen excluders

[Abstract:0130]

Post-harvest Handling Procedure to Obtain Pure Beeswax: South-East Nigeria Experience

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Beeswax being one of the industrial raw materials from honeybees has not been fully identified as a source of income in some places especially developing countries where local or traditional technologies still dominate in all bee related activities. In those areas, honey is the only recognized bee product while the comb (wax) is regarded as chaff which could be thrown away or mishandled to obtain honey without considering quality of the wax.

Historically, the value of beeswax was about eight times that of honey but since paraffin, gas and electricity took over from beeswax candles, well over 100years ago in some countries, beeswax has averaged only about twice the price of honey depending on the quality (Ron Brown, Bee Craft Magazine).

Over millions of years, honeybees have been programmed by nature to produce both honey and wax in their wild colonies. We know from experience that when young bees, gorged with honey or sugar syrup, hang in a cluster, they produce tiny platelets of clear or whitish wax from their waistcoat pockets and build hexagonal cells in vertical combs. In the cells, broods are reared and honey and or pollen stored without affecting the quality negatively rather enhances it by adding attractive colour.

In this research, 20 farmers from each of the five states (Ebonyi, Enugu, Anambra, Imo and Abia) in South-East Nigeria were randomly interviewed using structured questionnaire to ascertain how they handle the bee combs after honey extraction (post-harvest). 50% of the farmers throw away the combs as chaff; 40% boil the honey combs directly after harvesting from field as the wax solidifies on top; while 10% use little water to boil the comb with some honey still there after pressing, the melted wax sieves out and allows to solidify. From the result, none of the methods or procedures brings out high quality beeswax.

Based on the result, this presentation unveils the post-harvest handling operations carried out by some farmers which reduces the wax qualities and goes further to detail simple procedures to obtain pure beeswax which does not need any further refining for industrial use.

[Abstract:0135]

Sensitive Simultaneous Screening of Nitroimidazoles and Chloramphenicol on a Biochip Array Through the Use of Dedicated Multi-Analyte Immunoaffinity Columns for Honey Sample Clean-Up

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Introduction. Nitroimidazoles (NMZ) and Chloramphenicol (CAP) are prohibited from use in foodstuffs of animal origin in the EU (Annex IV of EU Commission Regulation 37/2010). The availability of ever more sensitive screening methods is then crucial for the efficient monitoring of honeys. For this reason, the current Antimicrobial Array V (AM V) biochip assay has been adapted to include the use of dedicated Immunoaffinity Columns (IACs) for the enhanced, simultaneous clean-up of NMZs and CAP from honey samples for the ultra-sensitive multiplex detection of Metronidazole (MNZ), Dimetridazole (DMZ), Ronidazole (RNZ) and CAP. Moreover, these multi-analyte affinity columns keep within the same timeframe as the current solvent extraction method.

Methods. Simultaneous purification of NMZs and CAP from honey samples (2g) using in-house prepared 0.3mL multi-analyte IACs, followed by application of the reconstituted eluates to the biochips. The AM V biochip array kit applied to the Evidence Investigator analyser was used for the simultaneous screening.

Results. The NMZ and CAP assays were standardised to MNZ and CAP, respectively, with the cross-reactivities remaining as 90% for DMZ and 310% for RNZ. When employing the IACs rather than the current AM V solvent extraction method, the LOD for NMZ was lowered from 0.9ppb to 0.35ppb for MNZ and DMZ and to 0.2ppb for RNZ. Similarly, the LOD for CAP was lowered from 0.1ppb to 0.05ppb. The binding capacity for the NMZ and CAP assays were 60ng and 5ng per column, respectively. Recoveries were within 60 to 130% for all analytes.

Conclusion. The results demonstrate increased sensitivity for the current AM V screening assay to levels comparable with analytical methods (LC-MS/MS); i.e. 0.35ppb detection for MNZ and DMZ, 0.2ppb detection for RNZ (reduced from 0.9ppb for NMZs) and 0.05ppb detection for CAP (reduced from 0.1ppb). Not only has sensitivity been improved by reducing the matrix background, but the sample preparation time has been kept to a minimum by the employment of rapid 0.3mL columns. Therefore, up to 45 honey samples can be sensitively screened for multiple analytes with results obtained within 4 hours 30 minutes.

[Abstract:0149]

Palynological, Chemical and Quality Characterization of a Bee Pollen Sample from San Orlando Apiary (Tabio-Cundinamarca, Colombia)

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Bee pollen is a beekeeping product with a great nutritional value, particularly because it contains a considerable amount of sugars, lipids and proteins. Moreover it is a source of bioactive substances such as phenolic compounds and flavonoids, renowned by their great antioxidant activity. Due to the previously mentioned reasons the population has increased its consumption, especially as a nutritional supplement. The aim of this work was to determine, by means of a palynological analysis, the botanical origin of a bee pollen sample from San Orlando's farm located in the municipality of Tabio, Cundinamarca. Additionally, the quality of the bee pollen was assessed evaluating parameters such as moisture, ashes, percentage of lipids and proteins. Also, a preliminary phytochemical analysis was performed by tube reaction tests and thin layer chromatography. With respect to botanical origin of pollen, the presence of pollen grains from *Eucalyptus globulus* was high, followed by *Calendula officinalis* pollen. Regarding to quality control, the sample complies with the quality control specifications for pollen according to Argentina, Brazil and France regulations for moisture, ashes, lipid and protein content. In chemical characterization, the pollen sample showed a wide variety of phenolic compounds, such as flavonoids and tannins. Additionally, terpene compounds, such as steroids and triterpenoids, were detected. In the quantification of total phenolic and flavonoid content, values of 27.87 GAE/g of pollen and 7.95 QE / g of pollen were found. These contents are related to the antioxidant capacity values obtained, which were 154.73 µmol trolox/g and 127.43 µmol trolox/g for DPPH and ABTS assays, respectively. Finally, the presence of myricetin was established. This flavonol was purified by conventional chromatographic techniques and its structure was established using mono and two-dimensional nuclear magnetic resonance experiments. Our results contribute to the characterization of a Colombian pollen sample obtained from artisan form, in order to give added value and helping to grow local beekeeping industry. Due to the lack of a Colombian regulation for pollen more studies are needed with the aim to create a national legislation according to the specific features of this bee product.

[Abstract:0155]

Beeswax Foundation as a New Method of Transporting Medical Substances for bee disease control

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The available methods of combating common bee diseases, e.g. bacteria, bacilli, microbes, streptococci, fungi, are ineffective. We have invented a new technique to treat and prevent bee diseases. It is based on restoring the natural pathogenic protection to bees. It includes a new method of feeding protective components to bee-colonies. The medical and preventive substance is fed to beeswax foundation performing some important functions. To treat and prevent some bee diseases it is important to take into account:

- the starting time
 - the period of exposure
 - a reliable and plain method of feeding the medical substance and ensuring that the bee is in continuous contact with it from egg to adult.
- The spring period of bee-colony formation clashes with that of growing diseases. That is also the period when bees are intensive to build their honeycombs. When making honeycombs on beeswax foundations bees are known to take up to 70-80% of wax from the foundations themselves, 20-30 % belonging to the bees. The above fact and the fact that the main protective component is propolis made us introduce fractions of bee glue into the beeswax foundation. The new Propolis Beeswax Foundation product was tested in vitro by the Prokopovich Apiculture Institute and other establishments. The findings have shown that the propolis beeswax foundation is inhibitive and anti-mycotic, which is 85-95% against *Askosphaera apis*, and *Aspergillus flavus*.

The in vitro researches were supported by factory tests prompting to launch the mass-production of the highly effective Propolis Beeswax Foundation.

Honey bees mix the propolis and their own protective useful bacteria to combat fungi. We used *Bacillus* bacteria fed by the foundation to the colony. In addition, we have created Organic Super Probiotic ensuring a good formation, high productivity, restored immune system, high antagonistic activity. All rights are reserved.

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[Abstract:0172]

Antioxidant Activity of Bee Products

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Antioxidants have an important role on preventing diseases which common in today's world like diabetes, cancer, neurological diseases and slow down aging process. Honey bees (*Apis mellifera*), need different products like propolis, pollen, royal jelly and bee venom as well as honey for survive in hives. In recent researches, it is revealed that bee products which suitable for human consumption, have high antioxidant activity. It is known that honeys from different regions of Turkey have high antioxidant activity and chestnut honey has highest antioxidant activity. Special manuka honey of New Zeland is a rich source of antioxidant compounds. Pollen, protein source of bees, have significant antioxidant activity. It is reported that propolis has protective effect against degenerative disease originating from free radical. Also royal jelly which is used for feeding queen bee and known as long life source, is an important bee product due to its antioxidant activity. High antioxidant activity of bee venom is determined by studies. Higher antioxidant activity of propolis according to other bee products is monitored via comparative works of this topic. Also pollen, royal jelly and bee venom have higher antioxidant activity than honey. However, antioxidative effect of all bee products differ in terms of varied factors such as climate, geographical conditions and plant species of region.

[Abstract:0177]

Physicochemical and Sensory Properties of Different Types of Honey

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The main objective of this study was to evaluate the quality and sensory of thirty different honey samples collected from various regions in Serbia and verifying their compliance with national and international regulations. Physicochemical properties and sensory of five honey types acacia, sunflower, linden, blossom and honeydew were studied. Methods established by the International Honey Commission (IHC) were used. High Performance Liquid Chromatography was used to determine the sugar content and 5-hydroxymethylfurfural (HMF). Sensory analysis was carried out using quantitative descriptive analysis method. In this work we evaluated the color of honey, taste, smell and viscosity of honey.

This paper gives an overview of current established quality criteria and the methods used for their determination. The aim was to compare the results of our analysis with reference values taken from national and international regulations and dealt with the different aspects of such analysis in detail. It has been observed that the honey produced in Serbia is of very good quality.

[Abstract:0188]

Determination of Pyrrolizidine and Tropane Alkaloids in Honey with Liquid Chromatography Coupled to High Resolution Mass Spectrometry Detection

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The presence of natural toxins as contaminants of food and feed is an open issue due to their adverse effects to human and animal health. Alkaloids are basic compounds biosynthesized by numerous plant species, which may be extremely dangerous if consumed without control. For these reasons, two compound classes were recently highlighted: pyrrolizidine alkaloids (PAs) and tropane alkaloids (TAs). Awareness was raised by the European Food Safety Authority (EFSA) through scientific opinions that stress the lack of data and gaps of knowledge. Furthermore, in February 2016, maximum levels of TAs in cereal-based foods for infants and young children have been regulated (Commission Regulation (EU) 2016/239). The present study aimed at the elaboration of a rapid method for the simultaneous determination of PAs (retrorsine, senecionine, seneciophylline, senkirkine, lycopsamine, intermedine, echimidine, heliotrine, lasiocarpine) and TAs (atropine, scopolamine) in honey. The method was applied to forty honey samples purchased in local market. A modified QuEChERS sample treatment and liquid chromatography coupled to high resolution mass spectrometry detection, which combines the high resolution performances of the Orbitrap with the high selectivity of the quadrupole, were used. The method resulted in good linearity ($R^2 > 0.99$) and low LOD and LOQ, ranging from 0.04 to 0.2 $\mu\text{g kg}^{-1}$ and from 0.1 to 0.7 $\mu\text{g kg}^{-1}$ respectively. Recoveries ranged from 92.3 to 114.8% with repeatability lying between 0.9 and 15.1% and reproducibility between 1.1 and 15.6%. The application of the method to forty real samples showed that at least one PAs or TAs was present in 70% of the samples with concentrations $> \text{LOD}$. PAs were detected in 68% of the samples analysed. Echimidine was the most abundant PA, present in 52% of the PAs positive samples, followed by lycopsamine, detected in 48% of the PA positive samples. Regarding TAs, researched for the first time in honey, scopolamine has never been observed, but atropine was present in 22% of the samples. Five of them, with concentrations ranging from 1.4 to 3.8 $\mu\text{g kg}^{-1}$, would exceed the maximum limit set by the Commission Regulation (EU) 2016/239, if extended to honey.

[Abstract:0197]

Artificial Insemination of Apis Cerana

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Control mating is very important aspect in bee breeding program. The technique of artificial insemination is the possible one that can surely control mating of the selected drones with the virgin queen. This technique was first successful applied with *Apis cerana* by Woyke in the 1970s but this is the first time applied with *A. cerana* in Korean. Altogether 18 queens were artificially inseminated and 2,000 drones of *A. cerana* both in Korea and Vietnam were used to evaluate amount of semen collection. Semen from *Apis mellifera* also was collected as a comparison. Semen of *A. cerana* is much difficult to separate from mucus in comparing with *A. mellifera*. The average amount of semen can collected from one Korean *A. cerana* drone was 0.09 µl and 0.1 µl of Vietnamese one, whereas the *A. mellifera* was more than 6 times (0.58 µl semen per *A. mellifera* drone). Obtaining 1 µL of semen have to collect from 11.94 drones that successful semen ejection and have to kill 17 drones of Korean *A. cerana*. Queens artificially inseminated with 4 µl of semen (once insemination) or 8 µl of semen twice (each insemination with 4 µl of semen) started laying egg later than naturally mated queens 5.3 and 2.5 days, respectively. The onsets of oviposition of artificially inseminated queens were 12.5 to 15.3 days. Queens received twice inseminations start laying egg 2.8 days earlier than that received only once insemination. Artificially inseminated queens produced exclusively brood and were similar as the naturally mated ones. The brood production of the queen received once insemination with 4 µl of semen was insignificant difference with the one that received twice inseminations or naturally mated one suggested that one artificial insemination with 4 µl of semen is favorable.

[Abstract:0199]

Technique of Apis Cerana Breeding for Disease Resistance

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In This study, we are introduced explain about in vitro larva rearing technique for rearing of *Apis cerana*. An in vitro method to rear worker honey bee (*Apis mellifera*) was applied to rear worker honey bee (*Apis cerana*) larvae to the adult stage. The average survival rate from larvae to pre-pupae stage was 74.6%. The average survival rates from pre-pupae to adult stage and from larvae to adult stage were 40.7 % and 30.4 % respectively. We also performed artificial infection experiments in vitro conditions. And then, we are reared Queen and drone from resistance line for artificial insemination. Artificially inseminated queens produced exclusively brood and were similar as the naturally mated ones. The brood production of the queen received once insemination with 4 µl of semen was insignificant difference with the one that received twice inseminations or naturally mated one suggested that one artificial insemination with 4 µl of semen is favorable.

[Abstract:0206]

Simple Measurement of D-Glucose, D-Fructose and Sucrose in Honey with Two Assay Kits Applied to the RX Altona Analyser

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Introduction. Honey is a natural product composed mainly of sugars, water and also a wide range of other minor constituents such as phenolic compounds. Fructose and glucose are the main sugars present in honey, the remainder includes disaccharides (e.g. sucrose) and higher oligosaccharides. Sugar content of honey has been considered a measure of the purity and important in quality control of honey. The development of analytical methods which monitor the compliance to quality specification, facilitates fraud prevention and the protection of authentic honeys. This study reports the analytical performance of two assay kits, one for the determination of D-glucose and D-fructose and the other for the determination of sucrose in honey samples, involving simple sample preparation.

Methods. Assay kit for D-glucose and D-fructose: the method is based on enzymatic reactions and the concentration of sugars is directly proportional to the increase in absorbance measured spectrophotometrically at 340 nm. Liquid honey samples (1g) were dissolved in deionised water (100 mL) and 5µL was used for sample analysis. Assay kit for the determination of sucrose: the method is based on enzymatic reactions and the concentration of sucrose in the sample is determined via D-glucose concentration before and after enzymatic hydrolysis. Liquid honey samples (1g) were dissolved in deionised water (100 mL), glucose was removed from the sample via glucose oxidase/catalase treatment prior to analysis. The assay kits were applied to the semi-automated analyser RX altona.

Results. The sensitivity and linearity values were 3g/100g and 75g/100g respectively for D-glucose, D-fructose and D-glucose + D-fructose. For sucrose, analytical evaluation showed sensitivity and linearity values of 0.5g/100g and 17.5g/100g respectively. The intra-assay precision, expressed as CV(%) was <5% for different target concentrations across the analytical ranges.

Conclusion. Results indicate that these assay kits, applied to the semi-automated RX altona analyser, represent a reliable and convenient analytical tool for the determination of sugars in honey, which facilitates the quality control in respect of compliance to legislative requirements.

[Abstract:0207]

Physiochemical Analysis of Some Saudi Arabia Honey

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BACKGROUND: Honey had been well documented as oldest traditional medicines. Its use is recorded in Egyptian papyri dated from 1900 to 1250 B.C. which used many of the Egyptian prescriptions including honey. It is also mentioned in the Holy Qu'ran. Honey enhancing the growth of tissues for wound repair, suppress inflammation, and bring about rapid autolytic debridement. The objective of this study was aimed to determine the Physiochemical analysis of some Saudi Arabia honey. **MATERIAL-METHODS:** The fresh 66 honey samples (3 kg of each) were kindly provided by Alnahal aljwal Company, 2016 flowering season. Honey sample was collected in a sterile universal glass container and kept at 2– 8°C until tested. Physiochemical analysis was done. Determination of sediment content, total grains, moisture content, water soluble solids, pH, acidity, electrical conductivity, colour analysis, ash content, total protein content, sugars content, inverted sugars, glucose (g/100 g), fructose (g/100 g), fructose/ glucose sucrose (g/100 g) diastase enzyme activity, HMF and microbiological examination were performed. **RESULTS:** Physiochemical analysis of honey samples were varied according to different honey sources. It was obvious that the honey quality was varied based on the botanical origins.

[Abstract:0237]

High-throughput Screening and Quantification of Multi-Xenobiotics in Honey Using Hybrid Quadrupole-Orbitrap Mass Spectrometer Based on a Home-Built Accurate-Mass Database

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Depending on the living environment of the nectariferous plants, honey bees may be exposed to an ever-changing array of xenobiotics from both natural and synthetic sources. So, the honey bee is easily contaminated by environmental pollutants from nectar and pollen via overspray and airborne transmission or systemic pesticides drawn from the soil, surface water or guttation water produced by plants at the leaf margins. Moreover, the honey bee is easily attacked by bacteria, viruses, fungi and exotic parasitic mites under inappropriate environmental conditions, which can result in the occurrence of disease. Antibiotics and pesticides present in honey bees may lead to the presence of drug residues in honey, posing potential hazards to consumers.

We develops a rapid, automated screening and quantification method for the determination of multi-xenobiotic residues in honey using ultra-high performance liquid chromatography-hybrid quadrupole-Orbitrap mass spectrometry (UHPLC-Q-Orbitrap) with a user-built accurate-mass database and parallel reaction monitoring (PRM). The database contains information regarding multi-xenobiotics, including their formula, adduct type, theoretical exact mass, retention time, characteristic fragment ions, ion ratio and mass accuracy. A simple sample preparation based on extraction and salt-out was developed to reduce the loss of xenobiotics in the honey samples. The screening method was validated on the basis of the deviation of retention time, mass accuracy via full scan-data-dependent MS/MS, and the isotope signature ions and their ratios between the spiked sample and corresponding standard solution. The quantification method based on the PRM mode as a promising new quantitative tool was validated in terms of selectivity, linearity, recovery, repeatability, decision limit, detection capability, matrix effects and carry-over. The optimized methods enable the automated screening and quantification of ca. 157 compounds in less than 15 min. The present study , as a convenient protocol for large-scale screening and quantification, provides a research approach for the analysis of various contaminants in other matrices.

[Abstract:0249]

Chloramphenicol Residues in Honey – A New Chapter in a Well-Known Story

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Chloramphenicol is a widely used broad-spectrum antibiotic which is not authorized anymore for use in food-producing animals in the EU and in numerous other countries, due to several adverse toxic effects. As a relatively quick and inexpensive technique many laboratories and honey distributors use an ELISA technique to analyze for chloramphenicol. Confirmation measurements of positive ELISA results are performed by the more specific LC/MSMS technique. In routine analysis some food authorities in Germany or other countries in the EU use only LC/MSMS because it happens occasionally that honey samples deliver false negative results by ELISA. These false negative ELISA results can lead to disputes for honey distributors. To address this issue we developed and validated a new LC/MSMS method to analyze the four stereoisomers of chloramphenicol, which cannot be separated by classical LC/MSMS. A special chiral reversed phase liquid chromatography is used for this purpose. In an internal survey, honey samples with identified chloramphenicol residues were re-analyzed by this new method. In many samples partly or only SS-chloramphenicol was detected, the corresponding ELISA analysis showed low or no results, respectively. SS-chloramphenicol is not detectable by commercially available ELISA kits, thus showing false-negative results by ELISA. In contrast to RR-chloramphenicol the SS-stereoisomer is without antimicrobial activity. This is the first report about SS-chloramphenicol residues in honey and, in general, in food samples. The potential sources for SS-chloramphenicol are discussed and the need for further systematic studies emphasized. The chiral LC/MSMS technique is described in detail in "Gerhard G. Rimkus and Dirk Hoffmann, Enantioselective Analysis of Chloramphenicol Residues in Honey Samples by chiral LC/MSMS and Results of a Honey Survey, Food Addit Contam A 2017, <http://dx.doi.org/10.1080/19440049.2017.1319073>".

[Abstract:0250]

Kinetic $^{12}\text{C}/^{13}\text{C}$ Isotope Fractionation of Sucrose in Honey by Invertase: Evidence for in Vitro Effect of Isolated Honey Enzymes and in Vivo Effect in Natural High Sucrose Containing Honeys by Analysis with LC-IRMS

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The detection of honey adulteration with different kinds of starch based sugar syrups is realized by several different methods but up today mainly by isotope analysis. Beside the comparison of the $\delta^{13}\text{C}$ total honey vs. the $\delta^{13}\text{C}$ honey protein another comprehensive method is used, in which the $\delta^{13}\text{C}$ of the sugar fractions (glucose, fructose and di-, tri- and oligosaccharides) are checked for differences. In application of this method especially for fresh honeys containing higher concentrations of sucrose (like botanical origin lavender and acacia) a high number of adulterated samples can be observed. To identify the reason, the isotope value of spiked sucrose in different natural honey solution was analyzed. Also the behavior of a mixture isolated honey protein with sucrose and melibiose was tested. It could be shown in vitro and in vivo, that linked to the Invertase reaction a distinct isotope effect appears which could lead to false positive results in LC-IRMS method.

[Abstract:0262]

Application of an Easy to Use Assay Kit to the RX Altona Analyser for the Reliable Determination of HMF in Honey

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Introduction. Hydroxymethylfurfural (HMF) is produced by acid-catalyzed dehydration of sugars, primarily fructose. HMF occurs naturally over time in most honeys but elevated concentrations provide an indication of overheating, poor storage conditions, possible adulteration with other sugars or syrups and/or higher age of the honey. The levels of HMF in honey are regulated in many countries, therefore reliable analytical tools for the determination of HMF are relevant to monitor the conformity of honey to regulatory standards. This study reports the application of an easy to use assay kit applied to the RX altona analyser for the reliable determination of HMF in honey, although the kit can also be used manually. **Methods.** Differential UV-photometry method with and without sodium bisulphite-reduction of HMF. The assay kit included ready-to-use reagents and standard solution. The semi-automated analyser RX altona was used, the system takes blank and sample readings at the both wavelengths 280 and 340nm, and automatically processes and reports the results. Honey samples (5 g) were dissolved in ddH₂O and then mixed with R1 reagent followed by R2 reagent. Then they were diluted to volume with ddH₂O and filtered, the first 10 mL of filtrate were rejected and the remaining volume was used directly in the assay if [HMF] <100 mg/kg, otherwise dilution is required.

Results. Initial data showed the sensitivity and linearity limits for HMF were ≤10 mg/kg and 100 mg/kg, respectively. Intra and inter-assay precision were assessed and CV (%) values of ≤5 were achieved for twenty replicates of three honey samples spanning the analytical range of the assay.

Conclusion. Results indicate optimal analytical performance of the assay kit for the measurement of HMF in honey samples when applied to the semi-automated analyser RX altona. Although the kit can also be used manually, the application to the RX altona offers the advantage of calculating the concentration of HMF in the sample by automatically switching between wavelengths and storing absorbance data at the two required wavelengths and uses internal calculations to process results. This system represents a convenient and reliable analytical tool to evaluate the compliance of honey samples with regulatory requirements.

[Abstract:0268]

Comparison of Honeys Supplied from Beekeepers and Markets's Honeys Produced in Same Region in Terms of Biochemical Structure

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AIM: This study was carried out to determine the biochemical structures(pH, acidity,% ash, diastase, HMF, invert sugar and sucrose) of honeys produced in Niğde province.

MATERIAL-METHODS: Honey samples used in the study were taken from the harvest tent in 2014 from the beekeepers producing multi-floral honey in the rural areas of Niğde region and kept in glass jars at room temperature until analysis. Honeys from the market were produced in the same region but followed by the marketing chain. Honey specimens were brought directly from the honey harvesting machine to the labs which were taken in 1 liter glass jars during the harvest. Honeys taken from the beekeepers were kept at room temperature for about 8-10 months, and honeys taken from the markets were kept at same condition for about 2 months and then all honey samples analyzed at the same time. In the analysis, the values of pH, acidity, ash%, diastase, HMF, invert sugar and sucrose were determined.

FINDINGS: In biochemical analyzes, the average pH values of First group(market honey), and Second group(beekeepers honey) were found as 3.99, 4.36; average acidity were found as 4.43, 3.65; average ash values were found as 0.1308%, 0.13,40%; average diastase number were found as 12.86, 12.47; average HMF values were found as 16.69, 20.87 mg/kg; average invert sugar (%) values were found as 56.88%, 51.65%; average total phenolic substance values were found as 145.67, 161.90 and average sucrose values were found as 1.91%, 1.79% respectively.

RESULTS: when we look at the results obtained, while there were found statistically significant differences between treatment groups (p <0,01) on pH, free acidity and invert sugar, there weren't found any significant(p>0,05) difference between treatment groups on sucrose, total phenolic substance, diastase number, HMF and ash%. All of the honey obtained from both honey sources is within biochemical confidence limits.

[Abstract:0285]

Revealing Pesticide Residues Under High Pesticide Stress in Taiwan's Agricultural Environment Probed by Fresh Honeybee Pollen

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Significant pesticide residues are among the most serious problems for sustainable agriculture. In the beekeeping environment, pesticides not only impact a honey bee's survival, but they also contaminate bee products. Taiwan's agricultural environment has suffered from pesticide stress that was higher than that found in Europe and America. This study deciphered problems of pesticide residues in fresh honey bee pollen samples collected from 14 monitoring apiaries in Taiwan, which reflected significant contaminations within the honey bee population. A total of 155 pollen samples were screened for 232 pesticides, and 56 pesticides were detected. Among the residues, fluvalinate and chlorpyrifos were the highest ranked residues, followed by carbendazim, carbaryl, chlorfenapyr, imidacloprid, ethion, and flufenoxuron. The average frequency of pesticide residues detected in pollen samples was ca. 74.8%. The amounts and types of pesticides were higher in winter and in southwestern Taiwan. Moreover, five of these pollen samples were contaminated with 11-15 pesticides, with levels ca. 1,560-6,390 ppb. Compared to the literature, this study emphasized that honey bee pollen was highly contaminated with more pesticides in Taiwan than in the America, France and Spain. The ubiquity of pesticides in the pollen samples was likely due to the field applications of common pesticides. Recently, the Taiwanese government began to improve the pesticide policy. According to the re-survey data in 2016, there were reductions in several pesticide contamination parameters in pollen samples from West to Southwest Taiwan. A long-term investigation of pollen pesticide residues should be conducted to inspect pesticides usage in Taiwan's agriculture.

[Abstract:0304]

Infusion of Seed Extracts into Honey as Additional Source for Better Healthy Living

Bukola Rifkat Adeshina

A And Shine International Limited, Abuja Nigeria

A and shine is currently processing and packaging honey in the following ways:

- 1) Processing and packaging of pure honey targeted at preventing/reducing the risk of some ailments
- 2) Processing and packaging of honey infuse with extract from ginger. This is targeted at reducing the risk of many lifestyle-related health conditions that results in its decreasing tendency risk of obesity, diabetes, heart diseases and overall mortality while promoting a healthy complexion and healthy hair and increase of energy and overall weight reduction.
- 3) Processing and packaging of honey infuse with extract from garlic. Garlic belong to the family of "Allium" (Onion family). It has therefore been found to contain a compound called "Allicin" that is responsible for distinct garlic smell. Allicin enters the body from the digestive track and travels all over the body, where it exerts its potent biological effects and benefits of its incredible high nutritional values with very few calories containing a little bit of almost everything the body needs (rich vitamin C, B6 and Manganese).
- 4) Processing and packaging of honey infuse with extract from Moringa. Moringa with honey is a complete package of vitamins, minerals, antioxidants and phytonutrients that boost energy and stamina as well as increasing concentration. It controls risk of different diseases I will be our pleasure to share these at Apimondia Congress.

[Abstract:0308]

Residue Problem in Bee Products

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Honey is a very beneficial food which produce by honey bees via chemical conversion of nectar that collected from flowers and fruit buds, in honey stomach through invertase enzyme. Drugs which are using in contrast with being forbidden, like antibiotics, acaricides as well as agricultural drugs in environment influence honey quality badly. Also, it is known that, natrality of honey degenerate by heavy metals, radioactive compounds, organic pollutants, pathogen bacteria and genetically modified organisms. Pesticides can damage, out of action environments by venting and ground waters by leakage from soil. Pesticide residues which contaminate bees through soil and water, affect bees adversely. Antibiotics use of beekeepers be banned in 2006. Antibiotics that used previous years against american foul brood disease, be abolished to use in consequence of residues in honey. However antibiotic usage of beekeepers determined in despite of ban. Herbal struggling methods, development of stable honey bee subspecies against diseases and pests by biological control methods must be considered. Organic beekeeping and honey production should be promoted. Residue problem in bee products can be minimised significantly with these methods.

[Abstract:0318]

The Effect of Heat Treatment Applications on Individual Phenolic Compound Levels of Propolis

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Propolis is resinous substance collected by bees from parts of plants, buds and exudates. There are 300 constituents have been identified to date. Most of the biological effects of propolis are ensured from phenolic compounds. Propolis is among the natural products which in preferred to in folk medicine for years due to these cited beneficial effects. Recently, propolis show the prevalence of use in cosmetic and food industry, veterinary and human medicine as complementary. Propolis also can be used in the food industry as preservatives, antifungal, color and taste additives.

In case when propolis is being used in industrial area, heat treatment applications may be required depending on the process (pasteurization, etc.). Similar applications can be used to increase extraction capacity on a producer basis. However, studies on this subject are limited. In order to spread industrial use of propolis with biological activity, it is important to determine impact of temperature grades at which the process might be applied on diversity and quantity of phenolic substances and therefore the biological value.

The aim of this study is to determine the effects of heat treatment of propolis on phenolic compound levels with different heat gradients between 65°C and 100°C at different durations between 15seconds and 60minutes.

In this context, two propolis samples with different origins were studied in three forms: crude propolis, 70% ethyl alcohol tincture and water tincture. Following heat treatment, phenolic compound levels were measured by HPLC-DAD.

In the heat treated groups at the determined degrees and durations, there were not significant changes up to 75°C; however, statistical significance were observed in phenolic compound levels depending on the application time when the heat grades reached 90°C. As a result, the phenolic compound content of propolis may vary depending on the temperature grade applied and the duration of application. In this study, the ideal temperature grades and application times that can be applied with minimum loss of biological value, have been revealed. Depending on the area where propolis is going to be used, the effects of heat gradients and application durations on propolis biological activity must be taken into consideration.

[Abstract:0322]

Sustainable Management in Apiaries and Adaptation to Climate Environment: Relationship between Winter Losses and Reserves

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The Pan-European studies of EPILOBEE (2015) showed a high mortality of honey-bee colonies during winter, observed also in Spain. One of the causes could be a lack of winter reserves in relation with the climatology of apiary sites. A study was carried out in 2015-16 to analyze the possible relationship between these two factors, hive winter stocks and colony losses in northern Mediterranean climate conditions. An ex-post facto questionnaire was designed and data of 218 apiaries from Catalonia (North-Est of Spain) were collected following the methodology suggested by Coloss (2016), and statistically analyzed. Two studies were carried out: a) 128 of the apiaries were selected, attending to their management, where all hives were treated against Varroa destructor and some artificial feed was added in autumn. Their survival was analyzed depending on the quantity of reserves kept. a) Hives of the total of apiaries with 6 honey-frames kept were split in two groups, depending on if artificially feed (1.5 kg/hive) was added or not. Between 3 and 9 honey-frames were left per hive as winter food stock with a weighted average of 6.59 ± 1.59 . With this quantity of reserves, 18.46% of the bee-hives died and 42.99% weakened after wintering. Results show a correlation between winter reserves in hives and colony losses and also that stock quantity is correlated with hives death or weakness. They suggest that more than 6.59 frames would reduce winter mortality and this would be of 13.41% with 9 frames. Differences between the kind of food (only honey versus an artificial addition) that hives received suggest a lower mortality (2%) or weakness in artificially fed hives than in ones that were not.

According to these results, in Northern Mediterranean conditions, autumn food support and an increase of reserves (until 9 frames) should be advised to reduce winter losses. Results should have to be confirmed using an experimental methodology instead of a questionnaire survey in future research.

[Abstract:0323]

Determination of Heavy Metal Pollution in Honey Samples Collected from Ankara

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In this study the concentrations of some element levels in 100 honey samples obtained from honey producers producing beekeeping from all the counties of Ankara province (Center, Ayaş, Kalecik, Kazan, Kızılcahamam) in 2016 were investigated.

The levels of Al, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sr and Zn elements in honey samples were determined by ICP-OES instrument. In the samples pretraement a microwave oven (MARS xpress plus, CEM). The means of element levels and the lowest and highest values were determined in honey collected from city center and counties. Cr, Ni, Ti, B, Zn, Pb and Bi values was found below the detection limit.

As a result of analysis, the contents of elements in honey were detected as 34667,51±67942,57 ppb, 3589,92±704,69 ppb, 0,69±0,55 ppb, 13,77±0,1 ppb, 3,04±1,81 ppb, 325,03±508,09 ppb, 560,58±416,61 ppb, 11,10±7,69 ppb, 10,64±2,96 ppb and 1667,62±747,68 ppb for K, Na, Ag, Li, Ga, Al, Mg, Sr, In and Ca respectively.

To conclude, the results of this study below the maximum residue limits when compared to some international limits. It was concluded that the samples analyzed would not pose any danger to human health.

[Abstract:0325]

Useful Bioactive Phenolic Compounds and Trustworthiness of Local and Imported Propolis Samples Sold in Turkey

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The aim of the study was to determine and evaluate quality of useful phenolic compounds in commercial propolis found in local markets and produced both in Turkey and abroad.

A total 35 propolis samples have been collected around 2016-2017 from beekeepers and companies which have used local and imported propolis to make products for consumers. 15 among samples have been collected from different districts in Turkey including Bursa, Balıkesir, İzmir, Antalya, Konya, Ankara and İstanbul; and 19 other samples were supplied from Brazil, China, United States of America, Canada and South Korea. Fifteen flavonoid and phenolic acids were investigated by High Performance Liquid Chromatography and Diode Array Detector (HPLC-DAD). Significant differences were determined among local and imported propolis samples. In the present study results showed that qualitative and quantitative analysis of propolis commercial samples for useful phenolic compounds is important for propolis quality and consumer health.

In Turkey, propolis production, importation and quality control should be much addressed as well as propolis producers, sellers, doctors and consumers should raise much awareness about propolis and its quality control for support to treatment. General standardization is required to propolis production and use in Turkey, and Turkish Ministry of Health should play an important role as controller and directive organizer.

[Abstract:0327]

Hive Tracking System with Cheap Amateur Devices

Cem Taşkent

Home, Yalova

The purpose of the project is to electronically gather data about the colonies with a device that will not exceed 40 dollars for each hive. Data such as temperature, humidity, CO2 level, sound frequency analysis, weight, number of bees entering and leaving the hive are collected with a microprocessor and sensors and wirelessly transmitted to the main unit. Any piece of information such as "the hive cover is open", can also be transmitted to the main unit for alarm purposes. The main unit receives data from the terminals and writes it to the SD card and to a database on the internet via wifi or GSM / GPRS connection. In this way, all the hives can be monitored in real time. Since the system will be in a modular structure, it can be modified as desired. For example, if you want to work on temperature, you can only add temperature terminal to the network, or scale terminal if you interested in weight. For instance a tiny meteorological station can also be added to the system to allow the acquisition and analysis of local meteorological data and colony behavior due to those conditions.

All collected raw data can be analyzed and processed later on.

[Abstract:0333]

Physicochemical Properties of Honeys from Sivas Region

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Honey is a sweet food product which produce by honey bees via collecting flower nectars and secretions of living parts of plants, transforming with their body secretions, maturing and storage. Honey contains approximately %17 water content, %80 carbonhydrates and low contents of proteins and lipids. Climate and nature of Turkey are quite suitable for honey production and beekeeping is performed in several regions. Especially Sivas region, which is located at about 1285 altitude in Central Anatolia is available for beekeeping activities between may-october months causing by its geographic characteristics. Although beekeeping activities are affected positively by physical properties and floral variety of region, climate properties of region limits beekeeping activities. In 2015 3327.46 tones, in 2016 2861.03 tones honey was produced in Sivas region. In this study 31 honey samples from 2015 and 2016 years are analysed. Fructose, glucose, fructose+glucose and sucrose level analysis, moisture analysis, proline analysis, diastase number analysis, pH analysis of these samples are performed. Mean values of analysis results from 2015 samples were respectively %38.26, %31.76, %70.03, %1.18, %17.53, 673, 21,70 and 3.80; from 2016 samples were respectively %35.35, %30.33, %65.68, %4.13, %17.41, 413, 19.62 and 3.58. It is detected that a part of honey samples that were analysed in 2015 and 2016 are not proper according to Turkish Food Codex Honey Cominique. Especially, proline and sucrose analysis results of honey samples from 2016 were not proper. Also number of honey samples which improper to cominique from 2016 samples were more than 2015 samples.

[Abstract:0344]

Development of a Real Time PCR Method for *Aethina Tumida* DNA Detection from Beehive Debris, Brood Combs and Brood Comb Swabs

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Aethina tumida, or Small Hive Beetle (SHB), is an exotic parasite belonging to Coleoptera order, Nitidulidae family, causative agent of a notifiable parasitic disease in the EU and considered by Regulation (EU) No 206/2010 that governs the import of bees from Third Countries. *A. tumida* has been reported for the first time in southern Italy in September 2014 in the region of Calabria, Reggio Calabria and Vibo Valentia Provinces, and in the region of Sicily, Siracusa Province.

Following its detection a nationwide surveillance program has been established based on clinical inspection of beehives. In order to facilitate the surveillance activities, a Real Time PCR method for *A. tumida* DNA detection from different beehive matrices has been developed.

For this purpose 1 g of hive debris, 70 g of brood combs and 200 µl of comb swab diluted in PBS respectively, were used to develop a DNA extraction protocol. After specific preparation of each matrix, DNA extraction was performed using commercial kits: kit NucleoSpin® Tissue Macherev-Nagel for hive debris and brood combs, and QlampDNA® Blood Mini kit Qiagen for comb swabs. The extracted DNA was used as template for a specific Real Time PCR for a 109-bp fragment of the cytochrome oxidase I gene (cox1) of SHB.

The developed protocols have been tested by different laboratories on matrix samples circulated by Istituto Zooprofilattico Sperimentale Lazio e Toscana. All the laboratories identified the presence/absence of SHB DNA in the artificially contaminated/not contaminated matrix samples.

The limit of detection (LOD) of the molecular protocols has been determined:

- 1) 10 target molecules/g for hive debris (approx. 0.5 larva/g)
- 2) 20 target molecules/70 g of brood comb (approx. 0.5 larva/70 g of brood comb)
- 3) 5 target molecules/0.2 mL of swab (approx. 0.33 larva/0.2 mL of comb swab)

The presence of potential inhibitors in the investigated matrices did not seem affecting DNA amplification.

In conclusion the application of these protocols for SHB DNA detection in different beehive matrices seems applicable and reliable to support SHB surveillance programs.

[Abstract:0345]

Development of Three Real-Time PCR Assays for the Differentiation of *Aethina Tumida* from Other Nitidulidae (Coleoptera) Species as Alternative to Morphological Examination

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Introduction. The small hive beetle (SHB) *Aethina tumida* (Coleoptera: Nitidulidae) is a parasite of the honeybee colonies, detected in two regions of Southern Italy (Calabria and Sicilia) since the second half of 2014. Thanks to the intensive surveillance plans carried out in 2014-2017, the presence of the parasite is so far confined only in Calabria region. Some Nitidulidae species are associated with the honeybees, among these *Cychramus luteus*, whose presence has been reported in Europe, could be confused with SHB.

In general, other Nitidulidae species, like *Meligethes aeneus* and *Brachypeplus glaber*, could be present in the territory under SHB surveillance, and it should not be ruled out their interference with the analysis of identification of *Aethina tumida*. To assist the surveillance and control activities of SHB, we developed three distinct Real-Time PCR assays to ease the differentiation of SHB from these mentioned Nitidulidae species, over all when parts of insects are found in hive debris. **Materials and methods.** For each Nitidulidae species, Cytochrome oxidase subunit 1 gene (COI) sequences, available from Gen Bank, were aligned using the Clustal W within BioEdit (Hall 1999). Three new sets of specific primers and MGB probes, were designed using Primer Express Software (Applied Biosystems, UK).

Results. Distinct TaqMan™ Real-Time PCR assays were developed for detecting the presence of DNA of *Cychramus luteus*, *Meligethes aeneus* and *Brachypeplus glaber*. Synthetic DNA taken from reference samples of these species were positive, confirming the sensitivity of these methods; similarly, total DNA extracted from SHB larvae or adults were negative when tested with our Real-Time PCR assays, confirming their specificity. **Discussion.** The TaqMan™ Real-Time PCR assays we developed, could represent a reliable support to get a quick differential identification of SHB from *Cychramus luteus*, *Meligethes aeneus* and *Brachypeplus glaber*. Above all, this identification is useful, in the presence of parts of insect.

More analyses on DNA extracts, taken from beehives of Calabria region containing parts of Nitidulidae that resulted negative to *A. tumida* PCR Real-Time (Ward, 2007), are still ongoing.

[Abstract:0358]

Development of New Biochip-Based Immunoassays for the Detection of Pesticides

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Introduction. Pesticides are widely used as a measure to control unwanted weeds and insects, and therefore greatly increase crop yields. However, their widespread release into the environment can result, not only in the contribution of colony bee losses, but can also result in pesticide residue in the food supply intended for human consumption. Therefore pesticides are regulated globally by various governmental agencies. The availability of immunoassays enabling the screening of pesticides is relevant for monitoring food safety. This study reports the development of new biochip-based immunoassays for the detection of acetamiprid/thiacloprid, coumaphos, fenpyroximate, imidacloprid and thiamethoxam, which is of value in test settings.

Methods. Immunogens were developed for acetamiprid/thiacloprid, coumaphos, fenpyroximate, imidacloprid and thiamethoxam and were administered to adult sheep on a monthly basis to provide target-specific polyclonal antisera. IgG was extracted from the antisera and evaluated via competitive chemiluminescent biochip-based immunoassays. The selected purified antibodies were immobilised on a biochip platform, which is also the vessel for the immunoreactions, and analysed using the semi-automated analyser Evidence Investigator. Analytical parameters were evaluated.

Results. Initial evaluation of each immunoassay showed the following sensitivity values, expressed as half maximal inhibitory concentration (IC₅₀): 0.121 ppb (acetamiprid), 0.062 ppb (thiacloprid), 0.172 ppb (coumaphos), 1.34 ppb (coumaphos-oxon), 0.060 ppb (fenpyroximate metabolite), 2.164 ppb (fenpyroximate parent), 0.017 ppb (imidacloprid) and 0.141 ppb (thiamethoxam). The intra-assay precision values, expressed as %CV, were <15% for all the immunoassays when different concentration levels were assessed.

Conclusion. The data of this initial evaluation indicate that these new biochip-based immunoassays are applicable to the detection of the above pesticides. Biochip array technology offers flexibility to incorporate multiple assays on the same biochip, thus up to 44 pesticides could be simultaneously detected, leading to consolidation of the screening process in test settings.

[Abstract:0361]

Determination of Shelf Life of Chaste Tree (*vitex agnus castus*) and Pine Honeydew (*Marchalina Hellenica*) Honeys

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Chaste tree and honeydew honeys were bought from three different producers (natural) and three local markets (commercial). The honey samples were stored for 30 months at room temperature. The shelf life of the samples was estimated for indices of HMF and diastase activity. The values for HMF formation and diastase deactivation fitted to a zero-order reaction. The highest rate of HMF formation was observed in the chaste tree honey as 2.674 ± 0.0127 mg/kg/month while the least value was observed in the honeydew honey as 0.4348 ± 0.0372 mg/kg/month. The maximum diastase deactivation was determined in the natural chaste tree honey as 0.6133 ± 0.0003 DU/kg/months and the minimum was 0.3175 ± 0.002 DU/kg/months for the commercial chaste tree sample. In terms of HMF, all honeys except commercial chaste tree honey, have exhibited longer shelf life than 30 months of storage. The results showed that the shelf life of the commercial honeys depend on the botanical origin, pH, electrical conductivity, temperature, and storage.

[Abstract:0363]

Determination of Antibiotic Residues from Honey Produced in Hizan District, Bitlis Province

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Honey has the nutritional value and by reason of be a healthy food ingredient, is a valuable nutrient of animal origin consumed by humans. Diseases such as American foulbrood and European foulbrood sighted in honey bees cause great loss in bee colony. The use of antibiotics with struggling against these diseases causes the residual problem in honey and honey products. Antibiotics residues in the honey cause problem such as antibiotic resistance and allergic reactions in people who consume honey. The use of antibiotic in the European Union and beekeeping activities in our country is prohibited due to these negative effects on human health. In this study, the tetracycline group (oxytetracycline, chlorotetracycline, tetracycline, 4-epitetracycline, 4-epichlortetracycline, doxycycline) and the sulfanamide group (sulfadiazine, sulfathiazole, sulfadoxine, sulfameter, sulfabenzamide, sulfamethazine, sulfachlorpyridazine, sulfisoxazole, sulfamethoxazole, sulfadimethoxine) antibiotics residues were tried to be determined by LC/MS/MS method, honey samples taken from the filtered bees in the 20 different regions where the members of the association of honey producers in Hizan district were placed in Bitlis province. As a result, We can be said that the producers in this region do not use antibiotics and the produced honey in this region is quite natural.

[Abstract:0365]

Heavy Metal in Bee Pollen

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In the last century, industry and developing technology lead to environmental pollution and increasingly destroy the ecological system. Heavy metals as a factor of global pollution pose significant hazard for all living life. Products obtained from apiculture where are making mainly near the urbanization and close the vehicle traffic are contaminated with heavy metals. Among these products, pollens which place an important role account for their antioxidant, antiinflammatory, antimutagenic and antimicrobial properties are preferred as food support.

Bees use large surface area (7km²) for collecting the nectar and pollen. Therefore honey bees and bee products are acceptable ideal bioindicators for chemical pollution. Honeybee colonies located by beekeepers will cause heavy metal accumulation in bee products unawares constitute potential hazard for public health.

Bee pollen is one of the most affected bee products from pollution because it is exposed to more outdoor conditions than nectar. Products obtained from bee colonies close to motorways and industrial areas with heavy traffic pose a risk for food safety and public health. Lead (Pb) and cadmium (Cd) are frequently studied toxic heavy metals in bee products. Pb is mostly caused by motor vehicles and results in air pollution, so it can directly contaminate nectar, pollen and honey through air pollution. Cd caused by the metal industry and incineration plants can be moved from soil to plants and contaminate bee products. Only a small fraction of the Cd can infect bee products via air. Iron (Fe) is responsible for degenerative brain diseases such as Parkinson's and Alzheimer's, high concentration of Zinc (Zn) causes the weakening of the immunity system and overdose manganese is responsible for nervous system diseases. Pollen, contaminated by heavy metals, acts as an allergen causing various diseases in humans such as asthma. Therefore, it is important to raise the awareness of beekeepers about the subject, because production of high quality and healthy bee products is only possible with conscious beekeepers. In the production of bee products, heavy metal contamination in pollen and other bee products can be prevented from accurate zone detection and application.

[Abstract:0386]

Homogenate of Drone Larvas – Biologically Valuable Food Product

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Homogenate of drone larvas is not synthetic, but natural product, so it should be included into the diet as a nutritional protein food that is not inferior to animal meat, and even exceeds its content of microelements and vitamins. As a separate biologically active food homogenate of drone larvas is relatively new, which interests scientists and nutritionists with its properties. Analyzing the work of scientific institutions and individual scientists on qualitative and quantitative composition of homogenate of drone larvas, we noted inconsistencies in the results obtained by them. For example, D. Lazarian in his work (2002) indicates that homogenate of drone larvas has 38.5% of protein content, and G. Grechka (2005) notes this index in the amount of 13.0%. L. Burmistrova (2009) indicates that its active acidity (pH) level of homogenate of drone larvas ranges from 4.8 to 6.7, whereas I. Prohoda (2007) notes that this neutral (pH=7.0). The same trend is observed with the content of hormones. Thus, L. Osyntseva (2012) found that the amount of testosterone and estradiol in the body of 5-6 day old larvas is 8.19 and 274.50 nmol/l respectively, and in studies of S. Bogdanov (2016), these figures are indicated in quantity of 0.31 and 677.6 nmol/100g respectively.

So, now it is scientifically proven that homogenate of drone larvas contains a large number of biologically active substances, but the dynamics of transformation of quantitative and qualitative composition, considering physiological stages of drone larvas in families of different breeds (races) in different climatic conditions of Ukraine, is still not sufficiently studied. The very technology of homogenate of drone larvas production needs to be improved in view of these figures. That's why research on these tasks was initiated at the industrial apiary of BEEHIVE Company in May 2017.

[Abstract:0402]

Identification of the Geographical Origin of the Honeys of the South of Chile by Direct Sample Analysis-Time of Flight-Mass Spectrometry

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Honey is a food with a high added value, whose composition is associated with its botanical origin, as well as the soil and climate characteristics that determine the melliferous flora. The authenticity and traceability of honey in relation to its geographical origin have become an important requirement for consumers and producers around the world, since bees are exposed to contaminants that are present in the foraging areas, which are entered into the hive, either by interaction with water and plants in contact with the soil, or by the transport of particles with contaminants from the soil. For this reason there is a greater need to develop new methods and techniques to discriminate the different origins of honey.

This study evaluates the use of direct-sample-time-of-flight-mass-spectrometry technique (DSA-TOF-MS) for the analysis of honey and soil samples to establish some type of correlation between signal profiles in both types of samples. DSA-TOF-MS is an open atmosphere ambient ionization technique that allows rapid and direct analysis with little to no sample preparation.

For this study, samples of honey and soil were considered adjacent to the beehives of southern Chile; these samples were characterized by standardized methods. From the samples aqueous extracts were obtained which were analyzed by the DSA-TOF-MS technique. The results of the characterization of soils realized a pH in water ranged from 4.56 to 6.57. The m/z spectra obtained using the DSA-TOF-MS technique of the aqueous extracts of honey were considered as fingerprints, which, when compared to the m/z spectra of the aqueous extracts of the soil, allowed to discriminate its origin correlating the distribution of signals. From the results obtained, it is possible to conclude that the DSA-TOF-MS technique allows evidencing the presence and origin of residues present in the honey of the sampled sectors.

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[Abstract:0405]

Encountered Adulterations in Commercial Honey

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Honey, which is extremely nutritious and has various benefits in terms of health, is a relatively high priced food item due to its limited production.

According to TFC Honey Communiqué and in the Codex Alimentarius Honey Standard, any external material including food additives shall not be added to honey; honey can not be heated or processed to cause any change in its natural composition and/or its quality; pollen or other honey-specific components except for the losses that are unavoidable during the separation of foreign organic or inorganic substances, can not be removed from honey. Due to the high economic value of honey, cheating is often encountered. Adding the low priced sugar syrups to increase the honey production is one of the most frequently encountered adulterations. In case of inadequate natural food resources, supplemental feeding may be given to honey bee colonies during the winter months and early spring. Continuation of this feeding in the honey production season in order to increase the honey production causes the honey to lose its purity characteristic.

Another adulteration in the honey is to add aromatic substances to the industrial sugar syrups to obtain honey taste, and to sell these sugar solutions with honey aroma in the name of honey. Harvesting the honey and supplying to the market without waiting for the withdrawal period of the antibiotics and chemical substances used in honey bee colonies is one of the issues that is considered within the scope of adulteration. Not specified or given correctly botanical origin of honey can cause mixing of floral honey and honeydew or unifloral honey and multi floral honey. Masking of botanical and geographical origins of honey are done to avoid customs tariffs and tests on imports as well as selling over the market price of honey. High hydroxymethyl furfural content, which is the result of heating and storing in improper conditions, is also considered to be one of the adulterations of honey. Adulterated honey is offered for sale at prices equivalent to pure honey. This situation causes unfair competition in commercial sense as well as deceiving consumers and loss of confidence.

[Abstract:0410]

QTL Identification of Worker Foraging Initiation in Iranian Honeybee (*Apis Mellifera Meda*)

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Honeybee is a pollinator that has prominent role in agriculture products and nourishment for human. So, the most number of studies like genetic improvement were done on honeybee. Recent advances in knowledge of molecular genetics of bee emphasize the potential for using genetic markers to select favored traits. This research was done to determination of first foraging age (AFF) loci's in Iranian honeybee (*Apis mellifera meda*). In the first phase, two colonies with high production- long longevity and low production- short longevity were selected from 11th generation of "Iranian Honeybee Breeding Project. Considering that colonies with different genotypes have different foraging, Iranian honey bee colonies were compared in foraging behavior using two high and low honey production colonies and their F1 backcrosses colonies. In the high production colony, foraging initiation had started sooner (age of 9-33 day). Also, the length of foraging initiation period in comparison with low production colony (age of 12-29 day) was longer. In the end of first and second phase, worker bees of high and low production colonies after numbering and determining of foraging initiation, were analyzed through AFLP method for appointment of loci polymorphism. The results of molecular analyzes in parent and backcrosses colonies were used for determining of foraging initiation loci in Iranian honeybee. In mapping of quantitative trait loci (QTL), the relationship between one or more markers and QTL is studied. Therefore, we constructed an amplified fragment length polymorphism (AFLP) genetic linkage map of honey bee using 46 progenies from a BC population of the crossing between a queen from high production colony and a male from low production colony, selected from eleventh generation of honeybee breeding program. Data were analyzed using the software Win QTL Cartographer and Map Manager Ver. 2.6.5. Total 113 polymorph bands formed by 30 MseI / EcoRI primary combinations were classified in 8 linkage groups, and the length of the whole map was 4436.5 centimorgans, and average distance between markers was 8 centimorgans. Interval mapping identified 2 QTLs controlling foraging behavior which were in linkage groups 1 and 3.

[Abstract:0419]

Determination of Some Quality Properties of Muğla Pine Honey

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In this study, it was aimed to determine the quality properties (physical, chemical and antioxidant properties) of pine honey samples produced from secretion of *Marchalina hellenica* living on *Pinus brutia* Tenore in Muğla Province. For this purpose, 15 pine honey samples collected from the beekeepers who live in 5 different locations (Köyceğiz, Bodrum, Datça, Menteşe, Yatağan). Minimum and maximum values of pine honey samples are as follows; electrical conductivity 0,892- 1,838 mS/cm, optic rotation (-0.12)- (+3.51), L* 44- 70, a* 16- 30, b* 76- 88, moisture content 15.6 %- 18, proline 388- 682 mg/kg, diastase 9- 21, glucose 22.1 %- 28.76, fructose 28.6 %- 35.6, saccharose 0 %- 2.1, trehalose, 0 %- 0.23, maltose 0.02 %- 0.65, meleziose 0 %- 0.36, total polyphenol content 27- 48 mgGAE/100g, total flavonoid content 0.1- 1.5 mgQAE/100g, FRAP (ferric reducing antioxidant power) 1.1- 1.52 µmol FeSO₄.7H₂O/g ve DPPH- SC50 radical scavenging activity 32 mg/mL- 55 mg/mL. Different locations significantly affected the electrical conductivity and optic rotation values of the pine honey samples (p<0.05). However, the effect of location differences on the other analyzed quality parameters were not statistically significant (p>0.05). In pollen preparation made from pine honey samples, it was observed that the highest rate of pollen was seen in Compositae, Fabaceae, Rosaceae, Lamiaceae, Erica and Cistus types. Fungi spores which characterize pine honey were also observed in the samples.

[Abstract:0433]

Investigation of Sugar Composition and Some Properties of Honey Produced in Migratory Beekeeping Conditions in Various Regions of Turkey

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Turkey is an important beekeeping country with its climate, flora and biological diversity. Different climatic conditions in our country provide a suitable environment for migratory beekeeping. According to seasonal conditions and the need of the colonies, hives are transported between regions so as to make the best use of the flora, in the application of migratory beekeeping. The content of honey may vary depending on the climate, flora, seasonal conditions, colony status, beekeeper's production techniques, pollen and nectar source. This difference can be seen better in the honey produced especially in the conditions of migratory beekeeping. Because migratory beekeepers can locate in different regions without harvesting honey and that lead to presence of different regions honey in the same hive. This situation sometimes causes difficulty to determine standardization and common quality criteria of honey. In this study, which was carried out in order to determine various properties of honey produced in the conditions of migratory beekeeping; Honey samples were collected from the beekeepers in Antalya, Bingöl, Bitlis, Burdur, Diyarbakır, Edirne, Erzincan, Erzurum, Isparta İstanbul, Karabük, Mersin, Muş, Samsun, Sivas, Tekirdağ and Tokat provinces in 2015. Sugar composition (Fructose, Glucose, Invert sugar, Fructose / Glucose ratio, Sucrose, Maltose), diastase and proline analysis were performed in collected samples. At the end of the analyzes, mean fructose was found 37.7%, glucose 34.2%, invert sugar 72.0%, fructose / glucose ratio 1.1%, sucrose 1.7%, maltose 2.12%, diastase number 16.0 and proline content 462 mg / kg. All of the analyzed honey samples were found suitable according to Turkish Food Codex Honey Communiqué in terms of proline and diastase values, while sucrose ratios of some samples were not found in compliance with the Communiqué.

[Abstract:0435]

The Technology of Running Beekeeping in Armenia

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Running of beekeeping technology is mostly based on transporting hives in Armenia. Beekeepers chiefly apply Dadant-Blat hives. During the season, colonies are transported from the plains to subalpine and alpine meadows, where the land mounts up to 2300 m above sea level. Two subspecies of honey bee exist in Armenia: Mountain Caucasian Grey bee (*A.m. caucasia*) and Caucasian Yellow bee of Meghri population (*A.m. remipes* Gerst., frequently called as *A.m. armeniaca*). Beekeepers often confront varroa mite in Armenia. They usually treat colonies against varroa mite once a year, from October to November, mostly applying medicines based on fluralinate. The reason of lost colonies commonly is the varroa mite. The problem is not incurability of the disease but the incorrect treatment circuit implemented by beekeepers and the application of the same active substance for several years. Nosema and ascospores sometimes occur in some apiaries where colonies are weak and correct maintenance is ignored by beekeepers. Studies observed that ascospores declines honey harvest by 30% in each diseased colony.

Currently, we are planning a breeding program, which includes instrumental insemination of queens' as well. Honeybees poisoning by pesticides are seldom in Armenia for the source of honey yield is from subalpine and alpine wild meadows, where no pesticides or other chemical substances are applied. Bees do not confront the problem of monoculture pollen as they attend for wild polyflower fields. In consideration of these advantages, presently organic beekeeping practice is encouraged in Armenia, in the result of which, plant-origin medicines are employed. Armenia is rather favorable for organic beekeeping, because there are no cultivated plants and honey yield comes from wild plants which are not sprayed with any pesticides. Now, Armenia exports honey to Russia, USA, China, Europe, UAE, Saudi Arabia, and Japan. However, quantities are not big and the country has a problem of honey consumption and the problem is in relatively high price because of low harvest. Due to the training, recently beekeepers have reduced applying medicines based on amitraz. The organic beekeeping trend and relinquishing chemical-based medicines in non-organic beekeeping operations may achieve new market opportunities for Armenian honey.

[Abstract:0439]

Characterization of Honeys Produced in the Region of Djelfa Steppe Land in Algeria

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In the vast steppe areas of Algeria, natural vegetation is the first barrier to desertification but also provides an essential resource for local people with the honey and incomes from beekeeping. It is an ecosystem service rarely assessed. In order to develop this resource, physicochemical and palynological properties were determined to characterize 38 honeys from the steppe semi-arid region of Djelfa. The results of the pollen analysis identify 34 present taxa. The most important is *Ziziphus lotus* with a distribution of 92.11%. Its pollen is dominant in 27 honeys with pollen percentages more than 45%. Plants belonging to Asteraceae, Brassicaceae, Cistaceae, and the species *Euphorbia bupleuroides*, *Peganum harmala*, *Thapsia garganica*, *Echium* sp and *Retama retam* have distributions above than 55%. Their Pollen percentages allow to classify them into secondary or tertiary pollen. The results of physico-chemical parameters (moisture content, pH, free acidity, electrical conductivity, color, content in Hydroxymethylfurfural, diastase, saccharase index and carbohydrate content) revealed that honeys of Djelfa comply with European and international standards quality. Determined characteristics participate in the establishment of a data bank of reference for Algerian steppe honey particular those in the region of Djelfa. This region is an area of great bee transhumance for honey production of *Z. lotus* (jujube), a species of great importance for beekeeping.

[Abstract:0460]

Advanced Identity Methods to Identify Genetic and Environmental Factors for Selection Programs

Soheil Yeganehrad, Hossein Yeganehrad

Caspian Apiaries

Two key factors that affect genetic selection are the environment and bee genetics. The environment refers to all variables unrelated to the genetic line including, but not limited, to drift, hive color, and hive nutrition levels. The environment has a greater impact on selection than bee genetics. Caspian Solution™ increases bee's protein consumption and as a result bee nutrition can be controlled; other environmental variables such as drift, age of queen, and population size can also be regulated. Genetics, however, is a variable that cannot be manipulated. Feeding Caspian Solution™ to a hive with five frames of population will enable the bees to feed high levels of jelly to the larvae. If the larvae show signs of chalk brood it is not a result of poor nutrition but rather poor genetics. The larvae method for genetic selection chooses a superior genetic line that produces high levels of worker jelly and raises brood to full maturity. All environmental variables in this selection method need to be controlled to be effective. This method requires separating a queen-less 10 frame populated hive with four frames of genetically different larvae and feed Caspian Solution™ to the hive. When the larvae become capped, remove the frames and introduce four new frames of larvae. If all environmental variables are optimally controlled, poor genetics can cap only 60% of the larvae on the first round and 10% on the second round. Good genetics, however, can cap up to 95% of the larvae on the first round, 65% on the second round, and 30% on the third round. The colony that raises more brood at the capped stage can consume and digest more protein leading to increased worker jelly production. Queen cell method for genetic selection boosts royal jelly production and raises queen cells to maturity. This method follows a similar process as the larvae selection method, except that grafted queen cells are introduced rather than worker larvae. The hives yielding the highest levels of queen cells after each introduction can produce higher levels of royal jelly.

[Abstract:0466]

Honey – A Connoisseur's Food

Stuart Anderson, Emily Grace

Beeinventive

Consumers have not yet woken up to the vast range of tastes in good quality honey. Few outside Australia have tasted Tasmanian leatherwood with its thick almost pungent nuttiness. Can the clear freshness of clover honey be compared to New Zealand honeydew? What about Italian sweet chestnut? Its dark bitterness is certainly an acquired taste.

Honey has the potential to become celebrated as a gourmet product with a huge range of tastes and, like wine, having those tastes linked to particular flora and regions of honey producing countries. As the variety of tastes becomes known, so too does respect for honey's uniqueness and for regional high quality.

When Cedar and Stuart Anderson developed the Flow hive they were attempting to make harvesting easier for the beekeeper and gentler on bee colonies. In the years of testing the innovation they began to get reports from beekeepers around the world that not only did the harvesting method work, the honey tasted better. One Australian beekeeper said, "It's like biting into fresh honeycomb, all the floral notes are there" while a Canadian beekeeper refuses to share his 'Flow Honey' with family or neighbours. "I keep that honey for myself" he said, "The taste is just too good".

While anecdotal statements are fine it was important to test the Flow honey in a controlled situation.

Stuart Anderson, the co-inventor of the Flow hive will present the findings of Queensland University sensory analysis comparing the same honey that was 'backyard extracted', 'commercially extracted' and harvested with a Flow hive. This information will be discussed in the light of studies comparing crushed honeycomb to regular centrifugal extraction. The implications of these findings will be considered regarding the perception of honey world-wide. There is great potential to alter consumer perception and shift Honey from being a low-quality, standardised, supermarket merchandise to a connoisseur's product, recognised around the world as carrying an exciting variety of tastes and flavours.

[Abstract:0479]

Mineral and Trace Elements in Honey

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Mineral elements are chemical elements that are not synthesized or decomposed by simple chemical reactions. Mineral substances intake has negative and positive effects for human life. Some of these minerals have been reported to have toxic effects in case excess intake. For this reason, WHO and FAO publish guidelines about tolerable amounts of these minerals. Foods are rich products in mineral substances. Considering negative effects of mineral substances, detecting sort and content of mineral substances is very important.

Also honey is important food resource in terms of mineral substances. Mineral concentration of honey is between %0,1-%1. Potassium is most abundant mineral in honey and respectively chlorine, sulphur, silicium, calcium, magnesium, sodium, phosphorus contain in honey. Iron, copper, zinc, manganese are some of trace elements in honey. Mineral elements can be detected by plenty of different methods. In studies mineral substances are detected by using devices like AAS, ICP-MS, ICP-OES, ICP-AES. In studies, toxic minerals in honeys can be confirmed. Heavy metals in honey may be a biomarker of environmental pollution surrounding hives. Locating hives far away from highways and railways was suggested to solve this problem. Many factors are effective in mineral contents of honey as botanical origin, soil, beekeeping equipments, mineral content of nectar, honey harvest season and air conditions.

[Abstract:0482]

Effect of Heating on HMF and Diastase activity in Honey

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Like any other food items which are placed for sale, honey is one of them, its freshness is a matter of concern. Beekeepers usually use to heat crystallized honey to make it more attractive for consumers. During this process fructose from honey is thermally degraded to hydroxymethylfurfural (HMF). Heating also deactivate diastase enzyme in honey. This research is focused on enzyme degradation and evaluation of changes in HMF content of multi-floral and acacia honey due to thermal treatment performed at 25°C, 35°C, 45°C and 55°C temperatures for 4 hours. Both these quality parameters are one of the important indicators for freshness and proper heating of honey. Multi-floral honey samples were collected from beekeepers of different areas of Punjab. Results were subjected to Statistical analysis. It was found that except 25°C, the other temperatures caused rising of HMF content and lowering of both enzymes i.e HMF content and diastase activity with different ratio depending on duration of heating time.

[Abstract:0486]

The Sacred Bee: In history, Mystery and Myth and it's Relevance on Modern Beekeeping Practices

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Throughout history *Apis Melifera* and her sister species have been represented in a Sacred and mythical context as well as consistently and cross-culturally revered. Exploration of this perspective and the context of animal communication brings the bee-tender into closer relation with high value and universal spiritual principles and brings a more thorough understanding of bees and nature and our connection to both. Through investigation of this plethora of symbolic inspiration I have discovered meditative technologies and historical themes that provide a template for healing and connection in these modern times.

Taking the study of bees beyond biology, economics and agriculture and into the realms of anthropology, history and myth both deepens and structures a more ethical understanding of *apis melifera* and our universal, intrinsic relationship with Nature and our food systems. While we study rural and indigenous bee practices with wonderment and inspiration, bringing forth these ethics and language into the modern universal context of the Anthropocene epoch is both enriching and essential. From this pollinated perspective, new solution, understanding and methodology is being developed.

Honeybee biology in itself both reinforces and illuminates the sacred principles that resonate in seminal ancient myths such as the stories of Bhramari Devi whose mantra is "first sound" known as the "sound of the bee." Taken further, this mantra practice brought into an educated beekeeping culture helps unite us with our beekeeping world lineage in our bodies and, like yoga, becomes a spiritual embodiment practice. Essentially, by meditating with the bees, we gain bee wisdom and insight into ourselves.

In my presentation I will discuss relevant literature and myth, relate it to our current state of environmental awareness and compare ancient understanding of bees with our current one. Finally, with the ethos of Native American tradition, I will share a few examples of the meditative technologies, bee ethics and beekeeping practices as developed through my research/practice, and recount some of the discoveries made by co-horts, students and myself. My lecture will include a rich power-point of symbols from around the world and throughout history.

[Abstract:0501]

Effect of honeybee venom collection frequency on collecting and storing honey

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Measurement of collecting and storing honey activity of *A. m. carnica* as well as its control colonies and *A. m. ligustica* as well as its control colonies were investigated to evaluate the effect of collecting venom in different seasons through the year on this activity inside the colony. Data demonstrated that highest area of stored honey areas (inch²) was from Control of Carniolan, hybrid Carniolan, Control of Italian, and hybrid Italian it was 415.9, 386.3, 291.2, 279.1 (inch²) respectively, with significantly different between hybrid Carniolan and its Control, and significant different found between hybrid Italian and its control, there was a wide variation in significant difference between times of collection through the year, the highest area of stored honey areas (inch²) was in July, 2014, it was in mean $\pm$ se 674.7 $\pm$ 72.967 the lowest area of drone brood (inch²) was in March 2015 it was 131.6 $\pm$ 22.436 (inch²). Also data obtained demonstrate that the highest amount of stored honey weight in the seasons during the year was in summer and spring it was in mean $\pm$ se 5144.7 and 2844.9 mg. respectively, with significantly different too. It's clear from the results illustrated that venom collection decreased the percentage of stored honey amount (in mg.) with 7 % in Carniolan hybrid from its Control and with 4 % in Italian hybrid from its Control.

[Abstract:0505]

The Effect of Variations in Beehives on Propolis Quality

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Propolis is a natural blend that honey bees produce to protect their hives from all types of hazards. The composition and biological active value of propolis vary based on the flora, geographical and environmental characteristics of the region where it is collected and the mode of production. Polyphenolic compounds are the agents responsible for the biological activity in propolis and its diversity and quantity could again vary based on the mode of production.

In the present study, the variations in propolis quality induced by the differences between beehives were investigated. For this purpose, all the conditions were kept constant and propolis produced in three different hive types (Plastic thermo-hive, styrofoam-polystyrene beehive and wooden hive) were compared based on total polyphenolic substances and phenolic profiles. The propolis collected from plastic thermo-hives was found to be richer both in terms of the total amount of phenolic material and 14 phenolic compounds studied. It was also found that the plastic hive propolis was richer in caffeic acid phenolic ester (CAPR) and antioxidant capacity.

[Abstract:0508]

The Effect of Heating, Heating and Storage Time on HMF and Diastase Number in High Plato Honey Samples

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This study was carried out with the purpose of determining the effect of heat following the harvest, heating duration and storage time on HMF and diastase number, which are important quality criteria of the honey in high plato honey samples which are intensively produced across the Turkey. Within the scope of the study, Firstly, some of the important biochemical analyses (ash, moisture, pH, acidity, HMF, diastase, electrical conductivity, invert sugar and sucrose) were conducted in order to reveal the general structure of the honey samples. These analyses resulted in the determination of the composition of honey samples. Following the biochemical analyses, honey samples were divided into two equal pieces for the water bath (benmari) and the ultrasonic water bath heating methods. Then, different heating temperatures (Control, 40 °C, 60 °C, 80 °C) and times (45 and 90 minutes) were applied for each heating process as three repetitions. The HMF and diastase number of honey samples were determined following the heating process, in 6 and 12 months by analyzing samples in 3 different periods of deposition. The HMF amount in honey samples were 20.64±0.98 mg/kg and 26.26±0.95 mg/kg while the diastase number of honey samples were 26.13±1.23 and 25.97±1.24 for water bath (benmari) and ultrasonic water bath heating methods, respectively. In the present study, the increase in the account of HMF values in honey samples were significantly affected by heating temperature and time (P<0.01), but were not significantly affected by the interaction between methods and heating time (P>0.05), as statistically. The heating temperature and time were significant (P<0.01) for the decrease in the diastase number in honey samples, but the interaction of heating methods and heating time were not significant (P>0.05) as statistically.

[Abstract:0517]

Pesticides Application Control and Its Impact on Beekeeping

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INTRODUCTION: Agricultural production is based on the application of pesticides. In recent year saround the world a drop in the number of bee society is particularly acute problem. It is believed that this significant contribution given from uncontroled and inconsistent application of pesticides during the most important andmost dangerous period of application of pesticides is the blossom of wild and cultivated plants, especially during April and May. The use of chemical agents because of their toxicity, the area still causing unintended consequences for members of the ecosystem, especially bees. Most of the distributed nature causing air and water pollution and the poisoning of a large number of non-target organisms.

Results and DISCUSSION: It is particularly significant adverse actions of pesticides on bees due to sensitivity to most of currently used pesticides. Significant and statutory obligations of users of pesticides is strictly respecting the rules of application where there is a danger or a risk of poisoning of bees. According to the current legislation on the application of pesticide users are required to inform beekeepers and associations about the time of application and the type of pesticide they use. Allowed the use of pesticides of low toxicity to bees in the prescribed doses and concentrations, at a time when grown plants not in bloom. In use it is necessary to prevent the drift effect of pesticides caused from wind to the surrounding area, and the time of application customized to nuisance is minimal. The application of pesticides is necessary to put under the control of state institutions and professional services through institutional legal framework. All participants in the chain of pesticide application must comply with the law established rules and norms.

CONCLUSIONS: With the aim of lessening the harmful effects of pesticides on beekeeping is necessary to establish a system of control of its application. For the control of the application of pesticides is necessary to respect the rules of informing beekeepers as well as rules for the application of pesticides in accordance with the weather conditions, dosages, concentrations and exposures, and alignment treatment with the dynamics of the flight of bee colonies.

[Abstract:0518]

The Research on the Amount of Zinc Addiction in the Royal Jelly at the Different Levels to the Syrup Which Is Used in the Nutrition of Apis Mellifera

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In this study, the amount of zinc which passes into the royal jelly by feeding the colonies of apis mellifera with zinc ws searched. The research was done at the apiary of Ordu Apiculture Research Center. With this purpose, the research was carried with 75 colonies in total as 25 initiator colonies and 50 support colonies. The testing colonies were equalized in terms of the number of frame with bee and the area with young at the beginning, and they were separated into 5 groups as 5-colonies for each of the groups and randomly. The groups are; the control group was separated as 1 ppm Zn, 5 ppm Zn, 10 ppm Zn, and 20 pmm Zn (in ZnSO4 form). 2 pieces of the support colonies were used for each of the initiator colonies. The sorbe which was prepared was given as 1 lt to each of the colonies for each time everyday. 90 larva transfer in total were done as 2 frames and 45 larvas in each frame for each of the initiators. The budding was done for 4 weeks in total (6750 x4=27000) as three times in at week and 6750 buddings for each week. The royal jelly which was obtained from each harvest from the colonies was put separately into the dark-coloured bottles by the woody spoon for each of Zinc analysis, the number of beehive and the day of harvest were labeled onto the surface. The royal jelly was brought to the laboratories in the deepfreeze thermos bottles under +4°C and it was kept in -18°C deepfreeze until it was analyzed without the deterioration of cold chain. The amount of zinc in the royal jelly was reviewed in the research. The results of research showed that the zinc addiction at the different levels into the syrup didn't affect on the amount of zinc in the royal jelly (p>0.001).

[Abstract:0536]

Analyzes of Determination of Honey and Product Quality

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The fact that the honey, imitation and the products which have different composition according to the season and the plant which is obtained, is included among the products which are made to be attached, increases the importance of the analyzes made. If the honey is crystallized, it should be dissolved in water so that it does not exceed half an hour below 60 ° C after mixing, samples should be taken after cooling. The samples should not be heated in the diastase count and hydroxymethylfurfural assay. According to DIN-10753, the conductivity is measured with Atomic Absorption Spectrometer, the protein content is measured with AOAC (Conductivity meter), and the protein content is measured with a spectrophotometer, According to method 990.03, the amounts of HMF are made according to the method of DIN 10751-1, the invert sugar method AOAC 920.193 and the amount of sucrose according to the method of 107760 relative to the Lane-Eynon method with AOAC 920.184 method.

Normally matured balloons contain about 17% water. The pH of the honey varies between 3.4 and 6.1, and its specific weight is between 1.41 and 1.45 gr / cm3. It is envisaged that the total number of pollen in 10 gr pure bal is between 20,000 and 100,000. The amount of water-insoluble substance on the press ball can not exceed 0.5 g / 100g. The maximum limit of HMF nodule is 40 milligrams per kilogram. Free acidity (max.) 50 meq / kg, Sucrose (max.) 5 g / 100 g, C13 assay which measures the sugar protein ratio of honey must be lower than -1. Since the presence of pathogenic microorganisms in the honey is dangerous, analysis and quality determination should be done before the honey is consumed and the consumption of beer that conforms to the TSE and international standards should be presented. The high proportion of water in honey causes honey to be more easily deteriorated. If honey is more than the standard amount of sucrose specified in the standard, it can be suggested that cheating is done.

[Abstract:0542]

The Effects of the Queenbee Production of Different Household Types

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It is aimed to compare the colony acceptance rates and the qualities of the main bees grown in the queen bee breeding boxes with different types and characteristics used in commercial queen beetle growing in the Ordu province. As the mating box, the study used a pair of styroporous mating box, a small wooden wicket and a three-section standard bushing model used for queen bee breeding. Thickness acceptance ratios and queen quality for each breeding group; Outweighed weight, mating queen weight, colony acceptance rate as breeding parameters, and incubation production efficiency.

Limit Acceptance Ratios: The standard three-compartment bucket is 100%, the two-compartment mini-wood is 55.5%, and the control-strapping compartment is 95.8.

In live weights measurements made following the exits of three different breeding colonies, the mean weights of the 1st group (three-compartment standard beehive) parent bees are 202.17 ± mg, the second group (two-compartment tiny beech) Mean weight 202.08 ± mg., Group 3 (control-strain mating box) mean weights of the main bears were 201.67 ± mg..

Paired Pear Bee Weights In the live weights measurements made following the output of the pear beans fitted to three different mating colonies, the mean weights of the first group of the first group are 197.83 ± mg, the mean weights of the second group are the mean weights of the second group 198.92 ± mg., Group 3 (control-brachytherapy box) mean weights of the main bears were 198.42 ± mg..

Colony Acceptance Ratios were 83,3% for three compartments, 75% for two-compartment mini-woods, and 75 for control-stratified compartments.

Incubation Production Activity: Average of hatchery production activities were made at 21 day intervals during the nectar season, and the average of the litter size of the groups. In the measurements made in three different groups, the average incubation production activities of the 1st group (three compartment standard hive) main bears were 322,24 ± cm2, The mean incubation production efficiencies of the parent group (two-compartment tiny walnut) were 262,58 ± cm2 / frame, the third group (control-styraptor mating compartment) and the mean incubation production efficiencies of the parent bean were 233,98 ± cm2 /.

[Abstract:0548]

Honey Production and Quality Assessment Questionnaire Regarding the Chinese District Beekeepers

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Among the bee products, the product with the highest awareness is honey with 99.4%. Honey, consumed since ancient times, is a good source of income for beekeepers. In our country, annual honey production is 94,245 tons according to FAO 2013 data. With this production, the world took its 2nd place after China. Aydın province is one of the most important centers in our country in terms of beekeeping activities and is one of the top 5 producers in terms of honey production.

In general, about 80% of honey comes from different sugars (35% glucose, 40% fructose, 5% sucrose) and 17% water. The remaining 3% consists of up to 180 different substances such as enzymes, amino acids, gluconic acid, phenol compounds, lactone, minerals and various vitamins. Honey is an indisputable issue in terms of human health as well as nutritional value. It appears to be used as a therapeutic and supportive treatment for many diseases such as strengthening the system, antibacterial properties, ulcers, burns and skin diseases. Honey It can show quite different structures according to various regions and time of acquisition. In order to reveal the quality of the honey, analysis results such as HMF and Dextrin which are also made in the laboratory are needed.

This study will be conducted by using a face-to-face interview method with approximately 30 beekeepers who are actively engaged in beekeeping activity in the province of Aydın in the province of Aydın in order to measure the information about analysis of honey and honey related beekeepers producing an important product such as honey.

It is thought that the survey results will primarily contribute to informing the beekeeping sector of our region and our country and other sectors related to beekeeping activities.

[Abstract:0551]

Monofloral Honeys from Turkey

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Having a rich plant flora for honey production and suitable climatic conditions, Turkey ranks second in honey production in the World. Despite the existing of approximately 12,500 flowering plant species in Europe, the availability of 11,800 flowering plant species in our country makes it clear that our country is rich in plant flora. Diversity is also increasing in the honeys produced in Turkey due to the richness of the plant cover. Botanic origin and composition of honey influences the quality of the honey. In particular botanic origin is the most important honey quality parameter and plays an important role in determining the price of honey. In addition, the composition of the honeys varies depending on the production area and the plant variety. For this reason, the natural chemical content and other activities of our monofloral honey are important. There are studies showing that chestnut honey from monofloral honey has high antioxidant activity. It is also reported that oak honey, which is dark brown monofloral honey, has a high total phenol content while cotton honey has low total phenol content. Chemical composition of some monofloral honeys which are originate from endemic plants, distinctive and with high added value, are investigated with this review and honeys are compared among themselves.

[Abstract:0558]

Chemical Composition and Antioxidant Activity of Mint Honey

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Due to, rich plant flora of Turkey, beekeeping has greatly increased in the world ranking in recent years. The number of more than 11,500 plant species on Earth, there are approximately 10,000 species of plants in Turkey and most of them endemic. The origin of honey is determined which plants to belonging with pollen analysis. Pollen analysis is playing important role to determine the nectar sources, geographical origin, quality and classification of honey. If the density of pollen in honey is consisting mostly nectar of mint plant (*Mentha* sp.), it is known mint honey. In this study, our aim was to investigate chemical components and antioxidant activity of mint honey from Turkey.

After pollen analysis, Mint honey diluted in water and five different concentration solutions prepared (2,5, 5, 10, 20, 40 %). Antioxidant activity performed four different method which are: β -carotene linoleic acid bleaching assay, DPPH radical scavenging activity, ABTS cation radical scavenging activity and CUPRAC ion reducing methods. In addition to antioxidant activity, mint honey was extracted with chloroform and solvents evaporated under vacuum. After, derivatization of honey extracts to volatile components with TMS, Chemical compounds of honey extract analyzed as qualitative and quantitative by GC-FID and GC-MS systems. Chemical components, were characterised according to their retention times and with using library data NIST07.

According to the obtained chemical results, Benzoic acid, cinnamic acid, sebacic acid, p-coumaric acid, β -D-glucopyranose, suberic acid ve vanilic acid were found as major compounds of Mint honey. Additionally, 2-keto-glukonic acid, syringic acid, palmitic acid and stearic acid were found in honey as well. Antioxidant activity results are the following: In β -carotene linoleic acid bleaching assay and ABTS cation radical scavenging activity $92,55 \pm 0,91$ % and $81,74 \pm 0,25$ % at 40 % concentration respectively. In DPPH scavenging and CUPRAC assays with percentage inhibition and absorbtion values of $71.15 \pm 1,03$ and $2,20 \pm 0,11$ respectively at 40 % concentration.

Acknowledgements: We are thankful to Mugla Beekeepers Association for their support.

[Abstract:0581]

Analyses of Propolis Productivity in Selected Lineages of Honeybees in Eastern Serbia

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For collecting pollen we observed 5 colonies from 7 lineages in the period of three years in the Centre for Selection of Selected queens of "Timomed" Company in Eastern Serbia. The intake of propolis was monitored in August during thirty days. We put "collector" which was previously measured by a digital scale. Comparing the difference in the weight of the "collector" before being placed into the hive and the weight of the collector with propolis 30 days later, we determined the production of propolis. In the first year of observation the largest average quantity of propolis was in PR lineage = 17.19 g, in the second year of observation the largest average quantity of propolis was in PR lineage = 10.88 g. In the first year of observation the largest average quantity of propolis was in BO lineage = 8.38 g, and PR = 7.86 g (LSD test showed no significant differences between the average of the quantities in the two lines). Based on test results ANOVA we established that there is a very significant influence of the year ($F = 56,00^{**}$), a very significant influence of the lineage ($F = 2,69^{*}$) the production of propolis. In the first year of observation the average air temperature was $22,870^{\circ}\text{C}$, and the amount of rainfall was 70,1 mm. In the second year the average air temperature was $22,330^{\circ}\text{C}$, and the amount of rainfall was 42 mm, and in the third, the average air temperature was $21,890^{\circ}\text{C}$, and the amount of rainfall was 17,1 mm. A greater amount of rainfall in the first year of observation probably influenced the fact that in that year the quantity of propolis was also greater compared to the other years. PR lineage has the best results in collecting propolis in two years, whereas in the third year it collected u insignificantly less propolis compared to BO lineage. The observed productive trait is characterized by variability and its expression depends on hereditary basis and influence of external factors.

[Abstract:0590]

Granulometric Analysis of Colombian Highland Cundiboyacense Beepollen During an Annual Harvest Period

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Colombian highland Cundiboyacense beepollen is characterized by its excellent nutritional and bioactive composition. It is currently proposed as a natural ingredient in the food industry and particle size analysis is presented as an easy and non-destructive characterization technique. In this work the particle size analysis of bee pollen collected during a period of one year (2016) is carried out, in order to find the distribution of particle sizes of the product and its relation to the collection season or month in this region.

For the retained fractions, it was observed that during the months of January and February the fraction of 10-mesh size (1.68 mm) was the majority. Between March and September, the average particle size is smaller, with the majority being the 12-mesh size (1.41 mm), with a minimum in April with a smaller particle size, the largest fraction being 16-mesh size (1.00 mm). Then, an increase in particle size is seen again from October to December, where a retained majority fraction of 1.68 mm size was obtained. A cycle of particle sizes during the year is observed, with two peaks of average particle size in January (1.47 mm) and June (1.35 mm) and two lows in March (1.13 mm) and August (1.14 mm), coinciding with the dry and rainy seasons of the region.

For the accumulated fractions, the largest change is between fractions 1.68 mm and 1.41 mm, in those fractions is where the largest amount of pollen was found. Fraction with diameter of 1.00 mm is where they have the lowest contents, except in April. These differences in particle sizes may be due to the humidity influenced by the climate cycles during the year, as well as to the pelletized pollen loads. The floral cycles of the plants in the region vary, so bees in each season can visit flowers where pollen has different binding ability.

[Abstract:0591]

Honeys from the Lake Region of Chile: Botanical Origin, Biological Activity and Innocuity

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The Los Lagos Region extends between the parallels 40° 13' and 44° 3' South latitude and between the co-ordinates 74 ° 49 'to 71 ° 34' W, ranging from the Pacific Ocean to the Cordillera de los Andes. The climate is mostly Mediterranean type with more than 2000 mm of annual precipitation, Valdivian Forest or Temperate Forest dominates in most of the region with near 70% of native/endemic species. This characteristic allows the beekeeping activity to be very attractive for the development of local products with unique characteristics. In this study we worked with 120 local beekeepers from different areas of the Lake Region in order to analyze several properties of their honeys allowing to add value for national and international markets. A total of 150 honeys were harvested during the period 2015-2016 assessing i) botanical origin, ii) antimicrobial activity, iii) presence of Glyphosate residues and iv) presence of Neonicotinoid residues. Using the melisopalinological method it was detected that 64% of the honeys are native and 66% are unifloral such as ulmo, tiaca, tineo and avellano honeys, *In-vitro* antimicrobial activity was evaluated by inhibitory diameter measurement and MIC. The assays were conducted against relevant bacteria (*Escherichia coli* ATCC-25922, *Staphylococcus aureus* ATCC-25923, *Pseudomonas aeruginosa* ATCC 27853, and *Streptococcus pyogenes* ISP 364-00). Residue analyzes were performed using the QuEChERS method. Honey from the Lake Region had the largest and most significant inhibition zone against *S. pyogenes* and ulmo honey after the experiment with catalyze to eliminate the hydrogen peroxide continue showing a significant antibacterial activity against the four study bacteria. No residues of glyphosate and neonicotinoids were detected in the samples that exceed 50 ppb. Honey from the Lake Region of Chile showed a great potential to be used in new functional products.

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[Abstract:0616]

Environmental contaminants and veterinary drug residues in bee honey

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Nowadays, the tendency of people is not only to feed, but to consume healthier and more reliable products. This tendency has led to questioning of quality and reliability of the products, especially in conventional products, even in organic products. The fact that honey is a valuable food source for people and the anticipation of many health benefit has led to a more stringent questioning of the the honey. For this reason honey is analyzed in terms of various contaminants and veterinary drug residues both national and international. Today, environmental contaminants and veterinary drug residues have been followed more strictly by incorporating into "residue monitoring programs" in many countries. The bees meet their nutritional needs from a circular area of 1-14 km depending on bee breed and nutritional sufficiency status. The benefits of such a wide range and variety of plant resources naturally increase the susceptibility of environmental contaminants such as heavy metals and pesticides in honey. On the other hand, the possibility of using veterinary drugs such as acaricides, antibiotics and fungicides, most of which are prohibited to use, against serious bee diseases and other diseases caused by mites such as *Varroa destructor*, which destroyed all colonies in 2-3 years, increases the risks and concern of drug residues in honey. Studies have shown that even organic honeys, specially traditional honeys, may have environmental contaminants or veterinary drug residues below or above legal limits.

[Abstract:0628]

Mitigating the African Challenge in Apiculture with the Invention of the Xtreme Indestructible Hemispherical Hive

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In the years leading up to the 19th century prior to the mass modernization and colonization of Africa by the west, when agriculture in general was relatively crude and faced with eminent destruction of local natural occurring hives for honey expression using fire to subdue bees, many farmers and hunters found satisfaction and a sense of somewhat personal accomplishment in the bush hunting for honey and some of its by products, believed to treat many ailments in addition to primarily supplementing sugar intake and sweeteners in local foods like corn meal etc. Most saddening was the fact that in the process, bees were killed, dwindling the overall bee population per hive.

Fast forward to the 21st century- despite employing the more modern *Kenyan top-bar hives* and *langstrooth hives*, this practice remains somewhat unresolved in the African region, no small thanks to the destruction of agricultural lands that would have otherwise been used as nectar and pollen sources for bees as well as the destruction off these more modern hives by herdsmen as a way of enriching themselves with the abundance of honey from apiaries within these grazing communities. These unwholesome activities inevitably lead to *cattle rustling* by affected farmers, agropreneurs and community members, the consequences thus evident in the maiming and many times the killings of community members by herdsmen, as the *grazing bill* proposed by governments is seen by many as a hoax rather than a lasting solution to the problem despite being hailed as a welcome development by few.

The purpose of this paper thus, is the systematic application of advanced technology to agricultural entrepreneurship in apiculture, known as *technoagropreneurship* to arrest these problems by the invention of the hemishperical hive, capable of indestructibility, ensuring carbon free organic honey and bee by-products while mitigating the above recounted African challenge faced by apicultural agropreneurs.

It is believed that this new hemispherical hive invention will address the issues of herdsmen destruction of apiaries, cattle rustling by farmers and inform the drive, zeal and desire to gainfully engage in commercial production of honey and its by-products by new and existing beekeepers.

[Abstract:0637]

Microscopic Analysis of Honey Sample from Bayburt

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In this study, we aimed to determine the plants which are important honey resources for Bayburt region. For this reason, pollen diagnosis was made in the honey sample by microscopic analysis. Honey sample was supplied from Bayburt region in 2016. By using microscopic analysis method, pollen diagnosis was made in honey sample, and plants, which are important honey sources, were determined for this region. The pollen profile of honey sample was determined according to the methodology described by Louveaux et al., (1978). Firstly, 20 ml of distilled water was added to 10 g of honey sample and kept in a 45 ° C water bath for 10-15 min for dissolution. The supernatant liquid was then poured off; and the basic fuchsin added glycerin gelatin (about 1-2 mm³) width was taken with the help of a sterile needle; by being transferred onto a slide by imbruing it in the pellet remaining in the bottom of the centrifuge tube. The slide in this form was heated at 30-40 °C for the dissolution of basic fuchsin added glycerin gelatin. The prepared preparation was examined by light microscopy (Leica DM 500) after about 12 hours.

In the diagnosis of pollen grains, the microphotographs of pollens in the literature and the reference preparations were utilized. The pollen types were identified and classified according to their percentages, as dominant pollen (more than 45% of the total pollen), secondary pollen (from 16 to 45%), minor pollen (from 3 to 15%), and rare pollen (less than 3%). As a result of microscopic analysis of honey sample, pollens belonging to different families were identified at different rates in honey sample from Bayburt region. Pollen of the Fabaceae and Asteraceae families were detected extensively in honey. Also; the pollens of families Poaceae, Lamiaceae, Rosaceae and Salicaceae were found at secondary density. This study is a preliminary study to determine the plant sources of Bayburt honey. It is planned to work with more honey samples in order to clarify the plant species that form the source of the Bayburt region.

[Abstract:0651]

Propolis: Edible Coating

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Food packaging has gained more and more importance in recent years in order to meet consumer demands and to preserve the nature. Therefore, research on edible coatings has been quite increased to prolong the shelf life and to increase the quality of food. The use of propolis, an important antimicrobial agent, as an edible coating material has been examined in this study. Therefore, it is aimed to raise awareness of a different use of the propolis. The studies made in Turkey and in the world on edible coating have been examined. Thus, this manuscript has been prepared to assess the importance of propolis as an edible coating material for producers and consumers.

The packaging material is of vital importance to preserve the characteristics of the food. Edible films and coatings are edible coating materials that are applied in the food or on the surface of the food. The use of edible coatings in the packaging industry has many advantages. Besides the use of artificial packaging materials, the coating materials obtained from natural products, which have many bioactive properties such as propolis, prolong the shelf life of the food and increase the quality. The number of studies on the availability of the propolis as an edible coating material, in addition to the applications with various materials, is very limited. This bee product, which has positive bioactive characteristics for health, should be evaluated as a coating material and further studies on this issue are needed.

[Abstract:0652]

Dry and Royal Jelly Larva Transfer in Queen Bee Production

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Turkey which is located between three continents has an important potential for production of honey and other bee products as well as being an important gene resource center due to its different climatic and vegetation cover. However, production quantities of honey and other bee products produced are not at the desired level. The quantity and quality of the production depends not only on the environmental factors but also on the genetic characteristics of the colony. The quality of the queen bee, which is the genetic predecessor of the individuals in the colony, is a direct factor in the efficiency of the colony.

Commercial queen bee production in Turkey does not meet the demand. In addition, the genetic structure and quality of the main bees produced are unknown. The production method chosen on the quality of the queen bee is considerably influential. In queen bee production, many controlled queen bee production methods are used besides the main bee grown from nature. Today, Doolittle (grafting) method is used in many firms where queen bee farming is done in Turkey. The way of application of the method also affects the quality of the queen bee.

Honey bees pass eggs, larva and pupa periods until they become a mature individual. During these periods, larva period is the only nutrition period. All individuals in the colony are fed with royal jelly during the first 3 days of larva period. In the second period, individuals who will be queen bee continue to be fed with royal jelly. In queen bee growing, feeding the larva with royal jelly in sufficient quantity has a direct effect on quality. In the Doolittle method, different applications are made to the queen cell while larva transfer is done. One of the applications that have influenced the quality of the grown queen bees is known to be the application of grafting by putting nothing (dry) on the queen cell or by putting some royal jelly during larva transfer.

[Abstract:0669]

Melissopalynological Analysis of Honeys Designated Honey of Euphorbia Resinifera in the Province of Azilal, Morocco

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Euphorbia resinifera is an endemic honey herb in the Azilal region known for its acrid-tasting honey, which is highly sought after by both beekeepers and consumers. In order to characterize the honey of such species, we carried out the present study on 42 samples. Thirty samples were harvested by ourselves, while 12 samples were purchased from local beekeepers, in July 2014 and 2015. These samples have come from three regions: Ait Attab (840 m), Ait Mhamed (1600 m) and Azilal (1300 m). Quantitative analysis of these samples showed that nectar or nectar + honeydew were the main source of honey in the samples studied. The qualitative analysis identified 75 species belonging to 23 families. E. resinifera pollen is present in 26 samples with percentages ranging from 1% to 37%. The pollen of Quercus ilex, a source of honeydew, is present in 36 samples. The sample associations in the Ait Mhamed region are dominated by Cistus laurifolius, Melilotus sp. and Lotus sp. While those of the Azilal and Ait Attab regions are made up of the Fabaceae, the Brassicaceae and the Apiaceae, in particular the genus Eryngium.

[Abstract:0678]

Honey Grading

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Up to 76% of honey sold in grocery stores in the United States is not genuine honey, and this not only impacts consumers but beekeepers alike. Twelve countries account for over 80% of global honey exports, and honey grading regulations differ across international markets impacting honey quality. Consumer quality expectations and perceptions contrast among global markets. Middle Eastern consumers tend to perceive crystalized or creamy honey as fake, whereas North American consumers favor honey that is filtered, pasteurized, clear, and in a liquid state. In Europe, consumers prefer honey free of GMOs. Another issue impacting honey quality is the presence of chemical residue and the use of antibiotics in bee colonies for disease control. Government regulations for honey labeling can mislead consumers by not providing the required information, including the honey's origin, production process, additives, among others. Lack of regulations around what can be marketed as real honey can be mitigated by educating the consumer on the properties of real versus fake honey. As a result, consumers can ensure they are receiving all the nutritional benefits derived from honey, as well as protect beekeepers worldwide from regulations that allow for fake honey to be marketed and sold as real.

[Abstract:0687]

Determination of the Initial Flora of Propolis Produced in Bolu for Some Important Foodborne Pathogens and Parasites and Revealing the Contamination Ways

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Propolis is a natural hive product which is collected from buds, and produced by honey bee. The major compounds of propolis are flavanoids and caffeic acid esters which are also responsible for biological activity of propolis. Propolis has been especially used by folk medicine for ancient times for treating various diseases of both human and domestic animals. Furthermore, propolis is being used for storing tuber crops and in furniture industry besides medical usage. Propolis possesses versatile biological activities, proved on scientific bases, including antimicrobial, antiinflammatory, regenerative, antioxidant and cytostatic. However despite its abovementioned properties there is not a medical literature about propolis' initial microbiological / parasitological flora. In this study it is aimed to explore propolis' initial microbiological and parasitological flora for 6 different parameters (plate count, coliforms, *Escherichia coli*, *Staphylococcus aureus*, *Clostridium botulinum* and *Nosema* spp.). For this purpose it is planned to collect 100 propolis samples which are produced in Bolu and its districts. Alongside, it is also targeted to determine the microbiological / parasitological risk factors and contamination ways of the aforementioned pathogens and to prove the critical control points in propolis producing processes. According to the results it was determined that samples were contaminated by the analyzed parameters at different concentrations. Moreover, it was decided that GMP procedures must be completely applied in every steps of bee products. Lastly further related studies would be very useful to identify the existence and mechanisms of the food borne pathogens in propolis.

[Abstract:0688]

Development of Opportunities of Honey Producers for Producing Healthy and Qualified Honey

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In spite of honey includes a plenty of bioactive antimicrobial components, hydrogen peroxide for antimicrobial activity can not be sufficiently produced because of low water activity and this situation revives the existence risks of food and/or bee originated pathogens and fungal agents in honey. There are a lot of studies about antimicrobial and bacteriostatic effects of honey. However the studies about growing profile of foodborne and bee originated pathogens and fungal agents in honey and the initial flora of honey are very limited. To determine the infection and infestation agents in honey became very important for consumers' health and preventive medicine because of because of primary and secondary contamination sources, environmental factors and developing of resistant pathogens / mycotic agents.

In this study it was explored the presence of different microbiological and parasitological parameters (Plate count, total coliform group bacteria count, *Escherichia coli*, *Staphylococcus aureus*, *Ascosphaera apis*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Penicillium larvae*, *Melissococcus pluton*, *Nosema* spp., *Varroa* spp.) in honey samples provided from various districts of Kırklareli (Merkez, Ulukonak, Çağlayık, Lüleburgaz, Kofcaz, Demirköy, Pehlivan köy, Vize, Babaeski). Binary significance correlations among all the microbiological parameters were exposed while there were not any binary significance relations among the parasitological parameter analyzed. According to the results of the study it was concluded that continuous inspection of the hives by specialized veterinarians, correct hive transportation applications, interactive education programs to the producers that would be given by related official institutions would be very important to prevent the colony losses and to provide qualified honey. It is also thought that aforementioned prevention applications would also increase the honey production capacity for both internal market and exportation of our country, which is one of the important honey producer countries of the world.

[Abstract:0689]

Hive Tracking and Hive Management Systems - Reconciling Data Requirements of Authorities, Research and Beekeepers

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Different government agencies and institutions as well as research projects have an interest in maintaining data on location and movement of bee hives as well as data on bee losses and other monitoring data. Such data collection efforts tend to run into serious difficulties in the beekeeping sector. This is especially true, when they are based on the assumption, that bees are just another farm animal. Also beekeepers have very little incentive to participate in such a system. Participation as condition for receiving government support is not happening, because the money actually received by beekeepers is too insignificant. Participation as condition for placing products on the market does not work for the many hobby beekeepers who distribute their products to friends and family.

By offering a system, which is extremely useful to beekeepers and has guaranteed privacy built into the architecture, valuable aggregate information can be generated. Such a system might make it unnecessary to force beekeepers to register anything with the government. It would actually provide more accurate data than a mandatory system, because the encryption, anonymization and aggregation make sure that there are no negative consequences for the individual beekeeper. It might be an alternative or complimentary to a government mandated traceability system by offering a solution that addresses the concerns of the beekeepers while at the same time providing information for legitimate scientific and veterinary purposes. Possible role of authorities could be to promote standardized ways for exchange of data in all systems tracking bees and beekeepers.

Hive and hive product tracking is essential to any well run beekeeping operation. Such a system is only useful to the beekeeper, if it contains accurate and current data. Incentives and disincentives to have "alternate facts" in the system make it useless for everybody. Beekeeping community and authorities should work together to balance beekeepers interests with legitimate government interests. Systems need to be designed to have built in privacy protections which do not depend on trusting current or future governments. Commercial suppliers of hive tracking systems need to be included in the process.

[Abstract:0695]

Propolis: Past, Present and Future

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Nowadays, natural products have been gained attention again because of their biological activity on human health. Propolis is an important natural product of honeybees. Propolis has been used as an antibiotic from ancient times. It is a mixture of oils, pollen, special resin and waxy materials which are collected from tree cones, shells and buds of plants by honey bees. Propolis has antimicrobial, antifungal, antiviral, anti-inflammatory and anesthetic effects. It also plays an important role in lots of beneficial biological activities. Therefore, it has been used as a functional food supplement or as a natural drug in apitherapy, bio cosmetic and healthy nutrition. Propolis has been processed by using traditional extraction methods (alcohol extraction etc.) today for market. It is important to improve propolis production process since propolis is an imported good. In the case of developing novel process methods in order to obtain pure one, propolis will not be imported for regular use in daily. In future, it is necessary that the extraction conditions of propolis and shelf-life will be carried out. Moreover, this product will be encapsulated with cyclodextrins just before the drying step for protecting from oxidation in order to produce new product. In this review, the past, present and future products, production methods and applications of propolis will be discussed.

[Abstract:0714]

Beekeeping Field Schools: A Great Chance in Commercial Beekeeping Technology Transfer for Rural and Young Populations for Sustainable Development: A Case Study in Singida Youth Entrepreneurs and Consultants at Kisaki village in Central Tanzania

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Beekeeping Field School (BFS) is unique and unbelievable beekeeping technological Youth initiative situated on roots of Mount Kilimanjaro at Kisaki village Singida- Tanzania developed by senior beekeeping practical experts who are university graduates from different universities in Tanzania. They decided to be self-employed and real-transformed mind in entrepreneurial practical skills to master their environment. They developed different infrastructure such as beekeeping class, accommodation, honey processing units, Queen rearing projects, planting for the bees units, global beekeepers networking, beehive carpentry units, Candle making units, Beekeeping museums, water facilities, Apiary master plans, bees wax processing units, conserving forages by fencing the apiaries. They formalized these initiatives along beekeeping value chains, and provide appropriate guidance and direction towards commercializing Tanzania beekeeping sector for better beekeeping technology transfer, development and sustainability, where they built 'BFS' providing field experience, education, skills and knowledge of best beekeeping practices package for commercializing the beekeeping sector in their locality since 2014 to date.

Today, It is a unique place where they are providing field experience, education, skills and knowledge of best beekeeping practices package for commercialization of beekeeping sector along great rift value zone and great depression along 14 countries in Africa. More They designed a beehive where a beekeeper can harvest everyday and providing opportunity for young people (female and Male) to have one month fully stay in camps by camping near beekeeping forest reserves for them to adopt best commercial beekeeping practices for better tomorrow and talk the same language of bees as one. Through this monthly incubation as short courses 267 young people succeed to Graduation out of 92, in 6 batches, The graduates are employed to different private beekeeping ventures in different parts the country as Apiary managers and they are performing well. Currently, We developed curriculum packages to fit for international participants and working hard to build the " World Beekeeping Museum(WBM) enough to accommodate one acre plot for each country on the Earth surface to provide historical background to date.

We like to share this case with others during Apimondia in Istanbul, Rwanda this year 2017.

Thank in Advance,

Karibu Tanzania, Asante Africa.

[Abstract:0717]

Standardization of Beekeeping Products in Countries of European Economic Union and the Russian Federation

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The requirements for the quality of honey, wax, pollen renewal, beebread, royal jelly and propolis on the territory of the EEU are governed by GOSTs developed by the Interstate Technical Committee (ITC) 531 "Beekeeping", whose secretariat is in FSBSI "Research Institute of Beekeeping". The current regulatory documentation is adapted internationally and aimed at standardizing the methods of analysis that confirm the naturalness of beekeeping products, that help to find out violations of storage conditions and expiry date, as well as identify botanical and geographical origin.

The main document setting the requirements for the safety of bee products on the territory of the EEU is the Technical Regulations of the Customs Union "On Food Safety".

Despite the fact that the introduction of changes to the current Technical Regulations of the Customs Union "On Food Safety" is the prerogative of the working groups of the Eurasian Economic Commission, specialists of the ITC 531 "Beekeeping" monitor accumulation of experimental data confirming the need to correct the requirements for the safety of bee products.

As many experts note, the EEU in general, and the Russian Federation in particular, have significant reserves for the production and export of organic beekeeping products on their territories. A deterrent to the development of organic beekeeping in the EEU countries is the absence of some appropriate regulatory and legal framework, but in recent years the situation in this area has begun to change. TC 040 "Products of organic production", of which the FSBSI "Research Institute of Beekeeping" is a member, developed in 2014-2016 some interstate and national standards regulating activities in the field of organic production. In 2013 a group of companies established in the Russia the National Organic Union, whose main goal is to provide comprehensive assistance to the formation and sustainable development of the national market of organic products. Currently, there is a public discussion of the draft federal law "On the production and circulation of organic products" (organic production) and on the introduction of changes in certain legislative acts of the Russia.

[Abstract:0720]

General Characteristics, Antioxidant Activity and Composition of Crude and Ethanolic Extract of Propolis Collected in Western Region of Yucatán Peninsula, México

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Propolis is a resinous mixture that honey bees produce by mixing saliva and beeswax with exudate gathered from tree buds, exudates, or other plant tissues. Studies have shown some biological activities which great interest in pharmaceutical industry. The objective of this study was to evaluate the general characteristics, antioxidant activity and composition of crude propolis and its ethanol extract, collected in western region of Yucatán peninsula, (YP) México. 10 samples of propolis were collected in apiaries from western region of YP. Some characteristics of crude propolis (moisture, ash, wax, and color) and their ethanolic extract (EEP) (total phenolic content (TPC), total flavonoids content (TFC), antioxidant activity (ABTS and DPPH techniques) and individual phenolic compounds (by HPLC) were evaluated. EEP was prepared by extracting 6 g of propolis with 20 mL of ethanol with constant stirring at dark for 12 days. Extracts were filtered and stored in absence of light at -8 °C until use. Significant differences were found in moisture (between 1.8 and 6.9 %), and ash (between 0.8 and 4.8 %). 5 of propolis studied were greenish, 4 were brown and 1 reddish color. Their consistency varies between soft, slightly soft and hard. The dry extract content of EEP varied widely between 2.3 and 11.5 g/100 mL of EEP and the content of waxes between 1.8 and 2.9 g/100 mL of EEP. Its content of TPC and TFC ranged from 3.9 to 94.2 mg equivalent to gallic acid/g of EEP and from 1.7 to 42.6 mg equivalent to quercetin/g of EEP, respectively. Antioxidant activity ranged from 0.2 to 4.3 mM Trolox/g EEP (DPPH assay), and from 0.9 to 5.0 mM Trolox/g EEP (ABTS assay). With HPLC analysis, more than 30 compounds were separated in each extract, 8 were identified present in the 10 samples, 6 phenolic acids (gallic, chlorogenic, ferulic, ellagic, vanillic and syringic) and 2 flavonoids (catechin and chrysin), whose concentration varied significantly between samples. Differences in the concentration of the extracts would explain the differences in antioxidant activities found. It concluded that the composition and properties of the propolis collected in the studied region vary significantly.

[Abstract:0750]

Melilot Honey: Identification and Quality Parameters

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The Russian Federation has great potential for producing melilot honey. White melilot (*Melilotus albus* L.) and yellow melilot (*Melilotus officinalis* L.) grow widely on its territory both in natural and cultivated conditions. Due to high nectariferous qualities and attractiveness for bees, the plant was called melilotus - giving honey. Melilot honey is characterized by original and delicate pleasant taste and aroma, reminiscent of vanilla. The color of the melilot honey is light amber extra or white. Sometimes it acquires some golden or greenish shade depending on the geographical origin.

The parameters of melilot honey quality are characterized by high content of reducing sugar, enzymatic activity, low sucrose and high electrical conductivity and proline mass fraction. Unconventional for light-colored honey, the electrical conductivity and proline content can be used to identify melilot honey.

Some samples of melilot honey contain from 20 to 87 % of melilot pollen. These differences do not significantly affect the quality of honey. Therefore, to confirm the botanical origin of melilot honey along with the identification of pollen grains of this plant, it is necessary to study its physicochemical parameters. All melilot honey samples are characterized by high content of calcium, magnesium and potassium, sodium, iron, zinc and others are present. No toxic elements like lead, cadmium or arsenic were found in the samples being tested. Melilot honey possessing high nutritional and medicinal properties is recommended for respiratory, colds, headaches and insomnia. It is rated as one of the best honey.

[Abstract:0768]

Characterization of Honeys by their Botanical and Geographical Origins Based on their Physico-Chemical Properties and Chemo-Metrics Analysis

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Honey because of its nutritional and medicinal values it has got high demands and it becomes as one of the important market commodities. However, the issue of its quality and authenticity remain as important factors in consumption and marketing of honey. To assess the possibility of discriminating honeys by their geographical and botanical origins; 30 fresh honey samples of different botanical and geographical origins were collected and their major physico-chemical properties such as: total dissolved sugar (TDS), total ash, sugar profile, acidity, metallic ions and electric conductivity (EC) were investigated. The data was subjected to different chemo-metric (Hierarchical Cluster, Principal Components and Stepwise Discriminant) analysis. Among the 23 characters used in the analysis; only 11 (TDS, EC, acidity, total ash, color, and some specific metallic ions) characters have showed significant variations among different origin honeys. According to the stepwise discriminant analysis; 11 variables confirmed the grouping of the honey samples into four cluster groups based on their botanical and geographical origins. The clustering of the honeys associated with dominant plant source & climatic conditions of their origins. The study generally revealed the successful discrimination of honeys into their botanical and geographical provenances using fewer physico-chemical characters supported with melissopalynological data through applying suitable chemo-metric analysis

[Abstract:0769]

Design and Construction of Avrin Bee venom Collector, Biological Control of Varroa Mite and the Impact on Growth and the Productivity of the Hive

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Iran.East Azerbaijan-Tabriz-Fadakh intersection-Asgharpour Honey

As we know,bee venom is one of the most valuable products in the pharmaceutical industry and could be profitable for keepers.But unfortunately,for reasons such as neglecting this valuable material, to date it is not possible and also not having a perfect device to extract the precious products,I tried to design the optimal system by brand (Avrin bee venom collector) and trying to resolving deficiencies on other devices,such as working with high voltage which is one of the main problem,which in addition to damaging the building bees wax glands, causes disturbance in the peace of the apiary. The advantages of this device is its function with low and rotational voltage (about 5 volts and less than 1 amp) and with on losses for the apiary.

Among other advantages, is low weight(about 1 kg and in the dimensions 36.24)and connectivity to multiple devices.The most important feature of this device is it's ability to charge and equipped with solar panels (per charge equals twenty hours of continuous operation).As we know,in most apiaries in the country,there is no access to electricity, therefore the device must be adopted to these conditions,it can be programmed manually and by computer and declares all the symptoms to signals to the operator.

Warranty and after-sale services have been added to the benefits. The venom average extraction per 5 to 6 hives is about 1 gram.In addition to venom collecting,it is effective in controlling and loss of varroa mite. And this was evident during venom collecting levels (one day after each collecting).

In the hives that were studied within a year and were collecting venom every three days significant changes were observed in comparison to the other hives.top honey,healthier population and better wintering is among the advantages of this device.in the open floor hives that were arranged with this device,after 12 hours the loss was observed. The likely effect of the poison pheromone in the hive can be the cause of the loss. Investigation into the case continues.

[Abstract:0771]

Evaluation of Antitusive, Epectorant and Anti-Inflammatory Activities of Argentina Stingless Bees Propolis

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Propolis from stingless bees is well known for its biologic properties; however, few studies have demonstrated these effects. Therefore, this study aimed to investigate the antitusive, epectorant and anti-inflammatory activities of propolis from the stingless bees *Tetragonisca fiebrigi* and *Scaptotrigona jujuyensis*, found in Estación Experimental Agropecuaria Famaillá del INTA, Tucumán, Argentina.

Scaptotrigona jujuyensis (EPSc) and *Tetragonisca fiebrigi* (EPT_r) propolis were extracted with ethanol by maceration. Wistar rats were used and maintained under normal laboratory conditions of humidity, temperature (25 ± 1 °C) and light (12hs light / dark) cycle, and allowed free access to food and water ad libitum. Antitussive activity was investigated on a classical cough model induced by ammonia liquor. During the ammonia exposure the animal was continuously monitored by a trained observer. The antitussive activity was assessed as the percentage of inhibition of the number of coughs with respect to control group. To determine the expectorant activity the red phenol method was used with readings at 546 nm. Anti-inflammatory activity was evaluated using cotton pellet-induced granuloma formation.

Propolis of both species of ANSA presented antitussive and anti-inflammatory activity. At 125 mg/kg body weight (lower dose) the (EPSc) significantly inhibited the cough frequency of the rats and increased the latency time of the same. Chronic anti-inflammatory activity was similar for both extracts and they did not present expectorant activity at all tested doses. These results validate the use of propolis of native bees without sting as important therapeutic alternatives for different pathologies. Our research may be an opportunity that encourages rational exploitation and favors the use of ANSA propolis with greater added value, favoring its incorporation into the Argentine Food Code.

Currently working on isolation and identification of compounds responsible for the pharmacological activities displayed by propolis

[Abstract:0773]

Sensory, Physicochemical and Antioxidant Characteristics of Propolis from the Southern of Buenos Aires, Argentina.

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The Buenos Aires province is located in the "Pampa húmeda" region of Argentina, particularly the south is semiarid with annual average values of temperature and rainfall of 14.8°C and 516 mm respectively, in which natural vegetation coexists with intensive irrigated crops. This geographical zone belongs to the principal zone of beekeeping production, mainly as a producer of high quality honey for export. However, in recent years there has been a growing interest in the diversification of activity, in order to improve profitability. In this sense, propolis is an excellent alternative that can be commercialized both raw and processed, for which it is necessary to establish parameters that define its quality.

OBJECTIVE: to establish the sensory, physicochemical characteristics and antioxidant activity of propolis obtained in the south of Buenos Aires.

MATERIALS-METHODS: 11 samples were analyzed, 6 produced in the locality of Patagones and 5 in Hilario Ascasubi between the years 2014 to 2016. Once extracted from the hive, propolis was kept in freezer at -18 °C until analyzed. Sensory characteristics (appearance, consistency, color, odor, taste) and physicochemical characteristics (wax, resins, mechanical impurities, total phenols (TP), flavonoids (FLA) and UV spectrogram) were determined according to IRAM-INTA 15935-1 standard. The antioxidant activity was evaluated by the method of inhibiting the radical ABTS+. The minimum concentration of propolis (dry weight) to scavenge 50% of radical ABTS+. (SC50) was determined from ethanolic extracts.

RESULTS: the samples showed a heterogeneous appearance, consistency: malleable-slightly soft, predominant colors: brown and light brown with orange-brown tones, odor: soft resinous and flavor: tasteless. The values of the physicochemical parameters (mean ± sd) were: wax: 25.0±6.9 (g.100 g. ppl-1), resins: 64.4±5.4 (g.100 g. ppl-1), mechanical impurities: 6.5±3.8 (g.100 g. ppl-1), TP: 23.3±4.1 (g GAE.100 g. ppl-1), FLA: 7.3±0.8 (g QE.100 g. ppl-1). The UV spectrogram showed a curve with a maximum absorption at 294 nm and the SC50 was 11.3±1.9 (ug ppl.mL-1)

CONCLUSION: Propolis from southern of Buenos Aires showed high quality by its sensorial and physicochemical characteristics, in addition its antioxidant capacity makes possible its use in the design of functional foods.

POLLINATION AND BEE FLORA

[Abstract:0031]

Habitats of Black Sea Region Rhododendrons (Rhododendron L.) and Some Morphological Characteristics of Its Pollen

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This study has been conducted on yellow (Rhododendron luteum S.) and purple (Rhododendron ponticum L.) rhododendrons that grow natural range in middle and East Black Sea Region. This research has been carried out in May and June, bloom period of rhododendron, in the region in 2015. Samples were picked up from the anther where pollen sacs of rhododendron flowers in Samsun, Ordu, Giresun, Trabzon, Rize and Artvin. Reference preparations were prepared from the pollens of rhododendron flowers with Wodehouse method. The study has been completed by measuring single-width, single- height and full height of pollen (μm), examining pollen preparations under a light microscope with camera (40x / 0.65).

In the laboratory measurements were made. The yellow rhodendrons (Rhododendro lateum S) pollen is single-width is $39,87\mu\text{m}$, the single-height is $28,41\pm 0,35\mu\text{m}$, full height of pollen is $52,93\pm 0,43\mu\text{m}$. The pollen single-width in purple rhododendron (Rhododendron ponticum L) is $40,31\pm 0,34\mu\text{m}$, the single- height is $28,92\pm 0,28\mu\text{m}$, full height of pollen is $54,77\pm 0,50\mu\text{m}$. During the morphological measurements of rhododendron pollen have shown that there may be differences in pollen size. This difference in pollen size is depend of fact that samples are taken from different region and the laboratory working time.

[Abstract:0109]

Importance of Blue Weed Echium Vulgare L. Plants among Phacelia Phacelia Tanacetifolia B., Red Clover Trifolium Pratense L. and White Clover Trifolium Repens L. on Preference of Honey Bees

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This study was carried out in the experimental area of Karadeniz Agricultural Research Institute in 2014. In the study, 4 separate plots of 100 m² each, phacelia, blue weed, white clover and red clover plants were planted with the same flowering plan. Six bee colonies were placed beside the experimental plots before flowering. Censuses related to bee visits were made simultaneously for 5 minutes at three different times, at 09:00, 12:00 and 15:00 hours, on an area of 1 m² each day during flowering periods in the plants. During the flowering of the plant, pollen traps were attached daily to the hives and daily pollen counts were made. The pollen ratios of the honeys belonging to the study group plants were determined in samples taken from 4 colonies.

The highest visit average of honey bees in terms of plant preference was 142.11 pcs / m² with blue weed plant. This was followed by phacelia with 72.74 visits while white clover with 3.75 visits and red clover with 1.16 visits were determined as less preferred by honey bees.

During the flowering periods in the plants, the highest visit during the day was measured at 12:00 with 63.44 honey bee visits and it was followed by 54.01 visits / m² at 15 o'clock. At 09 o'clock, honey bees were least visited with 47.38 visits / m². It was determined that the highest number of pollen was phacelia with 6.87 pollen palettes, followed by white clover with 2.40 pollen pallets and blue weed with 2.05 pollen palette from randomly selected 200 pollen palettes. In the study, the pollen of the red clover plant was not encountered. 5.37% of the blue weed pollen, 5.0 % of phacelia pollen, 4.75 % of white clover pollen and 1.75 % of red clover pollen were determined in honey samples, in the first 200 pollen detected by microscope.

The introduction of phacelia and especially blue weed plants to the beekeepers and taking place in the formation of honey forests or bee bushes of this plants will provide significant benefits in the name of bee keeping.

[Abstract:0122]

Diversity of Trees and Shrubs of Arasbaran Forests for Honey Bee Feed, Iran

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Forestry and beekeeping can easily be combined for several reasons. Forest trees and shrubs provide food source and shelter for honey bees and hive. In contrast, they need honey bee, as a pollinator, to help insure pollination. So, there is needed that how is forest potential for beekeeping. This study was carried at Arasbaran forests where is located in northwest of Iran with an area about 163000 hectare. We will focus on the Arasbaran forests flora which are important in feeding honey bee. The beekeeping places was recognized by direct observations. Then, data on species diversity were collected by library studies and direct observations. Approximately 800 species were found in Arasbaran region. Based on Arasbaran flora, there was found invaluable source of nectar production such as six species of raspberry (*Rubus* sp.), two species of plum (*Prunus* sp.), three species of pear (*Pyrus* sp.), Cornelian cherry (*Cornus mas*), three species of dog rose (*Rosa* sp.), *Rhus coriaria*, eight species of *Cirsium* sp., and etc. In addition, different plant species which are used to nectar production were found at this region such as 15 species of *Astragalus* sp., *Thymus* sp., eight species of *Centaurea* sp., six species of *Verbascum* sp., *Polygonum* sp., *Trifolium* sp., and etc. These plants can be used in natural feed of honey bee. Because of rich flora and much altitude changes (between 400 to 2800 m a.s.l), and high humidity of the region, nectar production potential in plants has favorable conditions. Based on results, we conclude that Arasbaran region has high potential for the beekeeping industry.

[Abstract:0126]

Taranjabin Honeydew Honey in Khorasan Province, Iran

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Manna is a sugary liquid secreted by insects, which is removed as the waste from their gut as the result of their feeding on the host plant and remains on different parts of the plant in crystallized and solid form. There are different types of Manna each of which is the result of the activity of one type of insect on its own host plant. Alhagi, *Alhagi camelorum*, belonging to the family of Papilionaceae, is a perennial woody plant that grows wild in many semi-arid areas of Iran. In addition to producing abundant nectar and pollen, this plant species is of high importance in terms of producing honeydew in beekeeping. Honeydew is secreted as a result of the activity of a leaf hopper species on Alhagi plant, which is later gathered by local residents after being crystallized. This type of honeydew is called Taranjabin or Persian Manna in scientific resources. Taranjabin Manna has valuable nutritional and medicinal properties and has special place in traditional medicine. It was found in scientific studies that the insect producing Taranjabin Manna is a leaf hopper species with scientific name of *Poophilus nebulosus* Lethus from Cercopidae family and Homoptera order. This leaf hopper species has 5 nymphs' and 3 generations per year in Khorasan province, and the first crystals of Taranjabin Manna are produced by nymphs of the second generation in early August and continuous until mid-fall. Since Camel's thorn Manna is a sugar-rich liquid, honey bee, *Apis mellifera*, collects it from different parts of the plant including stems and leaves before being crystallized, and transfers it to its hive for processing. In some parts of Iran, including Khorasan province, where optimal situation in terms of the presence of honeydew-producing insects and temperature conditions is provided, the possibility of harvesting honeydew Honey with high dominance exists. Camel's thorn Manna like many types of honeydew Honey including pine honeydew Honey has dark color, and much research is needed to be conducted in the field of pharmaceutical active ingredients of this honeydew Honey.

[Abstract:0181]

Comparison Analysis of Pollination Activities between Honeybee (*Apis Mellifera* L.) and Bumblebee (*Bombus Terrestris* L.) During the Flowering Period of Asian Pear (*Pyrus pyrifolia* N.) Under Variable Weather Conditions

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We investigated pollination and foraging activities of honeybee (*Apis mellifera* L.) and bumblebee (*Bombus terrestris* L.) during flowering season of the asian pear (*Pyrus pyrifolia* N.) under different weather conditions. There was no significant statistical difference about the pollination activities of two species. However, the pollination activities of bumblebee were more active than those of honeybee under low temperature and rainfall period. The activities of honeybee and bumblebee were more influenced by temperature than other factors (i.e. illumination and wind velocity). Honeybee was more sensitive to temperature and illumination than bumblebee. At low temperatures (<20) on cloudy days (<30,000 lux) with a certain wind velocity (>4.0 m/s), the pollination activity of the honeybee was lower twice than that of bumblebee. Therefore, the results from this study suggest that there was different foraging activity properties between honeybee and bumblebee, and bumblebee was more effective for pear pollination than honeybee under low temperature and bad weather during pear blossoming season.

[Abstract:0278]

Guidelines for the Establishment of Honey Forests

Kodjo Logou Agossou

Organisation pour la promotion des arts apicole et sylvicole (opaas)

The apiculture forest, it is the green space where the bee finds in addition to its raw food, sources of the honey and royal jelly, well many other compounds certainly for its immunity and its self-medication.

To be effective the forest must abound in these materials both in quantity and in quality. In effect, nectar, pollen, honeydew, propolis... would bring in proportions and various quality, sugars, amino acids, fatty acids, oligo and macronutrients, vitamins, hormones and well of other compounds certainly antibiotics or against worms.

The type of forest to aim in beekeeping is the one likely to provide these nutrients and other substances of growth or medicine ones the more regular basis as possible during the course of a year and in a perfect heterogeneity. By doing this the Bee will enjoy a good health for better express their labours capabilities. Therefore we advise for this type of forest all flowering species locally encountered with a representativeness relatively high of the best. The species or varieties of interest to others heavens will be tested; those that are at best express in the host ecology will gradually be promoted. The management of such forests must contribute to a maximum expression of flowering potentialities of species.

We must also have in mind the existence of relations between plants; beneficial ones must be search and the negative ones avoided to the maximum. Generally, at least in my region, the trees, shrubs, and herbs have flowering regimes which take turns: Herbaceous including grasses bloom predominantly in the rainy season while the first ones after. The density of settlement and the positioning of large species must therefore allow a wise development of the plants of the lower floor.

One will ensure, in these forests to the creation of permanent and accessible water sources as well as to the introduction of animal species compatible.

Create a beekeeping forest it is seek at any time to solve the equation: What kind of biological diversity around the apiary for a sustainable beekeeping slightly inclined to the transhumance where feeding and veterinary care are rare?

[Abstract:0281]

Managed Honeybee Pollination: Present and Future Need to Enhance Productivity and Quality of Horticultural Crops in Nepal

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Pollination has been defined as an essential stage in the development of fruits, nuts, seeds and vegetables of many horticultural crops. Many insects visit flowers of horticultural crops and play a vital role in their pollination. However, honeybees are the best and assured pollinators among all insects. The multidisciplinary role of honeybees in pollinating many crops and producing bee hive products were long been recognized. Horticulture has been identified the major agricultural field in the world mostly dependent upon honeybee pollination. Honeybee pollination enhances the yield and quality of fruits, seeds, nuts and vegetables many folds. However, the population of native honeybee species is declining sharply causing inadequate pollination in crops of Nepal. The increasing area under horticultural crops and declining population of native honeybee species and other natural pollinators have demanded for the managed honeybee pollination. The indiscriminate use of pesticides, loss of habitats and forage, changing cropping patterns, urbanization, climate change, unscientific honey hunting and increasing pressure of pests and predators over honeybees were the responsible factors for the decline in honeybee population in Nepal. Lack of desired level of pollinators was one of the major factors for abortion of flowers, immature seeds and fruits of many horticultural crops. Managed honeybee pollination is under practice since long time in many developed and developing countries to provide desired level of pollinators in horticultural crops. Value of honeybee pollination is underestimated in Nepal.

[Abstract:0312]

Nectar Secretion and Honeybee Visiting Characteristics of Hawthorn (*Crataegus pinnatifida*) Selected from Korea

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In this study, we analyzed the flower morphological characteristics, honey bee visiting and nectar secretion of hawthorn (*Crataegus pinnatifida*) to investigate the potential for using honey plants. Hawthorn has been used as herbal medicine in Korea for the treatment of various cardiovascular disease, arteriosclerosis and hypertension. The fruits of *C. pinnatifida* (Rosaceae) have been used traditionally as a peptic agent in Oriental medicine and recently as a local soft drink material. Hawthorn of five clones (selected from different area of Korea), and four Chinese hawthorn cultivars grown in the National Institute of Forest Science (Suwon) were utilized. The aim of this study was to investigate the nectar secretion and honey production potential of 5 clones and 4 cultivars of hawthorn. We measured the quantity of nectar sugar per flower four times a day using capillary tubes. The distribution of the flowering period for each clones was determined through continuous monitoring and the average amount of honey that can be obtained from a single plant was estimated from the average numbers of flowers per plant. We also examine the taxonomic relationships among species by flower morphological characters, and carried out principal component analysis and cluster analysis. From the results of this study, we can conclude that the average amount of nectar secretion is $13.80 \pm 2.7 \mu\text{L}$ per one flower, the average honeybee visiting times is 5.19 ± 2.6 per one hour to one flower cluster and the flowering period distributions of the each clone varied from one clones to another (from 15 May to 27 May). It is also believed that some hawthorn clones are considered as possible major honey tree because of the high amount of nectar secretion ($15.18 \pm 2.2 \mu\text{L}/\text{flower}$).

[Abstract:0336]

A Strategy for Protection of the Main Pollinators in the Nature - the Bees and for Sustainable Development of Beekeeping

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Bee populations are decreasing at alarming rates worldwide.

Bees pollinate over 80% of the blossoming plants all over the world and thus, help produce 1/3 of the food. Thanks to the pollination of plants performed by bees and wild pollinators, there is support not only for food production but also for the biodiversity and the ecological balance. In order to save bees and the other pollinators from extinction, от the CBB предлагаме Общото събрание (General Assembly) да вземе решение за разработване под егидата на Apimondia на "Strategy for Protection of the Main Pollinators in the Nature – the Bees and for Sustainable Development of Beekeeping" със следните основни цели:

1. The first and most important GOAL: protection of the main pollinators in the nature – the bees, and sustainable development of beekeeping. Here are some of the sub goals:

1.1. A change of the bees paradigm. It is redefined in the following way: "The natural and main role of bees in the nature is pollination of entomophilous plants, and not production of honey and bee products."

1.2. Development and implementation of a large scale information campaign (PR campaign) in order to popularize the change of the beekeeping paradigm until it is accepted by the whole beekeepers' community, the farmers, the general public and the governing bodies which take decisions at national, регионално и международно levels.

1.3. When the governing bodies, the beekeepers and the farmers take any action, connected with protection of the bees and the wild pollinators, the leading principal should be the idea for the natural role of bees and wild pollinators as pollinators of plants which provide 1/3 of our food.

1.4. In order to stimulate beekeepers to look after bees – the main pollinators in the nature:

a) A fair payment should be introduced for the ecosystem service of "Pollination" performed by the bees.

b) Beekeepers should be exempt from taxes.

2. Protection of bees by prophylaxis and fight against diseases.

3. Taking strict and efficient measures to protect the bees from pesticide poisoning.

Key words: bees, pollination, ecosystem service, paradigm.

[Abstract:0357]

Lebanon's First Beekeepers Calendar

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Migratory beekeeping is one of the practices that add to the productivity of bee colonies in terms of both the quantities and qualities of the honey produced, especially in countries rich in their green cover like Lebanon, needless to mention its pollination benefits. The beekeepers calendar serves the purpose of allocating beehives with respect to the existing spread of useful bee plants, for both floral and honeydew honey. A first successful attempt was made to construct Lebanon's Beekeepers Calendar, with ongoing revisions, and proved to help the Lebanese beekeepers make optimal use of migratory beekeeping through utilizing the existing natural resources for beekeeping, both major and minor. The constructed calendar, resulting from over three years of data collection, analysis and mapping, combines three factors for that PURPOSE: the spread, density and the flowering times of the honey plants in Lebanon throughout the seasons, colony dynamics in terms of brood to adult bee ratios and the required practices by the beekeeper. The calendar is also annexed by a geographical and seasonal grid of Lebanon showing the time versus space mapping of the bees' natural resources, and it is considered a pioneering step in furnishing the local beekeepers with the needed tool for making their apicultural practices more efficient and productive.

[Abstract:0370]

Evaluation of the use of *Apis mellifera* as a biological vector in the pollination of almonds in a commercial company (AGROLAND)

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This study arose from the need of the company Agroland SA to develop and optimize technical protocols for the use of hives in the pollination of almond trees. The general objective was to increase the competitiveness of almond production by optimizing pollination by factors as a critical factor of productivity and quality. Its specific objectives underwent the actual pollinating activity *Apis mellifera* in almond trees, establishing the technical and quality parameters for an optimal pollination service and the validation of the proposed protocols. According to the results obtained in 2015, it was observed that the phase between pollination and fertilization (progamic phase) was affected by several extrinsic and intrinsic factors which conditioned, among others, a curly mayor and better yield. During the fertilization phase the ambient temperatures between 14 and 16 °C were scarce. Most of the present almond tree crops are incompatible with automobiles Ferragnes, Ferraduel, Marcona, which means that in the actual design of plantations it is necessary to distribute more pollinators of different cultivars. There were significant differences in the number of bees per hectare. The yields of the fruits were increased with the use of bees in a significant way.

[Abstract:0372]

Effects of Honeybee (*Apis mellifera* L.) Pollination on Watermelon (*Citrullus lanatus*) Production

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There are a lot of pollinating insects are involved in pollinating plants that require cross pollination. Pesticides used in agricultural areas have major threats to the living conditions of wildlife. This situation is caused to insufficient pollination of the crops, and significant yield and quality loss in most species. On the other hand, honey bees have an important role for plant pollination throughout the year.

In this study, the pollination effect of honey bees on watermelon plant was investigated. Two different applications, bee visited and bee restricted, have been tested on four different watermelon types. The research was organized by three replicated randomized block designs. Yield per da, the number of female flowers, total number of fruits, fruit attitude, number of pollen, number of seeds in the field, and trapezoidal fruits of total 24 watermelons were taken.

The watermelon yield average was 6445±1464.12 (kg/da) in open watermelon areas and 5936±1629.92 (kg/da) in bee restricted application. The number of female flowers was 8.83±1.64 (unit/plant) in bee visited application, 8.67±1.97 (unit/plant) in bee restricted application. Total number of fruits was found to be 7.25±1.36 (pcs/plant) in bee visited and 5.83±1.27 (pcs/plant) in bee restricted application. In the applications of bee visited and bee restricted, fruit orientation was 82.20±6.26% and 67.80±7.70% respectively. The number of pollen ranged from 54000±24701.86 (number/flower) to 53666.67±26023.88 (number/flower) according to the applications whereas the number of seeds was 206.67±123.45 (pieces/fruit) and 185.50±114.83 (pieces/fruit) in both applications, respectively. For trapezoidal fruit, these values determined as 4.80±6.62% and 27.48±9.65%.

There were no differences between the yield of watermelon, number of female flowers, total number of fruit for bee visited and bee restricted applications and watermelon types ($P > 0.05$). It was determined that the number of pollen was different according to the watermelon types, the fruit orientation and the trapezoidal fruit application ($P < 0.01$). On the other hand, the number of live seeds differed both in terms of application and types ($P < 0.01$).

[Abstract:0385]

Pollinator Diversity and Conservation in Asia: Asian Pollination Initiative

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In view of the reported pollinator decline in some parts of the world, Asia should work together to conserve its diverse native pollinator species. The strategy is using the ecosystem approach which takes into account the plant-pollinator interaction, relative abundance and distribution pattern of wild species as affected by climate change and anthropocentric activities. We aim to derive empirical data on the diversity of the pollinators to have a basis in assessing whether there is decline. However, we need to develop a harmonized method to survey the state of pollinators in the region (country-by-country basis), their diversity and relative abundance and health. Moreover, the initiative would seek to identify the most vulnerable scenarios, determine causes and provide mitigation methods in order to protect the pollinators. This paper presents the status of pollination biology in select Asian countries. The proposed method for pollinator assessment and a case study in the Philippines will be discussed.

[Abstract:0388]

Country Information Paper on Crop Pollination and Agricultural Production in Nigeria

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An identification visit was carried out in 12 pilot states (randomly selected from each of the 6 geo-political zones) to identify individual/commercial farms with fruiting trees Orchards & plantations and existing Associations/cooperative groups in Nigeria's apiculture industry. The project employed quantitative research methodology. Primary data was collected using direct (one-on-one) interview with the farmers. Results of the visit shows that a total of 882 individual farms (farmers) and 946 commercial farms (Farms) were identified; and 27 existing Associations/Co-operatives were also identified. In conclusion, the project revealed that: there is low awareness on the use of bees for pollination services in Nigeria; farmers lack the skill and technical know-how on the strategies for management of bees for pollination services and lack of inputs for pollination services. Recommendation was on creating awareness on the benefits of bee crop pollination in agricultural production, need for capacity building for farmers on pollination services and provision of pollination services inputs to farmers by the Federal Ministry of Agriculture and Rural Development.

[Abstract:0400]

The First Application of NMR Spectroscopy in Differentiation of Turkish Honeys

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In classification of honey, GC, IR, Raman, and NMR Spectroscopies are common techniques. Among these, NMR spectroscopy is one of the most important tools. This study is the first example of NMR based honey classification of Turkish honeys.

In the first step of the study, chemical composition of 52 honey samples from 5 different districts (Edirne, Tekirdağ, Anzer, Bartın, Ardahan) were studied using Bruker 400 MHz NMR spectrometer. In the second step, honey samples were classified according to their geographical origin using multivariate statistical methods.

When examined the spectrum of honey samples, it was seen that glucose and fructose peaks between δ 3.20-4.20 ppm, were dominant peaks of the whole spectrum. Besides these peaks, the peaks of disaccharides, carboxylic acids and amino acids were also common for all honey samples.

Interpreting ¹H-NMR spectra, it was easily seen the differences between the honey samples, but the origin of these differences were undetermined because of the high number and complexity of the peaks. Therefore, in this study, statistical methods were used for clarifying these differences. According to MANOVA, at 95% confidence level, the peaks between δ 3.33-5.40 ppm region were found to be significant in determination of the geographical origin of honey samples. Using these significant variables, when LDA was applied, four statistically significant discriminant functions were produced and all honey samples were correctly classified according to the five different district, by 100%. In this study, classification of Turkish honey was successfully conducted first time.

[Abstract:0408]

Characterization of Honey and Bee Pollen of the Southern Slope of the High Moroccan Atlas

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Since the beginning of the 90s, the succession of dry years and the anti-locust treatments have affected beekeeping profoundly in the southern slope of the high Moroccan Atlas, which creates a major challenges for the sustainability of The local breed, *Apis mellifera sahariensis*. Over the last ten years, the beekeeping sector on the slope as for the whole of Morocco has undergone major transformations, and an increase of the productivity by replacing the traditional hives by productive modern hives. However, neither the beekeeping nor the honey and other products of the hive, as they appear on the market, reflect this transformation, Other products such as bee pollen and jelly are not valued.

It is in this context, we have achieved some floristic inventories at the foraging sites of eleven apiaries localized in different sites of southern slope of the high Atlas, the honey and pollen pellets samples collected are carried out to be analysed. The aim of this study is to identify the variance in foraging honey bees behavior, and to characterize the variety of monofloral and polyfloral honey types of the Southern slope of high Atlas. The preliminary results of the botany survey identify up to 170 wild and cultivated species. These plants are mostly melliferous and polliniferous, but some of them are medicinal. Consequently there are many different types of honey with a multitude of tastes, for example; *Thymus saturejoides ssp*, *Vitex agnus-castus* and *Zizyphus lotus*. Palynological analyzes show the preferences of bees for collecting certain pollen types over others, and the relationship between the color of a pellets and its pollen composition. This is the case of yellow pellets which are dominated by *Plantago psyllium* and orange pellets by *Asphodelus tenuifolius*. Furthermore, a pollen pellets contain one to four species. This diversity may be related to the fact that pollen produced by floristic species has different protein content, and honey bees seek out essential nutrients ressources.

How the honey bees diversify their foraging resources to compensate for their nutritional requirements ? Only the analysis of the biochemical composition of pollen pellets will answer the question.

[Abstract:0427]

"The Role of Insect Pollinators in Thailand's Agriculture"

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"Thailand has been promoted conservation and beekeeping of the various natural insect pollinators for example, Indian honey bee *Apis cerana*, Dwarf honey bee *Apis florea*, Giant honey bee *Apis dorsata* and Stingless bee. Especially, European honey bee (*Apis mellifera* L.) is the prominent insect pollinators for pollen efficiency enhancement of agricultural productivity in Thailand's agricultural sector. This study was applied *A. mellifera* L. to help pollinate for 12 Thai economic crops such as pandan, sunflower, tangerine, longan, school rambutan, lychee, melon, sweet tamarind, sesame, Durian, Mango and Cashew. The result reveal that the productivity of these crops were increased for 93.78%, 86.87%, 83.00%, 78.78%, 75.09%, 42.05%, 39.00%, 28.11%, 26.70%, 20.00%, 14.00% and 11.00 %, respectively. In 2015, the beekeeping (*A. mellifera* L.) was upgraded to the industrial level. This honey production was high level at 34th in the world and the 2nd in ASEAN. Now a day, there are 1,200 beekeepers and 303,500 hives in Thailand. The honey is collected from lychee, sesame, coffee, sunflower and *Chromolaena odorata* (L.) for 9,109 tons. Almost all honey are exported to The United States, China, Taiwan, Malaysia and Indonesia about 8,267.38 tons as equal value at 638.48 million baht."

[Abstract:0443]

Honey Bee Floral Resources in Northern Region of Algeria

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The study focuses on knowledge of the honey flora of the Mitidja region through 11 beekeeping stations. Field observations of cultivated and spontaneous plants made it possible to establish the floral spectrum of the region. 103 species have been identified, 32 of which belong to 16 botanical families, are forested by bees *Apis mellifera intermissa*. The floral spectrum shows two distinct periods: One is distinguished by a weak presence of flowering species, it runs from July to February, the other extends from March to June; it is characterized by an important floral diversity. The results show that when floral availability is low, bees visit almost all the flowers present; On the other hand, in the case of a high availability of flowers, the bees select flowers, they forage only about half of them, and they would look for the quality and quantity of nectar and pollen they need. The statistical treatment of the results confirms the observations made on the ground.

[Abstract:0463]

A Survey of Plant Species Diversity in and Around Selected Apiaries in Oyo State, Nigeria

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Despite the factual information on forest bees trees for apiculture practices, there is a paucity of data on forage species composition within beekeeper. This project aimed to generate information on woody species diversity in and around selected apiaries in Oyo State, Nigeria. The study was stratified into three ecological zones Low Land Rain (LR), Derived Savanna (DS) and Guinea Savanna (GS). Data collected were analyses using diversity index. The maximum species richness (DMg 10.58), Simpson and Shannon-Winner diversity index (D' 0.98 and H' 3.76), showed that LR had the most diverse plants, followed by Derived Savanna DS (DMg 6.76, D' 0.98 and H' 3.76), and GS (DMg 5.75, D' 0.93 and H' 2.96) recorded the lowest. In contract GS species evenness (0.09) had the highest, followed by DS (0.08) and LR gave the lowest. The Jaccard similarity coefficient showed that the highest similarity was observed in DS and GS, while the most dissimilarity was noticed between LR and GS. The highest Important Value Index (IVI) species were found in the GS includes (*Adansonia digitata* 47.66), and (*Parkia biglobosa* 45.80), followed by DS with (*Parkia biglobosa* 41.96) and (*Vitellaria paradoxa* 31.68). Also, (*Anacardium occidentale* 26.01), (*Mangifera indica* 24.46), (*Azadirachta indica* 24.45), and (*Anogeissus leiocarpus* 21.64) were found haven higher IVI before (*Pinus caribaea* 21.51), which had the highest IVI in LR. Some of threatened, agroforestry and Non Timber Forest Product (NTFP) plants species such as (*Milicia excelsa*, *Triplochiton scleroxylon*, *Khaya grandifoliola*, *Irvingia gabonensis*, *Chrysophyllum albidum*, *Azadirachta indica*, *Vitex doniana*, *Ceiba pentandra*, *Spondias mombin* and *Treculia Africana*) were found. The results revealed that apiculture with good knowledge of forest forage and NTFP woody plants biodiversity in and around studied apiaries will not only promotes culture of self-planting but will also bridge the gap between economic and environmental need of the society. Hence, there is need to initiate a concept called "Apiforestry" that will integrate apiculture and forestry. This will require a research based study as well as economic implication for further study.

[Abstract:0472]

Status of Honey Tree Research in Republic of Korea

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The industry of beekeeping has the immense potential because of their role which provides pollinator honey as well as its vast variety of beekeeping products. Compared to 2014, the honey production and the total amount of beekeeping products in Korea was decreased approximately 47% and 17 billion won in 2016, respectively. It was mainly caused by two reasons: acacia tree (*Robinia pseudoacacia* L.) which is responsible for over 70% of honey production in Korea has fallen into decay and the global warming has made the flowering period of tree shorten. Because the way to collect honey in Korea has primarily depended on a mobile beekeeping, the research to extend the flowering period is needed. Therefore, in this research, through investigation of the floral nectar characteristics and flowering periods, we have developing new honey trees to cope with the climate change and to facilitate sustainable honey production. By enhancing the diversity of honey tree in domestic forests, we wanted to improve the apicultural production system. As a result, we represented the successive beekeeping model from April to September by investigating various flowering periods of 20 species which flower at different times. Furthermore, we have also tried to find individuals which flower early or later compared to the mean of flowering time within the same species to help to extend the period of honey harvest. Based on the analysis of characteristics of nectar secretion, it was found that male flower of *Evodia daniellii* Hemsl. (2.73±0.73ul/flower) and *Tillia mandshurica* Rupr. & Maxim. (2.2±1.5ul/flower), etc., showed more nectar volume than acacia tree (1.7±0.5ul/flower) did. Especially, *Hovenia dulcis* var. *koreana* Nakai known as a medicinal tree had a high nectar volume (4.15±1.11ul/flower). *Hovenia* honey also showed even higher antioxidant effect and tyrosinase inhibition activity than Manuka honey did. Through this study, we hope to provide a basic data and vitalize the domestic beekeeping market.

[Abstract:0484]

The Most Famous Varieties of Honey in Morocco

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Because of its important floristic diversity, Morocco is endowed with an important beekeeping potential and unique giving it a great originality. Beekeeping in Morocco is mainly a honey production activity with an average annual production of about 3000 tons. But the production is characterized by nine (18) typical mono-floral varieties honeys with unique and particular biological, palynological and physico-chemical properties. The most famous varieties of honey in Morocco are thyme (*Thymus* spp.), euphorbia (*Euphorbia resinifera*, *Euphorbia officinarum* subsp. *echinus* et *Euphorbia regis-jubae*), jujube (*Ziziphus lotus*), thistles (*Eryngium ilicifolium*), arbutus (*Arbutus unedo*), Oregano (*Origanum vulgare*), argan (*Argania spinosa* L.), thuya (*Tetraclinis articulata*), acacia (*Acacia raddiana*), buplèvre épineux (*Bupleurum spinosum*), Fennel (*Foeniculum vulgare*), Carob (*Ceratonia siliqua* L.), Rosemary (*Rosmarinus officinalis*), Lavender (*Lavandula*), Alfalfa (*Medicago sativa*), Bersim (*Trifolium alexandrinum*), Eucalyptus (*E. Camaldulensis* et *E. Gomphocephala*), Citrus and large Polyfloral honey. 4 honey are labeled IGP: *Euphorbia resinifera* "Tadla-Azilal région", arbutus "Moulay Abdessalam Mountain" *Euphorbia officinarum* subsp "Sahara" and thyme "Sous Massa".

In this study, The famous varieties of honey and the main honey production areas will be reviewed and discussed.

[Abstract:0502]

World Bee Day, a Chance for a Better Life of Bees

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Slovenian Beekeepers' Association

Bees and other pollinators play an important role in ensuring food security, which is one of the objectives of sustainable development. At the same time agriculture on a global scale has become in the last 50 years increasingly dependent on pollination. Bees and other pollinators are responsible for nearly one in every three bites of food we eat. Therefore, The Republic of Slovenia, on the initiative of the Slovenian Beekeepers' Association, hence proposed to the United Nations (UN) to declare May 20 a World Bee Day. The World Bee Day Initiative has been launched in 2014 and was supported by the Republic of Slovenia and in 2015 backed by Apimondia. The procedure is still ongoing; it is expected to be completed at the end of year 2017.

The observance of the World Bee Day by the international community would contribute significantly to raising awareness of the global public on the importance of bees and other pollinators and the role of the beekeeping for the agricultural sector. Especially with regard to the fact that in the last period bees are increasingly threatened.

Pollinators are economically, socially and environmentally important. In addition to food, pollination contributes to growing of crops that provide biofuels, fibres, medicines, forage, and construction materials. Bees are also of great importance for maintaining the ecological balance and ensuring the conservation of biodiversity in nature. Protection and conservation of biodiversity and associated ecosystem services prevents biodiversity loss and the degradation of ecosystem services. Bees and other pollinators are also important bio indicators of the state of the environment.

Through the observance of the World Bee Day we will be able to remind every year the global public and the policy-makers of the importance of bees and other pollinators. Our livelihoods and well-being depend on pollination. Throughout international cooperation we can in fact achieve better results in the protection and care for the bees and the development of beekeeping.

[Abstract:0523]

Two New Monofloral Honey Types from Turkey

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Euphorbiace sp. (Euphorbiaceae family) and *Verbascum* sp. (Scrophulariaceae family) species have cosmopolite distribution in Turkey. *Verbascum* is the second most common genus in Turkey with 232 species, 185 of them are endemic in Turkey. Also *Euphorbia* genus has about 95 species, 15 of them are endemic in Turkey. The nectar efficiency of *Euphorbia* and *Verbascum* species are secondary and the pollen efficiency of them are generally trace amounts. These two genus are frequently visited by honey bees, depending on the flora of the region where they are located. So nectars and pollens are carried into the hive. Although their pollen grains can be found in multifloral honeys, in Turkey verbascum honey and euphorbia honeys are not produced as monofloral honey. In this study it has been determined monofloral euphorbia and verbascum honey types via mellissopalynological analysis from Diyarbakır and Bingöl provinces the first time in Turkey. Also total phenolic and total flavanoid capacities were made via UV-Spectrophotometer (Genesys 10S UV-VIS Spectrophotometer). Chemical composition (Fructose&Glucose and HMF content) was determined by HPLC (Agilent 1200 Series) and GC-MS (Agilent Series).

According to mellissopalynological analysis, these honey types had *Euphorbia* sp. (7,5% important minor) and *Verbascum* sp. (97% dominant) pollen grains. As a result of antioxidant capacity analysis, total phenolic content was determined as 146.49±0.11 mgGAE/kg for verbascum honey and 136.92±0.06 mgGAE/kg for euphorbia honey. Total flavanoid content was determined as 30,54±0,05 mgQE/kg for verbascum honey and 40,68±0,03 mgQE/kg for euphorbia honey. According to sugar analysis with HPLC, F/G rate was 1,84±0,17 for verbascum honey and 1,33±0,02 for euphorbia honey. GC-MS chemical substance analyses of honeys were found aldehydes, aromatic acids, aromatic alcohols, flavanones, esters, aromatic amines and other chemical substances

[Abstract:0525]

Stingless Bees as Biological Models for Public Engagement and Education

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Bees play a crucial role as pollinators of a wide variety of wild plants and commercial crops in the tropics, helping maintain plant biodiversity in natural environments and assuring crop yields. But how may researchers and beekeepers effectively communicate that bees have great ecological and economic importance to a broader audience? Stingless bees are an excellent biological model to achieve this goal, because they: i) are the most diverse group of all eusocial bees; ii) are characterized by having long-lived colonies; iii) are widely distributed across tropical regions of the world; iv) lack a functional sting, making management easier than honeybees; v) can be kept in wooden free-foraging nest boxes placed in stingless bee apiaries – known as meliponaries. Between 2014 and 2015, five meliponaries housing native stingless bee species were implemented in São Paulo State, Brazil, in order to educate and promote public interest in bees. These meliponaries are located at a Secondary Agricultural School (Rio Claro), University campus devoted to agriculture and forestry (Piracicaba), Scientific Institute (São Paulo), Zoo (Ribeirão Preto) and Beekeeping Association (Capão Bonito). Until now, the success of the project has been measured by media coverage, number of people (nearly 800 people) who attended courses about stingless bee biology and management, and number of visitors (nearly 840,000 people), encompassing primary and secondary students, undergraduate and graduate students, teachers, small farmers and general public. Overall, stingless bees are a great tool to promote education and public awareness of the ecological and economic value of tropical pollinators.

[Abstract:0546]

Botanical Origin of Pollen Loads from Slovakian Apiaries

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In nine dates from April to September 2015, pollen loads were sampled from hives at five apiaries located in different regions and types of landscape around Slovakia. Pollen samples collected were subsequently subjected to microscopic pollen analysis to determine its botanical origin. We have found that most of the pollen presented in the hives environment comes from a relatively limited number of plant species and families. In early spring pollen originated mainly from willows, at the end of spring pollen originated dominantly from rape and where not available, from plant families of Aceraceae, Asteraceae and Rosaceae. In the summer, legumes and sunflower pollen loads begin to dominate and at the end of the season Asteraceae plants begin to dominate again, in mountain areas fireweed. Seasonal variability of floral resources in individual localities is analysed and impacts of sufficient supply of pollen on the development of bee colonies is discussed. Supported by grant VEGA 1/0511/15.

[Abstract:0562]

Half-Lives of Antibiotics

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Beekeeping is a common form of agricultural production in our country. Products such as honey, pollen, royal jelly and propolis which are obtained as a result of these production activities, are demanded both domestic market and outside market. Honey is the first among the bee products in terms of production amount. According to data of Turkish Statistical Institute in 2015; 107.665 tons of honey from 7.709.636 hives were produced in our country. Although Turkey have high potential honey production, it can't transform this potential to export.

Honey has been produced in the world for twenty million years and according to data of Food Agriculture Organization (FAO) in 2014, our country is came in second after China. It is thought that; in the case of solving some problems cause to our country's deserved position in world market, opportunities of Turkish honeys'sales to abroad will be get better.

One of the problems is residue of antibiotic in honey. The aim of the general use of antibiotic substances in beekeeping, is the treatment of infections such as foul brood due to bacteria. However these medicines are forbidden in our country because of cause to residue problem in bee products by way of Turkish Food Codex Honey Communique, which are referred to Classification of Pharmacological Active Ingredients Found in Animal Food and the Maximum Residue Limits Regulation, is regulated by Republic of Turkey Ministry of Food, Agriculture and Livestock.

Antibiotic residues show a relatively long half-life and they may have direct toxic effects on consumers, e.g., allergic reactions in hypersensitive individuals and disorder of the haemopoietic system, or cause problems indirectly through induction of resistant strains of bacteria. It is reported that; tetracyclines, sulfonamides, streptomycins are frequently determined in researchs in spite of the fact that usage of antibiotics for bees are forbidden. Every substances have different efficacy levels, maximum residual limit values and half-lives as well as molecular weights which factors can be determined by experimental researchs.

In this study, researchs about determination of various antibiotic substances' half-lives will be mentioned.

[Abstract:0575]

If the world is our coal mine then the bees are our canaries

Sandra Evans

arnia Ltd

Electronic monitoring of honey bees, originally conceived as a tool for beekeepers and bee scientists, is progressively finding its application in wider environmental studies. In this presentation we will illustrate two such projects whose impacts influence policies and strategies for safeguarding our environment.

Non native species are a constant and real threat to ecosystems. One such species with negative social and economic impact is Asian hornet *Vespa velutina*, honey bee predator that was accidentally introduced in Europe in 2004. Since then its range has steadily spread through Europe and last summer a colony was found and destroyed in UK. Key to successful containment and destruction of the infestation lies in early detection of the hornet's activity and subsequent location of its nest. Working with Italian beekeepers, where the hornet is already established, we have identified a unique acoustic signature to identify the presence of this predator. Using strategically placed monitoring equipment, we are monitoring its arrival and potential spread across the UK.

By facilitating sexual reproduction of many plants honey bees play a crucial role in protecting biodiversity. Monitoring honey bee colonies and their dynamics in and around the city, in a variety of urban, semiurban and semirural landscapes, the value of green spaces to biodiversity is assessed. In collaboration with Newcastle University and local beekeeping organisation 20 beehives in 10 different locations are being monitored. Data collected is not only used to inform the city authorities on how to maximise the efforts aimed at biodiversity protection but is also available live to public via a portal, contributing to a larger "Urban Observatory" project. By engaging citizens the project aims to inform, educate and encourage responsibility for the local environment.

[Abstract:0589]

Foraging Behavior of Honey Bees on Alfalfa (*Medicago sativa* L.) in Saudi Arabia

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The foraging behavior of Carniolan honey bees (*Apis mellifera carnica* Pollmann) and dwarf honey bees (*A. florea* F.) on alfalfa flowers was conducted in May of 2013 and 2014. In comparison to the Carniolan bees, the dwarf bees were more active on alfalfa flowers. Two peaks of foraging activity for the two species were recorded; the first one was at 0800-0900 hrs, while the second and the highest peak was at 1700-1800 hrs. Carniolan bees were more active in gathering pollen at 0800-0900 hrs. It is concluded that Carniolan and dwarf honey bees were found to be the most abundant pollinators on alfalfa flowers in Saudi Arabia. The present study recommends that, to protect insect pollinators, it is advisable to apply pesticides, if needed, during the flowering period of alfalfa when the bees are not active in the fields, so as to maintain the pollinator population and protect the alfalfa crop.

[Abstract:0611]

Diversity of Wild Bees in Forest and Horticultural - Ecosystem in Ziarat Valley of Balochistan-Pakistan

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District Ziarat of Balochistan, with extremely cold climate in winter, and almost 8000 ft above the sea level is the home of evergreen *Juniper excels* forest and biodiversity. Genetic and ecological biodiversity play key role in healthy crop production and sustainable forest management. Wild bee was collected/sampled from forest (3-locations) and horticulture (9- locations) ecosystem. Apple, cherry and apricot were the main fruit trees in agro-ecosystem. While, in forest ecosystem *Juniper excelsa*, *Peroviskia abrotanoides*, *Hertia intermedia*, *Malva neglecta* and *Sophora mollis* were dominant herbaceous forest ground flora in sampled area. In both ecosystems, wild bees were sampled during fruit trees bloom in 2016 and 2017. Regardless of locations, significantly higher biodiversity index (Shannon) of wild bee were recorded in forest (1.722) compared to fruit orchards (1.300). In all fruit orchards and forest, wild bee biodiversity and population was inversely and directly proportional with number of chemical sprays and flora, respectively.

[Abstract:0663]

Inventory and Identification of Some Melliferous Plants in Morocco

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Due to its specific geographical location and ecological conditions, Morocco represents a very important phylogenetic resource.

Its vascular flora is estimated at more than 4500 species and subspecies, distributed in 130 families and 920 genera.

In this study some Moroccan melliferous plants have been identified. Three methods were used: ecological distribution, ethnological surveys and ethnological observations.

Field surveys provide a tentative list of more than 22 species composed of crops (vegetable and fodder crops, fruit and forestry trees, etc.) and other annual or perennial spontaneous species grouped in 20 families and are: *Thymus satureioides* (Lamiaceae), *Origanum vulgare* (Lamiaceae), *Rosmarinus officinalis* (Lamiaceae), *Lavandula dentata* (Lamiaceae), *Lavandula multifida* (Lamiaceae), *Euphorbia resinifera* (Euphorbiaceae), *Euphorbia officinarum* subsp. *Echinus* (Euphorbiaceae), *Euphorbia regis-juba* (Euphorbiaceae), *Eryngium ilicifolium* (Asteraceae), *Ziziphus lotus* (Rhamnaceae), *Arbutus unedo* (Ericaceae), *Argania spinosa*. L (Sapotaceae), *Bupleurum spinosum* (Apiaceae), *Foeniculum vulgare* L., 1753 (Apiaceae), *Acacia raddiana* (Fabaceae), *Ceratonia siliqua*. L

(Fabaceae), *Medicago sativa* (Fabaceae), *Trifolium alexandrinum* (Fabaceae), *Eucalyptus camaldulensis* (Myrtaceae), *Eucalyptus Gomphocephala* (Myrtaceae), *Citrus* sp (Rutaceae), *Tetraclinis articulata* (Cupressaceae),...

Hence the value of continuing the research due to the high number of other taxa identified at an insufficient precision level.

[Abstract:0716]

Melliferous and Carrying Capacity of *Oenothera biennis*

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Oenothera biennis L. is a biennial or perennial plant of the Cyprinidae family (Onagraceae). Flowers are yellow and large, collected by an elongated brush, bloom simultaneously from 1 to 5-6. Nectar drops are visible with the naked eye. *Oenothera biennis* blooms in the second half of June, and blooms until the end of August. Flowers open in the evening, when the sun sets, and close at 9-10 am. In a case of high clouds they remain open daylong. In order to attract nocturnal insects flowers emit waves of tender aroma, similar to the smell of the tea-rose. *Oenothera biennis* grows mainly in places of human economic activity, on poor sandy, sandy-humus and calcareous lands; along motor roads, on abandoned fields and wastelands.

Bees begin to collect nectar in the earliest hours of the morning. They fill the honey sac by visiting one or two flowers. *Oenothera biennis* is characterized by a high content of sugar in nectar. In one flower, this parameter varies from 27.7 to 32.1 mg. Herewith, the melliferous capacity of the evening primrose is from 511 to 1034 kg/ha, depending on the year. The carrying capacity of this plant is also very high. The herbage yield ranges from 403.7 to 685.0 dt/ha. Studies have shown that the primrose has high seed productivity. On average, for 4 years, its seed productivity was 17.8 dt/ha. Seeds are small and the mass of 1000 seeds is 0.41-0.47 g.

Thus, *Oenothera biennis* is a promising culture for multi-purpose use.

[Abstract:0765]

Bee Fauna Fertilizing Natural Plant Flowers at the Southern Region of Algeria

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The study is conducted in south-eastern Algeria, Biskra. It belongs to the bioclimatic stage. It is concerned floral resources favoured by wild bees and honey bees. Bees contribute to biodiversity and life on Earth. Indeed, the relationship between bees and flowers is therefore mutualistic. The result shown five plant species that belong to four plant families. The Brassicaceae family is the most favored; its flowers are visited by 13 bee species. Next is the Asteraceae family with 3 species then the Labiateae and the Malvaceae families with 2 species. The main plant appreciated by bee fauna is *Sinapis arvensis* which presents about half the visits. It is visited by 19 species. This plant is followed by rosemary *Rosmarinus officinalis* with a visit rate equal to 34.31% but it is only fertilized by 2 species of bees. The plant species endemic to the arid regions *Moricandia arvensis* (Brassicaceae) has an average visitation rate of 14.7% and is only visited by 4 taxa such as *Megachile (Chalicodoma) sicula* Rossi, 1792, out of a total of 26 species. The fauna of wild bees we recorded is divided in four families and nine genera. Several species are new records for Algeria, such as *Andrena (Suandrena) savignyi*. The maximum number of taxa is observed in February, coinciding with the flowering of most plants.

[Abstract:0766]

Potential Bee Pollinators of *Asphodelus Microcarpus* Viv. (Liliaceae), Medicinal Plant in Western Mountainous Region of Algeria

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This study is focused on potential bee species visiting the medicinal plant *Asphodelus microcarpus* in the region of Tissemsilt, in the natural environment at the national park of Theniet El Had mountain in western Algeria. One-third of the world's crops require pollination to improve the quality of seeds and fruits, the great majority being pollinated by some of the ca. 25,000 species of bees. In this context, our study has recorded 39 plant species that belong to 15 plant families. *Asphodelus microcarpus* plant species is the most favored; its flowers concentrate 46, 67% of the total number of visits. In terms of species richness, our analyses show that the wild bee communities are very diverse. This is due to the mild climate and rich flora of the region. The fauna of wild bees we recorded is divided in four families and twelve genera. A significant diversity is noted for the Apidea family. Twenty-two species are new records for Algeria, such as *Bombus vestalis*, *Megachile octosignata*, *Halictus pollinosus*. The maximum number of taxa is observed in April and May, coinciding with the flowering of most plants.

[Abstract:0767]

Spatiotemporal Distribution of Wild Bees (Hymenoptera, Apoidea) in the Northwest of Algeria

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There is increasing concern about the status and trends of pollinators across the globe. Pollinators play an important role for the functioning of ecosystems and are essential for crop production. However, they have suffered accentuated declines over the past century. Understanding the processes that have led to shifts in pollinator diversity is essential to develop better conservation measures that stop declines and restore pollinator communities. The present work concerns the distribution of wild bees through three stations in the National Park of Tlemcen, following an altitudinal gradient. The study was conducted from April to June 2014. A comprehensive inventory of 155 taxa is established. These species are distributed among 21 genera and 5 families. The Apidae have the highest rate with 36% before the Andrenidae 21%, the Megachilidae 21%, the Halictidae 20%, and finally the Colletidae 2%. The study noted three new species for the fauna of wild bees of Algeria. Those are *Andrena marginata* Fabricius, 1776, *Anthidium manicatum* Dallatour 1877 and *Megachile latimanus* Say, 1823. The index study and statistical treatments applied to results allowed to identify the composition of the fauna, its dependence on floral resources and its spatial and temporal distribution. The results reveal a strong wealth of Apoidea in the region where conservation is needed in the future as this fauna plays a key role in the pollination of plants and their diversity in natural and agricultural ecosystems.

ROUND TABLES

SEPTEMBER 30th, 2017

- 10:00 - 12:00 **HONEY ADULTERATION**
Moderators: Norberto Garcia Greou , Etienne Bruneau, Nevzat Artık,
Ahmet Güler
- 14:00 - 16:00 **CONTINENTS SPEAKING / EUROPE**

OCTOBER 1st, 2017

- 10:00 - 12:00 **CONTINENTS SPEAKING / AFRICA**
- 14:00 - 16:00 **CONSERVATION OF LOCAL BEES AND GENETIC POLLUTION**
Moderator: Maria Bouga
- 16:00 - 18:00 **CONTINENTS SPEAKING / ASIA**

OCTOBER 2nd, 2017

- 10:00 - 12:00 **BEE HEALTH AND BREEDING BETTER BEES**
Moderator: Marina Meixner
- 14:00 - 16:00 **CONTINENTS SPEAKING / AMERICAS**
- 16:00 - 18:00 **CONTINENTS SPEAKING / OCEANIA**

OCTOBER 3rd, 2017

- 10:00 - 12:00 **PESTICIDES and ANTIBIOTICS POLLUTION**
Moderators: Fani Hatjina, Geraldine Wright, Ali Bilgili
- 14:00 - 15:30 **MOVIE**
“VANISHING OF THE BEES”
Directed by : George Langworthy and Maryam Henein
Narrated by : Ellen Page

EDITORS

BURAK KAPTAN
EBRU DAYAN

Note:

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