20th COLOSS Conference

Wicc, Wageningen International Congress Centre B.V, Lawickse Allee 9, 6701 AN Wageningen, Netherlands, 12th - 13th November 2024

Full Proceedings

COLOSS Conference 2024 proceedings - A note from the president

Dear colleagues,

On behalf of the organizing team, I would like to welcome you to the 20th COLOSS conference.

We are organizing again a hybrid event so that many members from all over the world will be able to join us.

I would personally be delighted given that we will have more joint approaches globally. At the end of the day this is what COLOSS is all about. Connecting us honey bee people around the world. To foster this even more, we will offer more free time windows at this conference enabling a true bottom-up approach to our discussions, plans and actions.
I would like to sincerely thank all of the people who made this meeting possible. In particular, it would have again been impossible without the exceptionally organized efforts of Wageningen University & Research and Wageningen International Congress Centre.

Appreciation is also addressed to all contributors. Please be so kind as to actively contribute to our Core Project and/or Task Force discussions. Indeed, the success of this conference will depend on you. In particular, I would like to encourage all of you to consider joint experiments, joint fundraising and joint publications beyond our BEEBOOK.

Financial support for this meeting is kindly granted by the Ricola Foundation *Nature and Culture*, Veto Pharma, VITA beehealth, the Eva Crane Trust, IBRA and ANEL.

I am looking forward to fruitful in person and online discussions with all of you and hope you will enjoy this conference.

I am delighted to see many new faces from all over our COLOSS globe!

Kind regards

Prof. Dr. Peter Neumann, President, COLOSS Association

TOPICS

Annual conference to provide updates, stimulate discussions and provide future research and policy directions.

Annual General Assembly:

- Presentations of sponsors and stakeholders of COLOSS
- Presentations of COLOSS Panuwan Chantawannakul Awardees 2024
- Award for “Best student poster”
- COLOSS Annual report, budget and discussion
- Bologna hosting EurBee 11, 08.-11. September 2026 (5+5)
- Results of the 2nd IBRA Art Competition (5+5)

WHEN

Tuesday, November 12

- General Assembly - Welcome, Open topic voting and keynote speech
- Core Project & Task Force ‘State-of-the-Art’ presentations and sessions

Wednesday, November 13

- Core Project & Task Force ‘Update’ presentations and sessions
- General Assembly 2

WHERE

Physical

Wicc, Wageningen International Congress Centre B.V, Lawickse Allee 9, 6701 AN Wageningen, Netherlands

- Reception room to start the congress: HUGO tech zaal.
- Three Session rooms: Expert street 2&3 combi room; Expert street 6&7 combi room; and HUGOtech zaal.
- Poster room is Expert Street 5&6
- Social Dinner H41: Herenstraat 41, 6701 DH Wageningen, Niederlande

Online / Hybrid

Zoom or Teams – (links to specific sessions will be distributed to registered participants)

ORGANIZER CONTACTS

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POSTER SESSION

The best student poster will receive the "COLOSS Best Student Poster Prize" if the student is the corresponding author and willing to participate in the competition, as indicated in the registration.

The winner of the prize will be announced at the conference, at the COLOSS website and on social media.

Oral presentations can be given by the awardees, the invited speaker, the sponsors and the chairs of the CPs/TFs, the rest are posters only!

CERTIFICATES

Certificates will be sent by request (please let us know during the registration).

AWARDS & PRIZES

Best student poster prize was awarded to:

Tal Erez / Viral Infection and Chemical Cues in Honey Bee Pupae

Panuwan award ceremony for the winners of the 2024 award:

Karen Power / Do electric harps reduce *Vespa orientalis* predation on honey bee colonies?

Asia Piovesan / Genetic diversity and pesticide tolerance in honeybee colonies

Caio Eduardo da Costa Domingues / SENSITIVITY DIFFERENCES BETWEEN *Apis mellifera carnica* AND *Bombus terrestris* AFTER INSECTICIDE AND FUNGICIDE EXPOSURE

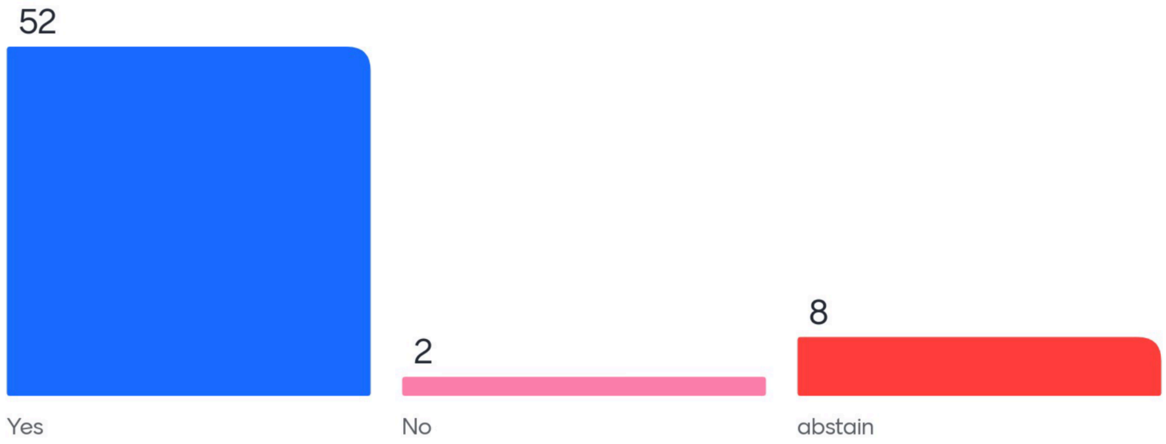
AGENDA

COLOSS CONFERENCE AGENDA 2024

	Monday 11.11.2024
	Session 1 – Executive Committee Meeting 1
19:00-20:30	Final organizational issues
Day 1	**Tuesday 12.11.2024**
	Session 2 – Welcome & Key Note
08:30-09:00	**Sign-in & poster set-up**
09:00-09:30	Welcome by President and Local Organizing Chair, Topics for open discussion
09:30-10:30	Keynote "*Tropilaelaps mercedesae*: a looming threat on the horizon for Apis mellifera outside of Asia". by Geoff Williams (30+30 min)
10:30-11:00	**Break, with drinks / snacks (possibility to visit posters)**
	Session 3 – COLOSS Updates
11:00-12:30	Core Projects (N = 3) & Task Forces (N = 8) state-of-the-art (ca. 6 min each)
12:30-13:30	**Lunch (covered) (possibility to visit posters)**
	Session 4 – Parallel Discussions 1
13:30-14:30	1. Varroa control, 2. Small Hive Beetle, 3. Vespid
14:30-15:30	1. World Bee Health, 2. B-RAP, 3. RNSBB
15:30-16:00	**Break with drinks / snacks (possibility to visit posters)**
	Session 5 – Parallel Discussions 2
16:00-17:00	1. Viruses, 2. Tropilaelaps (formerly APITOX), 3. Nutrition
17:00-18:00	1. BEEBOOK, 2. Monitoring
	Session 6 – Posters & Social Dinner
18:10-19:15	**Poster session**
19:30 - open	**Social dinner**
Day 2	**Wednesday 13.11.2024**
	Session 7 – General Discussions 1
08:30-10:30	To be voted upon bottom-up **1. OPEN TOPIC** 2nd time slot for **2. WHBH, 3. BEEBOOK**
10:30-11:00	**Break with drinks & snacks**
	Session 8 – General Discussions 2
11:00-13:00	To be voted upon bottom-up **1. OPEN TOPIC** 2nd time slot for **2. Nutrition, 3. Varroa**
13:00-14:00	**Lunch (covered)**
	Session 9 – Updates & Plans
14:00-16:00	Updates & plans Core Projects & Task Forces (10 min each)
16:00-16:30	**Break with drinks & snacks**
	Session 10 – COLOSS General Assembly
16:30-18:30	Discussions, Presentations of sponsors and stakeholders of COLOSS, Presentations of COLOSS Panuwan Chantawannakul Awardees 2024, final plans, budget binding decision making; ceremony of Best Poster Prize & farewell; Bologna hosting EurBee 11, 8-11 September 2026 (5+5); IBRA competition (5+5)
	Session 11 – Executive Committee Meeting 2
19:00-20:00	Debrief and follow-up

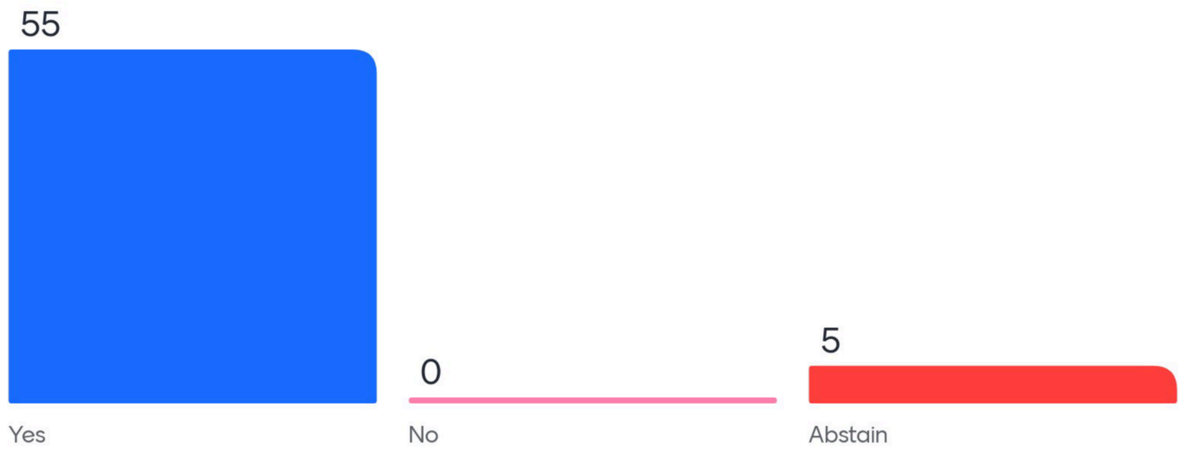
GENERAL ASSEMBLY DECISIONS

Do you agree that a new group named BEEscholars within COLOSS will be founded?

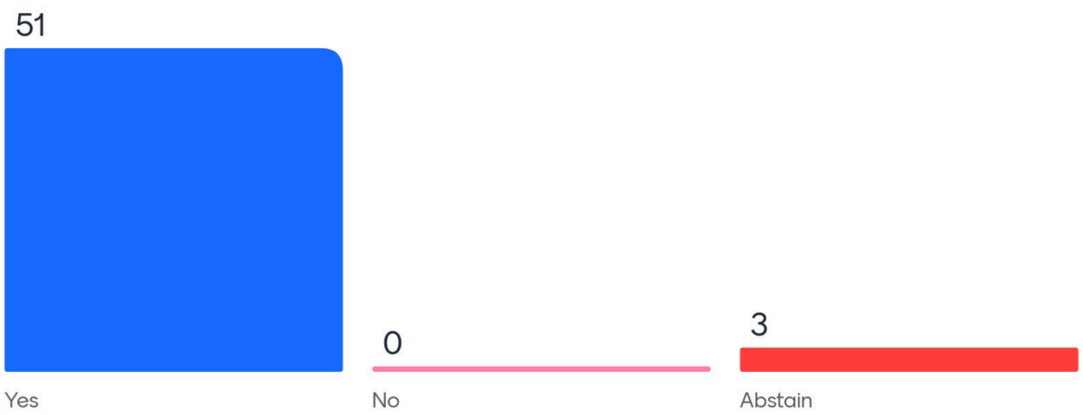


How should we define the role of BEEscholars within COLOSS?

Do you approve the financial statement and the auditor's report for 2024?



Do you approve the annual 2024/25 budget proposed by the EC?



LIST OF POSTERS

Title	Authors	Are you a student
ASSESSING THE IMPACT OF RF-EMF EXPOSURE ON HONEY BEE COLONIES	Anastasia Kalapouti1; Leonidas Charistos1; Jürg Fröhlich2; Marco Zahner2; Zoi Thanou3; Antonios Tsagkarakis3; Andri Varnava4; Menelaos Stavrinides4; Pieterjan De Boose5; Felipe Oliveira Ribas5; Arno Thielens5;6; Anke Huss7; Maria Bouga3 and Fani Hatjina1	Yes
An unprecedented Large-scale survey of honey bee mitochondrial DNA and wing shape variation in europe	Maíra Costa1,2, Ana R. Lopes1,2, Telma Gonçalves1,2, Fernanda Li1,2, Dora Henriques1,2, Andreia Quaresma1,2, Carlos Yadró1,2, Alexandre Albo3, Laima Blažytė-Čereškienė4, Robert Brodschneider5, Valters Brusbardis6, Norman Carreck7, Leonidas Charistos8, Robert Chlebo9, Mary F. Coffey10, Bjorn Dahle11, Ellen Danneels12, Constantin Dobrescu13, Anna Dupleix-Marchal14, Janja Filipi15, Anna Gajda16, Kristina Gratzer5, Linn Groeneveld11, Fani Hatjina8, Jes Johannesen17, Michal Kolasa18, János Körmendy-Rácz19, Marin Kovačić20, Preben Kristiansen21, Maritta Martikkala22, Grace McCormack23, Raquel Martín-Hernández24, Borce Pavlov25, Marco Pietropaoli26, Benjamin Poirot3, Zheko Radev27, Aivar Raudmets28, Vincent René-Douarre29, Ivo Roessink30, Maja Ivana Smodiš Škerl31, Gabriele Soland32, Dalibor Titera33, Joseph van der Steen34, Andri Varnava35, Flemming Vejsnæs36, Mathew Webster37, Dirk C. de Graaf12, M. Alice Pinto1,2	No
Comparison of morphometric characteristics of Tropilaelaps spp. from different populations.	Brandor Anna	No
Varroa control strategies of different beekeeper groups and corresponding honey bee colony mortality in Central Europe	Ewa Mazur1; Ondřej Biemann2; Robert Brodschneider3; Robert Chlebo4; Anna Gajda1; Maria Iller5; Ondrej Vencalek6; Jan Brus2; Jiři Danihlík7	No
Uncontrolled hybridization threatens the existence of indigenous bee breeds in Ukraine	Anna Volkova; Olexandr Cherevatov; Irina Panchuk; Roman Volkov	Yes

Polyandry and pesticide resistance in honeybee colonies	Asia Piovesan(1); Peter Neumann(1); Alexis Beaurepaire(1;2)	Yes
POLYANDRY LEVELS AND POPULATION DENSITY ARE POSITIVELY CORRELATED IN SMALL HIVE BEETLE (AETHINA TUMIDA)	Aura Palonen1; Anna Papach1; Alexis Beaurepaire1; Michael N.K. Muturi1; Érica Weinstein Teixeira2; Geoffrey R. Williams3; Jay D. Evans4; Francisco J. Posada-Florez4; Christian W. W. Pirk5; H. Michael G. Lattorff6; Kayode Lawrence Akinwande7; Adewale A. Sorungbe7; Robert Spooner-Hart8;9; Clarissa M. House9; Giovanni Federico10; Giovanni Formato11 and Peter Neumann1	Yes
Quality of queen bees inseminated with fresh and stored semen	Małgorzata Bieńkowska; Mikołaj Borański; Beata Panasiuk	No
Managed honey bee colony losses and causes during the active beekeeping season 2022/2023 in nine Sub-Saharan African countries	Beatrice T. Nganso1*; Workneh Ayalew1; Abebe J. Wubie1; Freweini Assefa1; Lulseged Belayhun1; Nelly N. Ndungu1; Daniel Toroitich2; Z. Ngalo Otieno-Ayayo3; Mbatha B. Wambua1; Yudah O. Oyieyo3; Ntirenganya Elie4; Rachidatou Sikirou5; Souradji B. Idrissou5; Willy Mwiza6; S. Turner7; Bridget O. Bobadoye8; Sidonie T. Fameni9; Sayemie Gaboe10; Mawufe K. Agbodzavu11; Patrick Mafwila12; Geraud C. Tasse Taboue13; Kimathi Emily1; Tonnang Z.E. Henri1;14; Saliou Niassy15; Simplice N. Fonkou16; Christian W. W. Pirk17; Alison Gray18; Robert Brodschneider19; Victoria Soroker20; Sevgan Subramanian1	No
Full Title: Managed honey bee colony losses and causes during the active beekeeping season 2022/2023 in nine Sub-Saharan African countries	Beatrice T. Nganso1*; Workneh Ayalew1; Abebe J. Wubie1; Freweini Assefa1; Lulseged Belayhun1; Nelly N. Ndungu1; Daniel Toroitich2; Z. Ngalo Otieno-Ayayo3; Mbatha B. Wambua1; Yudah O. Oyieyo3; Ntirenganya Elie4; Rachidatou Sikirou5; Souradji B. Idrissou5; Willy Mwiza6; S. Turner7; Bridget O. Bobadoye8; Sidonie T. Fameni9; Sayemie Gaboe10; Mawufe K. Agbodzavu11; Patrick Mafwila12; Geraud C. Tasse Taboue13; Kimathi Emily1; Tonnang Z.E. Henri1;14; Saliou Niassy15; Simplice N. Fonkou16; Christian W. W. Pirk17; Alison Gray18; Robert Brodschneider19; Victoria Soroker20; Sevgan Subramanian	No
Seasonal growth of Varroa destructor populations in Florida and IPM strategies for sustainable control	Cameron Jack and James Ellis	No

Invasive species threating Euroepan apiculture	Aleksandar Uzunov 1; 3; Giovanni Cilia 2; Chao Chen 3; Cecilia Costa 2; Thomas Galea 4; Irakli Janashia 5; David Mifsud 6	No
Current distribution of Tropilaelaps mercedesae (Mesostigmata: Laelapidae) in the Central Asia and Korea	Chuleui Jung1;2; Saeed Mohamadzade Namin2; Sun-Ho Kwon1;3; Boymakhmat A. Kakhramanov3.	No
Design and Synthesis of Thymol-Based Derivatives as Potential Acaricidal Agents against Varroa destructor	Daniel Bisrat1;2; Tekalign Begna2 and Chuleui Jung2;3	No
The Better-B project aims to restore the resilience of honey bees	Dirk C. de Graaf	No
Diversity patterns of detoxification genes in 15 honey bee subspecies	Fernanda Li1; 2; Carlos Ariel Yadró Garcia1; 2; José Rufino2;3; Annelise Rosa-Fontana1; 2; Gilles Verbinnen4; Dirk C. de Graaf4; Lina De Smet4; Medibees Consortium; M. Alice Pinto1; 2 Dora Henriques1; 2	No
Small Hive Beetle Infestation and Control Measures in Andhra Pradesh	Monish N K1 and Dr H R Bhargava2 Monishnarendrakumar27@gmail.com and drbee1976@gmail.com	Yes
Varroa control strategies of different beekeeper groups and corresponding honey bee colony mortality in Central Europe	Ewa Mazur1; Ondřej Biemann2; Robert Brodschneider3; Robert Chlebo4; Anna Gajda1; Maria Iller5; Ondrej Vencalek6; Jan Brus2; Jiři Danihlík7	Yes
Where to place Asian hornet traps to protect apiaries and which bait maximize efficacy and selectivity ?	Florian BASTIN; Cyril VOSS; Louis HAUTIER	No
Tropilaelaps: a looming threat on the horizon	Geoff Williams	No
genetic diversity and population structure of Algerian honeybees	HAMI Halima ADAOURI Mohamed	Yes
Flight skills of the Asian Hornet: The search for an effective method to detect nests	Heleen Van Ransbeeck; Tim Adriaens; Femke Batsleer; Dries Bonte; Sander Devisscher; Emilie Gelaude; Sanne Van Donink; Axel Neukermans; Emma Cartuyvels; Johan Wauters & Jasmijn Hillaert	Yes
Impact of Acetamiprid on Fatty Acid Composition in the Central Nervous System of Honey Bees	Fanni Huber 1*; Csilla Sebők 1; Júlia Vöröházi 1; Patrik Tráj 1; Rege Márton 1;2; Zsuzsanna Neogrády 1; Gábor Mátis 1;2; Hedvig Fébel 3; Máté Mackei 1;2	Yes

THE MOST COMMON HARMFUL BEE INSECTS IN BELGRADE AREA	1 Academician Dr. Ivan Pavlović; Principal Research Fellow 2 Milan Stevanovic	No
Spatial syncrony of Varroa destructur and colony loss rates of honey bees	Jes Johannesen; Valon Mustafi; Saskia Wöhl; Christoph Otten	No
Investigating Plant Virus Dynamics Through High-Throughput Sequencing Data from Honey Bees in the Public SRA Database	Jiho Jeon[1]; Eui-Joon Kil*[1]	Yes
Viral community Investigation of Varroa destructor in South Korea	June-Sun (Sunny) Yoon	No
Do electric harps reduce Vespa orientalis predation on honey bee colonies?	Karen Power	No
Pesticides in pollen: results from the German Bee Monitoring (DeBiMo)	KIRSTEN TRAYNOR GERTJE PETERSEN ELKE GENERSCH MARINA MEIXNER CHRISTOPH OTTEN STEFAN BERG MARC SCHÄFER	No
Evaluating the importance of AI Chatbots in the daily practice of bee health extensionists and advisors	Linde Morawetz (1); Dirk Louis P. Schorkopf (1); Robert Brodschneider (2); Lotta Fabricius Kristiansen(2)	No
COLOSS-members and their activity in the COLOSS-network	Ms. Lotta Fabricius Kristiansen (1); Dr. Linde Morawetz (2); Dr. h.c. Preben Kristiansen (3); Mr. Flemming Vejsnaes (4)	No
THE INFLUENCE OF THE POLYMINERAL DRUG «APIPLASMA» ON THE METAL CONTENT IN THE APIS MELLIFERA L	Liudmyla Yazlovytska1; Olexandr Cherevatov1; Volodymyr Кaravan1; Anastasiya Sachko1; Ostap Palamar1; Vasyl Kravchuk2	No
Development of a Rapid and Accurate Diagnostic Method for Deformed Wing Virus Using Isothermal Amplification	Man-Cheol Son; Dahye Park; Kyeongheon Jeong; Chuleui Jung; Eui-Joon Kil	Yes
Queen ringing for brood interruption		No
Impact of tebuconazole on honeybee flight muscles: disruption of redox homeostasis and adaptive responses	Máté Mackei1;2*; Fanni Huber1; Csilla Sebők1; Júlia Vöröházi1; Patrik Tráj1; Rege Márton1;2; Zsuzsanna Neogrády1; Gábor Mátis1;2	No
Turning the Tables: Prevention of Beekeepers Participation LOSSes in the COLOSS Survey	Michela Bertola; Anna Pinto; Casarotto Claudia; Franco Mutinelli	Yes

Quality of queen bees inseminated with fresh and stored semen	Małgorzata Bieńkowska; Mikołaj Borański; Beata Panasiuk	No
Nationwide Survey of Honey Bee Viruses in South Korea in 2024 Using Bioinformatics Technology	1.2.Minhyeok Kwon and 1.2.Eui-Joon Kil	Yes
Bisphenol A Risk in Propolis	Dr. Miray Dayıoğlu Tuğçe Olgun Prof. Dr. Sibel Silici	No
BPA Contamination Risk in Proplis Production	Dayıoğlu; Miray1* Olgun; Tuğçe1; Silici; Sibel2	No
Disaccharides in Honey	Mohammad Forsi DVM.	No
Prevalence of Viruses in Palestinian Honeybee Colonies	Mohammad I. Alqurneh; Lena Bauer; Abdul-Jalil S. Hamdan; Islam I. Nairoukh; Hans-Hinrich Kaatz	No
Foraging Behaviour of Apis dorsata and Episyrphus balteatus in pesticide treated fields of onion	Mohammad Abdul Waseem*; Vallabuni Sailaja	No
Data for Good - Creating frameworks for community building standardised data	Noa Simon Delso; Eduardo Marcos; Gregor Susanj; Grega Lipovsek; Michael Rubinigg	No
Pollinator Hub - a tool to boost pollinator research with a community logic	Noa Simon Delso1; Gregor Susanj2; Grega Lipovscek2; Eduardo Marcos1; Michael Rubinigg1	No
An Insightful View: In-Hive Flatbed Scanners for Non-invasive Long- Term Behavior and Disease Monitoring of Honey Bee Hive Combs	Parzival Borlinghaus; Jörg Marvin Gülzow; Richard Odemer;	Yes
Molecular detection of Apis mellifera filamentous virus (AmFV) in Montenegro	Tatjana Perović1.; Vučeta Jacimović1.; Sabri Alla-Eddin Zaidat2.; Maria Saponari3.; Raied Abou Kubaa 3;4*	No
Multiplex suspension array immunoassay for the rapid and sensitive monitoring of multiple bee-hazardous pesticides	Rubing Zou1;2; Ruud van Dam1; Nathalie Smits1; Erik Beij1; Toine Bovee1; Dirk C. de Graaf3; Yirong Guo2;*; Jeroen Peters1;*	No
Assessment of Apis mellifera health in relation to varroa sp. infestation. and morphometric analysis of the mite in two phytogeographic zones of Burkina Faso	Sawadogo Souhaïbou1; Dingtoumda Oswald Gilbert1; Bazie Hugues Roméo1; Zella Sinali.2 Bationo Modeste Florentin2; Ilboudo Zakaria1	Yes

Viral infection and chemical cues in honey bee pupae	Tal Erez1;2; Angelina Fathia Osabutey1; Elad Bonda1; Assaf Otmy1; Nor Chejanovsky1 and Victoria Soroker1	No
The Effect of Some Herbal Essential Oil Applications on the Expression Levels of Chemoreceptor; Chemosensor and Neurotransmitter Genes in Varroa Mites	Tuğçe OLGUN1; Miray DAYIOGLU1; Unal KARIK1; Metin ERDOGAN2	Yes
Monitoring of Vespa velutina and Vespa orientalis in Italy and beekeepers' perception of hornet impact on honey bees	Valeria Caringi; Laura Bortolotti	No
The Critical Role of Omega-3 Fatty Acids in Honeybee Nutrition	Yael Arien1; Arnon Dag2 and Sharoni Shafir3	No

ABSTRACTS

ASSESSING THE IMPACT OF RF-EMF EXPOSURE ON HONEY BEE COLONIES

Anastasia Kalapouti[1]; Leonidas Charistos[1]; Jürg Fröhlich[2]; Marco Zahner[2]; Zoi Thanou[3]; Antonios Tsagkarakis[3]; Andri Varnava[4]; Menelaos Stavrinides[4]; Pieterjan De Boose[5]; Felipe Oliveira Ribas[5]; Arno Thielens[5,6]; Anke Huss[7]; Maria Bouga[3] and Fani Hatjina[1]
[1] Department of Apiculture Institute of Animal Science; Hellenic Agriculture Org. "DIMITRA"; Nea Moudania, Greece; (anastasiakalapoutii@gmail.com; [2]Fields at Work GmbH; Zurich; Switzerland; [3]Department of Crop Science; Agricultural University of Athens, Athens, Greece; [4]Department of Agricultural Sciences; Cyprus University of Technology, Limassol, Cyprus; [5]Department of Information Technology; Ghent University – imec, Ghent,Belgium; [6]Photonics Initiative; Advanced Science and

Research Center; the Graduate Center of the City University of New York; New York; USA; [7] Institute for Risk Assessment Sciences; Utrecht University; Utrecht; The Netherlands

The current study aims at investigating the effects of radio-frequency electromagnetic fields (RF-EMFs; at 3.6 GHz) on honey bee brood development - under controlled conditions. To achieve this objective; three honey bee colonies were exposed to 5G modulated RF-EMF at 3.6 GHz while three other control colonies were not. The two groups of colonies were kept in separated rooms electromagnetically shielded from each other. The colonies were placed on digital scales and equipped with sensors measuring electric fields; temperature; humidity and CO_2. During the pilot study the colonies were monitored for a period of three brood cycles. The development of the eggs; larvae and pupae were monitored continuously; as well as the state of the queens. The development of the brood was assessed by marking the cells using transparent sheets. A number of about 100 cells with eggs were marked for each brood cycle in each colony. We observed that 11% of eggs and 20% of larvae from the exposed colonies as well as 1% of eggs and 15% of larvae from control colonies were removed by bees before the capping stage. We also observed one day delay in hatch for 23% and 8% eggs in exposed and control groups; respectively and one day delay in the emergence of adult bees for 19% and 4% of larvae; in exposed and control bees; respectively. Total emergence percentage was not different between the exposed and the control group (ca. 100%). No differences were observed on queen status; weight; brood temperature; humidity or CO_2 between the two experimental groups. More tests and repetitions will be carried out to increase the overall sample size of brood cells measured. For future experiments we plan to monitor additional relevant variables providing information about the oxidative stress of adult bees; foraging intensity and possibly sound differences between the groups. The study is part of the ETAIN project; funded by the European Union's Horizon Europe research and innovation funding program under grant agreement No 101057216 Keywords: honey bees; control; exposure; RF-EMF; 3.6 GHz.

VARROA CONTROL STRATEGIES OF DIFFERENT BEEKEEPER GROUPS AND CORRESPONDING HONEY BEE COLONY MORTALITY IN CENTRAL EUROPE

Ewa Mazur[1]; Ondřej Biemann[2]; Robert Brodschneider[3]; Robert Chlebo[4]; Anna Gajda[1]; Maria Iller[5]; Ondrej Vencalek[6]; Jan Brus[2]; Jiři Danihlík[7]

[1]Laboratory of Bee Diseases; Department of Pathology and Veterinary Diagnostics; Institute of Veterinary Medicine; Warsaw University of Life Sciences, Warsaw, Poland; [2]Department of Geoinformatics; Faculty of Science; Palacký University Olomouc; Czechia; [3] Department of Biology; University of Graz, Austria; [4]Institute of Animal Husbandry; Faculty of Agrobiology and Food Resources; Slovak University of Agriculture; Nitra, Slovakia; [5]Department of Parasitology and Invasive Diseases; Faculty of Veterinary Medicine; University of Warmia and Mazury in Olsztyn; Poland; [6] Department of Mathematical Analysis and Applications of Mathematics; Faculty of Science; Palacký University Olomouc; Czechia; [7]Department of Biochemistry; Faculty of Science; Palacký University Olomouc; Czechia

Control of the honey bee parasite *Varroa destructor* is still a challenge for veterinary services and beekeepers. Beekeepers usually use more than one treatment per season; but there is a lack of information which treatment combinations they apply and how this affects colony survival. This study aimed to establish the most frequently used treatment strategies in four Central European countries; also, in context of the size of beekeeping operations. In addition, we determined "the best treatment strategy" (BTS) which was the control strategy that resulted in the lowest winter loss rate. We analyzed winter colony losses from 2 seasons (2019/20 to 2020/21) in Austria, Czechia, Poland and Slovakia. Data was taken from COLOSS surveys of beekeepers on honey bee colony losses. We included data from 8;655 respondents about 171;756 overwintering colonies. Three categories of beekeeping operations were established: small-scale beekeepers (SB) with ≤25 colonies; medium-scale beekeepers (MB) with 26-79 colonies and large-scale beekeepers (LB) with ≥80 colonies. We merged treatment methods into 5 categories based on the drug's active substance or the type of treatment (Biotechnical methods; Organic acids; Essential Oils; Acaricides; Other methods) and pooled 12 months into 4 seasons (Spring; Summer; Autumn; Winter). We used the Classification Tree; part of the Orange Data Mining software to determine BTS. Differences in treatment strategies were observed between countries. Austria differed from other countries; as beekeepers avoided acaricides. Preferences in Czechia; Poland and Slovakia were quite similar; however; only Slovak beekeepers used Essential Oils more often. In every country; winter colony losses with BTS were lower the larger the beekeeping operation was. There were similarities in BTS between beekeeping clusters only in Austria and Czechia.

AN UNPRECEDENTED LARGE-SCALE SURVEY OF HONEY BEE MITOCHONDRIAL DNA AND WING SHAPE VARIATION IN EUROPE

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Worldwide commercial beekeeping poses a threat to the native origin of the honeybee (*Apis mellifera*); with beekeepers favouring subspecies of Eastern European C-lineage ancestry; due to their docile behaviour and high honey production traits. In many parts of western and northern Europe; queens of Western European M-lineage ancestry have been massively replaced by queens of C-lineage ancestry; and this has led to the development of conservation programs aiming at recovering native lines. The maternally-inherited mitochondrial DNA (mtDNA); particularly the intergenic region tRNAleu-cox2; has been the marker of choice for assessing honey bee variation at large geographical scales. Herein; we will show the results obtained for over 1000 colonies collected across 30 European countries for mtDNA diversity and subspecific classification using the geometric-morphometrics software DeepWings©. The results indicated that; apart from Portugal; Spain; Ireland; and the conservation centers in France and Denmark; where the colonies exhibited African or M haplotypes; the remaining countries are primarily dominated by colonies of C-lineage maternal ancestry. In conclusion; this unprecedented survey of honey bee diversity conducted across Europe underscores the worrying dominance of C-lineage genetic variation; highlighting the urgent need for strategic conservation efforts to preserve the native genetic diversity of *Apis mellifera*. This work was conducted in the framework of the project Better-B; funded by the European Union; the Swiss State Secretariat for Education; Research and Innovation; and UK Research and Innovation; under the UK government's Horizon Europe funding guarantee (grant number 10068544).

COMPARISON OF MORPHOMETRIC CHARACTERISTICS OF TROPILAELAPS SPP. FROM DIFFERENT POPULATIONS.

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In 2021; in the North-East of Eurasia; an infestation of bee colonies with *Tropilaelaps spp*. was discovered; where previously it was considered impossible to parasitize the mites on a honey bee; due to the presence of a barren period in the life cycle of bee colonies. Currently; *Tropilaelaps* spp. is registered in Northern Asia and Eastern Europe: Russia (Brandorf et.al.; 2022; 2024); Uzbekistan (Omid Joharchi at.al.; 2023); Georgia; Abkhazia – the discovered mites belong to *Tropilaelaps mercedesae*; but despite the same origin; some morphological differences are noted in female mites. The purpose of the research is to study the

characteristics of the size of *Tropilaelaps* spp.in different populations. Body length and width; ventrianal plate (anal shield) length and width were measured in female *Tropilaelaps* spp. using the stereo zoom microscope (Leica DM500 (X100). In total; 200 females from apiaries in Russia (Krasnodar region and the Republic of Dagestan); Georgia was studied; for comparison; *Tropilaelaps spp*. females from China (Ningbo province) were measured; which were selected from bee colonies in August 2023. To compare the size of mite, the ratio of body length to width was calculated. When studying the length and width of the body of mite; differences were revealed on the basis of the ratio of length to body width; the maximum values were noted in ticks from Georgia (2.01± 0.14 µm); the average in ticks from China (1.85± 0.15 µm); the lowest values were for ticks from Russia (1.79±0.15 µm). The dimensions of the ventral plate on the females' body did not show differences between individuals from China and Georgia with a plate length of 0.179 ±0.02 µm and 0.178±0.02 µm; respectively; and with a width of: 0.122±0.01 µm and 0.130±0.02 µm. However, the female mite parasitizing bee colonies in Russia were different. They have a ventrianal plate length of 0.165 ± 0.01 µm; but the width was 0.136 ± 0.01 µm. These findings suggests formation of special populations in different territories. In this regard, it is necessary to study the morphological and biological features of *Tropilaelaps* spp.; against the background of non-endemic natural and climatic conditions; which will allow developing a strategy to prevent its spread to new territories.

POLYANDRY AND PESTICIDE RESISTANCE IN HONEYBEE COLONIES

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Genetic diversity is essential for species adaptation and survival in a changing environment. In honeybee colonies, diversity of worker genotypes is ensured by queen polyandry; which confers adaptive advantages and results in higher colony resilience. Together with pests and pathogens; pesticides are one of the main stressors contributing to worldwide colony losses. To date; several studies have documented that the different worker patrilines found in the same colony display different levels of resistance to pathogens; and that high polyandry colonies perform better than low polyandry colonies in controlling *Varroa destructor* infestations. However, the potential links between polyandry and pesticide resistance have not been considered so far. According to that; the aim of the project is therefore to investigate whether patrilines exposed to the neonicotinoid Acetamiprid show differences in pesticide susceptibility through standard acute oral toxicity test. This neonicotinoid is registered in many countries and has been re-approved for use in Europe until 2033. Three honeybee colonies have been selected in a local Swiss apiary and ~400 workers per colony have been selected. After starvation; bees were singularly fed with the control or the treatment solution (LD50 48 h acetamiprid = 5.40 µg/bee) according to their assigned group and then placed in group cages (30 bees/cage) provided with ad libitum sugar solution at 30°C. Mortality and food consumption were checked daily for 48h. Five microsatellite markers will be used for genotyping using standard methods to assign each individual to a patriline to estimate resistance heritability through the comparison of bees survival between patrilines as well as between colonies. In addition, sublethal effects will be assessed in survivors from different subfamilies to assess whether the survival can be related to sublethal responses. This study will link worker patrilines to both lethal and sublethal pesticide effects; thereby generating novel knowledge on the importance of genetic diversity for pesticide resilience in honeybee colonies.

POLYANDRY LEVELS AND POPULATION DENSITY ARE POSITIVELY CORRELATED IN SMALL HIVE BEETLE (*AETHINA TUMIDA*)

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Increased population density may lead to higher levels of polyandry by reducing costs of mate finding. Higher polyandry levels can; in turn; lead to skewed patterns of paternity via sperm competition and/or cryptic female choice. However; the importance of polyandry is poorly understood for most invasive species; including *Aethina tumida*; the small hive beetle (SHB); a parasite of honeybee nests. The recent discovery of polyandry and skewed paternity in SHB in the USA raises the question of whether polyandry levels and paternity skewness differ across SHB populations and whether polyandry levels correlate with population density. Here; we investigated SHB population densities; polyandry levels and paternity skewness across native (South Africa; Nigeria; and Kenya) and invasive (Brazil; Australia; Italy; and USA) populations. From each location, 8-12 field-caught SHB females and 17-31 laboratory-reared offspring from each female were genotyped at 11 DNA microsatellite loci to estimate the number of mates for each female; as well as paternity skewness. Population densities at their apiaries of origin were recorded during colony inspections. Our results show significant differences in polyandry levels between the populations; and a significant positive correlation between polyandry levels and population density. Further results will be presented and discussed. These findings enhance our knowledge of mating behavior in the invasive SHB and lay the foundation for understanding the role of polyandry in biological invasions.

INVASIVE SPECIES THREATING EUROEPAN APICULTURE

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The recent detection of the red dwarf honey bee *Apis florea* in Malta and of the parasitic mite *Tropilaelaps mercedesae* in Georgia are described. Potential risks are discussed and methods to detect and control these invasive species. The role of European research projects (among which the Horizon Europe project BeeGuards) in supporting preparedness of European beekeeping to the threats posed by these species is discussed.

SEASONAL GROWTH OF *VARROA DESTRUCTOR* POPULATIONS IN FLORIDA AND IPM STRATEGIES FOR SUSTAINABLE CONTROL

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Most beekeepers seek to control *Varroa destructor* by treating honey bee colonies with synthetic miticides. However, a successful approach to control this parasite must include the application of effective treatments at the correct time. To understand the effect that treatment timing has on V. destructor populations during different seasons; we conducted an experiment using a dataset comprising two separate field trials over multiple years in north central Florida environments. We observed that it takes about 4–5 months after treatment in winter and spring for mite populations to return to the standard economical threshold (3 mites/100 bees). There is a steeper increase in mite populations after treating colonies in summer and fall; when it takes

CURRENT DISTRIBUTION OF *TROPILAELAPS MERCEDESAE* (MESOSTIGMATA: LAELAPIDAE) IN THE CENTRAL ASIA AND KOREA

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The mites belonging to the genus *Tropilaelaps* are ectoparasites of honeybees; primarily infesting the larval and pupal stages. Originating from subtropical regions; these mites can cause brood malformation; bee mortality; and subsequent decline or absconding of colonies. During field surveys conducted in Nepal; South Korea; and Uzbekistan to investigate honeybee pests; several populations of *T. mercedesae* were collected. This is the first record of *T. mercedesae* from Uzbekistan. Phylogenetic analysis indicated the presence of four distinct lineages within the mainland-Indonesian populations of *T. mercedesae*. Notably, an evolutionary divergence was observed between the haplotypes from Sri Lanka and the Philippines compared to the remaining mainland Asian and Indonesian haplotypes. Further monitoring study in Uzbekistan showed wide spread in the country. Also, we present the current distribution patterns *of Tropilaelaps* in Korea; too.

DESIGN AND SYNTHESIS OF THYMOL-BASED DERIVATIVES AS POTENTIAL ACARICIDAL AGENTS AGAINST *VARROA DESTRUCTOR*

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Thymol; a natural monoterpenoid phenol; is commonly used to control Varroa mites (*Varroa destructor*) in beehives. However, its effectiveness is limited by a narrow temperature range; reduced efficacy at high infestation levels; potential side effects on honey bees; and solubility challenges. To address these issues; four new thymol derivatives were designed using molecular docking techniques to enhance their interaction with acetylcholinesterase; a target enzyme in Varroa mites. These derivatives were successfully synthesized through the Mannich base reaction; purified via column chromatography; and their structures were confirmed using spectroscopic methods (HRESI-MS; ^{1}H; ^{13}C; and DEPT NMR). The acaricidal activity of these compounds was tested using the complete exposure method. Among them; 4-((dimethylamino)(phenyl)methyl)-2-isopropyl-5-methylphenol); aminoalkyl derivative of thymol; showed the highest binding affinity for acetylcholinesterase; with a docking score of −9.933 kcal/mol; significantly better than thymol's score of −7.051 kcal/mol. This compound also demonstrated superior acaricidal activity; with LC50 values of 5.92 µg/ml (4h-LC50) and 3.29 µg/ml (8h-LC50); compared to thymol's values of 67.75 µg/ml and 15.16 µg/ml; respectively. These results indicate that aminoalkyl derivatives of thymol are promising acaricides against varroa mites.

THE BETTER-B PROJECT AIMS TO RESTORE THE RESILIENCE OF HONEY BEES

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The overall aim of this 4-year Better-B project is to improve the resilience of beekeeping to abiotic stresses such as climate change; habitat loss and hazardous chemicals. Honey bee colonies are often poorly adapted to cope with these stresses; in no small part due to modern beekeeping practices. The key to resilient beekeeping is to harness the power of nature to restore harmony and balance inside the honey bee colony and between the colony and the environment; both of which have been disturbed by human activities. We believe that the path to harmony and balance is shown by Darwinian colonies: abandoned colonies and feral colonies that have survived in the wild. However; such colonies usually lack many favourable characteristics that are important in

modern beekeeping. The solution here is to understand the processes and mechanisms that apply in nature and to adapt modern beekeeping practices and decision making accordingly; and when appropriate using the benefits of advanced technologies. This is what BETTER-B stands for. The implementation of this new approach in apicultural management will be done in close collaboration with the actors involved. The restoration of harmony and balance must take place on three levels: the environment; the honey bee and beekeeping practices.

DIVERSITY PATTERNS OF DETOXIFICATION GENES IN 15 HONEY BEE SUBSPECIES

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Honey bees (*Apis mellifera*) inhabit a vast geographical range; spanning diverse natural and agricultural ecosystems. They are exposed to different levels and types of natural (such as plant allelochemicals) and synthetic (such as pesticides) xenobiotics within this range. Several genes have been implicated in the resistance of insects to pesticides; including cytochrome P450s; glutathione-S-transferases (GSTs); esterases; uridine diphosphate (UDP)-glycosyltransferases. Here; the sequences of detoxification genes from >1500 individuals representing 15 subspecies of the four honey bee main lineages will be analyzed. The functional annotation and effects of each variant will then be predicted using SnpEff and the allele frequency and FST (fixation index) of each SNP per population and evolutionary lineages will be calculated. It is expected to have highly differentiated SNPs among the different subspecies/lineages. This work was conducted in the framework of the projects MEDIBEES - Monitoring the Mediterranean Honey Bee Subspecies and their Resilience to Climate Change for the Improvement of Sustainable Agro-Ecosystems funded by PRIMA; Better-B; funded by the European Union; the Swiss State Secretariat for Education; Research and Innovation; and UK Research and Innovation; under the UK government's Horizon Europe funding guarantee (grant number 10068544) and Bee3Pomics: Omics insights into molecular effects of plant protection products in honey bees (*Apis mellifera*) funded by the RESTART-FCT.

SMALL HIVE BEETLE INFESTATION AND CONTROL MEASURES IN ANDHRA PRADESH

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The young bee hive beetle (*Aethina tumida*) poses a major threat to beekeeping worldwide. The impact has been severe in Andhra Pradesh. India This study explores the current status of shrew beetle (SHB) distribution in the region and evaluates the effectiveness of various beetles. Control measures used by local beekeepers Lhes of SHB attacks Key findings highlighting the prevalence and severity reveal that the level of spread will be intensified due to climate conditions. Guidelines for nest management and the limited availability of effective control strategies. The study also evaluated traditional and innovative control measures. Including chemical treatment biological control and integrated pest management strategies Especially the use of essential oils; the use of SHB traps and biological control using parasitic oils; effectiveness; practicality. and the cost-effectiveness of these methods are critically analyzed to explore their potential for widespread implementation... The findings provide valuable guidance for beekeepers and policy makers in Andhra Pradesh. The goal is to increase the health and productivity of the nest. These findings highlight the need for continued research and development of sustainable SHB control strategies to reduce the economic and ecological impacts of this pest. By integrating local knowledge with scientific advances This study contributes to the broader discourse of sustainable beekeeping.

THE MOST COMMON HARMFUL BEE INSECTS IN BELGRADE AREA

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Numerous insects' species are parasitic and cause significant health problems by their action or as vector of diseases. Insects from the Diptera family are the most important parasites among honey bees. From the family Vespidae we find two genera wasps and hornets. The most widespread is the wasp *Vespula spp*. Wasps are usually present in beehives from August until autumn; when entering the hives and taking honey from bees can cause significant damage; especially to weak societies. In addition to stealing honey from the hive; wasps kill bees that feed to feed the young. From hornets; the most common is the European hornet (*Vespa crabro*). Hornets catch bees in flight and take them to their nests; and they often penetrate hives where they are filled with honey and bees. They pose the greatest threat to bees in August and September. From the order Brachycera we occured two genera *Senotainia* and *Braula. Senotainia* is a genus of satellite flies in the family Sarcophagidae. *S. tricuspis* are widespread. The fly attacks the bees from the hive when they take off; when it bends the back of the body and lays the larva between the bee's head and thorax. The larvae and maggots of S. tricuspis are kleptoparasites and facultative internal parasitoids of adult honeybees. They feed on the hemolymph; pectoral muscles and soft tissues of the abdomen of the bee; which soon dies. *Braula coeca* or bee-louse is not a louse but a fly. It rides around on the body of the bee. When it gets hungry it crawls to the mouth parts; stimulates the bee to regurgitate some honey and then feeds at will. The fly apparently doesn't harm worker bees. The fly larvae tunnel just under honey capping and their tunnels may render honey in the comb unattractive or unsaleable. Newly emerged adult lice congregate on the queen and may result in her early replacement or hindrance in some way.

WHERE TO PLACE ASIAN HORNET TRAPS TO PROTECT APIARIES AND WHICH BAIT MAXIMIZE EFFICACY AND SELECTIVITY?

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Vespa velutina nigrithorax is widely recognised as a threat to honeybees and requires management through preventive and curative beekeeping measures. To reduce the presence of the Asian Hornet (AH) in apiaries; beekeepers turn to mass trapping in summer. A common question arises regarding the positioning of traps and the selection of bait. To provide some insights; we deployed 2 sets of 6 trap combinations in six apiaries across Wallonia; Belgium; from July to November: one within the apiaries and another 50 meters away. The traps utilised included five 'lid traps' with different baits: beer/wine/grenadine (BWG); Trappit Wasp Bait from Agrisense; VespaCatch from Vétopharma; homemade mixture with bananas (MixCRAW); as well as water and one Vetopharma trap with VespaCatch as control items. In total; over the six sites 4549 insects were captured with 1.7 times more in the apiary than at 50m. Regardless of the bait used; 2 to 3 times more AH were captured in the apiary than at 50m. In the apiary; the best bait was Trappit Wasp Bait (n=745) followed by MixCRAW (342); Vespacath (229); and BWG (150). No AH were caught with water and catches with Vetopharma trap with VespaCatch (321) were similar in lid traps with MixCRAW; Vespacath; BWG. Regarding selectivity; for all baits; more non-target insects were caught far the apiary in comparison to AH catches. The best selectivity (avg. 87%) was achieved in the apiary with the lid trap - Trappit Wasp Bait combination. The Vetopharma trap was less selective towards non-target insects both near (avg. 48%) and far (avg. 23%) capturing European hornets; wasps; and other insects rather than AH. From these results; we recommend for summer trapping installing traps close to beehives and using Trappit Wasp Bait to enhance the AH capture efficiency and limit the impact on insect biodiversity.

GENETIC DIVERSITY AND POPULATION STRUCTURE OF ALGERIAN HONEYBEES

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The Algerian honeybee (*Apis mellifera intermissa*) is an indigenous subspecies vital for pollination and honey production in Algeria. Understanding its genetic diversity and population structure is crucial for conservation and breeding programs. In this study; we employed molecular methods; particularly Single Nucleotide Polymorphisms (SNPs); to characterize the genetic makeup of Algerian honeybee populations. Genomic DNA samples were collected from diverse geographic regions across Algeria. Using high-throughput genotyping techniques; we analyzed a panel of SNPs distributed throughout the honeybee genome. Our results revealed significant genetic diversity among Algerian honeybee populations; reflecting historical and geographical factors. Population structure analyses identified distinct genetic clusters corresponding to different geographic regions; indicating limited gene flow and potential adaptation to local environments. Furthermore; we investigated the genetic basis of specific traits related to honeybee health and behavior; shedding light on the underlying genetic mechanisms. This study contributes to the comprehensive genetic characterization of the Algerian honeybee and provides valuable insights for conservation and breeding strategies. Keywords: *Apis mellifera* intermissa; *Apis mellifera sahariensis*; Single Nucleotide Polymorphisms (SNPs); population structure; Algeria

IMPACT OF ACETAMIPRID ON FATTY ACID COMPOSITION IN THE CENTRAL NERVOUS SYSTEM OF HONEY BEES

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The widespread use of neonicotinoid pesticides has raised significant concerns about their impact on non-target organisms; particularly pollinators like Western honey bees (*Apis mellifera*); which are crucial to ecosystem health and integrity. Bee populations are declining at an alarming rate worldwide; and the role of insecticides in this multifactorial process cannot be overlooked. Although the western honey bee is not a target species for these insecticides and acute toxicity is not so common; the effects of sub-lethal doses on behavior remain poorly understood. These sub-lethal effects; however; may be critical to understanding changes in bee behavior. Previous studies in other animal species; along with our own preliminary experiments; suggest that these compounds may affect not only central nervous system receptors but also induce oxidative stress-related processes; disrupting redox homeostasis and impairing fatty acid metabolism. Our research aimed to investigate the sub-lethal effects of acetamiprid; a pesticide widely used in agriculture. The initial phase of the study was conducted at an apiary in Ugod; Veszprém county; Hungary; where we first collected the experimental bees. The selected individuals were placed in specially designed cages that maintained appropriate temperature (30°C) and humidity (90%) conditions. The test groups were then provided with different concentrations of acetamiprid (per os lethal dose (LD)50/10; LD50/20; LD50/40/bee/day) ad libitum for 48 hours. At the end of the treatment period; the bees from each group were euthanized using dry ice and stored at -80°C until further analysis. Subsequently; after dissecting the honey bees' central nervous systems; we homogenized the samples and determined their fatty acid profiles using gas chromatography-mass spectrometry (GC-MS). In conclusion; exposure to acetamiprid adversely impacted the fatty acid metabolism in the brain of bees. Our analysis revealed significant changes in several fatty acid components; including an increase in lauric acid (C12:0) and myristic acid (C14:0) concentrations; which are indicatives of oxidative stress. Additionally; we observed elevated concentrations of linoleic acid (C18:2; n-9;-12); alpha-linolenic acid (C18:3; n-3; ALA) which are being associated with neurodegenerative diseases. Increases in stearic acid (C18:0) palmitic acid (C16:0) were also noted; alongside changes in total saturated fatty acid and total fatty acid levels; mirroring the patterns described above. In light of these findings; it can be concluded that acetamiprid disrupts the fatty acid homeostasis in the central nervous system of bees. Further research is necessary to elucidate the long-term ecological impacts and to develop strategies for mitigating the risks associated with neonicotinoid use.

SPATIAL SYNCHRONY OF VARROA DESTRUCTOR AND COLONY LOSS RATES OF HONEY BEES

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The parasitic mite *Varroa destructor* is a main cause for honeybee colony losses. While population dynamics of V. destructor have been studied comprehensively in and among local colonies; little is known about spatio-temporal dynamics at larger geographic scales. In this paper; we demonstrate that ordinal-based survey data reported by beekeepers have high quality for analysis of geographic-scale population dynamics of V. destructor. Ordinal judgements correlated significantly with published quantitative estimates of prevalence in Germany between 2013 and 2022 and predicted annual loss-rates of winter colonies at regional and national geographic scales. Annual prevalence trends across Germany revealed spatial synchrony but with substantial regional variance within the annual trend. Retrospective epidemiological mapping showed that geographic clusters of prevalence explained

the variance within years. Between years; clusters with relatively low prevalence in one year tended to experience relatively high prevalence (within the annual trend) the following year. This finding implies an auto-correlative response in annual prevalence trends and hence annual colony losses of honeybees. Based on ordinal judgements; geographic-scale prevalence dynamics can be tracked at low cost and trends disseminated rapidly to beekeepers.

VIRAL COMMUNITY INVESTIGATION OF VARROA DESTRUCTOR IN SOUTH KOREA

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A parasite *Varroa destructor*, is known to transfer viral infections to honeybees. However, the composition of the *Varroa*-mediated virus is unknown due to a lack of viral metagenomic research. In this study; we performed shotgun metatranscriptome sequencing to analyze the viral composition associated with *Varroa destructor* collected from six distinct locations of South Korea. The results indicated that the composition of viral community varies by area. Our metatranscriptomic study of *Varroa destructor* reveals the diversity and abundance of viruses; providing vital insights on its role as a vector in the transmission of viral diseases.

DO ELECTRIC HARPS REDUCE *VESPA ORIENTALIS* PREDATION ON HONEY BEE COLONIES?

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Vespa orientalis is expanding its areal to northern territories across Europe and America leading to creation of new interactions with autochthonous species. Social hornets of the Vespidae family are among the invasive species most dangerous for the wellbeing of the honey bee colonies due to their predatory and plundering behavior. It is important to find effective and sustainable tools to protect honey bee colonies from the attacks of *V. orientalis* and keep under control the number of animals in apiaries. Electric harps have been proven effective in protecting hives from *Vespa velutina* by reducing the rate of predation. The main aim of the project is to evaluate if electric harps can be effective also in lowering attacks of *V. orientalis* towards honey bee colonies. The study was carried out from July to October in 2 different apiaries located in the Campania region (Italy). Within each apiary 4 hives were protected by harps and control hives were left unprotected. The number of hunting *V. orientalis* in front of the hives was counted by two observers and by evaluation of camera recordings 20’ per day once every two weeks and once every week; respectively. Moreover; evaluation of the wellbeing of honey bee colonies was assessed by observing the flight of honey bees and pollen carriage for 5’ on camera recordings; and by evaluating resource storage; brood presence and winter loss. We have assisted to a shift forward in the life cycle of V.orientalis compared to the past years; and preliminary results showed a slight reduction in the predation activity of *V. orientalis* and an increase in storage in protected hives. Although to date results appear promising; testing should be performed on a greater time span including a second year.

PESTICIDES IN POLLEN: RESULTS FROM THE GERMAN BEE MONITORING (DEBIMO)

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The German Bee Monitoring has been in existence for 20 years to better understand drivers of colony losses; especially during winter. We have been collecting health measures; such as Varroa destructor infestation; pathogen presence; viral infections; and overwintering success since 2004. Over 120 beekeepers are currently involved nationwide with more than 1200 colonies monitored annually. The overwintering dynamics of these colonies are monitored. Bee; honey and pollen samples for disease and

residue analyses are taken up to three times per year in spring; summer and fall. Although pesticide residue analysis was first added in 2006; it has regularly been part of the annual analysis since 2009.   Here we report the preliminary pesticide residue results for 2211 apiary samples. In the last few years; our multi-residue analysis has been able to look for residues in stored pollen of 475 different pesticides and their metabolites. Honey bees' function like environmental monitors; foraging in a wide radius from their point-source colony. The residues detected thus essentially reflect current agricultural practices within a 2-6 km radius of the apiary; the typical foraging distance of honey bees.

THE INFLUENCE OF THE POLYMINERAL DRUG «APIPLASMA» ON THE METAL CONTENT IN THE *APIS MELLIFERA* L

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Providing honey bees with all the components necessary for proper nutrition (proteins; fats; carbohydrates; and minerals) is the basis for the healthy development and functioning of the colonies. During the autumn feeding of honey bee colonies; beekeepers often use artificial feeds; which are limited in mineral composition and can negatively affect the further development of the colonies. Researchers at Chernivtsi National University have found that "Apiplasma" (APL); (made in Ukraine; Private enterprise Kravchuk V.); a polymineral additive of natural origin with a high content of magnesium ions; has a positive effect on the winter hardiness and the rate of spring development of honey bee colonies; as well as increasing the bees' resistance to temperature and food stress. However; the specifics of mineral metabolism in bees that consume APL are in need of comprehensive research. This study aimed to investigate the effect of the polymineral additive "Apiplasma" on the metal content in the bees during the autumn feeding of *Apis mellifera* L. colonies.   The experiment used three apiaries from western Ukraine. At each apiary; control and experimental groups (15 bee colonies each) were formed. These included various honey bee subspecies (*A. m. macedonica*/*A. m. carnica*; and their hybrids) with no clinical signs of disease. Feeding occurred from late August to early November. The feeding mixtures consisted of a 50% sugar solution and a 50% sugar solution with a 20% honey solution containing the APL drug (0.3 ml/l) for the experimental colonies; while the control colonies did not receive APL. Each colony received 16 liters of syrup. To determine the metal content; worker bees were collected from the colonies immediately after the completion of autumn feeding and on the day of the spring cleansing flight. Wet ashing of the samples (worker bees without the digestive tract) was performed using an Anton Paar Multiwave 5000 reaction platform. The metal content was measured using an atomic absorption spectrophotometer S115-M1. We thank «Donau Lab Ukraine» for the opportunity to use the Anton Paar Multiwave 5000. It was found that autumn feeding of honey bees with sugar-honey syrup containing APL increases the accumulation of iron (Fe) and copper (Cu) in the worker bees during autumn; while the content of calcium (Ca); magnesium (Mg); manganese (Mn); and zinc (Zn) undergoes insignificant changes. Enrichment of sugar syrup with APL during the autumn feeding of colonies leads to an increase in the content of Fe; Mg; Ca; and Mn in the worker bees after wintering in spring. The content of other metals; such as potassium; Zn; and Cu; did not change in these bees. The level of metal assimilation by the bees under the influence of APL depended on the mineral balance in the environment of the apiaries. Thus, the polymineral additive "Apiplasma" corrects mineral metabolism in the honey bees.

EVALUATING THE IMPORTANCE OF AI CHATBOTS IN THE DAILY PRACTICE OF BEE HEALTH EXTENSIONISTS AND ADVISORS

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The introduction of the Large Language Model ChatGPT in 2022 led to a worldwide frenzy in testing this and similar chatbots in every aspect of our business and private life. However, it is important to look beyond the momentary hype in order to identify the potentials of such tools to solve given problems to be able to evolve these tools. Here we focus on the possibilities of AI chatbots to support beekeeping advisors and extensionists in their daily work. Their job description requires them to be experts in a multitude of different topics regarding beekeeping and bee health – dependent on the special needs of particular beekeepers or on the necessity to find solutions for acute bee health problems. Advisors need to keep in mind to find solutions within the legal

framework; which also differs among countries. In their daily work; they rely on broad knowledge and long experience as well as on a network of co-advisors and scientists. However, AI chatbots could act as additional tools; which assist them in summarising; structuring and exploring upcoming topics; and thus, may be useful and timesaving. This technology stands in strong contrast to the practical hands-on mentality; which is essential for beekeeping and advising. To be able to use it efficiently and responsibly; it needs the user to experiment with text input; compare different chatbot outputs and even to understand the basic principles of the underlying technology. Thus, we need to understand how the advisor community evaluates the technology in order to understand if they are open to adapt it into their working routine. At the 20th COLOSS conference; we expect to meet beekeeping advisors and researchers engaging in advising to be open to new developments and therefore to be potential early adapters for AI technologies. We are going to present a poster enabling the audience to interact and contribute to its content with the aim of asking the conference participants (1) about their own acceptance level of AI chatbots during advisory tasks as well as (2) the advantages and pitfalls of the named technology in regards to bee health advisory services. This interactive poster is part of the recent research focus on AI technology in advisory service by the COLOSS core group B-RAP.

COLOSS-MEMBERS AND THEIR ACTIVITY IN THE COLOSS-NETWORK

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The COLOSS B-RAP (Bridging Research and Practice) core project was created in 2014 with the specific intention to deal with knowledge transfer and capacity building in the beekeeping sector. In the course of its 8 workshops so far; we created and conducted a survey in order to learn more about how the COLOSS-members are involved in knowledge transfer and which tools they use. A part of the survey questions was also dedicated to the COLOSS-activity of the members and gives thus an insight into they way members are attached to COLOSS. The survey was conducted online in May and June 2019 and was answered by 150 persons (12% of the COLOSS members) from 49 countries from all inhabited continents. We asked the participants about their engagement in workshops; COLOSS related publications and the promotion of the COLOSS network. 57 % of the participants stated that they attended at least one workshop. The group of workshop-participants (WP) were also active in COLOSS-related publications (72 %) and promoted COLOSS by citations (92 %); acknowledgements (92 %); and logo use (75 %). The other 43 % of the survey participants; which didn’t attend any workshop yet (non-WP); were generally also less involved in other activities: 20 % of the were co-authors in COLOSS-related publications; 63 % cited COLOSS-publications; 54 % promoted COLOSS by acknowledgements and 17 % by logo use. Interestingly; the non-WP differ significantly in their interest in some of the COLOSS topics from the WP. 70% of them are interested in the Monitoring of Colony losses (WP: 49%; $Chi^2=6.04$; df=1; P=0.014) and 45 % in the Sustainable Bee Breeding (WP: 27 %; $Chi^2=4.37$; df=1; P=0.037). The data shows two different groups of attachment in COLOSS: a group of actively participating COLOSS-members; who also promote the network strongly; and a second group of interested members; who show also dedication to the network through promotion work; but who may have different interests in the COLOSS-network than the ‘visible’ and active members.

IMPACT OF TEBUCONAZOLE ON HONEYBEE FLIGHT MUSCLES: DISRUPTION OF REDOX HOMEOSTASIS AND ADAPTIVE RESPONSES

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Recent studies have highlighted that the widespread and excessive use of the azole fungicide tebuconazole in agriculture poses a significant threat to pollinator species; including honeybee colonies. This issue is becoming increasingly important due to the intensification of modern agriculture and the growing use of chemical agents; representing a serious problem from both ecotoxicological and agricultural perspectives.   The current study aims to assess the effects of acute sublethal exposure to tebuconazole; with a focus on the redox homeostasis of honeybee flight muscles. The results indicate that redox homeostasis;

particularly the glutathione system; is severely disrupted in exposed bees. However, the flight muscles manage to counteract the negative effects through the activation of protective processes. This successful adaptation may have led to overcompensation; resulting in lower concentrations of hydrogen peroxide and malondialdehyde after exposure. It is also suggested that tebuconazole may exhibit a non-monotonic dose-response curve; similar to other substances with endocrine-disrupting activity; in various tested parameters such as superoxide dismutase activity and total antioxidant capacity.   These findings highlight the harmful impact of tebuconazole on the redox balance in honeybee flight muscles; while also noting that; unlike other organs such as the brain; flight muscles may effectively adapt to acute oral tebuconazole exposure. All these data can contribute to a better understanding of the effects of agricultural pesticides and thus to the development of new protection strategies to mitigate adverse effects and reduce colony losses.

TURNING THE TABLES: PREVENTION OF BEEKEEPERS PARTICIPATION LOSSES IN THE COLOSS SURVEY

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Managed honey bee colonies (*Apis mellifera*) are crucial for pollinating crops; biodiversity and producing hive products that supports farmers and beekeepers. Despite a rise in managed colonies over recent decades; high rates of colony losses persist. This issue has led to the development of standardized; large-scale monitoring programs; particularly in Europe. The COLOSS monitoring survey is one such program that has collected data from 37 participating countries. Through centralized data collection and analysis; it has made significant contributions to identifying risk factors; such as floral resource availability; beekeeping management practices; and climate conditions. The COLOSS's mission involves both expanding the network of participating countries and increasing the participation rate of existing ones; which requires substantial annual efforts to engage beekeepers. Currently; about 4% of European beekeepers participate in the survey; but participation rates vary widely between countries; ranging from

DISACCHARIDES IN HONEY

Mohammad Forsi

The sugar composition of honey has been extensively studied by scientists worldwide. The primary sugars identified in honey are fructose; glucose; and sucrose (Fuente; Ruiz-Matute; Valencia-Barrera; Sanz; & Castro; 2011). Monosaccharides constitute about 75% of the sugars in honey; while disaccharides account for 10–15%; along with small amounts of other sugars (Kamal & Klein; 2011). Researchers have identified at least 14 different disaccharides in honey (Fuente; 2006; Bogdanov; 2004). This article discusses the health benefits of honey's disaccharides and details the structure; formation; and transformation of 16 disaccharides; illustrated using PowerPoint animations.

QUALITY OF QUEEN BEES INSEMINATED WITH FRESH AND STORED SEMEN

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The aim of the study was to evaluate the quality of honey bee queens inseminated with fresh semen and semen stored in different conditions. The semen from honey bee drones was collected into capillaries of 100 µl each. Filled capilaries were stored in room conditions for 1 to 6 weeks and in cooling conditions at the temperature of 14±1°C for 1 to 15 weeks. Semen quality control was conducted immediately after semen collection to determine its original quality and after storage. We also used fresh and stored semen to inseminate honey bee queens. Some of the queens were placed in the queen bank (in two-chamber cages with worker bees) and others were introduced into mating hives to check their survival and oviposition.   The following parameters were determined in the study: - concentration and viability of spermatozoa in 1 µl of fresh and stored semen - rate of survival and oviposition of inseminated queens - condition of the oviducts; concentration and viability of spermatozoa in spermatheca Spermatozoa counts in semen from capillaries and spermathecae; were evaluated in Bürker counting chambers. The ratio of live to dead sperm was assessed using the Live/Dead Sperm Viability Kit (Invitrogen™ by ThermoFisher Scientific); consisting of SYBR-14 and propidium iodide; was observed under a fluorescence microscope. The results indicate that spermatozoa viability in semen stored in cooling conditions for 1 to 6 weeks and at the room temperature for 1 to 3 weeks was high (75 to 92%); but significantly decreased with the time of storage. The concentration of spermatozoa in stored semen ranged from 5.5 to 7.5 million in 1 µl. Among the inseminated queens introduced into mating hives 82;5% started eggs laying after an average of 11.5 days. Almost 90% of dissected queens emptied the oviducts. It was found that the period and temperature of semen storage and conditions of keeping inseminated queens affected the number of spermatozoa; their concentration and viability in spermatheca. Research project entitled Storage of semen of honey bee drones a guarantee of maintaining the gene pool of bees with the highest breeding and utility value founded by Polish Ministry of Education and Science; CONTRACT No MEiN 2022 / 181319 August 2022

NATIONWIDE SURVEY OF HONEY BEE VIRUSES IN SOUTH KOREA IN 2024 USING BIOINFORMATICS TECHNOLOGY

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In recent years, the honey bee population in South Korea has experienced significant declines due to issues such as wintering failure and colony disappearance. Various factors; including mites; viruses; and climate change; are believed to have contributed to these declines. Among these, virus-related research has been relatively limited in South Korea. In 2022; the first study on honey bee viruses in South Korea was conducted using virome analysis based on high-throughput sequencing (HTS). This current study extends that research by conducting a comprehensive virome analysis of honey bee population across South Korea. The goal is to investigate the distribution of honey bee viruses; as well as identify any novel or previously unreported viruses present in the Korean honey bee population. Samples were collected from 79 honey bee colonies across 46 cities and provinces nationwide; excluding the Jeonbuk region. A total of 20 pooled samples underwent virome analysis using HTS. A comparison between the 2022/23 data and this study's findings revealed that the black queen cell virus (BQCV) was present in all samples. Additionally, viruses from the Lake Sinai virus group (LSVs) were detected as co-infections; with at least two species identified in every region each year. Surprisingly, despite the global prevalence of deformed wing virus (DWV) type B; this variant has not yet been detected in South Korea. The absence of DWV type B in South Korea; along with the persistent detection of LSVs—which pose a potential threat to honey bee health—highlights the need for ongoing and periodic monitoring of honey bee viruses in South Korea.

BPA CONTAMINATION RISK IN PROPOLIS PRODUCTION

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Propolis is a bee product produced from plant resins collected by honey bees. In general, its natural structure contains 50% resin and herbal balsam; 30% beeswax; 10% essential and aromatic oils; 10% pollen and other organic substances. In research; propolis has been revealed that it has many beneficial biological activities and pharmacological properties such as antibacterial; antiviral; antioxidant; anti-inflammatory; immunomodulatory; immunostimulating; hepatoprotective and cytotoxic.However; due to both environmental factors and beekeeping practices; propolis is exposed to many contaminants. Especially propolis production is carried out extensively in our country using plastic traps. It can be seen that the plastics of the plastic traps used meet very wide

quality standards. Bisphenol A; known as BPA in poor quality plastics; is one of the chemicals found in plastic and epoxy resin that threatens health. In Turkey, the use of BPA in packaging and plastics that come into contact with food was banned by the Ministry of Agriculture and Forestry in 2011. For this reason. our preliminary experiment aimed to determine the possible contaminant levels created by plastic traps; which are the most important source of contaminants resulting from beekeeping practices in propolis production. It is thought that propolis may be contaminated by bisphenol A migration from plastic traps in regions where beekeeping is carried out at high temperatures. Bisphenol A is an endocrine disrupting chemical and is specifically banned from food intake in many countries due to contamination by some chemicals found directly in foods or their packaging. In this preliminary study; the BPA content of a total of 20 propolis traps in two different colors; purchased from a company selling bee products; was analyzed. 0.06 ppm BPA was detected in the analyzed green propolis traps. This study emphasizes the importance of performing BPA analysis in propolis used for health purposes and obtained using plastic traps.

PREVALENCE OF VIRUSES IN PALESTINIAN HONEYBEE COLONIES

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Honey bees are critical for agricultural crops pollination. However, many countries have reported high annual colony losses caused by multiple possible factors. Diseases; including those caused by viruses of honey bees; are a significant cause of colony losses. However, nothing is known about the occurrence of viruses of honey bees in Palestinian honey bees. Therefore, eighty colonies from eight apiaries in Bethlehem and Hebron governorates were randomly selected and screened for the presence of 15 viruses of honey bees via quantitative PCR technique. Ten viruses were detected among which the Black Queen Cell virus (BQCV) was the most prevalent (96 % of all colonies) followed by Deformed Wing viruses (DWV) A (77%) and B (72%) and a new emerging virus; the Big Sioux River virus (BSRV; 70%). Other viruses (*Apis mellife*ra filamentous virus (AmFV); Lake Sinai virus 1 (LSV-1); Acute Bee Paralysis virus (ABPV); Sacbrood virus (SBV); Israeli Acute Paralysis virus (IAPV); and Chronic Bee Paralysis virus (CBPV) had lower colony prevalences ranging between 9 -29%. The study showed that most of the viruses were present in all apiaries; and multiple virus infections per colony were common in all colonies. Our findings fill a knowledge gap about the prevalence of viruses of honey bees in Palestine; which could assist in protecting the Palestinian beekeeping industry.

MANAGED HONEY BEE COLONY LOSSES AND CAUSES DURING THE ACTIVE BEEKEEPING SEASON 2022/2023 IN NINE SUB-SAHARAN AFRICAN COUNTRIES

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This study reports for the first-time managed honey bee colony loss rates and associated risk factors during the active beekeeping season 2022/2023 in nine Sub-Saharan African countries; namely Kenya; Ethiopia; Rwanda; Uganda; Benin; Liberia; Nigeria; Cameroon and Democratic Republic of the Congo. The sustainability of bee swarm catches as a main honey bee colony source tool for operation expansion by African beekeepers was also evaluated in Kenya and Ethiopia. In this survey; the 1;786 interviewed beekeepers across these countries collectively managing 41;761 colonies registered an overall loss rate of 21.3%; which varied significantly among countries (from 9.7 to 45.3%) and hive types (from 10.6% in hives with movable frames to 17.9% in frameless hives). The perceived causes of losses in order of significance were issues beyond the beekeeper's control (mainly theft; drought; and bushfire); absconding and pests (mainly wax moth; small and large hive beetles; ants and Varroa destructor mite); but this pattern varied greatly across countries. Among the management practices and characteristics; migratory operations and professional beekeepers experienced lower losses than stationary operations and semi-professionals and hobby beekeepers. Insights into the number of bee swarms caught revealed significant decreases in swarm availability over the past three years in Kenya. The opposite situation was observed in some regions of Ethiopia. These trends require further investigation. Overall, this comprehensive survey sheds light on the complexities and challenges beekeepers faced in Sub-Saharan Africa; pointing to the need for targeted interventions and sustained research to support the resilience and growth of the apicultural sector.

AN INSIGHTFUL VIEW: IN-HIVE FLATBED SCANNERS FOR NON-INVASIVE LONG - TERM BEHAVIOR AND DISEASE MONITORING OF HONEY BEE HIVE COMBS

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Honey bee colonies face significant threats from pathogens and pests; including chalkbrood disease caused by *Ascosphaera apis* and *Varroa destructor* mites. Traditional monitoring methods for these issues are often invasive and disruptive; hindering continuous and detailed observations. This study introduces a novel; non-invasive monitoring technique using a modified flatbed scanner integrated into a honey bee brood frame. The scanner; housed within a Dadant frame and connected to a Raspberry Pi; captures high-resolution images of the brood cells at regular intervals. This approach facilitates real-time observation of the brood lifecycle; including egg laying; larval development; and the presence of pathogens and mites. Over a three-month pilot study; the scanner successfully monitored 419 cells; capturing 2,819 images of each cell and documenting critical events such as Varroa infestations and chalkbrood development. The method demonstrated high-resolution imaging capabilities; enabling detailed analysis of pathogen dynamics and hygienic behaviors like Varroa-sensitive hygiene (VSH) without disturbing the colony. The results revealed a high frequency of brood removal and pathogen detection; providing insights into the natural behaviors of honey bees and their interactions with pests.

ASSESSMENT OF *APIS MELLIFERA* HEALTH IN RELATION TO *VARROA* SP. INFESTATION AND MORPHOMETRIC ANALYSIS OF THE MITE IN TWO PHYTOGEOGRAPHIC ZONES OF BURKINA FASO

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Varroa mite threatens *A. mellifera* and beekeeping by affecting pupae; causing viral diseases associated with colony collapse. This study investigates its prevalence and infestation level; and morphometric characterization in two phytogeographic zones of Burkina Faso (Southern Sudanese and Northern Sudanese). We randomly visited 238 hives from 48 apiaries in 9 provinces. In each hive,

phoretic *Varroa* mites were detected through a 70% alcohol wash. Once in the laboratory; 7 morphometric characters were measured on 1 to 10 varroa mites per hive. According to these measurements; the mites were identified as *Varroa destructor*. Data analysis reveals that 91.6% of the colonies studied are infested with *Varroa*. In the Northern Sudanese zone; the provinces of Bazèga and Zoundwéogo show high infestation level (5.93 % and 7.18% respectively); while in the Southern Sudanese zone; Ziro and Nahouri exhibit the highest level (9.00 % and 8.19%). In terms of body length and width (BL and BW); *Varroa* mites from the Southern Sudanese zone display averages of 1.177 ± 0.048 mm and 1.764 ± 0.050 mm; while those from the Northern Sudanese zone have averages of 1.167 ± 0.040 mm and 1.754 ± 0.055 mm. These morphological differences are statistically significant ($P \leq 0.05$); highlighting variability that may result from local adaptations or genetic variations. The morphological diversity of this parasite has implications for its biology; dispersion; and virulence towards bees. Future studies should explore genetic factors influencing parasitic dynamics and bee resistance for effective management strategies.

DATA FOR GOOD - CREATING FRAMEWORKS FOR COMMUNITY BUILDING STANDARDISED DATA

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BeeLife European Beekeeping Coordination; Brussels; Belgium ZIP Solutions; Maribor; Slovenia

After 5 years of experience generating the infrastructure to share and standardize pollinator related data; the EU Pollinator Hub (https://pollinatorhub.eu) is ready and operative. The EU Pollinator Hub is a collaborative platform enhancing pollinator health through data integration and dissemination. It serves as a comprehensive repository with capacity for data peer reviewing; ensuring that research data; once published; complies with FAIR principles: Findability; Accessibility; Interoperability and Reusability. In the Hub; researchers and stakeholders share harmonized data on pollinators and the environment. The Hub supports community engagement and collaboration; offering tools for working on data within a close team; data visualization and analysis. It emphasizes data standardization for consistency across studies and features APIs for real-time data updates. Educational initiatives and workshops raise awareness about pollinator health. Data security is prioritized; with contributors able to control their data's visibility and usage. Overall, the Hub is a pivotal resource for improving understanding and actions towards pollinator sustainability in Europe.

POLLINATOR HUB - A TOOL TO BOOST POLLINATOR RESEARCH WITH A COMMUNITY LOGIC

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The decline in insect pollinator populations has emerged as a significant global concern; with beekeepers and researchers alike noting alarming trends in both diversity and numbers. These declines pose serious risks to ecosystems and industries reliant on pollination; highlighting the urgent need for comprehensive; accessible data to inform conservation and management strategies. The Pollinator Hub; developed by the EU Bee Partnership; is an innovative platform designed to meet this critical need. By centralizing and standardizing data from various sources; the Pollinator Hub serves as a crucial tool for the bee research community; offering a robust repository for pollinator-related data that adheres to the FAIR principles (Findable; Accessible; Interoperable; Reusable). The Pollinator Hub empowers researchers and beekeepers by providing a platform for data curation; profiling; and dissemination. Each dataset uploaded to the Hub receives a Digital Object Identifier (DOI); transforming the data into a citable publication and enhancing its visibility and impact within the scientific community. The platform's horizontal approach ensures that users can maintain control over their data while contributing to a shared resource that benefits the entire research community. Furthermore; the Pollinator Hub facilitates the generation of new insights by providing tools for data analysis and visualization; making it accessible even to those with limited technical expertise. Beekeepers who collect field data but may lack the resources to analyze it can leverage the Hub's analytical capabilities; while researchers can access a wealth of curated data to support further studies. This communal approach not only enhances the quality and accessibility of pollinator data but also fosters collaboration among stakeholders; helping to build a more cohesive understanding of pollinator dynamics. In summary; the Pollinator Hub is more than just a data repository; it is a dynamic; community-driven tool that plays a pivotal role in advancing pollinator research. By ensuring that data is FAIR-compliant; citable; and centralized; the Hub supports a diverse community of researchers and practitioners in their efforts to understand and mitigate the factors driving pollinator decline. As a source of high-quality; accessible data; the Pollinator Hub stands to become an indispensable resource for future research and a cornerstone in the global effort to protect pollinators.

DEVELOPMENT OF A RAPID AND ACCURATE DIAGNOSTIC METHOD FOR DEFORMED WING VIRUS USING ISOTHERMAL AMPLIFICATION

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Isothermal amplification techniques have recently gained widespread use for pathogen diagnosis; offering a simpler alternative to the polymerase chain reaction (PCR) by amplifying target genes under constant temperature conditions. Among these techniques; recombinase polymerase amplification (RPA) stands out for its ability to rapidly amplify target genes within 20 to 30 minutes at approximately 37°C. In this study; we developed a rapid and accurate diagnostic method for detecting deformed wing virus (DWV) in honey bees using one-step reverse transcription RPA (RT-RPA). Using the TwistAmp® Basic kit supplemented with RevertAid Reverse Transcriptase; we successfully developed a one-step RT-RPA protocol for DWV detection. Prior to this; we designed an optimized primer set and fine-tuned the reaction conditions; adjusting variables such as temperature; time; primer concentration; and magnesium ion concentration. For further efficiency, we simplified the nucleic acid isolation process using QuickExtract™ DNA Extraction Solution; allowing direct use of supernatants for diagnosis. This streamlined approach reduced the overall time from nucleic acid extraction to diagnosis by approximately one-third. In addition to significantly shortening the diagnostic process; this method also holds great potential for field applications due to its simplicity and speed; making it an ideal tool for rapid; on-site diagnosis of DWV in honey bee populations.

VIRAL INFECTION AND CHEMICAL CUES IN HONEY BEE PUPAE

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The combination of the parasitic mite *Varroa destructor* (Varroa) and the viruses it vectors are major drivers of honey bee (*Apis mellifera*) colony mortality. These include the deformed wing virus master variants (DWV-A; DWV-B); acute bee paralysis virus (ABPV); and its variant; Israeli acute paralysis virus (IAPV). In general; it is to the colony’s advantage for adult bees to eliminate infected brood before it is infectious or when the viral load is low because this would limit pathogen spread. The detection of infected pupae by adult bees is influenced by the olfactory sensitivity of adult bees and the intensity of olfactory cues emanating from the brood. In this study; we tested the dose-dependent effects of pupae inoculation with DWV and IAPV variants on pupal development; survival; and chemical profiles independently of *Varroa* infestation. Worker pupae at the white-eye stage were injected with IAPV and DWV-enriched inocula at high; medium; and low concentrations. Mock-inoculated (PBS only) and untreated pupae were used as a control. No negative effects in terms of development or mortality following PBS injection were observed. Both control treatments; PBS and non-injected pupae; contained detectable viruses at 5 days post-injection; but these loads were significantly lower than those of the virus-injected pupae. Discriminant analysis of chemical profiles revealed that PBS and non-injected pupae had similar profiles; whereas the profiles of IAPV and DWV-injected pupae clustered separately. Our findings indicate that viral infection without *Varroa* infestation induces changes in volatile profiles emitted by the pupae.

THE EFFECT OF SOME HERBAL ESSENTIAL OIL APPLICATIONS ON THE EXPRESSION LEVELS OF CHEMORECEPTOR; CHEMOSENSOR AND NEUROTRANSMITTER GENES IN VARROA MITES

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To prevent economic losses due to Varroa mites causing colony weakening; it is aimed to detect the effective essential oils that are not harmful to honey bees and are lethal for Varroa mites. The use of organic acaricides to block the chemoreceptor senses of the Varroa mite; which is responsible for finding hosts and food; is one way to combat it. The effect of 5 different essential oils compounds (Peppermint (Mentha x piperita L.) and Thyme (*Origanum onites* L.) with high toxic effect); Eucalyptus (*Eucalyptus globulus* Labill.); and Lavender (*Lavandula angustifolia* L.) with low toxic effect; and Pine turpentine with anesthetic effect (2 heptatone effect *Pinus terebinthinae* L.)) in 3 different doses (0;1 ppm; 1 ppm; and 10 ppm); on Varroa mites (*Varroa destructor*) in 3 different feeding (Group A; honey bee larvae; Group B; honeybee fat body; Group C; live bee feeding) together with negative control and ethanol control groups was determined. Our research addresses blocking the chemoreceptor senses of the *Varroa* mite to able to prevent their food and host finding by using essential oils as an organic acaricide. The effects of these essential oils on the *Varroa* PRTF-like gene and ionotropic glutamate receptors (IGRs) - IR25a-like gene which are important for the successful host finding of Varroa destructor mites; and GABA-activated RDL receptors gene which is required for neurological functions such as movement control; olfactory learning; and regulation of sleep and aggression in peripheral nervous systems determine in this study for the first time. Our results indicate that eucalyptus as both fast- and long-acting and thyme as fast-acting organic acaricides were determined as the best acaricides for the *Varroa* mite that feeds on live honey bees while pine turpentine in all observation hours on live honey bees have the potential *Varroa* mite acaricide has almost 100% effectiveness. The study reveals that thyme was the most sensitive in the rapid expression of IGRs and PRTF genes; while lavender was the most sensitive in the prolonged expression of the GABA gene when *Varroa* mites fed on live honey bees.

MONITORING OF *VESPA VELUTINA* AND *VESPA ORIENTALIS* IN ITALY AND BEEKEEPERS' PERCEPTION OF HORNET IMPACT ON HONEY BEES

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In Italy the genus *Vespa* is represented by *Vespa crabro*; *Vespa orientalis* and *Vespa velutina*. The first two are native species; while the third is an invasive alien species introduced in our country in 2012. *Vespa crabro* has always occupied mainland Italy and Sicily; but in 2010 it also reached Sardinia; where it is considered an alien species. The original distribution range of *Vespa orientalis* was limited to the southern regions of Italy. In recent years; however; this species has been spreading northward; where it is considered a neo-native species. The presence of *Vespa velutina* in Italy currently affects only a limited number of regions; primarily Liguria and Tuscany; where it is now permanently established. Reports in Emilia-Romagna; Veneto and Lombardy regions; on the other hand; are sporadic and limited to a few provinces. In 2015 was created Stopvelutina; an Italian network of research institutions and beekeepers. The aim of the network is to monitor and control the spread of *V. velutina* in Italy and; in recent times; to track the diffusion of the neonative *V. orientalis*. To this end, the website www.stopvelutina.it allows citizens to report sightings of these species. From the beginning of Stopvelutina to date; the website has received more than 8;000 reports; of which about 11;5% concerned *V. velutina* and 6;6% *V. orientalis*. Despite the high number of inaccurate reports; the platform remains a valuable tool for monitoring the spread of *V. velutina* and *V. orientalis* in Italy and detecting new outbreaks. Furthermore; to investigate beekeepers' perception of the presence and the damages caused by *V. crabro*; *V. velutina*; and *V. orientalis* in Italian apiaries; a questionnaire was developed and distributed among beekeepers. The aim is to understand the perceived impact of these species on honey bee health and the control strategies adopted by beekeepers to menage the infestation. Over 500 questionnaires were completed and respondent beekeepers reported a limited impact and an infestation relatively contained. This result may be influenced by the high number of responses from regions where *Vespa velutina* and *Vespa orientalis* are present at low densities. The most used defence technique by beekeepers is the bottle trap with beer; followed by the identification and neutralization of nests. The incorrect reports received on Stopvelutina and the misidentification of hornet species in the completed questionnaires highlight the critical need to increase public awareness about the different hornet species and their characteristics.

UNCONTROLLED HYBRIDIZATION THREATENS THE EXISTENCE OF INDIGENOUS BEE BREEDS IN UKRAINE

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Yuriy Fedkovych Chernivtsi National University, Ukraine

Adaptation of western honey bee*; Apis mellifera* L. to local environmental conditions in specific geographic areas leads to its differentiation into numerous subspecies; which formed the basis for modern breeds. Ukraine is the natural distribution area of three honey bee subspecies: A. mellifera carnica; *A. m. macedonica*; and *A. m. mellifera*; represented by the Carpathian; Ukrainian steppe; and Dark European breeds; respectively. The Grey Caucasian breed (subspecies A*. m. caucasica*) can also be found in Ukraine; as it was actively imported in the second half of the 20th century. However; morphometric analysis has shown that a significant part of honey bees today is represented by hybrid forms; which likely arose as a result of spontaneous interbreed hybridization due to uncontrolled importation of bees from different regions. To determine the origin of these hybrid forms; we conducted genotyping using mitochondrial molecular markers. For this purpose; we developed a rapid SNP analysis method for the CoxI gene and the CoxI-CoxII intergenic region using PCR-RFLP. A total of 223 colonies from 94 apiaries in 15 regions were genotyped; allowing us to identify 85 colonies (38.1% of the total) with the mitotype Mit D (Ukrainian steppe breed); 83 colonies (37.2%) with Mit B (Carpathian breed); and 52 colonies (23.3%) with Mit C (Grey Caucasian breed). The Dark European breed was not found in the studied apiaries. The high prevalence of the Ukrainian steppe and Carpathian breeds; considered the main ones in Ukraine; seems quite predictable. However; the widespread presence of the genetic material of the Grey Caucasian breed in Ukrainian populations is somewhat unexpected. In addition; 3 bee colonies (1.3%) were identified with the mitotype Mit A; characteristic of Western European *A. m. carnica* lines. This result indicates that the current importation of honey bee breeding material from European countries is on a small scale. Overall, it should be emphasized that widespread violation of honey bee zoning regulations across Ukraine creates conditions for uncontrolled hybridization and threatens the existence of aboriginal breeds. Based on the available information; the spread of the Carpathian and Grey Caucasian breeds into territories not typical for them should be considered a result of anthropogenic introduction. At the same time, the expansion of the Ukrainian steppe breed into the territory of western Ukraine appears to be a natural process related to climate change.

FORAGING BEHAVIOUR OF *APIS DORSATA* AND *EPISYRPHUS BALTEATUS* IN PESTICIDE TREATED FIELDS OF ONION

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This study investigated the impact of two synthetic insecticides; fipronil and lambda-cyhalothrin; on the foraging behavior of major insect pollinators—*Apis dorsata* (representing *Apis* species) and the dipteran fly *Episyrphus balteatus* (non-Apis)—in onion crops grown from 2020--2022 at the experimental farms of Dr. Y. S. Parmar University of Horticulture and Forestry in Nauni; Solan; India. Observations of the foraging speed and foraging rate of these pollinators were recorded. The results indicate a decline in foraging speed and foraging rate for *A. dorsata* in the fipronil-treated crop; with significant reductions observed up to the 5th day (6.83 sec/flower and 7.66 flower/min; respectively). In the lambda-cyhalothrin-treated crop; these reductions occurred up to the 6th day (11.16 sec/flower) and 4th day (7.16 flowers/min) for the foraging speed and foraging rate; respectively. Overall; in the fipronil-sprayed field; *A. dorsata* visited more flowers (averaging 6.54 flowers/min) and spent less time per flower (10.16 sec/flower); and in the lambda-cyhalothrin-treated field; it visited 9.67 sec/flower and 6.37 flowers/min in lambda-cyhalothrin. For *Episyrphus balteatus*; a decline in foraging speed and foraging rate was noted up to the 5th day in the fipronil-treated crop (7.00 sec/flower and 8.16 flower/min; respectively) and up to the 5th day in the lambda-cyhalothrin-treated crop (8.16 sec/flower and 8.66 flower/min; respectively). In the fipronil-sprayed field; *Episyrphus balteatus* visited more flowers (averaging 7.57 flowers/min) and spent less time per flower (7.87 sec/flower); whereas in the lambda-cyhalothrin field; the corresponding figures were 7.82 sec/flower and 8.10 flowers/min.

INVESTIGATING PLANT VIRUS DYNAMICS THROUGH HIGH-THROUGHPUT SEQUENCING DATA FROM HONEY BEES IN THE PUBLIC SRA DATABASE

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Honey bees; as vital pollinators; play an indispensable role in sustaining global ecosystems. While they are vulnerable to numerous viruses; their extensive foraging behavior exposes them to a wide variety of pollen sources; raising the possibility that honey bees could serve as vectors not only for honey bee-specific viruses but also for plant viruses. In this study; we explored this hypothesis by conducting an in-depth analysis of plant viruses in honey bee samples using data from the NCBI Sequence Read Archive (SRA). Through reanalysis of high-throughput sequencing datasets; we detected a range of plant viruses in addition to those previously reported. Our findings revealed significant variations in virus distribution; influenced by the timing of sample collection and the geographical origins of the samples. As the availability of viral genomic data continues to grow; driven by advancements in next-generation sequencing and bioinformatics; this approach offers a powerful tool for uncovering plant viruses in pollinator insects like honey bees. This study highlights the potential of leveraging publicly available genomic data to unravel the complex interactions between pollinators; plant viruses; and their ecosystems. Our results provide valuable insights for improving the monitoring and management of plant virus outbreaks and reinforce the importance of honey bees in the broader context of plant health.

THE CRITICAL ROLE OF OMEGA-3 FATTY ACIDS IN HONEYBEE NUTRITION

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Honey bees (*Apis mellifera*) play a vital role in agricultural pollination; yet their populations are in decline; partly due to nutritional deficiencies. Pollen; the primary source of protein and fatty acids for bees; varies significantly in composition; particularly in essential omega-3 and omega-6 fatty acids. Modern agricultural practices; especially monoculture farming; limit bees to unbalanced pollen diets; potentially leading to malnutrition. While the importance of omega-3 fatty acids in mammalian cognition is well established; their effects on honey bee physiology and cognition remain underexplored. This study investigates the impact of omega-3 deficiency on honey bee cognitive and physiological performance; focusing on learning ability through Proboscis Extension Response (PER) assays. Experiments were conducted on both entire colonies and small groups of bees; using artificial and pollen-based diets either rich or deficient in omega-3 fatty acids. Fatty acid composition in bee bodies and brains was measured; alongside the size of the hypopharyngeal glands; which are crucial for producing brood food. Additional experiments evaluated the influence of omega-6:3 ratios and total lipid concentrations on learning; brood-rearing; and survival. Bees deprived of omega-3 showed impaired learning abilities and reduced hypopharyngeal gland size. Diets with a high omega-6:3 ratio (5) resulted in poor learning performance; brood development; and survival. The optimal omega-6:3 ratio of 1; combined with a 4% total lipid concentration; improved cognitive function and survival rates; while brood-rearing peaked with an 8% lipid concentration. This study underscores the critical role of omega-3 fatty acids in honey bee cognition and physiology; akin to their importance in mammals. Moreover, it highlights the essential role of balanced nutrition in maintaining honey bee resilience. Poor diets not only diminish cognitive performance but also affect brood development and longevity; factors crucial to the survival of colonies. The findings suggest that imbalanced or deficient diets may exacerbate stressors like disease and environmental pressures; ultimately contributing to colony collapse. Looking forward; addressing the nutritional needs of honey bees should be a priority in sustaining bee health and; by extension; global food security. This calls for the development of diverse forage landscapes; the reduction of monoculture dependency; and the design of nutritionally balanced supplements. Future research should explore more refined dietary formulations and interventions that mitigate the effects of poor nutrition; ultimately supporting honeybee resilience in an increasingly industrialized agricultural landscape. By understanding and optimizing honeybee nutrition, we can help fortify colonies against the myriad challenges they face today.

MONITORING OF MULTIPLE BEE-HAZARDOUS PESTICIDES

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Exposure to pesticides is one of the main drivers to global bee decline. However, the occurrence of pesticides in bee-attracting crops remains underexposed due to the lack of efficient on-site screening approaches for multi-analyte monitoring. Utilizing color-encoded superparamagnetic microspheres; we constructed a portable 8-plex indirect competitive microsphere-based immunoassay for the simultaneous determination of multiple bee-hazardous residues (Bee-Plex). Through a single measurement

within 40 min; Bee-Plex exhibited high sensitivities with IC50 values of 0.04; 0.08; 0.14; 0.15; 0.78; 0.86; 7.72; and 8.79 ng/mL for imidacloprid; parathion; fipronil; emamectin; carbofuran; chlorpyrifos; fenpropathrin and carbaryl; respectively. Moreover; the implementation of multiple broad-specific antibodies enables a wide-range screening profile for 30 pesticides and pesticide metabolites; detecting 6 neonicotinoids; 6 N-methyl carbamates 6 organophosphates; 5 avermectins; 5 pyrethroids and 2 phenylpyrazoles. The combination of Bee-Plex screening (93% accuracy) and LC-MS/MS confirmatory analysis revealed contaminations of neonicotinoids (100%) and avermectins (70%) in roses; with occurrence frequencies of 79%; 79%; 21%; 21%; 7%; and 7% for imidacloprid; acetamiprid; clothianidin; thiacloprid; imidaclothiz; and nitenpyram; respectively. Above all; this study offers a powerful analytical tool for rapid screening of multiple bee-hazardous pesticides; offering new insights in the occurrence of multi-pesticide contamination in ornamental plants.

Mass Death Of Bees In Russia, Its Features And Some Patterns.

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In the summer-autumn period of 2014, a high death rate of bee family's without obvious signs of any diseases was observed for the first time in Russia. The features of the condition of the lost families are shown and some patterns in their death are revealed. Colony losses occurred mostly before winter. It was found that a higher death rate of bees was observed in apiaries that had recently acquired imported bees. The vector of spread of mass asymptomatic death of bees is shown. For the first time, large-scale screening of honey bee colonies from apiaries in the European part of Russia were conducted for presence six bee pathogenic viruses: sac brood virus (SBV), black queen cell virus(BQCV), deformed wing virus(DWV), cashmere virus (KBV), Israeli acute paralysis virus (IAPV), acute paralysis virus (ABPV).. The diagnostics studies were carried out RT – PCR with specific primers. A non-uniform distribution of different types of viruses across apiaries has been established. A high viral load honey bee colonies was noted in the southern and central regions of the European part of Russia, but lower in the northern region. The mite load on bee colonies in the surveyed apiaries ranged from 0.2 to 19.5% and probably depended on the number of treatments and the quality of the preparations used.

Innovative Solution For Dispersal Of Active Compound Within The Bee-Hive

Ron Korkidi
ToBe Influence Innovation, Beit Berel Israel

Current *Varroa destructor* management strategies face significant operational limitations and diminishing efficacy. Contact-based acaricide strips are compromised by dependency on bee-mediated distribution and emerging resistance patterns. At the same time, Organic alternatives demonstrate inconsistent performance due to labor-intensive application requirements and temperature sensitivity. This study introduces an innovative automated precision-delivery system (Hive Master) that fundamentally reimagines acaricide administration through calibrated gas micropulses. The system achieves targeted respiratory delivery to *V. destructor*, utilizing only 20% of conventional acaricide concentrations, potentially mitigating selection pressure for resistance development twhile maintaining therapeutic efficacy. Integrating advanced IoT sensors transforms traditional colonies into smart monitoring units, providing continuous real-time data on critical parameters including temperature and humidity. The system employs machine learning algorithms to analyze these parameters, enabling early detection of colony stress, swarming preparation, and potential health issues. This predictive capability allows for preemptive interventions before clinical manifestations become apparent. A large-scale pilot study (n>1000 colonies) demonstrated significant improvements in colony health metrics, with a 50% reduction in yearly mortality and 30% increase in spring honey production compared to conventional treatments. These preliminary results suggest that precision-based acaricide delivery represents a significant advancement in apicultural management, offering enhanced efficacy in *V. destructor* control while providing unprecedented insights into colony dynamics. The system effectively transforms traditional apiaries into smart apiaries, enabling data-driven decision-making and proactive colony management. Further research is warranted to evaluate long-term outcomes and optimize both delivery and monitoring parameters.

Participants

Last name	First name	Country	Meeting type
Abou Kubaa	Raied	United States	Virtually
Afik	Ohad	Israel	Virtually
Albanese	Gianluca	Italy	In Person
Alberoni	Daniele	Italy	Virtually
Aleksovski	Goran	Macedonia	Virtually
Alexandru Ioan	Giurgiu	Romania	In Person
Ansaloni	Leticia	Slovenia	In Person
Antunez	Karina	Uruguay	Virtually
Arab	Alireza	Iran	Virtually
Arien	Yael	Israel	In Person
BAKHCHOU	Salma	Morocco	Virtually
Basso	Marilina	Argentina	Virtually
Bastin	Florian	Belgium	In Person
Beaurepaire	Alexis	Switzerland	Virtually
Beber	Raniero	Italy	Virtually
Berg	Stefan	Germany	Virtually
Bertola	Michela	Italy	In Person
Bisrat	Daniel	Ethiopia	Virtually
Blackburn	Hannah	United States	Virtually
Blazyte Cereskiene	Laima	Lithuania	Virtually
Bocquet	Michel	France	In Person
Bono	Pat	United States	Virtually
Borański	Mikołaj	Poland	In Person
Borioli	Aladin	Switzerland	In Person
Borlinghaus	Parzival	Germany	In Person
Bortolotti	Laura	Italy	In Person
Bouga	Maria	Greece	In Person
Brandorf	Anna	Russian Federation	Virtually
Brandt	Annely	Germany	Virtually
Brascamp	Pim	Netherlands	In Person

Broccard-Bell	Heather	Canada	In Person
Brodschneider	Robert	Austria	In Person
Bruinsma	Wietse	Netherlands	In Person
Brusbardis	Valters	Latvia	Virtually
Capela	Nuno	Portugal	In Person
Caringi	Valeria	Italy	In Person
Carnell	Paula	United Kingdom	Virtually
Carreck	Norman	United Kingdom	In Person
Čelić	Tatjana	Serbia	Virtually
Chakroborty	Neloy	India	Virtually
Chen	Peitong	China	In Person
COLLIN	Joanna	France	In Person
Cornelissen	Bram	Netherlands	In Person
Costa	Cecilia	Italy	In Person
Cutajar	Simone	Malta	Virtually
Dahle	Bjorn	Norway	In Person
Dall Olio	Raffaele	Italy	Virtually
Dayioglu	Miray	Turkey	Virtually
de Graaf	Dirk	Belgium	In Person
de Sousa	Raquel	Portugal	Virtually
Di Prisco	Gennaro	Italy	In Person
Diaz	Marcela	Ireland	Virtually
Diéguez-Antón	Ana	Spain	Virtually
Dietemann	Vincent	Switzerland	Virtually
Dittmann	Tobias	Germany	In Person
Doblas-Bajo	Mónica	Spain	Virtually
Dobrescu	Constantin	Romania	In Person
Domingues	Caio	Slovenia	In Person
Ehrenberg	Sandra	Germany	Virtually
ELBARED	PASCALE	Lebanon	Virtually
Elen	Dylan	Belgium	Virtually
Eliash	Nurit	Israel	In Person
Ellis	Jamie	United States	In Person
Erdag	Okay	Turkey	In Person
Erez	Tal	Israel	In Person
Erler	Silvio	Germany	Virtually
Fabricius Kristiansen	Lotta	Sweden	In Person

Falcao	Soraia	Portugal	Virtually
Fanni Sára	Huber	Hungary	In Person
Faulhaber	Marline	Germany	Virtually
Ferrario	Claudia	Italy	Virtually
FEVRE	Damien	France	Virtually
Fischer	Johann	Germany	Virtually
Formato	Giovanni	Italy	Virtually
Forsi	Mohammad	Iran	Virtually
Franzin	Alberico	Italy	Virtually
Fulton	James	United States	Virtually
Gabel	Martin	Germany	In Person
Gábor Balázs	Borsós	Hungary	In Person
GAERLAN	KAREN	Philippines	Virtually
Gajda	Anna	Poland	In Person
Garcia Andersen	Natasha	United States	Virtually
Garrido	Claudia	Germany	In Person
Gerula	Dariusz	Poland	Virtually
Giacomelli	Alessandra	Italy	Virtually
Golob	Spela	Slovenia	Virtually
Gong	Zebin	China	Virtually
Goodwin	Charlotte	United Kingdom	Virtually
Graham	Heather	Netherlands	In Person
Granato	Anna	Italy	Virtually
Gray	Alison	United Kingdom	Virtually
Groeneveld	Linn Fenna	Norway	In Person
Grossar	Daniela	Switzerland	Virtually
Haberl	Livia	Austria	In Person
Hafner	Anja	Germany	In Person
Hailu	Teweldemedhn	Ethiopia	Virtually
Hami	Halima	Algeria	In Person
HAMMAIDI	Abderrahim	France	In Person
Hatjina	Fani	Greece	In Person
Hautier	Louis	Belgium	Virtually
Heidinger	Ina	Germany	Virtually
Hendriks	Marc	Netherlands	In Person
Hendriksma	Harmen	Netherlands	In Person
Henriques	Dora	Portugal	In Person

Hohl	Dominik	Austria	In Person
Iesalniece	Ieva	Latvia	Virtually
Jack	Cameron	United States	In Person
Jeon	Jiho	Korea	In Person
Johannesen	Jes	Germany	In Person
Jones	Ben	United Kingdom	Virtually
Jung	Chuleui	Korea	In Person
Kadri	Samir	Brazil	Virtually
Kagiali	Evangelia	Greece	In Person
Kalapouti	Anastasia	Greece	In Person
Keller	Elise-Maria	Italy	In Person
Kil	Eui-Joon	Korea	In Person
Kocaman	Cigdem	Turkey	Virtually
Koeglberger	Hemma	Austria	Virtually
Korkidi	Ron	Israel	In Person
Korolev	Aleksandr	Russian Federation	Virtually
KOSMA	MARIA	Cyprus	Virtually
Kotrschal	Séverine	Netherlands	In Person
Kovacic	Marin	Croatia	Virtually
Kozar	Monika	Slovenia	Virtually
Kwon	Minhyeok	Korea	In Person
Leza	Mar	Spain	Virtually
Luesink	Jan	Netherlands	In Person
Mackei	Máté	Hungary	In Person
Maitip	Jakkrawut	Thailand	Virtually
Martikkala	Maritta	Finland	Virtually
Mattheijssens	Joris	Belgium	Virtually
Mazur	Ewa	Poland	In Person
Meijboom	Marianne	Netherlands	In Person
Meixner	Marina	Germany	In Person
Milioti	Vaia	Greece	Virtually
Mooney	Helen	Ireland	Virtually
Morawetz	Linde	Austria	In Person
Moro	Arrigo	Ireland	Virtually
Mustafi	Valon	Germany	In Person
Mutinelli	Franco	Italy	In Person
Muturi	Michael	Switzerland	Virtually

Nanetti	Antonio	Italy	In Person
Neumann	Peter	Switzerland	In Person
Nganso	Beatrice	Cameroon	Virtually
O'Connell	Darren	Ireland	Virtually
Olgun	Tugce	Turkey	Virtually
Osabutey	Angelina Fathia	Israel	Virtually
Özfen	Egehan	Ireland	Virtually
Ozkirim	Asli	Turkey	In Person
Palonen	Aura	Switzerland	In Person
Panasiuk	Beata	Poland	In Person
Pantelakis	Emmanouil	Greece	In Person
Panziera	Delphine	Netherlands	In Person
Papach	Anna	Switzerland	Virtually
Pașca	Claudia	Romania	In Person
Pedrelli	Camilla	Italy	In Person
Pietropaoli	Marco	Italy	In Person
Pinto	Alice	Portugal	In Person
Piovesan	Asia	Switzerland	In Person
Pirk	Christian	South Africa	Virtually
Pislak Ocepek	Metka	Slovenia	Virtually
Ponti	Benedetta	Italy	Virtually
Power	Karen	Italy	In Person
Pragert	Hayley	New Zealand	Virtually
Pries	Frens	Netherlands	In Person
Proni	Freddy	Germany	In Person
Raczyńska	Aleksandra	Poland	In Person
Raczyński	Marcin	Poland	In Person
Raime	Kairi	Estonia	Virtually
Reichart	Andreas	Luxembourg	In Person
Roessink	Ivo	Netherlands	In Person
Rojas Nossa	Sandra	Spain	Virtually
SAWADOGO	Souhaïbou	Burkina Faso	Virtually
Schaefer	Marc	Germany	In Person
Schiesser	Aygün	Turkey	In Person
Schmale	Ine	Germany	In Person
Schorkopf	Dirk Louis	Austria	Virtually
Simon Delso	Noa	Belgium	Virtually

Skerbis	Suzana	Slovenia	Virtually
Smodis Skerl	Maja Ivana	Slovenia	Virtually
Son	Man-Cheol	Korea	In Person
Soroker	Victoria	Israel	In Person
Steeger	Thomas	United States	In Person
Stevanovic	Jevrosima	Serbia	Virtually
Tandircioglu	Yanki	Turkey	Virtually
Ternar	Tudor	Romania	In Person
Thai	Pham	Viet Nam	Virtually
Tomkies	Victoria	United Kingdom	Virtually
Tosi	Simone	Italy	In Person
Traynor	Kirsten	Germany	In Person
Treder	Manuel	Germany	In Person
Tritschler	Manuel	Germany	Virtually
Tsagkarakis	Antonios	Greece	Virtually
Turapova	Elina	United Kingdom	Virtually
Uzunova	Aleksandar	Macedonia	In Person
van Gent-Pelzer	Marga	Netherlands	In Person
Van Heemert	Kees	Netherlands	In Person
Van Ransbeeck	Heleen	Belgium	In Person
Vejsnaes	Flemming	Denmark	In Person
Vlogiannitis	Spyridon	Greece	Virtually
Volkova	Anna	Ukraine	Virtually
von Knoblauch	Tammo	Germany	Virtually
Ward	Rachel	Switzerland	In Person
Waseem	Mohammad Abdul	India	Virtually
Williams	Geoff	United States	In Person
Wolf	Paula	United States	Virtually
Yanez	Orlando	Switzerland	Virtually
Yazlovitska	Liydmyla	Ukraine	Virtually
Yelkovan	Sedat	Turkey	Virtually
Yoon	June-Sun	Korea	In Person
Zeelenberg	Jimmie	Netherlands	In Person
Zending	Sean	Netherlands	In Person
Zheng	Huoqing	China	Virtually
Zou	Rubing	China	In Person

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