

BEE-GUARDS

for resilient beekeeping

Comparing colony performance under standard and innovative Varroa management in a European experiment

Marina Meixner & Marin Kovačić, Sergio Albertazzi, Athanasios Antonopoulos, Malgorzata Biełkowska, Maria Bouga, Robert Brodschneider, Matias Casalogue, Leonidas Charistos, Raffaele Dall'Olio, Gennaro Di Prisco, Dylan Elen, Martin Gabel, Egoitz Galartza, Dariusz Gerula, Fani Hatjina, Magdalena Jovanovska, Ioannis Manthos, Angelina Fathia Osabutey, Melanie Parejo, Janez Prešern, Zlatko Puškadija, Konstantinos Usunoy, Viviana Valenzano, Jerry Wilde, Jesus Yanz & Cecilia Costa
Tsakarakis, Aleksandar Usunoy, Viviana Valenzano, Jerry Wilde, Jesus Yanz & Cecilia Costa
Author affiliations are given in the abstract respectively.

info@beeguards.eu | www.bee-guards.eu

Investigating Resilience in European Beekeeping

The BEE-GUARDS project compares an innovative Varroa management concept to commonly used conventional treatment standards (overview on the right). This concept aims for increased honey bee health, reduced need for synthetic acaricide application and an overall improvement of natural selection mechanisms. Performance and resilience of colonies is measured using a standardized field protocol and digital monitoring tools. 17 partners across 12 countries are conducting a large-scale field experiment involving nearly 500 colonies to assess this approach.

BEE-GUARDS Workpackage 1

21 apiaries

(15- 35 colonies each)

with innovative/conventional groups respectively

Innovative

Summer treatment:
brood interruption by queen caging + oxalic acid trickling

Winter treatment:
Only if infestation thresholds are reached (e.g. oxalic acid).
Preferably no chemical treatment.

Conventional

Summer treatment:
Locally used treatment standard (e.g., formic acid or amitraz).

Winter treatment:
Default treatment (irrespective of the infestation level) according to local standards.

Fostering natural selection

The innovative management approach aims to foster natural selection and to reduce acaricide treatment whenever possible. Therefore, chemical winter treatments are omitted whenever possible to ensure a higher Varroa load in the following drone rearing season (selective pressure) and brood interruptions with oxalic acid application are used as a highly efficient summer treatment. Thereby we are testing the hypothesis that this well-timed treatment will ensure healthy winter bees and an accordingly good wintering of the colony.

Initial Results

- Despite lower varroacide application in the innovative group, data from the first study season indicate no meaningful differences between both groups in terms of colony strength (Fig. 1), brood production, pollen stores, and varroa infestation (Fig. 2).
- Notably, no negative effects of brood interruption in summer (innovative management) on colony strength were observed.
- Varroa infestation followed an expected seasonal pattern with slightly higher infestation during drone production in the innovative group (Fig. 2).

Internet of Apiaries

A digital pan-European apiary network was created by equipping approximately half of the colonies with digital monitoring devices (e.g., for temperature, flight activity & weight, Fig. 3). This allows continuous monitoring and additional in-depth analyses of colony development.

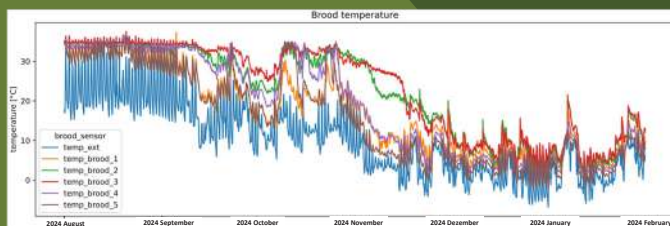
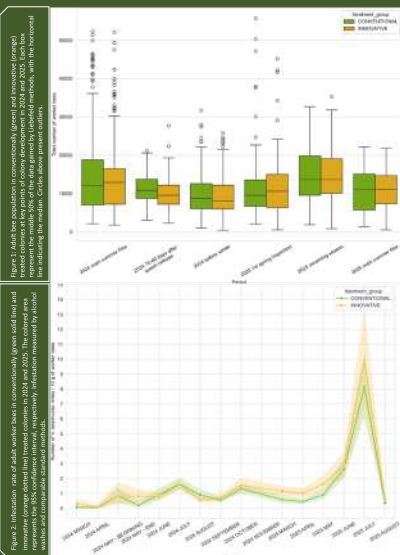
Conclusion & Outlook

- The innovative management approach seems to meet the expectations of reduced varroacide demand and increased Varroa pressure on drones despite proper colony development. This is closely connected to BEE-GUARDS Workpackage 2 (oral presentation; Abstract 0788) focusing on sustainable breeding strategies.
- It thus seems to suit the aim of resilient beekeeping under various climatic conditions.
- The remaining field data collection for 2025 is still ongoing and will be evaluated and presented in the future.



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Martin Gabel¹, Marin Kovačić², Janez Prešern³, Josipa Štavalj², Zlatko Puškadija², Marina Meixner¹, Jesús Yániz⁴, Matías Casalongue⁴, Pilar Santolaria⁴, Raffaele Dall'Olio⁵, Jerzy Wilde⁶, Dylan Elen⁷, Malgorzata Bienkowska⁸, Dariusz Gerula⁸, Victoria Soroker⁹, Angelina Osabutey⁹, Robert Brodschneider¹⁰, Georg Schaunitzer¹⁰, Fani Hatjina¹¹, Leonidas Charistos¹¹

¹LLH Bee Institute Kirchhain, Erlenstr. 9, 35274 Kirchhain, Germany

²Faculty of Agrobiotechnical Sciences Osijek, Josip Juraj Strossmayer University of Osijek, Osijek, Croatia

³Agricultural Institute of Slovenia, 1000 Ljubljana, Slovenia

⁴EPSH, University of Zaragoza, 22071, Huesca, Spain

⁵BeeSources, beekeeping consultancy, Bologna, Italy

⁶Department of Poultry Science and Apiculture, Warmia and Mazury University in Olsztyn, Poland

⁷Taskforce Research, ZwarteBij.org VZW, 9890 Gavere, Belgium

⁸The National Institute of Horticultural Research, Konstytucji 3 Maja 1/3, Skierniewice, Poland

⁹Agricultural Research Organization, The Volcani Institute, Rishon LeZion, Israel

¹⁰University of Graz, Department of Biology, Graz, Austria

¹¹ELGO DIMITRA, Institute of Animal Science, Department of Apiculture, Nea Moudania, 63200, Greece

Beekeeping practices play a fundamental role in maintaining bee health, particularly in the face of global challenges like climate change or invasive pests. To ensure sustainability, modern beekeeping needs to focus on the implementation of natural curing mechanisms into productive management systems. Within this framework, the mite *Varroa destructor* remains a key challenge for beekeeping and bees. The BeeGuards project thus investigates effects of an innovative varroa-control concept on performance and resilience of colonies in comparison to conventional management standards. To assess this approach, 17 institutions across 12 countries are conducting a large-scale field experiment involving nearly 500 colonies. The conventional approach consists of the treatment most commonly applied in each respective region, whereas the innovative approach is characterised by an induced summer brood interruption with subsequent oxalic acid application and a threshold-based strategy for the eventual winter treatment. Mite infestation levels and colony development are continuously monitored and complemented by diverse sensing devices. To this end, a Pan-European Digital Apiary is formed by equipping 50% of test colonies with digital scales, in-hive thermal sensors and bee counters. Structure, methods and initial findings will be presented.