Practice Abstracts II

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Authors

Nikol Yovcheva

Teodor Metodiev

Contributors

Desiderato Annoscia, Mark Brown, Matt Allan, Léna Barascou, Tom Breeze, Philippe Bulet, Marie-Pierre Chauzat, Elena Cini, Davide Frizzera, Michael Garratt, Harriet Gold, Sara Hellström, Margret Jürison, Reet Karise, Alberto Linguadoca, Chloe Mayne, Marika Mänd, Francesco Nazzi, Peter Neumann, Robert Paxton, Simon G Potts, Jorix Rockx, Elisa Seffin, Deepa Senapathi, Jane Stout, Edward A Straw, Verena Strobl, Norman Thürmer, Owen P Vaughan, Orlando Yañez, Virginia Zani

PoshBee

Pan-european assessment, monitoring, and mitigation of stressors on the health of bees

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Preface

The overarching goal of WP11 "Dissemination, Communication and Knowledge Transfer" is to maximise PoshBee's impact in supporting sustainable beekeeping and healthy bee populations. An essential part of achieving this objective is producing project outputs tailored to the needs of different stakeholders, ensuring effective knowledge transfer. To that end, WP11 has published two batches of practice abstracts on the EIP-AGRI platform, presenting PoshBee's results to one of the project's main target groups – practitioners. You can access all the project's practice abstracts here. Deliverable D11.9 described the project's first set of practice abstracts, whereas the current D11.10 sheds light on the development and publication of PoshBee's second batch of abstracts containing 13 new pieces.

Summary

In order to make its results accessible to practitioners, PoshBee has prepared and published a total of 16 practice abstracts on the European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) platform. These concise and easily understandable pieces of information present the practical implications of PoshBee's results and cover the project's full life cycle, from its objectives (presented in practice abstract 1) to its results. By hosting its abstracts on the EIP-AGRI platform, the project can ensure that its comprehensive collection of practical knowledge can be easily accessed by actors from the practice and intermediary sectors long after the project's end.

PoshBee prepared and submitted its first set of practice abstracts, containing three pieces, in 2019. Since then, the project has published 13 new practice abstracts, covering a variety of topics ranging from field-, semi-field and lab studies to communication best practices. The current deliverable D11.10 presents these 13 new practice abstracts, two of which are provided in more than one language.

1. Introduction

EIP-AGRI aims to support sustainable agriculture by bridging the gap between research and practitioners, and sharing innovative project ideas and practices in the form of practice abstracts. When preparing PoshBee's first set of practice abstracts (more information in Deliverable D11.9), the requested table sheet with metadata was created, including partner and project information. To meet the administrative requirements of the EIP-AGRI platform, a list of all PoshBee partners' data was compiled, along with a consent form allowing the usage of contact details for dissemination through the platform. Furthermore, to facilitate the process of writing the abstracts, partners were provided with easy-to-use instructions, templates and examples. This process was repeated for the second batch of practice abstracts and the information was updated when needed.

When selecting the topics of the new practice abstracts, careful consideration was given to ensuring that each project work package has the opportunity to produce at least one practice abstract highlighting its main result with practical implications. By producing a total of 16 practice abstracts, PoshBee has surpassed the initial target of 13 abstracts foreseen for the project.

2. Second batch of practice abstracts

2.1. Teamwork of scientists and beekeepers in the field, by Norman Thürmer (Imkerverband Sachsen-Anhalt e.V.)

"As part of a European-wide experiment to assess the exposure of bees to environmental stressors, we were involved in the pre- and post-project consultation for the delivery of honey bees, their care, sampling support and consultation for questions on the oil seed rape field areas.
Based on our experience we make the following recommendations:
• before the project starts it should be clear that there is enough time planned for the bees to be purchased.
• that for NGO partners or beneficiaries that have not previously been involved in an EU project, a fixed contact person for all EU formalities should be in place at a project partner who already has this knowledge.
• the use of an additional communicator on the part of the beekeepers to support the conduct of the experiment. This communicator is intended to facilitate communication between the scientific community and the beekeepers, specifically to query all parties involved in small time windows. In everyday life, the worlds of beekeepers and scientists are too different to notice discrepancies which might have negative impacts on the study early enough. To clarify, we present two examples of such issues:
a) it would prevent agreements in the field from being postponed and forgotten until one of the parties remembers too late.
b) to prevent the misalignment of biological reality and study design. For example, scientists want to take samples (e.g., honey) within a specific time (e.g., 3 weeks) and avoid hives swarming, while the beekeepers know that hives will swarm within 3 days, or immediately if honey is harvested. Without timely communication, neither party understands the issues."

2.2. Beekeepers' willingness to take up new bee health tools, by Tom Breeze (University of Reading)

"A key output of PoshBee was the survey of beekeepers' willingness to adopt a bee health card. In total, we surveyed over 470 beekeepers from seven countries. The findings reveal that beekeepers are more likely to adopt the tool if 1) there are monetary incentives to use it, 2) they believe it is easy to use and 3) they are confident in its effectiveness. Our findings have significant implications for future efforts to encourage good bee husbandry and health management.
If they were asked to pay any costs, beekeepers were much less likely to use the tool but they were more likely to use the tool if there were economic incentives (e.g. subsidies). When aiming to promote widespread bee health practices, subsidising the costs of these practices, at least initially, would greatly improve uptake and frequency of use. Similarly, efforts to make management options easy and convenient to use (e.g. through apps and analysis via posted samples) would also facilitate wider uptake.
Finally, effective communication of the usefulness of bee health tools and practices is key to encouraging uptake. Our analysis reveals that beekeepers associations (local and national) and other beekeepers are the main sources of information for beekeepers on bee health. Research and policy should therefore aim to disseminate information on the effectiveness of different practices to these associations as soon as they become available to support wider uptake."

2.3. Pesticide risk assessment in honeybees: Toward the use of behavioural and reproductive performances as assessment endpoints, by Léna Barascou (National Institute of Agricultural Research)

"In this review, we highlighted the gap between new evidence of pesticide toxicity in honeybees and regulatory toxicological bioassays recommended by regulatory test guidelines. In order to fill this gap and better assess the threat of pesticides to honeybees, we emphasized the need to complement current endpoints (essentially based on LD50 - dose at which 50% of the individuals die) with sublethal

endpoints. We focus on behavioural and reproductive endpoints, which have received increasing interest due to their ecological relevance and the emergence of new technologies made in their recording. Moreover, pesticides can have low-dose effects on these endpoints. So, this review reported the biological interest and methodological measurements of such endpoints and discussed their possible use in pesticide risk assessment. It appears that homing flights and reproduction have great potential for pesticide risk assessment, mainly due to their ecological relevance. If exploratory research studies in ecotoxicology have paved the way toward a better understanding of pesticide toxicity in honeybees, the next objective will then be to translate the most relevant behavioural and reproductive endpoints into regulatory test methods. This will require more comparative studies and improving their ecological relevance. This latter goal may be facilitated by the use of population dynamics models for scaling up the consequences of adverse behavioural and reproductive effects from individuals to colonies.
Link to the review: https://hal.inrae.fr/hal-03170652."

This practice abstract was also provided in French:

"*Évaluation des risques liés aux pesticides chez les abeilles domestiques : vers l'utilisation de paramètres comportementaux et reproductifs comme critères d'évaluation.*

Dans cette revue, nous avons mis en évidence l'écart entre les nouvelles preuves de la toxicité des pesticides chez les abeilles domestiques et les essais biologiques toxicologiques recommandés par les directives d'essais réglementaires. Afin de combler cette lacune et de mieux évaluer la menace que représentent les pesticides pour les abeilles, nous avons souligné la nécessité de compléter les critères d'évaluation actuels (essentiellement basés sur la DL50 - dose à laquelle 50 % des individus meurent) par des critères sublétaux. Nous nous concentrons sur les paramètres comportementaux et reproductifs, qui ont fait l'objet d'un intérêt croissant en raison de leur pertinence écologique et de l'émergence de nouvelles technologies permettant de les enregistrer. De plus, les pesticides peuvent avoir des effets sublétaux sur ces paramètres. Cette revue fait donc état de l'intérêt biologique et des mesures méthodologiques de ces paramètres et discute de leur utilisation possible dans l'évaluation des risques liés aux pesticides. Il apparaît que les vols de retour et la reproduction ont un grand potentiel pour l'évaluation des risques liés aux pesticides, principalement en raison de leur pertinence écologique. Si les études de recherche exploratoire en écotoxicologie ont ouvert la voie à une meilleure compréhension de la toxicité des pesticides chez les abeilles domestiques, le prochain objectif sera alors de traduire les paramètres comportementaux et reproductifs les plus pertinents en méthodes d'essai réglementaires. Il faudra pour cela multiplier les études comparatives et améliorer leur pertinence écologique. Ce dernier objectif pourrait être facilité par l'utilisation de modèles de dynamique des populations pour transposer les conséquences des effets comportementaux et reproductifs négatifs des individus aux colonies.
Voici le lien pour lire la revue : https://hal.inrae.fr/hal-03170652"

2.4. Pollen nutrition fosters honeybee tolerance to pesticides, by Léna Barascou (National Institute of Agricultural Research)

"*The availability of nutritive resources is a key factor affecting honeybee health. However, a reduction in floral resource abundance and diversity is generally observed in agro-ecosystems, along with widespread exposure to pesticides. We therefore studied whether the availability and quality of pollen diets could affect the susceptibility of honeybees to pesticides. For that purpose, we evaluated the toxicity of azoxystrobin (fungicide) and sulfoxaflor (insecticide) in honeybees provided with pollen diets of differing qualities. We found that both pollen availability and most importantly its quality (bees rarely facing a total lack of pollen) can improve their ability to eliminate pesticides and reduce the mortality risk that they cause.*

This nutritional modulation may increase variability in pesticide sensitivity in the field, given that the abundance and composition of honeybee pollen diets can be highly variable across landscapes and seasons. Consequently, the availability of floral resources should be considered in honeybee pesticide risk assessment. Finally, this study provides another strong argument for the restoration of floral resource abundance and diversity in such habitats.

Link to the study: https://royalsocietypublishing.org/doi/10.1098/rsos.210818"

2.5. Practical Aspects Of Semi-Field Bee Studies, by Matt Allan (Atlantic Pollination Ltd.)

"*We carried out semi-field studies on honey bees, bumble bees and solitary bees to study the impacts of pairs of stressors (pesticide + pesticide; pesticide + nutritional deficit). Key points for researchers of similar studies include:*
1. The supply of food (nectar and pollen) in enclosures must match or exceed demand. We suggest (a) an enclosure of 72m2 for a honey bee colony of 3,000 adults; (b) an enclosure of 54m2 for a bumble bee colony; and (c) an enclosure of 36m2 for 100 laying female Osmia species.
2. The crop (preferably Phacelia tanacetifolia sown at 5kg/ha) should be grown so that bloom coincides with the desired start of the study (approximately 55 days after sowing). The seed bed should be thoroughly prepared by mechanical means, without herbicides. Synchronising bloom of different species is challenging.
3. Timing of application of pesticides must be in accordance with the product label. Where products have to be applied before bloom, prediction of the correct date is difficult; regular and thorough monitoring of the plants is essential.
4. Honey bee colonies should be in small hives (Mini Plus Beuten), with specially manufactured components for research. These include study frames for photographing brood; converter hives for creating uniform study colonies; combined pollen traps, Varroa traps and dead bee traps, etc.
5. Bumble bee colonies should be small at the start of the study.
6. Osmia emergence must be controlled carefully.
7. There are many opportunities to use novel technologies in these studies."

2.6. Pan-European baseline of chemical, nutritional and pathogen stressors for bees, by Marie-Pierre Chauzat (French Agency for Food, Environmental and Occupational Health & Safety) and Jane Stout (Trinity College Dublin)

"*In 2019, PoshBee partners undertook a field survey across 8 European countries (CH, DE, EE, ES, IE, IT, SE, UK) to assess the exposure of bees to multiple stressors (chemical products, pathogens, and nutritional deficiency). Honey bees, bumble bees and mason bees were deployed on oilseed rape fields and apple orchards (128 sites in total). For each site, the agricultural practices, environmental parameters and landscape features were assessed.*
High levels of pesticide residues were found in bees and bee products. Nearly all beebread samples contained at least one pesticide, mostly fungicides. Approximately half of nectar samples were contaminated with pesticides, fungicides being often identified. More than two thirds of beeswax contained at least one pesticide. Potassium, magnesium and aluminium were quantified at high concentrations in honeybees and in beebread from the three bee species. The main pathogens (viruses, microsporidia, and bacteria) were detected in honey bees. In contrast, only few of them were detected in bumble bees and mason bees. In terms of nutrition, protein content in beebread did not vary at country and species level. In contrast, there was a high variation of lipid content at country and species level.
As a result, we recommend that:

• Scientists: Assess several types of stressors at multiple developmental stages and matrices when investigating pollinator health.
• Beekeepers: Thoroughly examine colonies for early detection of diseases to reduce damage on honeybee populations.
• Farmers: Pollinator health is also important for you. Adjust your plant protection strategy to reduce pesticide use."

2.7. Sulfoxaflor can benefit *Varroa destructor* and might interact with a commonly used acaricide, by Verena Strobl, Orlando Yañez, Peter Neumann (University of Bern) and Davide Frizzera, Elisa Seffin, Virginia Zani, Desiderato Annoscia, Francesco Nazzi (University of Udine)

"*Beekeepers are confronted with unsustainable high losses of managed Western honey bee, Apis mellifera, colonies. There is consensus that such losses are closely associated with ectoparasitic mites, Varroa destructor, which are potent vectors of several viruses. However, these mites may also interact with other stressors, e.g. acaricides (e.g., coumaphos) or widely used neonicotinoid-like insecticides (e.g., sulfoxaflor). However, the interface between mites and these chemicals is poorly understood. Here, we show that field-realistic concentrations of sulfoxaflor can increase the reproduction of V. destructor. Furthermore, in combination with coumaphos, sulfoxaflor can also cause higher mortality in bee larvae. Our data support that neonicotinoid (-like) insecticides can not only have negative consequences for bees, but also seem to have positive effects on mites.*
Implementations/recommendations: The positive correlation between sulfoxaflor and mite reproduction is concerning and should be considered when assessing the risk of agrochemicals to bees. The combined effects of sulfoxaflor and coumaphos are not fully understood and require further research. However, our data suggest that such possible interactions have to be integrated in the risk assessment process. Beekeepers should consider the possible negative side effects of their interventions and keep in mind that acaricides might also have undesired side effects on bees either alone and/or in combination with other agrochemicals."

2.8. Insights from experiments on interactions between sulfoxaflor and a parasite in bumble bees, by Verena Strobl (University of Bern); Elena Cini, Michael Garratt, Harriet Gold, Chloe Mayne, Jorix Rockx, Simon Potts, Deepa Senapathi (University of Reading); Edward Straw, Owen Vaughan, Mark Brown, Alberto Linguadoca (Royal Holloway University of London)

"*We conducted a range of laboratory experiments on individual bumble bees where we exposed them to one of three agrochemicals (sulfoxaflor, an insecticide; azoxystrobin, a fungicide; glyphosate, a herbicide) and/or Crithidia bombi (a common bumble bee gut parasite). We assessed impacts on survival, food consumption, parasite load and learning. We conclude that, under the experimental conditions we used, there are no meaningful interactions between these agrochemicals and the common bumble bee parasite. This suggests that current laboratory-based aspects of risk assessment of these agrochemicals does not require integration of parasitism as an additional stressor. However, we note that other conditions, and other, more virulent parasites, may still be a source of interactive impacts on bee health.*
We also exposed ~6-8 week old bumble bee colonies to sulfoxaflor and/or the parasite Crithidia bombi and examined impacts on colony development and pollination services. The results suggest that field realistic exposure of bumble bee colonies 6-8 weeks post-founding to sulfoxaflor, and/or the parasite, is not harmful to their development, nor does it impact pollination services. This develops our understanding of the safe use of sulfoxaflor. While sulfoxaflor has now been banned for outside use in the EU, our research does not suggest further changes to its registration in or outside the EU are

currently justified. However, further studies of interactions with other pathogens are needed before general statements can be made."

2.9. Communicating uncertainty, by Nikol Yovcheva and Teodor Metodiev (Pensoft Publishers)

"*PoshBee is a complex project requiring communication with multiple stakeholder categories with diverse knowledge, meaning we often have to transfer information from one category to the other, which involves overcoming certain barriers. Specifically, one barrier that seems to be relevant across all stakeholder groups' communication is sharing uncertainty. Uncertainty is an inherent part of knowledge, yet, with increasing doubt about scientific authority, we are reluctant to openly share it. However, not adequately communicating uncertainty can lead to a loss of trust from your audience. To help practitioners communicate their uncertainty to stakeholders, we present a list of PoshBee-tested tips:*

- *Establish the object of uncertainty: does it concern the underlying hypothesis or the claimed facts? Defining the scope of uncertainty will help you address it.*
- *Be transparent and specific: elusive expressions like "could be higher or lower" decrease the audience's trust. Being explicit about what you do not know avoids casting a shadow of mistrust over the entire message, making your audience think none of the information can be trusted. It is also important to explain jargon, avoiding wrong interpretations.*
- *Avoid repeating qualifiers: studies found that reading the same qualifier several times increases its strength in the audience's perception (Mislavsky & Gaertig, 2020), causing unwarranted certainty.*
- *Know how much science is enough: uncertainty can arise if your audience is flooded with the technicalities of scientific details. On the other hand, they may be inadequately informed if not presented with important uncertainties in the field, which create nuances on a certain topic.*

Source: dx.doi.org/10.2139/ssrn.3454796"

2.10. Good practices in science communication, by Nikol Yovcheva and Teodor Metodiev (Pensoft Publishers)

"*PoshBee's long-term objective is to support healthy bee populations & sustainable beekeeping, in which successful cooperation between diverse stakeholder groups is crucial. Here, effective science communication plays a huge role, bridging the gap between the groups' areas of expertise. To achieve that in PoshBee, we often receive feedback from our stakeholder groups, ensuring bi-directional communication, for example via surveys or dedicated sessions. Based on stakeholder feedback, we created a list of good practices to help practitioners in their cooperation with different stakeholders with potentially diverging expertise.*

- *Plain language: avoid jargon - use figures of speech instead. Illustrative figures like metaphors or examples provide a human dimension to the otherwise abstract information. They help the audience understand the new concept by connecting it to a concept already familiar to them. Additionally, visual communication like graphics accompanying the text makes information easier to retain and increases its accessibility as it can reach people of all literacy levels.*
- *Tailoring: take into account who your audience is. To develop messages which capture people's interest, it is essential to first identify & understand their values and needs. You can then use this understanding to determine the content they receive, how it is framed, who presents it & where. In this way, you make sure your message is indeed relevant.*
- *Positive arguments: emphasise solutions and benefits, not problems & losses. Make sure to acknowledge uncertainty and scepticism, but also demonstrate established knowledge. This ensures you address the barriers stakeholders face while providing them with solutions, which make change seem easy.*"

2.11. A new frontier for visualising the impact of stressors in honey bees: proteins in pictures, by Philippe Bulet (French National Centre for Scientific Research)

"In animal and human health care, imaging techniques such as radiology, echography and scanning by magnetic resonance imaging (MRI) have hugely improved the prognosis and diagnosis of diseases by veterinarians and doctors. Imaging mass spectrometry (IMS) provides unique opportunities for analysing tissues, organs, and even whole organisms at an unprecedented level of detail. We have adapted IMS for use in honey bees, enabling us to produce images of drugs/chemicals, metabolites, sugars, lipids (fats) & protein distributions across organs. This is visualised in scans of protein distribution in the body of honey bees that are infected, or not, by a fungal parasite, the causative agent of nosemosis.
-As Confucius, the Chinese Philosopher, said "a picture is worth a thousand words". Just imagine a general practitioner facing a broken leg without the image provided by a radiogram
-The unique IMS technique bridges the gap between visual examination & targeted molecular analyses
-A new frontier to discover protein signatures of an organ & a body in response to stressors
-A new generation of mass spectrometers are compatible for high-throughput screening of the spatial distribution of proteins, lipids, metabolites and drugs in any type of tissue or the entire body of a honey bee
-It is well known that nosemosis impacts gut morphology and physiology. When applied to a honey bee facing nosemosis, IMS also highlighted the nosemosis' impact on the flight muscles located in the thorax, on the gland secreting the Royalisin protein, and on the immune response triggered by Nosema (presence of the Apidaecin protein) in bee blood
-A versatile technique applicable to other pollinators
Sources: doi:10.1002/pmic.202100224, www.theses.fr/2020GRALV009"

2.12. Practical aspects for bee ecotoxicological assessments, by Margret Jürison, Reet Karise and Marika Mänd (Estonian University of Life Sciences)

"The superfamily of bees consists of many groups of bee species, varying in not only their behavioural aspects, but also their physiological ones. Moreover, in addition to variation between bee species, there is large functional and behavioural variation within species, both with respect to sex - females and males - and the queen and worker castes in social bees. They all represent a different ecological function and thus might have evolved variable responses to toxicants.
Within the PoshBee project, we have tested three bee species – honey bees Apis mellifera, bumble bees Bombus terrestris and solitary bees Osmia bicornis – to understand whether and to what extent the generalisation of toxic impacts of pesticides across bee species, sexes, and castes, is justified. We tested three agrochemicals – the insecticide sulfoxaflor, the fungicide azoxystrobin and the herbicide glyphosate. In similar laboratory conditions, we treated all the bee species, sexes and castes with these chemicals, either orally through a sugar feed or topically by dripping the chemical on the cuticle of the bee. We saw large variation in reactions to different chemicals in both mortality rates during the first days after treatment and the clearance rate of the chemicals from bee bodies.
For scientists: based on our results we point out to researchers that generalising across diverse groups such as honey bees, bumble bees and Osmia bees, and across sexes and castes, may result in misleading conclusions in ecotoxicological assessments.
For regulatory authorities: for policy makers we recommend much more seriously considering the demand for large-scale testing of new agrochemicals taking into account multiple relevant bee species, sexes, and castes, and exposure routes."

Also available in Estonian:

"Mesilaste toksikoloogiliste hindamiste praktilised aspektid

Mesilaste ülemsugukond koosneb paljudest mesilaste perekondadest, kes erinevad mitte ainult käitumise, vaid ka füsioloogiliste aspektide poolest. Lisaks liikide vahelisele esinevad ka liigisisesed erinevused emaste ja isaste ning sotsiaalsetel mesilastel emade ja töömesilaste vahel. Kõigil neil on funktsionaalsed ja käitumuslikud iseärasused ja nad täidavad erinevaid ökoloogilisi rolle, mistõttu võivad keemilised ained neid erinevalt mõjutada.

PoshBee raames testisime kolme mesilase liiki – Apis mellifera, Bombus terrestris ja Osmia bicornis –, et mõista, kas ja mil määral on pestitsiidide toksilise mõju üldistamine kõikidele mesilastele põhjendatud. Testisime kolme agrokemikaali – insektitsiidi sulfoksaflor, fungitsiidi asoksüstrobiini ja herbitsiidi glüfosaati. Sarnastes laboritingimustes mõjutasime nende kemikaalidega kõiki mesilaste liike, nende suguisendeid ja töömesilasi kas suu kaudu suhkrusöödaga või välispidiselt tilgutades kemikaali mesilase seljale. Nägime suuri lahknevusi erinevate kemikaalide mõjudes nii suremuse tasemes esimeste päevade jooksul pärast töötlust kui ka mesilaste kehadest kemikaalide kadumise kiiruses.

Teadlastele: oma tulemuste põhjal juhime tähelepanu sellele, et üldistamine üle erinevate liikide (nagu näiteks meemesilased, kimalased ja müürimesilased), sugude ja tööjaotuse võib põhjustada toksikoloogilistes hinnangutes eksitavaid järeldusi.

Seadusloome: poliitika kujundajatele soovitame palju tõsisemalt kaaluda vajadust uute agrokemikaalide ulatusliku testimise järele, võttes arvesse mitmeid asjakohaseid mesilaste liike, nende sugudest ja tööjaotusest tulenevaid erinevusi ning võimalikke kokkupuuteviise."

2.13. Husbandry of ground-nesting bees for eco-toxicology studies, by Sara Hellström and Robert Paxton (Martin Luther University of Halle-Wittenberg)

"Although the majority of wild bee species build their nests and rear their brood in the ground, very few experimental studies use ground-nesting species. Therefore, there is a general lack of knowledge on how pesticide residues in the soil substrate affect bee species nesting underground.

In the PoshBee project, we tested the ground-nesting hairy-footed flower bee (Anthophora plumipes) as a putative model species for such studies. We developed a system of soil-filled boxes which can be made of cheap materials and mounted on a wall. When placed in the vicinity of an existing nesting aggregation of the species, these soil blocks were readily colonised. This enabled us to evaluate the number, survival and vitality of the brood within. We tested a series of soil concentrations of the neonicotinoid Imidacloprid, which is known to have a long half-life in soil environments, on the nesting success of bees. Our results show no effect on any measured brood parameter in contaminated versus uncontaminated soil, even when the pesticide concentration was higher than field-realistic levels. This indicates that the brood may either be protected from exposure by the inner coating of the brood cells, or that the brood is resistant to imidacloprid exposure. Further studies should evaluate brood survival in laboratory settings.

Considering the ease of use and possible transportation of inhabited nest blocks, the hairy-footed flower bee may be used in semi-field and field studies evaluating effects of contaminants on both adults and brood."

3. Conclusion

Thanks to a consortium-wide effort, PoshBee has more than met its target of producing 13 practice abstracts. The project's collection has steadily been growing since 2019, reaching a total of 16 abstracts. These cover the project's objectives, as well as results from different WPs, providing a source of innovative research knowledge that is easy to understand and can be used to create high-impact practices for end-users. By hosting these abstracts on the EIP-AGRI platform, PoshBee ensures that its results with practical value will continue to be utilised by practitioners even after the project has ended.