Working Groups of the ICP-PR Bee Protection Group – Developments and Progress

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During the symposium, workgroups within the International Commission for Plant-Pollinator Relationships (ICP-PR) Bee Protection Group discussed the current status of their research efforts and identified future research needs/uncertainties.

The **Non-*Apis* Bee** Workgroup, formerly chaired by Sjef van der Steen (Wageningen University and Research; retired) and now chaired by Nicole Hanewald (BASF), reported out on their progress and development over the past three years. The work group was established in Brussels in 2013 and initially consisted of two subgroups, i.e., bumblebee laboratory and solitary bee laboratory; however, a third subgroup (i.e., bumblebee and solitary bee semi-field) also exists now. This year a fourth group was formed (i.e., stingless bee laboratory) that is mainly active in South America. Each of the subgroups are focused on the development of new methods for pollinator testing toward informing plant protection product registration decisions by regulatory authorities. To that end, the work group organizes regular workshops to facilitate the active exchange of ideas, review existing methodologies and possible adaptations toward establishing more robust and reliable test methods; the work group also helps to coordinate ring testing efforts.

Preliminary results from the acute oral toxicity ring test, primarily with *Osmia bicornis* using dimethoate as a reference toxicant. Bee feeding activity was variable across the participating test labs, but most labs had ≤10% control mortality. The full results from the ring test will be discussed at the non-Apis workgroup meeting in York (UK) in 2018. Also, preliminary results were presented on ring testing of the chronic toxicity testing protocol with bumble bees (*Bombus* spp.), again using dimethoate as a reference toxicant. Similar to ring test results with Osmia, the full results for the ring test with Bombus will be presented at the non-Apis workgroup meeting in 2018.

The non-Apis Bee Workgroup formed a new subgroup on stingless bees; the subgroup anticipates having a meeting in Brazil to discuss protocols and ring testing for select species of stingless bees.

The non-Apis Bee workgroup also reported on ring testing of bumble bees and Osmia under semi-field conditions, again using dimethoate as a reference toxicant. For bumble bees, colonies were initially maintained under laboratory conditions to better ensure robust colonies; however, some test labs reported poor queen production, which may have been the result of adverse weather and/or poor forage once the colonies were transported to the field. The workgroup noted that additional discussion is needed on when the "switch point" is set. (It is currently at 21 days after first queen pupa is identified). Concern was expressed about reliance on a single bumble bee supplier (BioBest); however, a single source was intended to reduce potential variability that may result from having multiple suppliers. Also, the group discussed multiple uncertainties, which included whether a source of water should be provided to colonies; whether colonies should be provided supplemental food during the monitoring phase; and, which measurement endpoints are the most relevant and statistically variable.

With respect to semi-field testing with Osmia, ring test participants indicated that the source of the cocoons was satisfactory; however, there was uncertainty about whether it was necessary to wash the cocoons and that sexing the cocoons by weight can lead to misidentification.

In the **Semi- and Full-field Testing Workgroup**, chaired by Keith Sappington (U.S. Environmental Protection Agency [EPA] Office of Pesticide Programs' Environmental Fate and Effects Division) and Mark Miles (Bayer CropScience), there are approximately 19 participants. The group identified four focus areas: pollen and nectar residue studies; large-scale colony feeding studies (LSCFS); semi-field studies (selection and interpretation); and full field studies (design and interpretation).

The group intends to develop guidance for designing field pollen and nectar residue studies to support the exposure assessment of bees to pesticides so as to improve the utility of field pollen/nectar residue studies of use by regulatory authorities for risk assessment and risk management; increase the consistency of bee field pollen/nectar residue studies within and across regulatory authorities; and, provide greater efficiency in the design and conduct of bee field pollen/nectar residue studies.

With respect to developing guidance for conducting LSCFS for pesticide testing with honeybees, the following broad objectives were identified: develop guidance for the design and conduct of honey bee (Apis mellifera) tests using the LSCFS design; identify and quantify "lessons learned" from past LSCFS designs; improve the utility of honey bee LSCF studies for use by regulatory authorities in pesticide risk assessment; and, foster consistency of LSCFS within and across regulatory authorities.

With respect to semi-field studies, the main goals are developing guidance for when to use which study (i.e., OECD tunnel studies versus Oomen-like feeding studies), and interpreting the results of the study. This guidance will identify the pros and cons of conducting such studies.

For full-field studies, the following broad objectives were identified: identify and quantify "lessons learned" form past efforts; improve the utility of honey bee full-field studies for use by regulatory authorities in pesticide risk assessment; and foster consistency of full-field study interpretation within and across regulatory authorities.

Each of these efforts will require the collection and analysis of data through data-mining, which will be a relatively large undertaking in need of funding given the constraints on people's time.

The **Monitoring Effects of Pesticides on Pollinators Workgroup**, chaired by Anne Alix (Dow Sciences), discussed the reasons why regulatory authorities may be interested in monitoring studies. Product registrations imply acceptable risks [based on available data] under the conditions of use of the product. However, monitoring may be recommended where uncertainties remain and/or to confirm the effectiveness of risk mitigation measures. Such studies are typically recommended/required after the end of the evaluation process for a pesticide. Since field studies cannot be reproduced on every single agronomic situation nor cover all indicator species, succeeding crops, or field margins, field studies provide an opportunity to examine the combined effect of these factors under actual use conditions. Therefore, the objectives of this group include the retrospective review of existing monitoring studies in terms of their intended purpose, conduct, results and reproducibility. Based on this review, the group will compile a summary of lessons learned and remaining uncertainties in order to draft recommendations on the design and performance of monitoring studies as well as recommendations on the implementation and interpretation of such studies. The group hopes to develop a decision tree for a monitoring study design base on the problem formulation for the pesticide(s) under consideration.

Thus far, 58 journal articles have been reviewed and were reported on during the 12th Symposium of the Bee Protection Group (ICP-PR 2015). Additional studies will be reviewed, and a database will be compiled. Based on this preliminary review, the group concluded that monitoring studies are important, but are resource intensive and costly and should only be initiated when triggered by specific circumstances. Also, the workgroup emphasized that when monitoring is needed, it should be conducted in a way that actually meets expectations with results that can be extrapolated to other locations/countries; therefore, there is a need for greater consistency in such study designs.

The **Bee Brood Workgroup**, chaired by Roland Becker (Bayer CropScience) and Johannes Lückmann (Rifcon), reported on efforts to improve honey bee brood testing methods, which include the Oomen and De Ruijter test (Oomen et al. 1992); the OECD Guidance Document 75 (semi-field test; OECD 2007); and the detailed brood evaluation methods in field trials described in EPPO 170 (EPPO 1998). Their current efforts are focused on honey bees; however, the efforts of

this group do not cover the laboratory-based studies on individual honey bee larval testing (i.e., OECD 237; OECD 2013); and OECD Guidance Document 239 (OECD 2016). Further see paper 2.1 in these proceedings.

A new **Workgroup on the Testing of Microbial Compounds** was also formed. The new group is chaired by Jacoba Wassenberg and Emily McVey, both from the Dutch Board for the Authorization of Plant Protection Products and Biocides) and Shannon Borges, who is from the EPA Office of Pesticide Programs' Biopesticides and Pollution Prevention Division. Roughly 30 participants of the symposium joined in this initial meeting to address concerns regarding how microbial pesticides may have effects in colonies beyond simple individual toxicity, and the lack of adequate test guidelines and risk assessment methodologies to address the possible effects of microbials on bees. The group discussed the option of developing a white paper to identify concerns, challenges and possible options for addressing both. Concerns were expressed about the current EPA honey bee test guideline (OPPTS 885.4380; USEPA 1996) for microbial pesticides and how it was determined that the study would be conducted for 30 days. Participants recommended that the group step away from the assumption that the current test methods are adequate and that it may be necessary to have tests specific to specific microbials (e.g., virus vs bacterium vs fungus). Some in the group noted that the current 30-day study duration could be achieved if study designs were modified; however, participants agreed that it would be beneficial to develop a protocol that addresses both the European Union (EU) and the U.S. requirements. The group discussed the challenges associated with defining the actual "dose" and determining the extent to which the agent may be multiplying in individual bees versus the colony. Concerns were expressed about laboratory security and whether researchers would have sufficient clearance/facilities to work with microbials. The group acknowledged that products have to be analyzed; however, the analysis may not be completely accurate, and that there is a critical need to have adequate negative and positive controls. Group co-chairs agreed to develop an outline of possible group activities, which may then serve for developing a white paper. They also hoped to receive a list of agents currently registered for use in the EU and the U.S.

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