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21 June 2017

**ENVIRONMENT DIRECTORATE  
JOINT MEETING OF THE CHEMICALS COMMITTEE AND THE WORKING PARTY  
ON CHEMICALS, PESTICIDES AND BIOTECHNOLOGY**

**Working Group on Pesticides**

**BACKGROUND INFORMATION DOCUMENT**

**OECD Seminar on Pollinator Safety**

**28 June 2017**



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**JT03416562**

## **OECD Seminar on Pollinator Safety**

*Wednesday 28 June, 2017*

*9h00 – 18h00*

*OECD Conference Centre, 2 rue André-Pascal, 75016 Paris*

*organised by the OECD Working Group on Pesticides (WGP)*

### **Background information document**

*Note: the Seminar Agenda is available as document [ENV/JM/PEST/A\(2017\)4](#)*

#### **1. Background – why this Seminar?**

In June 2016, the OECD Working Group on Pesticides (WGP) rated “pollinator (testing)” as a high priority area and subsequently agreed to organise a one-day Seminar in 2017 on the topic of pollinators. This underscores the continuing interest in pollinator issues at the OECD level, particularly with respect to the need for more consistent approaches toward pollinator safety among the international pesticide regulatory community and the potential for international harmonisation in this regard.

The Seminar will draw upon a number of related activities already on-going at OECD and at the international level, as summarised below:

##### **1.1. Work underway on pollinators at OECD**

In 2010, the WGP established an Expert Group on Pesticide Effects on Insect Pollinators (PEIP), responsible for four areas of work (themes):

- 1) communicating pollinator incidents;

- 2) testing requirements and risk assessment;
- 3) public portal on regulatory approaches adopted by OECD member countries to mitigate pesticide risks to insect pollinators; and
- 4) database on pollinator research.

In particular, in the second theme area, the so-called PEIP-2 group developed a “priority list for future work”. First developed in 2014, the list was reconfirmed by the WGP in June 2016. Activities included in that list are undertaken by the WNT (Working Group of National Coordinators of the Test Guidelines Programme) when a Member Country is willing to lead the development of a certain Guideline. Activities in the other three PEIP themes have been initiated by the WGP in the recent years resulting in a platform for reporting pollinator incidents, a portal on national regulatory approaches, and a database on pollinator research.

Work at the technical level on “testing requirements and risk assessment” is well underway at OECD through the WNT that is developing new test methods related to insect pollinators in addition to the already existing toxicity Test Guidelines (TG) and Guidance Documents (GD) on honey bees *Apis mellifera* (e.g., TG 213, TG 214, TG 237, GD 239). New test methods under development include chronic toxicity testing with adult honey bees and acute toxicity testing with non-*Apis* bees (bumble bees; *Bombus* spp.). These are aimed at addressing uncertainties regarding the potential impact of pesticides on honey bee colonies and examining the extent to which honey bees are reasonable representatives (surrogates) for the sensitivity of a large number of solitary and social non-*Apis* bee species which are important contributors to pollination and ecosystem services.

- *More information on OECD work can be found in [Annex I](#).*

## **1.2. Other on-going national/regional and international activities on pollinator safety**

A number of activities have taken place in international fora such as inter alia IPBES, EFSA/EC, US or EPPO.

- IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the intergovernmental body which assesses the state of biodiversity and the ecosystem services it provides to society, published a comprehensive “assessment report on pollinators, pollination and food production” in 2016-2017. Of particular relevance to pesticides, key messages no. 18 and 19 to policymakers outline the importance of addressing pesticide related pollinator issues at the international level.
- In 2016, the European Food Safety Authority (EFSA) organised an EU scientific workshop on bee health and sustainable pollination. Recommendations formulated by the EFSA bee task force were discussed, including one priority research recommendation regarding the need for data for chemical risk

assessment in different bee life stages/castes/sexes and under different conditions (e.g., diet, temperature). Also of interest is the EFSA MUST-B project that is developing a mechanistic model to assess the risks from pesticide exposure on a single honeybee colony. The associated topic of “Collecting and sharing data on bee health: Towards a European Bee Partnership” will be discussed in an EU symposium in Brussels on 26 June 2017.

- In January 2017, the US Environmental Protection Agency (EPA) hosted an international workshop on exposure issues for non-Apis bees. Participants discussed data needed to quantify exposure from various routes (e.g., mud, leaves) not currently evaluated for honey bees. They also identified areas where additional research may be needed to evaluate exposure for non-Apis bees. Moreover, the workshop emphasized the need to develop suitable algorithms for estimating exposure and parameterizing these equations with realistic measures of non-Apis bee ingestions rates.
- The European and Mediterranean Plant Protection Organization (EPPO) environmental risk assessment scheme for plant protection products (Standard series PP 3) and its Chapter 10 on Honeybees provides a set of formal instructions to government authorities on how the risk to bees from proposed uses of pesticides should be evaluated both qualitatively and quantitatively. In addition, the EPPO Standard testing method PP 1/170 describes the conduct of trials for the evaluation of side-effects of plant protection products on honeybees.
- More *information on national, regional and international activities related to pollinators* can be found in [Annex 2](#).

## 2. Who has planned this event?

The WGP meeting in 2016 tasked an ad hoc planning group (PG) to prepare the Seminar. This PG included representatives from Germany, the Netherlands, the US, EFSA, BIAC (industry) and the OECD Secretariat and helped shape this event that will take place just before the 2017 annual meeting of the WGP. The PG members have been instrumental in identifying the key issues and developing the agenda.

The members of the PG are the following:

- [Jens Pistorius](#) (Germany)
- [Rolf Forster](#) (Germany)
- [Achim Gathmann](#) (Germany)
- [Ivo Roessink](#) (The Netherlands)
- [Tom Steeger](#) (U.S. EPA)
- [Brenda Harris](#) (BIAC)

- [Csaba Szentes](#) (EFSA)
- [Leon van der Wal](#) (OECD Secretariat)

The agenda developed by the PG focuses on the central themes of pollinators safety (i.e. the potential role of pesticides in pollinator declines, pesticide risk assessment and risk management processes) in order to gain greater insight into possible future actions to meet the needs of the WGP.

### 3. Scope of the Seminar - Objectives and topics

This Seminar will address broad regulatory issues related to pollinator safety and protection. It is intended to cover issues beyond testing and assessment and PEIP-2 activities, thus to be of more interest to WGP delegates who are mostly regulators and risk managers. The key to this Seminar is having a candid dialogue among participants with respect to the risk management challenges regulators are facing. Risk assessors can accommodate a wide range of needs; however, without a clear understanding of managers' needs, resources can be misdirected.

The objectives of this Seminar are to:

- identify available methodologies and approaches for risk assessment and risk management of chemicals with respect to bees/pollinators across OECD countries;
- generate a common understanding of available tools for making assessments on a global basis in order to use regulatory agencies' resources more effectively; and,
- recommend ways to strengthen and streamline processes for internationally-agreed risk assessment and risk management procedures.

In line with the above, the Seminar will address topics structured around the main session themes, (*i.e.*, pollinator safety, global drivers and actions; pollinator risk assessment - evolving/harmonizing the science; and, pollinator risk management) focusing on country/region-specific pollinator issues, experiences and activities. The topics cover the following:

- What is the global status of pollinators? What is the actual impact of pesticides in the declines of some insect pollinators?
- What is the role of authorities regarding some of the factors (*i.e.*, beyond pesticides) affecting pollinators' health and safety? How (better) understanding of these other factors affect/influence the regulatory decisions concerning pesticides?
- What are the differences and commonalities in risk assessment in the different countries/regions?

- How the use of the same tools/test methods could lead to differences in interpretation among various countries/regions? How are variability and uncertainty addressed?
- How to effectively use the PEIP-2 priority list that was reconfirmed in 2016? How to combine the strengths of experts and countries to achieve quicker results as needed by the regulatory authorities (also in light of available resources)? How to ensure that future tests submitted to OECD are relevant and are required when necessary in risk assessment?
- How to make better use of limited resources and be less dependent on very resource intensive, elaborated studies and on animal testing?
- What are current outstanding issues in risk assessment: exposure assessment, *Apis* vs. non-*Apis* bees; predictive tools and models, *etc.*
- How strong is the level of interest in an internationally harmonised risk assessment process (for methodology), even if statutes for regulating risk are different in various regions of the world? In other words: while there are political/demographic boundaries, there is a common language of the science.
- What are the actual needs of the regulatory agencies to make more informed decisions in pollinator risk assessment and risk management? Are there different needs among OECD regions?
- How can OECD assist in harmonising science to promote a common understanding and for streamlining the harmonisation process?

#### 4. Possible outcomes of the Seminar

It is expected that the facilitated discussions following each main session will help build a better understanding of *e.g.*:

- status of activities in governments to assess pesticide impacts on pollinators;
- available tools for making assessments on a global basis, in order to use regulatory agencies' resources more effectively;
- diverging and converging issues for risk assessment and risk management in OECD countries;
- differences between scientific needs and OECD testing needs for both risk assessment and risk management (“regulatory science”);
- gaps and hurdles in risk assessment and risk management and how to overcome those gaps;
- similarities and opportunities for convergence and further harmonisation; and,
- priority areas for which there are gaps in knowledge and in regulatory areas.

The discussions and exchanges could, for example, lead to suggesting possible recommendations on:

- how to strengthen and streamline processes of internationally agreed risk assessment and risk management procedures;
- international actions for more concerted efforts (instead of separate/individual efforts);
- identified future areas of concern;
- pesticide policies (“pollinator-friendly policies”) in the areas of registration, exposure assessment, risk mitigation, *etc.*; and,
- innovative work areas (*i.e.*, to enhance pollinators safety).

At the end of the day, the Seminar will conclude with the development of agreed recommendations that could be directed to the relevant stakeholders: OECD countries, industry, civil society, and international organisations. Specifically, the Seminar will prepare recommendations, based on feedback provided during the facilitated discussions, for the WGP regarding further action on pollinator safety. These recommendations will be presented to the WGP meeting on 29 June.

## 5. Format of the Seminar

As outlined in section 2 above, the Seminar has been organised to be as interactive as possible, involving many different pollinator experts in their own area of expertise (IPBES, risk assessors, PEIP-members, risk managers in governments or in industry, research scientists), alternating presentations, Q&A and facilitated discussions. It will provide as much time as possible for countries to reflect their specific situations and perspectives, hence contributing to progress towards harmonised pollinator safety.

The agenda has been designed to have this combination of formal presentations and facilitated discussions to provide an understanding of current issues associated with pollinators particularly with respect to pesticides. Facilitated discussions are intended to focus on what is, and is not, working in terms of pollinator protection efforts relative to pesticides in member countries and how such efforts may extend beyond restrictive measures to involve increased stakeholder communication, cooperation and collaboration. These discussions will also help identify relevant, realistic and priority recommendations.

While most Seminar presentations will be provided by speakers in the OECD meeting room, some might be delivered through videoconferencing/Webex.

## 6. Seminar participants

The invitations have been sent to various relevant OECD groups including:

- The Working Group on Pesticides (*i.e.*, government representatives from 35 member countries and the European Commission)

- Observers to the WGP (industry, NGOs, other international organisations: EPPO, FAO, *etc.*)
- PEIP group experts
- Planning Group members
- The OECD Joint Working Party on Agriculture and the Environment
- Invited speakers from other fora, *e.g.*, IPBES

## 7. Preparing for this Seminar

The participants are invited to carefully read this document and refer to materials included in the Annexes for additional information. In order to be prepared and to actively contribute, participants are invited to consider the following questions:

1. **What are the main current activities of your country in the context of pollinator safety?**
2. **What are the current gaps and hurdles your country faces when performing risk assessments and risk management and in taking decisions, with respect to pollinator safety?**
3. **What are your country's needs in relation to pollinators and their safety? What are the most urgent?**
4. **What areas of the regulation of pesticides, in particular for the risk management phase, could be amended or improved to facilitate pollinator safety?**
5. **Are you aware of successful approaches in the pollinator area with regards to the risk management of pesticides (e.g., to enhance pollinators safety)?**
6. **What short-, medium- and long-term activities and innovative policies could be launched/promoted by OECD and in particular its pesticide group?**

## 8. Seminar sessions

As noted in the Agenda, the seminar is divided into four main sections (2 to 5). The first three sections (2, 3 and 4) will begin with general presentations to introduce the main topic followed by brief questions and answers. The concluding part of each section will be devoted to a facilitated discussion on the key topics focusing on the experiences of countries and current activities related to the topic. The final section (5) will be a general discussion of country-specific pollinator issues, how to support the response to such issues at the national and international level

## Agenda Session 2 - Pollinator safety, global drivers and actions

### Questions for the facilitated discussions on Country-specific pollinator issues, experiences and activities

*to be moderated by Tom Steeger (US) and Ivo Roessink (the Netherlands)*

- a) Do countries experience specific issues regarding pollinator safety and if so what are these issues?
- b) Is there a way to weigh the different factors involved in pollinator decline?
- c) How can (or should) other possible non-pesticide factors in pollinator decline be considered in pesticide risk assessment/risk management?

### Background information for the Session

There are a diverse number of perspectives on pollinator declines and these are reflected in social and scientific media. The extent of supporting information used in these various accounts can vary widely; however, each account informs stakeholder perspectives across multiple public and private sectors including government, industry, academia, and the general public. These accounts also fuel concerns that insufficient resources and government bureaucracy are delaying appropriate responses to understand and mitigate pollinator declines.

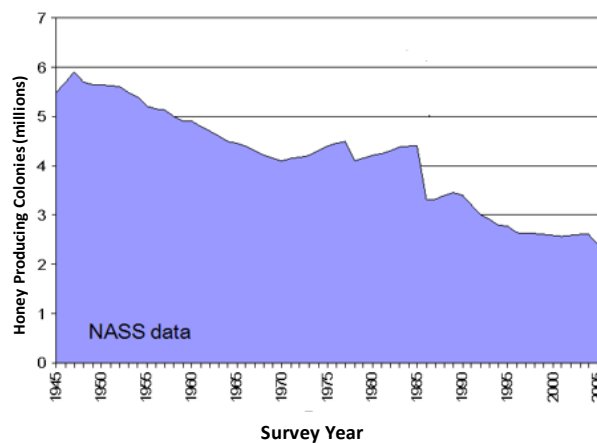
Multiple factors have been associated with declines of some pollinator species. Factors relative to declines in managed honey bees which are observed in some OECD countries include:

- pathogens such as the fungus *Nosema ceranae* and *N. apis* responsible for nosemosis, the bacterium *Paenibacillus larvae* responsible for American foulbrood, viruses like deformed wing and black queen cell virus, and parasites such as the trypanosome *Crithidia bombi*.
- Pesticides such as conventional, biological, antimicrobial chemicals - not just those used in agriculture, but also in residential settings and by beekeepers.
- Pests such as *Varroa destructor* (varroa mites), *Tropilaelaps* spp (parasitic mites), *Acarapis woodi* (tracheal mites), *Aethina tumida* (small hive beetles), *Archroia grisella* (lesser wax moth), *Vespa velutina* (yellow-legged hornet), *Vespa mandarinia* (Asian giant hornet).
- Poor nutrition due to inadequate forage area and/or diversity of forage in terms of proteins/carbohydrates and essential elements.
- Practices used within bee management such as crowding, long transport, inadequate monitoring/treatments.
- Socio-economic factors.

Other factors including changing weather patterns can affect bees as well. However, no single factor has been identified as the cause of overall declines; rather, the factors act in combination. Although these factors are acting in combination, there is no shortage of opinions regarding the prominence of one factor over another.

## United States

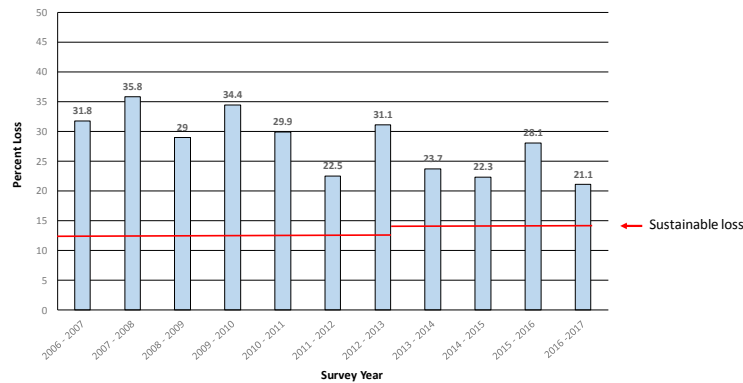
**Figure 8.1.**



Source: NRC, 2007

**Figure 8.1**<sup>1</sup> is taken from the National Research Council 2007 publication on the Status of Pollinators in North America and it depicts USDA National Agricultural Statistics Service (abbreviated NASS) data showing the number of managed honey bee colonies in the U.S. used in honey production. This graph has frequently been used to depict declines in managed honey bees and it shows a relatively steady decline since the mid-1940s.

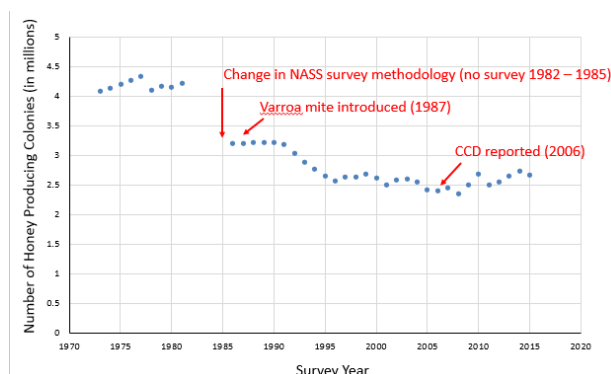
<sup>1</sup> National Research Council. 2007. Status of Pollinators in North America. Committee on the Status of Pollinators in North America Board of Life Sciences National Research Council of the National Academies. National Academies Press, Washington DC. Available on-line at: [http://www.nap.edu/openbook.php?record\\_id=11761](http://www.nap.edu/openbook.php?record_id=11761) (last accessed 05/28/17).

**Figure 8.2.**

Source: Bee Informed Partnership

**Figure 8.2** depicts the same data from 1970 through 2016; however, the data are depicted as discrete points. In this graph no points are depicted between 1982 and 1986, since NASS did not conduct beekeeper surveys during this period. Also, when NASS resumed its survey, the survey methods included fewer beekeepers; therefore, with respect to the marked decline in colony numbers from 1982 to 1987, there is uncertainty regarding the extent to which they may represent an artefact as a result of changes in the survey methodology.

The data indicate that following the introduction of varroa mites in 1987, there was a decline of roughly a half million colonies between 1990 to 1995; however, since 1996, the number of managed colonies used in U.S. honey production appears to have levelled off at around 2.6 million. The data also indicate that in 2006 when dramatic losses were reported in association with the phenomenon known as Colony Collapse Disorder (CCD), overall colony numbers remained relatively consistent. Although some might argue that the data do not support concerns regarding declines in honey bees, the numbers do not provide insight into what amounts to an unprecedented level of beekeeper effort to sustain numbers.

**Figure 8.3.**

Source: USDA NRCS 2007 - 2016

**Figure 8.3** depicts data collected by the USDA and the Bee Informed Partnership through a survey of small-scale (i.e., those with fewer than 25 colonies), sideline (those with 25 to 300 colonies) and commercial (those with greater than 300 colonies) beekeepers on the number of honey bee colonies lost during overwintering.

Prior to the introduction of varroa mites, roughly 5 – 10% of colonies failed to overwinter successfully. After the introduction of mites, overwintering losses averaged 15%. Since CCD was first reported in 2006, overwintering losses have averaged around 31%. When asked what beekeepers considered to be economically sustainable losses, the Bee Informed Partnership survey reported that 15%. This means that nationally, beekeepers are faced with overwintering losses that are roughly double what is considered economically sustainable. These numbers have fuelled concerns regarding the sustainability of the commercial beekeeping industry. However, the most recent overwintering losses reported by the Bee Informed Partnership (i.e., 21.1% for the 2016 – 2017 survey year) represent the lowest overwintering losses since the survey was initiated in 2006. These reduced losses are attributed to a milder winter and greater awareness of and treatment for varroa mites. The most recent data indicate that since 2013, the percent loss that beekeepers consider to be sustainable has also increased to roughly 19%.

For additional information on the status of honey bee colonies and beekeeping in Canada, please see the following websites:

- <http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/horticulture-industry/horticulture-sector-reports/statistical-overview-of-the-canadian-honey-and-bee-industry-2015/?id=1475694004047>
- <http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/agriculture-and-food-market-information-by-region/canada/honey-product-trends-in-canada/?id=1467224411621>

- <http://www.statcan.gc.ca/pub/11-630-x/11-630-x2016004-eng.htm>
- <http://honeycouncil.ca/honey-industry/statistic/>

### Agenda Session 3 - Pesticide risk assessment (evolving/harmonizing the science)

#### Questions for the facilitated discussions

*to be moderated by Tom Steeger (US)*

- a) How has the perception of pesticides as a factor in pollinator decline influenced the risk assessment/management process?
- b) How can governments ensure that endpoints of tier I and tier II tests are linked to colony or population level effects (e.g., EFSA good modelling practices)?

#### Background information for the Session

##### United States

Throughout the process of learning about the multiple factors associated with pollinator declines, US-EPA's focus has been on ensuring that the best science is brought to bear in assessing the potential role that pesticides may be playing in the declines of some species of insect pollinators. The overall risk assessment process is codified in a number of regulations. In 2011, EPA issued interim guidance on exposure and effect data on bees.<sup>2</sup> This guidance was based on the Agency's understanding of the evolving science through a SETAC Global Pellston Workshop on pollinator risk assessment in 2011<sup>3</sup> and work underway in Europe through the European and Mediterranean Plant Protection Organization (EPPO)<sup>4</sup>. In 2012, EPA in collaboration with Health Canada's Pest Management Regulatory Agency and the California Department of Pesticide Regulation

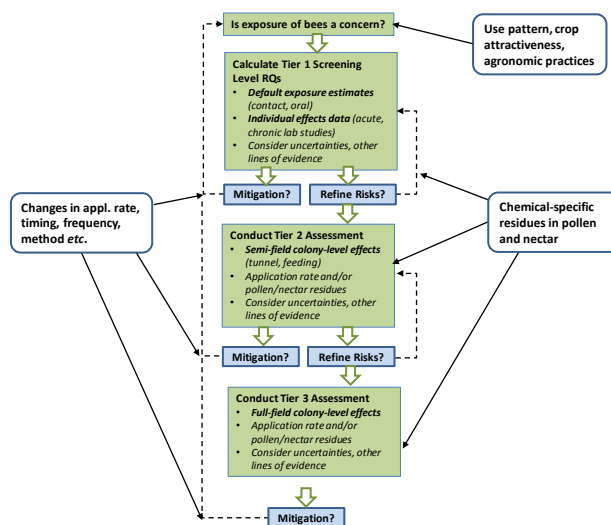
<sup>2</sup> USEPA. 2011. Interim Guidance on Honey Bee Data Requirements. Memorandum signed by Donald Brady, Division Director of the Environmental Fate and Effects Division, US EPA Office of Pesticide Programs.

<sup>3</sup> Fischer, D. and T. Moriarty. 2011. Pesticide risk assessment for pollinators: summary of a SETAC Pellston Workshop. Edited by D. Fischer and T. Moriarty. SETAC Press. Available on-line at: [https://c.ymcdn.com/sites/www.setac.org/resource/resmgr/publications\\_and\\_resources/executivesummarypollinators .pdf](https://c.ymcdn.com/sites/www.setac.org/resource/resmgr/publications_and_resources/executivesummarypollinators.pdf) (last accessed 05/28/17).

<sup>4</sup> EPPO. 2010. Environmental risk assessment scheme for plant protection products: Chapter 10, Honey bees. European and Mediterranean Plant Protection Organization (EPPO). Bulletin OEPP/EPPO Bulletin 40, 323–331. Available on-line at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2338.2010.02419.x/full> (last accessed 05/28/17).

presented a White Paper to the FIFRA SAP describing a conceptual framework for assessing risks of pesticides to bees. In 2014, based on the White Paper<sup>5</sup>, input from the SAP and additional guidance documents generated through the European Food Safety Authority, EPA / PMRA released the harmonized guidance<sup>6</sup> for assessing pesticide risks to bees. This guidance has subsequently been translated into Spanish for consideration as a NAFTA harmonized guidance document.

Figure 8.4.



Source: USEPA 2014

Figure 8.4 depicts a simplified version of the three-tiered process used to assess risk to bees where the answers to multiple questions determine the extent to which higher-tier studies (refinements) are needed. For example, the most basic question is whether it is likely that bees are exposed. This involves understanding whether the crop may be attractive to bees, whether applications occur at or near bloom, and the time at which compounds are applied. Also, transitioning to higher levels of refinement is influenced by whether mitigation measures may be available and the nature of data with which risk estimates may be refined.

<sup>5</sup> USEPA. 2012. White Paper in Support of the Proposed Risk Assessment Process for Bees. Submitted to the FIFRA Scientific Advisory Panel for Review and Comment September 11 – 14, 2012. Office of Chemical Safety and Pollution Prevention Office of Pesticide Programs Environmental Fate and Effects Division, Environmental Protection Agency, Washington DC; Environmental Assessment Directorate, Pest Management Regulatory Agency, Health Canada, Ottawa, CN; California Department of Pesticide Regulation. Available on-line at: <http://cues.cfans.umn.edu/old/pollinators/pdf-EPA/EAP-SAP-whitepaper.pdf> (last accessed 05/28/17).

<sup>6</sup> USEPA, PMRA, CDPR. 2014. Guidance for Assessing Pesticide Risks to Bees. Office of Pesticide Programs, United States Environmental Protection Agency, Washington, DC 20460. Health Canada Pest Management Regulator Agency, Ottawa, Ontario, Canada. California Department of Pesticide Regulation, Sacramento, CA. Available on-line at: [https://www.epa.gov/sites/production/files/2014-06/documents/pollinator\\_risk\\_assessment\\_guidance\\_06\\_19\\_14.pdf](https://www.epa.gov/sites/production/files/2014-06/documents/pollinator_risk_assessment_guidance_06_19_14.pdf) (last accessed 05/28/17).

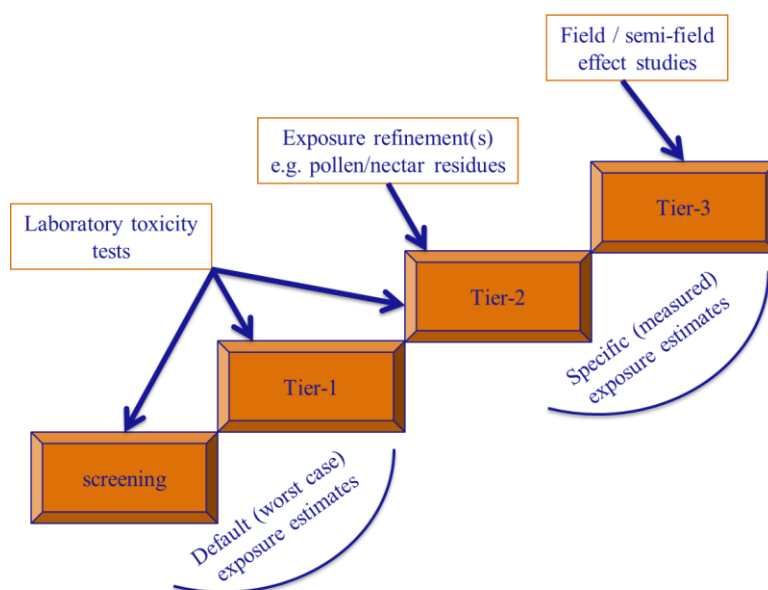
The process used to assess risks to bees is consistent with the process used by EPA with other taxa in that it is tiered. It consists of a screening-level process (Tier 1) in which conservative estimates of exposure and effects to individual organisms (e.g., adult or larval bees) are used to quantify potential risks. The screen focuses on what are considered to be the major routes of exposure (*i.e.* contact and ingestion of residues in pollen/nectar). Higher-tier assessments are conducted in which measured rather than model-estimated exposure values may be used and evaluations include colony-level data.

The process relies largely on guideline studies although several of the studies (*i.e.*, chronic toxicity in individual adult bees and bee larvae) have draft guidance documents. In addition to foliar treatments, soil and seed treatments are evaluated as well as trunk injections. As with other taxa, the process considers multiple lines of evidence including registrant-submitted data, open literature, residue monitoring data and incident data.

### **Risk assessment scheme of EFSA**

In the past, the risk assessment frameworks used in the European Union (EU) were largely based on the risk assessment schemes published by EPPO [1,2,3]. However, some years ago, the pollinator issues were reconsidered and the European Commission tasked EFSA to develop a new guidance for pesticide risk assessment for bee pollinators. The new EFSA guidance document [4] (not yet noted) was developed with the aim to consider the most relevant exposure routes and relevant available scientific information. The protection goals set by risk managers of the EU (e.g. maximum tolerated effect on the population of honeybee colonies is 7% at 90th percentile exposure situation [5]) were carefully taken into consideration.

Figure 8.5. Risk assessment scheme of EFSA



Source: EFSA

The EFSA guidance document includes a tiered risk assessment scheme with simple and cost-effective lower tiers moving to more complex higher tiers (see Figure 8.5).

For the lower tiers, a number of laboratory studies are required such as OECD 213/214, OECD draft for 10-day feeding test or the OECD Guidance Document No. 239. However, many aspects of the proposed risk assessment schemes are not yet covered by standardised laboratory test methods (e.g. tests for wild pollinators). Refinement of the lower tiers is possible with additional data, such as measured residues in nectar and pollen, or measured sugar content of the nectar of the crops under assessment. Currently these data are scarce and no internationally accepted standard protocols exist for generating such data. For the highest level of refinement in the new scheme, field effect studies can be generated. The exposure level (i.e., residues entering the hive) of the test hives should be measured and compared with exposure values generated in field residue trials. Validated population models may also serve as regulatory tools in the future.

### References:

- [1] SANCO/10329/2002, Guidance Document on Terrestrial Ecotoxicology Under Council Directive 91/414/EEC, 17 October 2002
- [2] OEPP/EPPO (2010) EPPO Standards PP 3/10 (3) Environmental risk assessment for plant protection products. Chapter 10: honeybees. Bulletin OEPP / EPPO Bulletin 40, 323–331
- [3] Alix A & Lewis G (2010) Guidance for the assessment of risks to bees from the use of plant protection products under the framework of Council Directive 91 / 414 and Regulation 1107/2009 Bulletin OEPP/EPPO Bulletin 40, 196–203

[4] European Food Safety Authority, 2013. EFSA Guidance Document on the risk assessment of plant protection products on bees (*Apis mellifera*, *Bombus* spp. and solitary bees). EFSA Journal 2013;11(7):3295, 268 pp., doi:10.2903/j.efsa.2013.3295

[5] Summary report of the standing committee on the food chain and animal health held in Brussels on 12 July 2012 - 13 July 2012 SANCO E Ares(2012)1422051

#### Agenda Session 4 - Pollinator risk management

##### **Questions for the facilitated discussions on Country-specific pollinator issues, experiences and activities**

*to be moderated by Ivo Roessink (the Netherlands) and Sofie Hofkens (European Commission)*

- a) What are the needs of the regulatory agencies to make more informed decisions in risk assessment and risk management?
- b) Diverging issues for risk assessment and risk management in OECD countries.
- c) Country-specific management options, including Integrated Pest Management/sustainable use options.
- d) Risk management and implications for decision making.

#### Background information for the Session

Risk assessment and management by regulatory authorities is typically dependent on specific protection goals which represent desired conditions or ecological values and are defined by the laws of a county; therefore, they reflect the statutory objectives of a regulatory agency and are founded on science. The goals inform decisions about the type of data considered and provide a basis for the criteria used in determining the need for additional refinements in risk estimates. Several protection goals have been identified for honey bees that are relatively consistent between the EU, United States, Canada, and Australia. These goals consist of insuring pollination services, continued production of hive products (e.g., honey, wax, propolis) and contributing to pollinator biodiversity.

Risk assessment and risk management need to be closely linked and also management options considered and investigated in the risk assessment. While there may be risks that cannot be excluded for all circumstances with absolute security, risk management comes into play. Risk management requires identifying suitable risk mitigation measures that help to reduce the risk or the effects to an acceptable level. The level of acceptance may be influenced by other needs of the society, e.g. to protect against complete crop failure due to excessive pest pressure. Management also means, that further aspects beyond the

level of risk identified may need consideration, such as weighing the uncertainties and the level of risk (e.g. potential risk to pollinators versus the need for crop protective measures). Mitigation measures range from simple label- instructions such as “do not apply during bee flight” to more complex mitigation measures, for example seed treatments with specific Heubach values may only be used in combination with mechanized seeding equipment. Risk management also comprises activities that go beyond the label restrictions and recommendations.

In advancing risk management, the United States believes that cooperation and communication are key components. Beekeepers, growers, applicators, chemical industry representatives and local, Tribal, State and Federal regulators need to communicate effectively with one another to identify and resolve complex interactions. To that end, the US EPA is engaging State and Federal partners through discussions with State FIFRA Issues Research and Evaluation Group (SFIREG) and the Association of American Pesticide Control Officials (APPCO), stakeholders through the Pesticide Program Dialogue Committee (PPDC), groups such as the North American Pollinator Protection Campaign (NAPPC) and the Honey Bee Health Coalition, discussions with beekeeping organizations, grower groups and the chemical industry to provide input on effective means of reducing potential risks to insect pollinators via either label language and/or through voluntary measures.

International efforts continue as well through the OECD to identify additional areas where cooperation would advance the science and/or the management around protecting pollinators. These efforts include:

- 1) Advancing and harmonizing the science of risk assessment.
- 2) Sharing risk management approaches. Risk managers in North America, Europe and beyond understand that policy is specific to not only statutory or legislative mandates, but is also reflective of a specific commercial agricultural profile. Sharing information on risk management approaches can identify innovative approaches toward addressing regional needs.
- 3) Timely and efficient sharing of information on causes, circumstances, effects, and response surrounding bee kill incidents to potentially avoid similar incidents in the future (e.g. Annex 3).

## ANNEX 1

### OECD work on Pollinators

#### *OECD Survey of pollinator testing, research, mitigation and information management (2009-2010)*

To get a better sense of efforts underway in countries to examine the potential role of pesticides in pollinator declines, in 2009 OECD member countries were surveyed about the management of bee kill incident information, regulatory pollinator toxicity testing requirements, on-going research efforts related to declines in pollinator populations, and the range of regulatory responses to pollinator declines as they relate to the potential role of pesticides.

OECD published the results of the survey in 2010 in which survey respondents indicated that pollinators contributed to each country's agriculture and that pollinator populations were in decline in each country. Most respondents associated declines with insect populations as opposed to birds and bats. Respondents frequently attributed declines in honeybee numbers to disease, parasites, winter losses and pesticides. In general, countries had processes for reporting bee kill incidents and the majority relied on beekeepers themselves to provide this information in writing; however, the data on bee kill incidents were not generally available electronically. All the countries required bee toxicity testing for the registration of pesticides; the acute oral and contact toxicity tests with adult bees were the most frequently required toxicity tests for pollinators. Only 20% of the respondents indicated that they required field pollinator toxicity tests; some countries indicated that they were expanding their toxicity testing to include studies of potential effects on developing honeybee eggs, larvae and pupae (collectively referred to as "brood") and toxicity of residue studies on/in pollen/nectar. The majority of the countries did not believe that current toxicity study designs adequately evaluated the potential sub-lethal effects of pesticides on adult and larval honeybees. Regulatory responses to mitigate the potential effects of pesticides on honeybees typically included label restrictions and advisory statements on pesticide labels; resource constraints limited countries from additional mitigation measures although respondents considered education and training as mechanisms for reducing potential risks. While respondents indicated an awareness of research regarding the potential effects of pesticides on honeybees, the majority were uncertain whether their respective countries had sufficient resources to devote to additional research.

#### *Pesticide Effects on Insect Pollinator (PEIP)*

Based on the results of the 2009 survey, OECD formed the Pesticide Effects on Insect Pollinator (PEIP) expert group and tasked it with addressing four theme areas:

- 1) Bee kill incident reporting;
- 2) Developing risk assessment tools;
- 3) Identifying risk management options; and,
- 4) Identifying relevant open literature studies on the factors associated with pollinator declines.

Since the formation of the PEIP in 2010, a confidential/protected incident reporting portal has been developed as a means of alerting countries to significant bee kill incidents and as a means of establishing a database for cataloguing such incidents internationally. PEIP has also developed a portal from which to obtain information on measures for mitigating risk to insect pollinators employed in various OECD countries. In addition, the PEIP has worked collaboratively with researchers in academia, government and industry through organizations such as the International Commission for Plant-Pollinator Relationships (ICP-PR) and the Colony Loss (COLOSS) Network to identify tools (test/assay methods) to address uncertainties related to potential exposure to and effects from pesticides in both honeybees (*Apis mellifera*) and non-*Apis* bees.

#### *OECD Test methods and guidance related to insect pollinators*

As part of the activities of the Working Group of National Coordinators of the Test Guidelines Programme (WNT), a number of test methods have been developed:

- a. [Test No. 213](#): Honeybees, Acute Oral Toxicity Test
- b. [Test No. 214](#): Honeybees, Acute Contact Toxicity Test
- c. [Test No. 237](#): Honey Bee (*Apis Mellifera*) Larval Toxicity Test, Single Exposure
- d. Test Guideline on honey bee (*Apis Mellifera* L.) chronic oral toxicity test 10-day feeding study (approved in 2017 but not yet published)
- e. Test Guideline Bumblebee, acute oral toxicity test (approved in 2017 but not yet published)
- f. Test Guideline Bumblebee, acute contact toxicity test (approved in 2017 but not yet published)
- g. [Guidance Document](#) on the Honey Bee (*Apis Mellifera* L.) Brood Test Under Semi-field Conditions (No.75)
- h. [Guidance Document](#) on Honey Bee Larval Toxicity Test following Repeated Exposure (No. 239)

## References

1. OECD Work Related to Bees/Pollinators: <http://www.oecd.org/chemicalsafety/pesticides-biocides/work-related-beespollinators.htm>
2. OECD. 2010. OECD Survey of pollinator testing, research, mitigation and information management: survey results. Environment Directorate Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology. [ENV/JM/MONO\(2010\)24](#). 12 May 2010. <http://www.oecd.org/chemicalsafety/pesticides-biocides/45275778.pdf> (last accessed 28/ May 2017)
3. June 2016 WGP paper [ENV/JM/PEST\(2016\)7](#) entitled: “Consideration of revisiting the expert group on pesticide effects of insect pollinators’ list of priorities”, including as Annex 1 document [ENV/JM/PEST\(2014\)3](#) entitled “Expert group on pesticide effects of insect pollinators: testing requirements and risk assessment: proposed priority list for future work”
4. “Managing Pesticide Risk to Insect Pollinators” portal: <http://www.oecd.org/chemicalsafety/risk-mitigation-pollinators/>

## ANNEX 2

### Examples of other international activities related to work on pollinators

#### 2.1 IPBES

#### 2.2 EU/EFSA

#### 2.3 US

#### 2.4 EPPO

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#### 2.1 IPBES

The **Intergovernmental Science- Policy Platform on Biodiversity and Ecosystem Services (IPBES)** is the intergovernmental body which assesses the state of biodiversity and ecosystem services, in response to requests from Governments, the private sector and civil society.

The objective of the **IPBES assessment of pollinators, pollination and food production** was to evaluate the role of pollination as a regulating ecosystem service in global food production and conservation and sustainability of biodiversity. The assessment focused on the role of managed pollinators (e.g., honeybees *Apis mellifera*, *A. ceranae*; bumble bees *Bombus terrestris*, *B. impatiens*; mason bees *Osmia* spp.) along with a large number of non-managed social and solitary species of pollinators.

In its “Summary for policy makers”, the IPBES outlines available management and response options to pollination declines and deficits and is intended to inform decision making at the national/international level. As mentioned in the Foreword, “*The report provides a critical assessment of the full range of issues facing decision-makers, including the value of pollination and pollinators, status, trends and threats to pollinators and pollination, and policy and management response options. It concludes that pollinators, which are economically and socially important, are increasingly under threat from human activities, including climate change, with observed decreases in the abundance and diversity of wild pollinators.*”

The IPBES assessment also discusses factors that are relevant in the context of assessing the risks from pesticide use to honey bees and other pollinators. The following key messages are stated in the report:

- key message 18: *“The risk to pollinators from pesticides arises through a combination of toxicity and the level of exposure, which varies geographically with the compounds used and the scale of land management and habitat in the landscape. Pesticides, particularly insecticides, have been demonstrated to have a broad range of lethal and sublethal effects on pollinators under controlled experimental conditions”.*
- key message 19: *“Exposure of pollinators to pesticides can be decreased by reducing the use of pesticides, seeking alternative forms of pest control and adopting a range of specific application practices, including technologies to reduce pesticide drift. Actions to reduce pesticide use include promoting Integrated Pest Management, supported by educating farmers, organic farming and policies to reduce overall use”.*

These key messages underpin the high importance of addressing the pesticide related pollinator issues on the international level.

#### References

- IPBES (2016): [Summary for policymakers](#) of the assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. S.G. Potts, V. L. Imperatriz-Fonseca, H. T. Ngo, J. C. Biesmeijer, T. D. Breeze, L. V. Dicks, L. A. Garibaldi, R. Hill, J. Settele, A. J. Vanbergen, M. A. Aizen, S. A. Cunningham, C. Eardley, B. M. Freitas, N. Gallai, P. G. Kevan, A. Kovács-Hostyánszki, P. K. Kwapong, J. Li, X. Li, D. J. Martins, G. Nates-Parra, J. S. Pettis, R. Rader, and B. F. Viana (eds.). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 36 pages
- IPBES (2016). The [assessment report](#) of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. S.G. Potts, V. L. Imperatriz-Fonseca, and H. T. Ngo, (eds). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 552 pages

## 2.2 European Union (EU) / European Food Safety Authority (EFSA)

### *EU scientific workshop on bee health and sustainable pollination (March 2016)*

#### **Abstract**

European Food Safety Authority and the European Commission's Directorate General for Agriculture and Rural Development©, 2016

On the request of the European Commission (EC) Directorate-Generals for Agriculture and Rural Development (DG AGRI), EFSA organized on 10 March 2016 a scientific workshop to discuss and prioritise research under the framework of H2020 and support EFSA's efforts to develop a holistic risk assessment approach for bees. The workshop gathered representatives of the EC (DG-AGRI and DG for Health and Food Safety), the EC Joint Research Centre, the European Environmental Agency and European Medicine Agency, coordinators/representatives of EC funded research projects on bee health and pollination related topics (11 EU research framework programmes FP6-7 and two COST-Actions), the US Environmental Protection Agency, the World Organisation for Animal Health, and the Food and Agriculture Organization of the United Nations. An online survey was performed prior to the workshop.

The objective was to review the relevance of the recommendations formulated by the EFSA bee task force on its 2014 report and to collect potential additional recommendations and clarifications. A total of 18 recommendations were identified for further assessment. During the workshop, based on the results presented from the EC projects and following an expert knowledge elicitation approach, the 18 recommendations were ranked according to two criteria: (i) to promote apiculture and sustainable pollination and (ii) to increase understanding of the bee biology and interactions at the ecosystem level. The results showed a large variation in expert opinions.

The discussions are reflected in the report. The research recommendation with the highest average priority concerns the need for data for chemical risk assessment (i.e. residue levels in bee matrices, species sensitivity, dose-response relationships, toxicokinetics, toxicodynamics for chemicals, contaminants and veterinary products, and metabolites) in different bee life stages/castes/sexes and under different conditions (e.g. diet, temperature).

#### Reference:

EFSA (European Food Safety Authority) and European Commission's Directorate General for Agriculture and Rural Development, 2016. EU scientific workshop on bee health and sustainable pollination. [EFSA supporting publication 2016:EN-1026](#). 75 pp.

### **The EFSA MUST-B project (<http://efsa4bees.efsa.europa.eu/must-b>)**

The MUST-B project comprises three ad hoc EFSA working groups of experts, MUST B, BEEHAVE and HEALTHY-B. The BEEHAVE working group of the EFSA Panel on Plant Protection Products and their Residues assessed the suitability of the BEEHAVE model for its potential use in a regulatory context and for the risk assessment of multiple stressors in honeybees at the landscape level. The MUST-B working group further considered results and recommendations from the EFSA Panel on Plant Protection Products and their Residues. The HEALTHY-B working group of the EFSA Panel on Animal Health and Welfare elaborated a toolbox (indicators, variables and methods/tools) to assess the health status of a honeybee colony in large field surveys.

According to EFSA opinion on good modelling practice, the MUST-B working group developed a conceptual model, which provides the basis for the development of a mechanistic model. The overall conceptual model is a series of layers. A base model representing the honeybee colony (Foraging module and the Colony and in-Hive Products modules), placed within a complex landscape (the Resource Providing Unit and Environmental Drivers modules) and the inclusion of multiple factors and stressors on colony health (the Pesticides module and the Biological Agents module) and the Beekeeping Management Practices module.

The objective of the mechanistic model is to assess the risks from pesticide exposure on a single honeybee colony. The model outputs should include colony size and mortality of the various honeybee life stages (queen, drones and workers such as foragers, in-hive bees, larvae and pupae) and egg-laying rates.

For the corroboration and verification of the bee colony model, data collection will be conducted at 10 sites (in the 3 EU regulatory zones). The data will be collected in a harmonized and consistent way in order to enable the further use of data by the modellers. It is expected that the forthcoming EU symposium on data collection and sharing ([Collecting and sharing data on bee health: Towards a European Bee Partnership](#); Brussels, 26 June) will also support this objective.

#### References:

- EFSA (European Food Safety Authority) PPR Panel (Panel on Plant Protection Products and their Residues), 2015. Statement on the suitability of the BEEHAVE model for its potential use in a regulatory context and for the risk assessment of multiple stressors in honeybees at the landscape level. [EFSA Journal 2015](#);13(6):4125, 92 pp. doi:10.2903/j.efsa.2015.4125

- EFSA AHAW Panel (EFSA Panel on Animal Health and Welfare), 2016. Scientific opinion on assessing the health status of managed honeybee colonies (HEALTHY-B): a toolbox to facilitate harmonised data collection. [EFSA Journal 2016;14\(10\):4578](#), 241 pp. doi:10.2903/j.efsa.2016.4578
  - EFSA (European Food Safety Authority), 2016. A mechanistic model to assess risks to honeybee colonies from exposure to pesticides under different scenarios of combined stressors and factors. [EFSA supporting publication 2016:EN-1069](#). 116 pp.
  - EFSA (European Food Safety Authority), 2017. Specifications for field data collection contributing to honey bee model corroboration and verification. [EFSA supporting publication 2017:EN-1234](#). 54 pp. doi:10.2903/sp.efsa.2017.EN-1234
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### 2.3 United States (US)

#### **Non-*Apis* Bee Exposure Workshop (2017)**

In January 2017 the US-EPA hosted an international workshop intended to identify the primary and secondary routes of exposure for bees other than the Western honey bees (*Apis mellifera*), which is currently used as a surrogate for evaluating potential risks to bees from the use of pesticides. The non-*Apis* bees evaluated included solitary (e.g., mason bees, leafcutter bees and alkali bees), social (e.g., bumble bees), and stingless bees (*Meliponini*). Invitations to participate in the workshop were based on the experience in assessing exposure to non-*Apis* bees and/or experience in bee risk assessment. The workshop consisted of 40 participants across three sectors (government, industry and academia); 40% of the participants were international researchers and regulators representing eight countries.

Participants discussed data needed to quantify exposure from various routes (e.g., mud, leaves) not currently evaluated for honey bees. Participants also identified areas where additional research may be needed to evaluate exposure for non-*Apis* bees. In addition to identifying routes of exposure that may not be currently assessed for honeybees, the workshop emphasized the need to developing suitable algorithms for estimating exposure and parameterizing these equations with realistic measures of non-*Apis* bee ingestions rates. The proceedings of the workshop will be published in a peer-reviewed journal and will include three separate papers on the biology on non-*Apis* bees including: social bees (bumble bees) and stingless bees (*Meliponini*), and for solitary non-*Apis* bees (*Osmia* spp; *Megachile rotundata*; and, *Nomia* spp).

Deliverables from the workshop include addressing the following questions:

1. What is currently known about non-*Apis* species and how their life history-traits differ from honey bees in relation to exposure to pesticides

2. Identify **dominant exposure routes** (via food ingestion and contact) and **secondary exposure routes** (via nest materials) to pesticides for solitary bees and bumble bees
3. Can such routes of exposure be readily quantified/estimated empirically (e.g., consumption rates of pollen and nectar for all bee ages, contact rates via leaves/mud in nests, etc.) in the same manner as honey bee (e.g., in BeeRex model)?
4. If so, how well are these estimates covered by those used for honey bee risk assessments?
5. What are the suitable surrogates for evaluating exposure to solitary bees and bumble bees if they were to be included in the pesticide risk assessment?  
Candidates:
  - a. Social non-*Apis* bees: *Bombus impatiens*; *B. terrestris*
  - b. Solitary bees: Mason bee (*Osmia* spp.), Alfalfa leafcutting bee (*Megachile rotundata*), Alkali bee (*Nomia melanderi*)
6. What research needs to be conducted to sufficiently and quantitatively answer all the above questions?

#### Reference

- EPA/PMRA 2012 White Paper (<https://www.regulations.gov/document?D=EPA-HQ-OPP-2012-0543-0004>)
- 2014 Pollinator Risk Assessment Guidance (<https://www.epa.gov/pollinator-protection/pollinator-risk-assessment-guidance>)

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#### 2.4 European and Mediterranean Plant Protection Organization (<https://www.eppo.int/>)

EPPO is an intergovernmental organization responsible for cooperation and harmonization in plant protection within the European and Mediterranean region and was founded in 1951. Under the International Plant Protection Convention (IPPC), EPPO is the regional plant protection organization (RPPO) for Europe. In 1990, the EPPO and the Council of Europe established a Joint Panel to develop environmental risk assessment scheme for plant protection products (Standard series PP 3, Chapter 10: *Honeybees*). This scheme is a set of formal instructions to government authorities on how the risk to bees of proposed uses of pesticides should be evaluated both qualitatively and quantitatively.

The ICPPR (International Commission Plant-Pollinator-Relationships) provided the technical input for Chapter 10 of the scheme and for the Standard testing method PP 1/170 *Side-effects of plant protection products on honeybees*. EPPO Standards go through the approval procedure of EPPO, i.e., comments and suggestions from the National Plant Protection Organizations of all EPPO member countries were sought before final approval by EPPO Council and recommendation to EPPO member countries for use in their registration procedures. The latest revision of both Standards dates back to 2010.

Historically, EPPO Guidance has been the basis for bee risk assessment in European Countries (and other countries beyond Europe), recommending the tiered approach, with laboratory tests as first tiers to investigate toxicity of active substances and products for both oral and contact exposure, and description of higher tier tests, such as semi-field and field testing. The EPPO guidance relied on and cross referenced the internationally harmonized OECD Test Guidelines, where available. While the EPPO risk assessment scheme dated 2010 represented the state of art, especially on the laboratory level the need for refined assessments and also further description and guidance for higher tier studies have been elaborated. Recently published guidelines (EFSA, U.S. EPA) follow a tiered approach and adapt further additional tests on the laboratory level, concerns such as chronic effects or effects on larvae and provide triggers for further investigation of concerns identified in first tiers. Within the EPPO scheme, concerns on larvae and chronic effects were intended to be investigated specifically in higher tier tests, considering the EPPO recommendations for semi-field and field testing. While some countries aim at using more elaborated and detailed but also more resource intensive recently published guidance, the EPPO approach serves up to date as a pragmatic approach recommending a framework as a foundation for a feasible risk assessment that is adapted to reflect the level of concern for individual products which is used in many OECD countries.

### Reference

[EPPO activities related to honey bees](#) (website)

Revised standards published in the EPPO Bulletin 40(3) of December 2010.

- PP 1/170(4) [Side-effects on honeybees](#) (English only)
- PP 3/10(3) [Environmental risk assessment scheme for plant protection products. Chapter 10: Honeybees](#) (English only)

## ANNEX 3

### Bee Poisoning Incident Investigation



#### Annual report of the Investigation Center for Bee Poisoning Incidents (Untersuchungsstelle für Bienenvergiftungen, UBieV): 2016

According to § 57 (2) 11 Plant Protection Act the Julius Kühn-Institut must investigate bee damages purported to result from exposure to plant protection products (PPP). In 2016, 144 bee incidents with suspected poisoning by PPP or biocides were reported to the UBieV, corresponding to 1353 damaged colonies and 150 concerned beekeepers. Over a third of the reported incidents came from Bayern (30) and Baden-Württemberg, followed by Niedersachsen (18), Sachsen (17), Mecklenburg-Vorpommern (13), Brandenburg (11), Nordrhein-Westfalen (9), Rheinland-Pfalz (6), Hessen (5), Sachsen-Anhalt (3), Schleswig-Holstein (3), Berlin (3), Saarland (2) and Thüringen (1). No damages were reported from the city states Hamburg and Bremen. The degree of damage ranged from single dead bees to the total loss of colonies. In some cases entire apiaries were lost.

To evaluate the potential cause of incident, 167 bee samples, 68 plant samples and 29 samples with combs and other materials were sent in by beekeepers or involved institutions (e.g., plant protection services, beekeeping institutes, vets, etc.). In many cases sampling and submission of samples was carried out in cooperation with the staff of plant protection services. For 117 of the incidents appropriate bee material was sent in, so that an investigation for analysis of bee poisoning by PPP or biocides could be conducted. In 27 of these incidents the submitted samples were small, too old, or inappropriate for other reasons and could not therefore be analyzed.

Appropriate bee- and plant samples were initially tested for presence of bee toxic PPP or biocides using a bioassay with larvae of *Aedes aegypti* L..

In 112 bee- and 33 plant samples presence of residues of bee toxic PPP or biocides could not be excluded due to enhanced mortality of the *Aedes*- larvae. These samples underwent further chemical analyses for bee toxic insecticides, acaricides, nematicides, EBI-fungicides (interacting synergistically with some insecticides) and other relevant substances using highly sensitive LC-MS/MS und GC-MS technique (140 active substances screened). If plant samples from treated crops were also present, both bee and plant material were analysed for an additional 142 non-bee toxic fungicides and herbicides, which serve as a "fingerprint" (e.g. if a number of residues is present both in bees and plants, indicating that bees have been foraging on this treated crop) for correlation of bee and plant samples (282 active substances in all). For 18 bee and 18 plant samples, relevant contamination could largely be excluded due to bioassay results. In these cases elaborate chemical analysis could be avoided to reduce processing time to other more relevant incidents.

In line with the routine examination on infestation with the gut parasite *Nosema apis* or *N. ceranae*, respectively, spores were found in 69 of 135 bee samples. In four bee samples high infestations were detected, suggesting that bees sent in for analyses were obtained from

colonies affected with Nosemosis. In 12 bee samples infestation was medium and in the remaining samples there was no indication of *Nosema*.

To understand the floral source of poisoning with PPP pollen from the bees' hair coat or loads from 125 bee samples was analysed under the light microscope and assigned to the respective plant family, genus or even species. In spring pollen from fruit and rape dominated, as expected. In autumn among mustard- and *Phacelia*- strikingly often buckwheat pollen were frequently identified suggesting the presence of special bee pasture.

Findings from biological and chemical analysis were reported to those who sent in the samples for analysis (e.g. plant protection services, bee institutes, bee keeping advisors, beekeepers) the sample materials. In all, 117 biological and 102 chemical reports were prepared. Additionally for all fully biologically and chemically investigated incidents, a final interpretation of the test results was provided and reported to the senders together with the chemical report. All findings and reports were also made available to the plant protection service.

In line with chemical analysis in 38 of the incidents, bee toxic insecticides were detected in bee samples. In 21 (55%) of these incidents the active substances were insecticides deriving from bee hazardous PPP classified as B1 (any application on flowering plants including weeds or on plants foraged by bees prohibited) and B2 (application on flowering plants only after daily bee flight until 23.00), respectively, or from insecticides classified as B4 (no hazard to bees and bee colonies in approved dosage) which were incorrectly applied in combination with EBI-fungicides, in combination with other insecticides or at excessive rates. In 9 (24%) cases, bee toxic insecticides were found which derive clearly from deliberate poisoning with biocides (illegal use). In 8 incidents insecticides were found which derive very likely from biocides, but were also authorized as PPP in the past, so that the legality of use in agriculture could not be completely excluded.

In the reporting year the most frequently detected active substance in bee material which proved to be responsible for bee poisoning was fipronil. This active substance is not authorised for use in agriculture at the moment and likely originates from biocides for control of ants within the home and garden sector. After contact with moisture these sugar-containing granular baits can be attractive to bees. Beekeepers therefore should be forewarned from using such products around their hives. The second most frequently determined active substance in bee material responsible for bee poisonings in 2016 is dimethoate, which is a B1-classified insecticide. The widely discussed highly bee toxic neonicotinoids were found in bee material in 3 (8%) of the incidents (*i.e.*, 2 cases associated with clothianidin and 1 incident associated with thiamethoxam / clothianidin).

In 16 reported incidents, the beekeeper suspected PPP used in oilseed rape as the cause. However, while in 6 of these incidents bee toxic insecticides from PPP or biocides were detected in bee samples, only in 2 of the cases the incident could clearly be attributed to the use of insecticides in oilseed rape based on residues detected in plant samples in combination with results from pollen analysis. In 7 reported cases PPP use in cereals was suspected as the cause of the damage by the beekeeper, however, bee toxic insecticides were only detected in 3 of these incidents and only 1 incident could clearly be attributed to cereals (hereafter abbreviated as 7/3/1). Further assumptions of damage were fruit (5/3/0), maize (2/0/0), potato (1/0/0), vine (1/0/0) and other crops (13/5/3). In 23 incidents, illegal use

(deliberate poisoning) was suspected, of which in 8 cases bee toxic insecticides from biocides were found. Although in 76 incidents beekeepers believed that PPP damaged their colonies, insecticide residues were only detected in 10 of these incidents.

In the majority of reported incidents in autumn 2016 bees showed symptoms of bee virus infections transmitted by varroa mites, indicating higher varroa infestation rates of affected colonies. Additional bee samples with suspected virus infections were routinely sent for virus analysis to the National Reference Laboratory of the Friedrich-Loeffler-Institut. As a result, nearly all bee samples exhibited DWV (deformed wing virus), often in combination with other relevant bee viruses. In an additional examination of 23 bee samples already proved for DWV, the only recently identified DWV-type VDV-1, which is known to be even more virulent, was found in 100% of them. The results of the virus analysis therefore suggest a massive increase of varroa populations observed in many colonies in autumn 2016, probably favoured by warm weather and dependant on the longer brood period of winter bees. In many of these cases necessary varroa treatments were carried out too late or remained largely ineffective.

In all, the number of reported bee incidents ranges above the average of last few years. These higher numbers can be attributed to an increase of incidents reported in the federal states Bayern, Baden-Württemberg, Mecklenburg-Vorpommern, Niedersachsen and Sachsen. However, the proportion of incidents actually caused by poisoning with PPP in the number of biologically-chemically investigated cases ranges at 28% which is much lower than in other years. This can be explained with the fact that nearly a third of the incidents were reported between October and December, in which only few applications of PPP are necessary and flight activity of the bees is decreasing. In fact, only in 2 out of 44 incidents during this period of time could be attributed to bee toxic insecticides deriving from PPP. The apprehension of many beekeepers, that late applications of insecticides against cabbage stem flea beetle or cereal aphids could cause bee poisoning, was not confirmed.

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