INTERNATIONAL COMMISSION FOR PLANT-POLLINATOR RELATIONSHIPS (ICP-PR)

Bee Protection Group

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HAZARDS OF PESTICIDES TO BEES

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Monument im Fruchtland 3, 3006 Bern, Switzerland

In 2010, one of the main conclusions reached by the European Commission for the Conservation of the Environment was the need to promote research on the conservation, restoration and sustainable use of the diversity of pollinators in agriculture. This situation together with the climate change and the notable decrease in the number of wild pollinators has meant that the European Union, FAO (United Nations Food Organization) and other important international organizations have raised the alarm about the need to look for how to maintain and increase the presence of wild pollinators.

In order to find practical solutions, the company Syngenta Crop Protection launched the "Operation Pollinator (OP)" project in 2009, a European-level initiative launched in Britain as part of the EU action called EPI ("European Initiative on Pollinators"), whose main objective is to protect pollinators, increase their biodiversity and promote their presence and also other beneficial or auxiliary arthropods in the crops.

The present study collects the results obtained in different agricultural farms of the Iberian Peninsula, demonstrating how right agricultural practices can also help to maintain biodiversity and favour its rapid increase, both qualitatively and quantitatively.

e. Introducing the INSIGNIA project: Environmental monitoring of pesticide use through honey bees

Jozef J.M. van der Steen on behalf of the Insignia consortium:

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INSIGNIA aims to design and test an innovative, non-invasive, scientifically proven citizen science environmental monitoring protocol for the detection of pesticides by honey bees. It is a 30-month pilot project initiated and financed by the EC (PP-1-1-2018; EC SANTE). The study is being carried out by a consortium of specialists in honey bees, apiculture, statistics, analytics, modelling, extension, social science and citizen science from twelve countries. Honey bee colonies are excellent bio-samplers of biological material such as nectar, pollen and plant pathogens, as well as non-biological material such as pesticides or airborne contamination. Honey bee colonies forage over a circle of 1 km radius, increasing to several km if required, depending on the availability and attractiveness of food. All material collected is accumulated in the hive.

The honey bee colony can provide four main matrices for environmental monitoring: bees, honey, pollen and wax. Because of the non-destructive remit of the project, for pesticides, pollen is the focal matrix and used as trapped pollen and beebread in this study. Although beeswax can be used as a passive sampler for pesticides, this matrix is not being used in INSIGNIA because of its polarity dependent absorbance, which limits the required wide range of pesticides to be monitored. Alternatively, two innovative non-biological matrices are being tested: i) the "Beehold tube", a tube lined with the generic absorbent polyethylene-glycol PEG, through which hive-entering bees are forced to pass, and ii) the "APIStrip" (Absorbing Pesticides In-hive Strips) with a specific pesticide absorbent which is hung between the bee combs.

Beebread and pollen collected in pollen traps are being sampled every two weeks to be analysed for pesticide residues and to record foraging conditions. Trapped pollen provides snapshots of the foraging conditions and contaminants on a single day. During the active season, the majority of beebread is consumed within days, so beebread provides recent, random sampling results. The Beehold tube and the APIStrips are present throughout the 2-weeks sampling periods in the beehive, absorbing and accumulating the incoming contaminants. The four matrices i.e. trapped pollen, beebread, Beehold tubes and APIStrips will be analysed for the presence of pesticides. The botanical origin of trapped pollen, beebread and pollen in the Beehold tubes will also be determined with an innovative molecular technique. Data on pollen and pesticide presence will then be combined to obtain information on foraging conditions and pesticide use, together with evaluation of the CORINE database for land use and pesticide legislation to model the exposure risks to honey bees and wild bees. All monitoring steps from sampling through to analysis will be studied and rigorously tested in four countries in Year 1, and the best practices will then be ring-tested in nine countries in Year 2. Information about the course of the project, its results and publications will be available on the INSIGNIA website www.insignia-bee.eu and via social media: on Facebook (https://www.facebook.com/insigniabee.eu/); Instagram (insignia_bee); and Twitter (insignia_bee). Although the analyses of pesticide residues and pollen identification will not be completed until December 2019, in my talk I will present preliminary results of the Year 1 sampling.

f. **Bee-O-Meter**

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schöbinger is an innovative cloud service that measures the ecological purity of our environment with the help of bee colonies. The measurement criterion is the bee loss rate, which results from the counted bee trips and returns to the hive. This measure is combined with other data from the hive and data from external stations. Based on AI (Artificial Intelligence) logic, various alarms are set, and a dashboard allows all data to be viewed.

The visual sensor recognizes the sexes, swarming, flight of a foreign queen, wasps and other insects, especially the prey beetle, from different bee species (e.g., Carnica Bee, Buckfast Bee). This is based on techniques from the field of ANN (artificial neural networks)

The Bee-o-Meter thus supports the individual beekeeper in the observation of his bee colonies.