Julius Kühn-Institut
Bundesforschungsinstitut für Kulturpflanzen

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

JKI-Institute for Bee Protection

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 Bavaria (30) and Baden Wurttemberg, followed by Lower Saxony (18), Saxony (17), Mecklenburg Western Pomerania (13), Brandenburg (11), North Rhine Westphalia (9), Rhineland Palatinate (6), Hesse (5), Saxony Anhalt (3), Schleswig Holstein (3), Berlin (3), Saarland (2) and Thuringia (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.. Based on these test results, 112 bee and 33 plant samples underwent further multi-residue (broad spectrum) chemical analyses for bee toxic insecticides, acaricides, nematicides, some fungicides (those known to potentially enhance toxicity of other pesticides *i.e*., EBI fungicides which interact 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 analyzed 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 (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 so that resources could be more efficiently directed 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 relatively high infestations were detected, suggesting that bees sent in for analyses were

DOI: 10.5073/20180619-110957

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 possible floral source of contaminated pollen loads from 125 bee samples were analyzed 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-, *Phacelia- and* 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 protections 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 11 p.m.), 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 cases 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 authorized 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, in 6 of these incidents, while bee toxic insecticides from PPP or biocides were detected in bee samples, only in 2 of the cases could the incident be clearly attributed to the insecticides actually applied to 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; however, bee toxic insecticides were only detected in 3 of these cases. One incident though could clearly be attributed to cereals (7 reported cases /3 cases with bee toxic insecticides /1 incident clearly attributed to cereals, hereafter abbreviated: (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) is suspected, of which in 8 cases bee toxic insecticides from biocides were found. Although in 76 cases beekeepers believed that PPP damaged their colonies, insecticide residues were only detected in 10 of these cases.

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 to the National Reference Laboratory of the Friedrich-Loeffler-Institut for virus analysis. As a result, in nearly all bee samples exhibited DWV (deformed wing virus), often in combination with other relevant bee viruses. In an additional examination, the only recently identified DWV-type VDV-1, which is known to be even more virulent, was found in 100 % of the 23 bee samples. The results of the virus analysis therefore suggest a massive increase of varroa populations observed in many colonies in autumn 2016, probably favored 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 Bavaria, Baden Wurttemberg, Mecklenburg Western Pomerania, Lower Saxony and Saxony. 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.

Contact:

Dr. Jens Pistorius
Institut für Bienenschutz / Institute for Bee Protection
Julius Kühn-Institut,
Bundesforschungsinstitut für Kulturpflanzen
Messeweg 11-12
38104 Braunschweig
jens.pistorius@julius-kuehn.de
Tel: 0049 - (0)531 299 - 4200

David Thorbahn
Institut für Bienenschutz / Institute for Bee Protection
Julius Kühn-Institut,
Bundesforschungsinstitut für Kulturpflanzen
Messeweg 11-12
38104 Braunschweig
david.thorbahn@julius-kuehn.de
Tel: 0049 - (0)531 299 - 4577