Julius Kühn-Institut
Bundesforschungsinstitut für Kulturpflanzen

Annual report of the Investigation Centre for Bee Poisoning Incidents (Untersuchungsstelle für Bienenvergiftungen, UBieV) 2017

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 2017, in total 116 bee incidents with suspected poisoning by PPP or biocides were reported to the UBieV, corresponding to 1056 damaged colonies and 129 concerned beekeepers. Over a third of the reported incidents came from Bavaria (21) and Lower Saxony (19), followed by Saxony (15), Baden Wurttemberg (13), North Rhine Westphalia (10), Brandenburg (8), Saxony Anhalt (7), Hesse (6), Schleswig Holstein (5), Mecklenburg Western Pomerania (4), Thuringia (4), Rhineland Palatinate (6) and Saarland (1). No damages were reported from the city states Hamburg and Bremen and the capital Berlin. 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, 139 bee samples, 52 plant samples and 18 samples with combs and other materials were sent in by beekeepers or involved institutions. In many cases sampling and submission of samples was carried out in cooperation with the staff of plant protection services. For 81 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 35 of these incidents the submitted samples were too 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, for 81 bee and 17 plant samples it could not be excluded, that the sample material contained residues of beetoxic insecticides or biocides. Corresponding samples underwent further multi-residue chemical analyses for bee toxic insecticides, acaricides, nematicides, 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 was additionally analyzed for numerous non-bee toxic fungicides and herbicides, which serve as a “fingerprint” for correlation of bee and plant samples (282 active substances in all). For 11 bee and 17 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 58 of 99 bee samples. In seven bee samples high infestations were detected, suggesting that bees sent in for analyses were

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obtained from colonies affected with Nosemosis. In 14 bee samples infestation was medium and in the remaining samples there was no indication of *Nosema*.

To localise the possible floral source of reported incidents pollen from the bees' hair coat or – when present - pollen loads from 92 bee samples were analysed under the light microscope by means of size, shape, surface structure and assigned to the respective plant family, genus or even species. Pollen from incidents reported until the end of february derived almost exclusively from ivy, mustard and *Phacelia* from last year. During spring willow, fruit and rape dominated as expected. Asparagus-Pollen, which was related to bee damages during Juli and August in the past, was found as secondary pollen only in one case.

In line with chemical analysis in 15 of the incidents, bee toxic insecticides were detected in bee samples. In 12 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 11 cases, bee toxic insecticides were found which derive clearly from deliberate poisoning with biocides (illegal use). In 3 cases insecticides were found which derive very likely from biocides, but were also authorized as PPP in the past, so that the use agriculture could not be completely excluded.

10 most frequently found active substances in line with bee damages in 2017:

active substances	classification as plant protection product	other uses	number of damages
Dimethoat	B1	-	2
l-Cyhalothrin + EBI-fungicide	B2 in mixture	-	2
Etofenprox	B2	biocide	2
Clothianidin	B1, B3	biocide	2
Fipronil	not approved	biocide	1
Imidacloprid	B1, B3	biocide	1
Chlorpyrifos	not approved	biocide	1
Indoxacarb	B4 (fruit), B1 (rape)	biocide	1
beta-Cyfluthrin	B2	-	1
Spinosad	B1	biocide	1

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, 81 biological and 71 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.

Partly bees from reported incidents in autumn 2017 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 relevant bee viruses.

In all, the number of reported bee incidents ranges below last year. Regarding the number of biologically-chemically investigated incidents the proportion of potential poisoning incidents relating to plant protection products was even lower than in recent years with 21 % only.

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