

Hazards of pesticides to bees - 14th international symposium of the ICP-PR Bee protection group, October 23 – 25 2019, Bern (Switzerland)

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of published literature was performed in which 16 relevant papers were identified. The aims were to determine a 90th percentile for occurrence of guttation on a certain crop and the 90th percentile for numbers of honey bees collecting guttation droplets, along with consideration of measured residue levels. Results of this evaluation are presented here in the context of the exposure risk from ppp residues in guttation droplets to honey bees at the colony level.

4.7 Measures taken - the Swiss national action plan for bee health

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Abstract

The annual winter losses of honey bees in Switzerland vary between 9% and 23% during the years 2008 to 2019 and are exceeding the as normal defined 10% level. The causes for the losses can have several reasons. However, one of the main reasons is the infection of the honeybees with the Varroa mite. Therefore, a health services for bees was founded to offer education programs for beekeepers and to support beekeepers in preventing and combating diseases. Switzerland further decided in 2014 to implement an action plan to promote the health of bees. Measures have been taken in the areas of disease prevention, promotion of food supply and reduction of risks from plant protection products. Immediate measures have been implemented such as the inclusion of a flowering strip in the Direct Payments Ordinance and measures to protect bees from plant protection products. Switzerland is actively involved in the development of new OECD test guidelines to evaluate the acute and chronic risk to honey- and wild bees. Honey and wild bees play an important role in pollination of agricultural crops and wild plants. The current situation is in evaluation to decide if further measures are needed.

Keywords: Prevention, diseases, Varroa, Plant protection product, habitat, pollination

Introduction

In recent years, the Confederation has implemented many measures to promote bee health. Based on the concept for bee promotion in Switzerland and the National Plan of Measures for the Health of Bees, measures have been taken in the areas of disease prevention and control for the protection of honeybees, the promotion of food supply and the reduction of risks from plant protection products. A large number of different research projects are underway to answer outstanding questions on bee health, pollination safety and biodiversity. Switzerland also participates in various international research activities on these topics.

Materials and Methods

The Federal council was mandated in 2014 to develop a strategy to promote the health of bees taking into account existing efforts and measures already taken. By the end of 2015, the causes of bee mortality should have been scientifically understood and suitable strategies developed to combat them. The action plan for the health of bees included recommendations of an expert group composed of representatives from research (Agroscope, ETH, University of Bern), authorities (FOEN, BLW, BLV), the Swiss Farmers Association, apisuisse and the Bee Health Service under the auspices of the Federal office for agriculture. For measures which have already been consolidated between the offices it was decided to implement them immediately. Further measures are reviewed for their effectiveness in sustainably promoting bee health and their suitability for practical use (national action plan 2014).

Results

Winter losses

The losses of honey bee colonies over the winter have been recorded for 12 years by an annual survey of more than 1,000 beekeepers. Winter losses in Switzerland have fluctuated on average

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between 9 and 23 % in recent years (Fig. 1). The differences between regions are enormous. The causes for the increased winter losses have not been clarified.

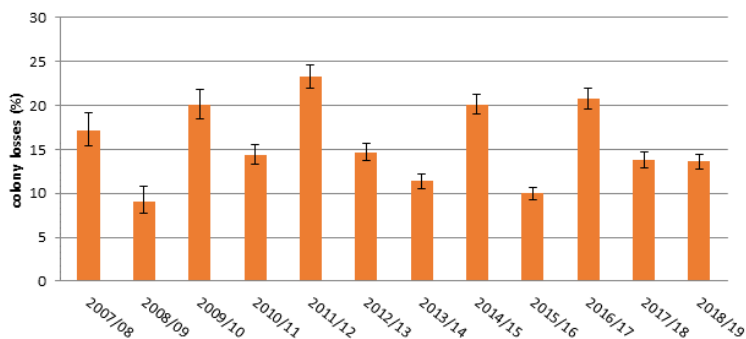


Fig. 1 Winter losses of honeybees from 2007 to 2017 in Switzerland.

The majority of beekeepers in Switzerland have low winter losses. However, a few have high loss rates. This could be targeted in order to clarify the causes of the losses. An explanation for the varying degrees of winter loss may be the differences in beekeepers knowledge of disease prevention and varroa control due to differences in the training and further training offered in the cantons. Since the services for promote bee health began its activities, however, the training and further education offered to beekeepers has improved considerably.

Acute honeybee losses due to intoxications

The low number of bee poisoning cases in Switzerland shows that the majority of the requirements for the protection of bees are met when pesticides are used. The suspected cases of honey bee poisoning have been reported since 1957 and have decreased continuously since 1961 (Fig. 2). In the 70s, the average number of suspected cases was still 20-40, but today the number halved. Since 2010, the analytically confirmed cases of poisoning with pesticides have been recorded. Of the average number of suspected cases reported between 2010 and 2015, only one third are poisoning with pesticides (Fig. 2).

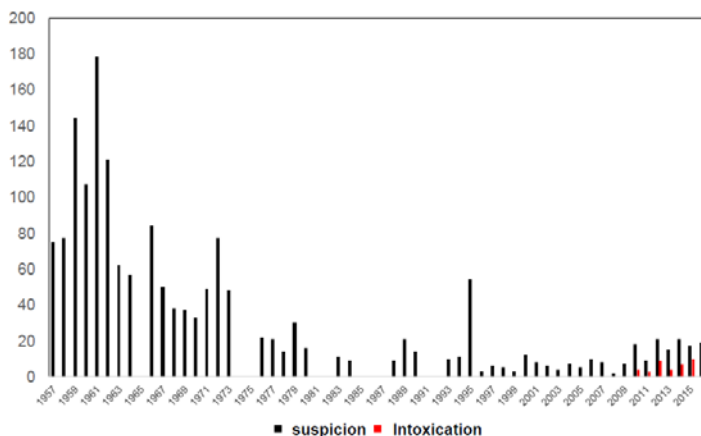


Fig. 2. Intoxications suspected and proven from honeybees.

Main substances responsible for the intoxications were thiamethoxam and indoxacarb (Tab. 1).

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Tab. 1. Main pesticides responsible for acute intoxications from 2010 to 2018.

substance	Number of intoxications	%
Thiamethoxam (Clothianidin)	9 (18)	38
Indoxacarb	6	13
Chlorpyrifos	4	8
Chlorpyrifos-methyl	4	8
Fipronil (not approved)	4	8
Imidacloprid	2	4

Prevention and control of diseases

Prevention, control and monitoring of animal diseases are important for maintaining and promoting bee health. The foulbrood and the acid brood of the bees as well as the infestation with the small hive beetle belong to the animal diseases to be controlled according to the Ordinance on epizootic diseases. This led in particular to a sharp decrease in the number of cases of sour brood per year. The small hive beetle has never been detected in Switzerland before. Measures has been established to combat the parasite and set up a national early detection programme in order to be able to detect an entry of the small hive beetle into Switzerland at an early stage and take the appropriate measures immediately. To control Varroa, every beekeeper is obliged to take care of his colonies and keep them healthy. The Swiss service for bee health has developed a health concept in accordance with good beekeeping practice, which also includes a varroa treatment concept. This concept is now tested in praxis and first results demonstrated that bee losses over winter were strongly reduced and were below 10%.

Pollination

In Switzerland, fruit and berry crops and rape are the most important crops in terms of area and dependent on pollination. Honey bees and other pollinators play an important role in the pollination of cultures. With the data on honey bees in Switzerland, it is currently possible to roughly estimate their contribution to pollination (Agroscope 2014). In this analysis it is assumed that a minimum of 2 and a maximum of 5. 3 honey bee colonies/ha (200 - 530 colonies/km²) are required for confirmation for the different cultures. Taking into account the number and distribution of bee colonies, Agroscope predicts that honey bees will be able to cover 25-100% of the pollination required (Fig. 3).

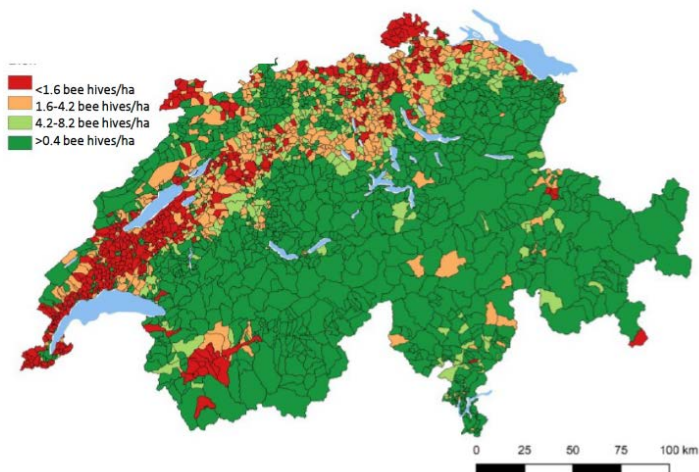


Fig. 3 Estimated pollination via honey bees in Switzerland.

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Promoting food supply and habitat for bees in agriculture

Since 2015, flower strips have been eligible for direct payment for pollinators and beneficial insects (DZV). To date, three seed mixtures for flower strips for pollinators and beneficial insects have been approved in Switzerland: two mixtures for the promotion of pollinators and one mixture for cabbage to promote beneficial insects. Information on the use, application and maintenance of flower strips can be found in Agridea's leaflet. In contrast to the perennial bunt- and rotational fallows, flowering strips are a one-year BFF element which, lasts at least 100 days on an area of 50 ares. A perennial flowering strip is in development. An analysis of the species composition on the flowering strip demonstrated, that important species for pollination (Klein et al. 2007) as well as species from the Swiss red list were present (Amet 1994, Müller et al. 2016). The flowering strip has therefore a high potential to support the important ecosystem services pollination and promote wild bees in agriculture (Sutter et al. 2016).

Management of risk to bees due to pesticides

The use of pesticides which are dangerous to bees has been more strictly regulated since 2014 and is now restricted, not only if exposure of the bee in the treated crop is possible, but also if there may be a risk for bees in neighbouring plots with flowering plants. Further risk mitigation measures were introduced in 2016. Based on the concept for a reduction of the risk for surface waters and biotopes to reduce the risk via drift, untreated buffer zones for bees and other pollinators are now also required in the permit. For the puffer zones, distances of 3, 6, 20 and 50 m are determined according to the risk assessment of the pesticide application. These distances can be reduced by the use of new spraying techniques with drift-reducing effect (BLW instruction see homepage), without creating unacceptable acute or chronic risks for bees and other pollinators outside the cultures. This guarantees that the drift of the spray mist outside the cultures is largely reduced and that bees and other pollinators are protected. Furthermore, Switzerland is involved in ongoing activities at OECD level for ring-testing new methods to study acute effects on bumble and solitary bees and sublethal effects in honey bees.

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