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V4 Quantitation of pesticides in pollen and bee bread collected by honey bees and the botanical origin of pesticide-contaminated pollen

Quantifizierung von Pestiziden in Pollen und Bienenbrot von Honigbienen und die Bestimmung der botanischen Herkunft von pestizidbelastetem Pollen

Christina Kast, Marion Fracheboud, Emmanuel Schaad, Benoît Droz

Swiss Bee Research Center, Agroscope, Schwarzenburgstrasse 161, CH-3003 Bern, Switzerland

Honey bees can introduce pesticides into their colonies while foraging in an agricultural environment. To investigate pesticide contamination, pollen and bee bread samples were taken every fortnight from April to August 2022 from five bee colonies in an agricultural region of Switzerland. The samples were analysed individually. Ultra-high performance liquid chromatography and mass spectroscopy allowed the quantitation of 50 pesticides. The individual pollen pellets of some pollen samples that showed high pesticide levels were separated into different fractions according to their colours. The pesticide concentrations were then determined again for each fraction. The botanical origin of the pollen pellets was determined by microscopic analysis to identify the type of pollen related to pesticide contamination.
Twenty-three pesticides were quantified in pollen and 26 in bee bread. The highest insecticide concentrations in the individual samples were measured for thiacloprid (70 µg/kg in pollen and 37 µg/kg in bee bread) and acetamiprid (48 µg/kg in pollen and 16 µg/kg in bee bread). The levels for fungicides ranged up to 2213 and 1964 µg/kg (cyprodinil) in the analysed pollen and bee bread samples and the levels for herbicides up to 72 and 38 µg/kg (prosulfocarb). Thiacloprid could be assigned to oilseed rape pollen collected by bees during the flowering period of the oilseed rape crops (5th April to 15th May 2022) near the beehives, while several other pesticides originated from wild plants, such as for example plantain and clover. These results show the risk of pesticide exposure of honey bees from non-cultivated, wild plants growing near cultivated area.

Keywords: honey bees, pollen, bee bread, pesticides, oilseed rape

E-Mail des korrespondierenden Autors: christina.kast@agroscope.admin.ch