

Role of food quality in bee susceptibility to fipronil and clothianidin

Simone Tosi*, Piotr Medrzycki, Gherardo Bogo, Laura Bortolotti, Francesca Grillenzoni, Giuseppe Forlani

*CRA-API (Agricultural Research Council, Research Unit for Beekeeping and Silk Breeding), Via di Saliceto 80, 40128, Bologna, Italy. Email: stosi@inapicoltura.org

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Abstract

Pollen is the honey bee's main protein supply. Newly emerged bees need pollen alimentation to guarantee correct development of physiological conditions and breeding potential. To ensure functional and efficient adult bees not only the quantity but also the quality of pollen is important: pollen of different plant species vary in nutritional quality for honey bees. Previous studies showed that a protein alimentation with pollen mixture is more adequate for bees than monofloral pollen. The kind of pollen collected by bees is in close relationship with the vegetation spectrum of the hive surrounding area. Thus, if the bee colony is surrounded by areas characterised by intensive agriculture - e.g. the Po Valley in Italy - it may mainly collect monofloral pollen. In these areas, use of pesticides is generally widespread.

The present study is based on the hypothesis that the quality of pollen available for the honey bee colony may influence the bee susceptibility to the intoxication by pesticides. For this reason, the same pesticide treatment could cause negligible or significant damages in relation to the availability of high-quality pollen (high amino acid diversity and high protein content).

In the experimental apiary, in order to obtain newly emerged bees of the same age, the queen bee was isolated on a comb in a queen-excluding cage for about 30 hours. Subsequently the queen bee was removed from the cage and the comb was left isolated for another three days, to avoid further egg laying. The comb was incubated inside the beehive for 20 days in order to guarantee the most natural conditions, then it was moved to an emerging cage and kept at 34,5°C. The bees were incubated at this temperature until the end of the test. At the beginning of the emergence the bees were fed *ad libitum* with water, organic *Robinia* honey and a kind of pollen in relation to the thesis: *Zea mays*, *Papaver*, *Cruciferae*, *Trifolium*, *Taraxacum* or a mixture of pollen. Thus groups of bees provided with different pollen diets were obtained.

On the 9th day, the bees were divided into groups of 20 individuals in small test cages in which clothianidin or fipronil - pesticides considered as one of the possible causes of the recent colony losses - in sucrose syrup (50%) were administered. Once the bees consumed completely the test solution, sucrose syrup (50%) was supplied *ad libitum*. Bee mortality was recorded and the LD50 of the active ingredients was calculated in relationship to the alimentation quality.

In conclusion, the influence of the quality of protein nourishment provided during the first days of adult life on the response to intoxication by clothianidin and fipronil was shown as evidence. Bees fed with low-quality pollen (low amino acid diversity and low protein content) seem to be more susceptible to pesticide intoxication and other stress factors than bees fed with high-quality pollen.