
Section 6– Microbials

6.1.P Assessment of the impact of microbial plant protection products containing *Bacillus thuringiensis* on the survival of adult and larval honeybees (*Apis mellifera*, L.)

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DOI 10.5073/jka.2020.465.062

Abstract

Recently, the number of publications regarding the potential adverse effects of chemical plant protection products (PPPs) on insect pollinators including apis and non-apis bees and concerns of the public on the potential side effects greatly increased. On the other hand, the development of microbial plant protection products as substitutes for chemical PPPs is exalted. However, there are several knowledge gaps related to toxicity testing with microbial PPPs and risk assessment (e.g., quantitative assessment such as HQ calculation) common for chemical PPPs, can not be performed. Therefore, an evaluation of the appropriateness of available test guidelines, which are used for testing the toxicity of chemical PPPs, for testing of microbial PPPs should be conducted.

In the current study, we evaluated the effect of the product FlorBac[®], with the active substance *Bacillus thuringiensis* ssp. *aizawai* (strain: ABTS-1857), on adult and larval honeybees (*Apis mellifera*) under laboratory conditions. The chronic oral toxicity tests on adult bees following the OECD guideline 245 and the larval toxicity tests with repeated exposure following the OECD guidance document 239 were conducted. Additionally, possible modifications of the chronic oral toxicity test, such as additional pollen feeding, were assessed.

Our results showed that the survival of adult bees was affected after chronic exposure to the tested product depending on the concentrations. The test duration seemed to play an important role, because the mortality of bees arose first after 96 h at the highest tested concentration. This indicates the limitations and/or inappropriateness of the duration of the acute tests, such as OECD 213, for testing the effect of microbials on bees, as these are usually terminated after 48h and may be extended to a maximum of 96h. Moreover, our results showed that the feeding of tested bees with pollen had a significant effect on the survival duration of the treated bees. Furthermore, the survival of treated larvae was significantly reduced at all tested concentrations, which indicated a higher sensitivity of the larval stage than of the adults to the tested microbial.

In conclusion, further studies are required to assess the side effects of microbial plant protection products on bees under realistic conditions. The current knowledge gaps regarding the realistic exposure duration, the quantitative exposure of larvae, life duration of different micro-organisms in different matrices within the hive, and their development under colony conditions need to be addressed.