

4.13 Synergistic effects between variety of insecticides and an EBI fungicide combinations on bumble bees (*Bombus terrestris* L.)

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Abstract

In recent year's severe decline in honey bees as well as in bumble bee populations have been observed all over the world. Pesticides have been proposed as one of the main cause of pollinators decline. Several studies show that variety of pesticides co-exist in environment and also in bee products at the same time and might therefore synergise.

Fipronil, cypermethrin, thiamethoxam and imidacloprid are agriculturally well known and used insecticides as well as fungicide imazalil. EBI fungicides like imazalil are functioning as detoxification inhibitor tools in insects. Thereby, the fungicide and insecticide co-occurrence might lead to synergy in bees. The cocktail-effects between insecticides and fungicides are still little studied. Aim of this study was to assess the impact of previously mentioned pesticides and their mixtures impact on bumble bee longevity and feeding rate. The bumblebee (*Bombus terrestris* L.) were fed with syrup containing different single pesticides and their combinations. Bees mortality and feeding rate was daily monitored.

Here we show that 3 of these insecticides are synergising with fungicide and due that causing significant decrease in bumble bees longevity and feeding rate. The results from this experiment allows us to suppose that EBI fungicide imazalil inhibits the detoxification processes in bees and due that toxicity of insecticides increases.

Although fungicides are considered as quite safe to bees when used appropriately and alone but in combination with insecticides might lead to faster individual death. Several studies have demonstrated impacts of single pesticides on bees, but yet there is a lack of data of synergistic effects. Future research should focus on synergistic effects of environmentally relevant doses of EBI fungicides and insecticides on pollinators longevity and physiology.

Reference

Published full text article can be found from journal Pest Management Science.

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4.14 Developing methods for field experiments using commercially reared bumblebee colonies – initial colony strength and experimental duration as influential factors

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Summary

Semi-field and field experiments with commercially used bumblebees (e.g. *Bombus terrestris*) gain more and more importance for both ecological studies and trials on potential side effects of plant protection products. However, standardized, replicable experimental methods are lacking so far and need further development. For example, initial strength of bumblebee colonies may vary across experiments but may be a key factor in successful colony development under field conditions. Trial duration and termination may impact results on total reproductive output (e.g. number of newly produced queens). In this study commercially reared bumblebee colonies of different initial strengths (number of worker bees) were placed along the field margin of each of six field sites. Each site was nested within one of two seasons and planted with one of two arable crops (*Brassica napus* and *Phacelia tanacetifolia*). Each colony was spaced approx. 50 m apart from the next