

## Assessment of lethal and sublethal effects by spinetoram on *Bombus terrestris*

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### Abstract

Nowadays the worldwide use of bumblebees as pollinator of several horticultural crops has resulted that they fulfil both an ecological and economical role. Consequently, exposure to pesticides is not unlikely. In general naturalyte insecticides as spinosyns are a major widely applied class because they are more selective than conventional pesticides, however, toxicity of spinosyns A and D (spinosad) has been reported on honeybees and bumblebees. In the field bumblebees can be exposed to pesticides by contact and by the consumption of contaminated food.

In this project we assessed the potential hazards of a novel naturalyte insecticide spinetoram consisting of spinosyn J and L. Three different experiments were conducted in the laboratory wherein workers of the bumblebee *Bombus terrestris* were exposed to different concentrations starting from the maximum field recommended concentration (MFRC) and then different dilutions (1/10-1/10,000). First, via direct contact with wet and dry residues of spinetoram severe worker loss was observed; the respective LC<sub>50</sub>-72h values were 50 µg/l and 21 µg/l. Typically, intoxicated bees showed symptoms of tremors and paralysis. Second, oral exposure via contaminated sugar water in micro-colonies demonstrated that the MFRC caused 100% worker loss after 4 weeks, whereas this was only 54% with 1/10 of the MFRC after 11 weeks. For worker mortality the calculated acute (72 h) and chronic (11 weeks) LC<sub>50</sub> values were 21 µg/l and 2.5 µg/l, respectively. At 1/100 of the MFRC no lethal effects were observed. Next to lethal effects, sublethal effects were evaluated. In the nests exposed to the MFRC and to 1/10 of the MFRC the numbers of drones produced were significantly (P<0.05) reduced when compared with the control group (57 ± 4 drones). However at lower concentrations starting at 1/100 of the MFRC no sublethal effects were seen on the reproduction. Third, we assessed for potential sublethal effects by spinetoram (1/100-1/10,000 of the MFRC) towards foraging behaviour. Here we used the bioassay as developed to assess foraging effects by neonicotinoids (Mommaerts et al., 2010). Here no change in the behaviour of the workers was seen.

In conclusion, the highest concentrations of spinetoram (MFRC and 1/10 of the MFRC) caused lethal mortality of exposed workers and this resulted in a loss of progeny. But when compared with spinosad, spinetoram is safer. Interestingly, no negative effects towards foraging behaviour were scored in the laboratory foraging bioassay. However, before making final conclusions about the compatibility of this compound with *B. terrestris* side-effects should be evaluated under more realistic field conditions with queen-right colonies.

### References

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