

4.6 Oral toxicity of dimethoate to adult *Osmia cornuta* using an improved laboratory feeding method for solitary bees

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Abstract

There is uncertainty regarding the extent to which the use of honey bees can serve as surrogates for non-*Apis* pollinator species in the risk assessment for plant protection products. In the EFSA Bee Guidance Document (2013), solitary bees are protected by a specific risk assessment scheme, although validated testing methodologies are currently not available. From this perspective, the development and ring testing of a standardized oral adult toxicity test for solitary bees is seen as a highly desirable focus area for advancing the tiered testing system's ecological relevance and for reducing uncertainty.

Oral dosing methods used on adult honey bees cannot be readily adjusted to solitary bee tests due to differences in feeding behavior and social interactions. The EFSA Bee Guidance Document and the ICP-PR non-*Apis* toxicity testing expert group (March 2014 meeting in Niefern, Germany) identified bees of the genus *Osmia* as suitable organisms for solitary bee risk assessment. Previous studies have explored laboratory feeding methods on two cavity nesting solitary bees (*Osmia lignaria* and *Megachile rotundata*; Ladurner *et al.* 2003 and 2005). These studies showed that, using the 'flower method', it is possible to feed adults known amounts of pesticides and to conduct an adult bee acute toxicity test from which a LD₅₀ can be calculated. However, further optimization of the feeding method is considered necessary to ensure reproducibility and repeatability of the test and to standardize protocols. In this study we compared the performance of several artificial flowers combining visual and olfactory cues against a simplification of the 'flower method' (henceforth 'petal method'). Feeding success was much lower with the various artificial flowers than with the 'petal method', which performed similarly to the 'flower method'. Thus, the 'petal method' resulted in high feeding success rates and became more easily reproducible than the 'flower method'.

Using the 'petal method', we assessed the effects of the toxic standard dimethoate on *Osmia cornuta* adults. The LD₅₀ values of dimethoate at 4, 24, 48, 72 and 96 hours were determined.

References

EFSA (European Food Safety Authority), 2013. EFSA Guidance Document on the risk assessment of plant protection products on bees (*Apis mellifera*, *Bombus* spp. and solitary bees). EFSA Journal 2013;11(7):3295, 266 pp. doi:10.2903/j.efsa.2013.3295