

3.5 The homing flight ring test: method for the assessment of sublethal doses of plant protection products on the honey bee in field conditions

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Abstract

In the framework of the current revision of plant protection product risk assessment on the honeybee by European authority (EFSA, 2013), a European ring test is conducted with 11 voluntary laboratories to test a methodology assessing the effects of sublethal doses of a plant protection product administered in controlled conditions on the homing capacity of forager bees in the field.

Homing success is measured by monitoring free-ranging honey bees with radio-frequency identification (RFID) tagging technology. To do so, we capture at the hive entrance, foragers coming from a known site located at 1 km (+/- 100 m) away from the experimental colony, to ensure that the foragers have a prior knowledge of the pathway back to the colony. RFID-tagged bees are orally exposed to 3 sublethal dosing solutions (0.1, 0.3 and 1 ng/bee) of the reference item, thiamethoxam, or to a control in laboratory. The dosing solutions are collectively administered to the honeybees with 20 µl per bee of a 30% sucrose solution (w/v). Then foragers are released on the known site and the homing success is recorded at the hive entrance with RFID system for 24 hours after release. The test endpoint is defined as the determination of a No-Observed Effect Dose (NOED) on the homing success.

In the first year of the ring test (2015), 7 laboratories out of 10 could conduct the test and found a common NOED of 0.3 ng per bee. One important limiting point was the use of a *Phacelia* field planted at 1km from the colony in order to collect bees with specific bright blue pollen loads. Methodological improvements were also necessary to better maintain the foragers during the laboratory phase. In 2016, an alternative to the *Phacelia* field consisting in collecting bees previously powdered and released at 1km from the colony was tested. For the laboratory phase, a feeding ad libitum with candi or sucrose solution 30% (w/v) was also added to maintain the bees just before release. All the laboratories could conduct the test in 2016 and similar or better homing results in control bees were obtained, this validating the alternative method to the *Phacelia* field. The factors of variability due to the protocol and context have been discussed.

3.6 Non-uniform distribution of treated sucrose solution via trophallaxis by honeybees affects homing success variability and mortality

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Abstract

Background: Food sharing in a group via trophallaxis might lead to a non-uniform distribution of pesticide spiked sucrose solution between caged honeybees. This can cause high variability in the homing success rate or mortality among group members and treatment replicates. In order to improve the oral food distribution of tested sucrose solution we compared two feeding schemes with two or ten bees per cage (20 µL/bee) and evaluated the impact on homing success rate and mortality.

Results: First results showed that food intake with the two-bees feeding regime is faster. Therefore, a more accurate dosing distribution among bees can be expected. We measured a less variable homing success rate and retuning time among runs and the corresponding treatments. Furthermore, mortality rate of the group-feeding scheme with ten bees per cage resulted in higher mortality values when compared to the two-bees feeding scheme. This might be an indication for a better and more uniform distribution of the treated sucrose solution among two caged bees.

Conclusion: Improving the uniform distribution of test items by orally treatment administration in smaller groups with honeybees should be discussed and considered, as toxicity endpoints of single-dosed wild bees