

Does imidacloprid have a negative effect on honeybee (*Apis mellifera*) behavior and olfactory learning?

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Abstract

The neonicotinoids are well known pesticides, used for their ability to act as an agonist on the nicotinic acetylcholine pathways in pest insects. The pesticide is distributed in the whole plant and it will end up in the pollen and nectar which beneficial insects, such as honeybees, might feed on. Imidacloprid is a well-used neonicotinoid and its possible negative effect on honeybee behavior and olfactory learning were tested in this present study. The proboscis extension reflex (PER) was used to test olfactory learning and memory retention, and a cage experiment was used to assess any changes in activity level, feeding rate and mortality. Different doses of imidacloprid were tested in both experiments. The results of the PER study showed a significant effect of the pesticide on the honeybees. The bees which ingested imidacloprid, performed less on both the olfactory learning and the memory retention, compared to the control bees. This suggests that imidacloprid acts on the honeybee antennal lobe and mushroom body, which is in control of the olfactory learning and memory formation. Imidacloprid did not elicit any changes in activity level, feeding rate or mortality.

Keywords: Activity level, feeding rate, honeybees, imidacloprid, mortality, neonicotinoids, nicotinic acetylcholine receptors, PER