

# Science for Environment Policy

## Bees actively prefer nectar contaminated with neonicotinoid pesticides

**Honeybees and bumblebees prefer feeding on nectar laced with certain neonicotinoid pesticides** to uncontaminated food, new research has shown. Far from the predictions of some, that bees would avoid food contaminated with neonicotinoid pesticides if given the choice, a new study has shown that bees did not avoid any of the three most common neonicotinoids: imidacloprid, thiamethoxam or clothianidin. Furthermore, they showed a preference for imidacloprid and thiamethoxam over uncontaminated sugar solutions.

**Research has already shown that neonicotinoids affect bees;** those exposed to the [pesticides](#) have been shown to have trouble feeding, navigating and foraging, as well as suffering from impaired movement. This can jeopardise the survival of the whole colony. This body of research led the EU, in 2013, to significantly restrict the use of the three most common neonicotinoids (imidacloprid, thiamethoxam and clothianidin) to crops not attractive to bees.

However, some critics say that these lab-based experiments do not reflect what would happen in the wild. They argue that the concentrations of pesticides used were higher than those that would be found in pollen and nectar. Furthermore, they say, the bees were not given a choice about what they could feed on. Bees in their natural environment may avoid pesticide-laced nectar, especially if they are given alternatives, such as flowers planted in field margins.

For this study, researchers gave two species of bees — the honeybee, *Apis mellifera*, and the buff-tailed bumblebee, *Bombus terrestris* — a choice of sugar water, either plain or laced with imidacloprid, thiamethoxam or clothianidin. The bees, which were all workers of foraging age, were placed in plastic boxes for 24 hours with a choice between uncontaminated sugar water and one of the three neonicotinoids. The concentrations of the pesticides were within the range of those found in nectar and pollen (0.5 – 150 nanomolar<sup>1</sup> (nM)).

The results showed that neither of the bee species avoided the pesticide-laced solutions, even when it reduced their survival. Further experiments also showed that the pesticides did not prevent honeybees from extending their mouthparts to feed and nor did it cause them to shy away from the food by retracting them.

In an unexpected result, the researchers found that rather than avoid pesticide-laced nectar when given a choice, as predicted by some researchers, in fact both honeybees and bumblebees *preferred* solutions containing imidacloprid or thiamethoxam to uncontaminated sugar water. Furthermore, bees consuming the pesticides ate less food overall, affecting their condition and survival. In the case of imidacloprid, they continued to show a preference for the pesticide-laced solution, even though they were more likely to die.

To get to the bottom of this, the team examined how the bees reacted to the taste of the toxins. Normally, such chemicals should stimulate taste nerves that register bitterness. However, the results showed no response from the 'bitter-sensing' neurons to any of the three neonicotinoids. This suggests that the bees cannot taste these pesticides in nectar.

These results are worrying because they suggest that foraging bees may not only endanger themselves but also bring back more neonicotinoid-laced food to the colony. Strategies such as planting flowers in field margins may not reduce the risks of pesticide poisoning for bees.



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1. This concentration corresponds to  $10^{-6}$  moles of molecules per cubic metre.