

Buzz kill

Neonicotinoids can harm some bees

Two studies show the risks from pesticides



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NEONICOTINOIDS are so good at killing things which suck the sap and chew the flesh of crops that they have become the world's most widely used family of insecticides. For decades, though, there has been a fear that they harm non-crop-eating insects, too—in particular, bees.

The evidence for this has been mixed. Swedish research published in 2015—two years after the EU imposed a moratorium on the use of three popular neonicotinoids, clothianidin, imidacloprid and thiamethoxam—found that wild bees in fields sown with neonicotinoid-treated oilseed rape (canola) reproduced poorly. Yet other field studies have found no discernible effects on either wild-bee

or honeybee populations. Two studies published in *Science* on June 30th add to the case against.

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The first*, by Ben Woodcock of the Centre for Ecology and Hydrology in Wallingford, Oxfordshire, and colleagues, was funded in part by Bayer CropScience, maker of clothianidin, and Syngenta, maker of thiamethoxam. The scientists, not the funders, controlled the design and execution of the research.

Neonicotinoids are frequently used to treat seeds rather than sprayed on to growing crops. This means the plants' edible tissues are laced with insecticide from the beginning, but the rest of the environment is less affected. Still, some of the insecticide gets into the plants' pollen and nectar, and thus into bees. The Wallingford study compared bees that fed on rape plants grown from clothianidin- or thiamethoxam-treated seeds with those that fed on untreated plants.

The research was carried out at 33 sites in Britain, Germany and Hungary. The team found that thiamethoxam-treated seeds appeared to have no significant effect on honeybee numbers. Honeybee colonies that fed on rape treated with clothianidin had fewer workers the year after the treatment in Britain and Hungary—but not in Germany. The different results in different countries could help to explain why past studies have reached inconsistent conclusions. The German bees at control sites where there were no insecticide-treated plants were healthier than the bees in the other countries' control groups. Rape pollen also made up less of their diet.

The researchers also measured the neonicotinoids in the nests of wild bees, where they found traces of a third common neonicotinoid, imidacloprid, too. Buff-tailed bumblebees (*Bombus terrestris*) with nests containing high total concentrations of these three pesticides produced fewer queens; red mason bees (*Osmia bicornis*) exposed to them made fewer eggs.

In the second study**, Amro Zayed of York University in Toronto and his colleagues measured the insecticide inside 55 honeybee hives. They found bee colonies close to fields of maize grown from treated seeds were exposed to neonicotinoids for nearly 12 weeks of the bees' six-month active period. Much of the exposure,

surprisingly, did not come directly from maize pollen but from that of wild flowers and weeds which picked the compounds up through the soil.

The researchers went on to feed ten colonies with an artificial pollen supplement, lacing the supply to half those colonies with clothianidin. After a 12-week regime that mimicked the pattern of exposure in the fields, the bees that had grown up in the hives getting spiked food had 23% shorter lifespans and were poorer foragers. Those hives also displayed a certain slovenliness, with adults less likely to remove pupae infected with disease. The team also found that a commonly used fungicide, boscalid, made neonicotinoids twice as toxic to honeybees.

Neonicotinoids have not been found responsible for big declines in bee populations, or widespread colony collapses. Bayer and Syngenta both argue the new results do not support a ban on the chemicals. But they do show that some neonicotinoids, at least, hurt some bees in some places and under some circumstances. Jeremy Kerr of the University of Ottawa, who reviewed the papers for *Science*, says they show that the insecticides increase the risks for bees of various species, acting as “a kind of reproductive roulette”.

** [Country-specific effects of neonicotinoid pesticides on honey bees and wild bees](http://science.sciencemag.org/content/356/6345/1393)*
(<http://science.sciencemag.org/content/356/6345/1393>) *** [Chronic exposure to neonicotinoids reduces honey bee health near corn crops](http://science.sciencemag.org/content/356/6345/1395)*
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