

New West Magazine – Feature Article

Are Regulators Doing Enough to Prevent Bee Die-Offs?

A veteran Colorado beekeeper is challenging the Environmental Protection Agency to remove a widely used pesticide from the market until there's proof it isn't contributing to bee die-offs. Is he jumping to conclusions or catching the EPA using flawed science?

By Brendon Bosworth, 3-14-11

For beekeepers, loss is something that comes with the territory. It's accepted that the cold winter months will whittle down the number of honeybees in a colony. But for Colorado beekeeper Tom Theobald, like many beekeepers across the country, the past several winters have brought losses that eclipse the regular die-offs.

"I'm expecting my worst losses this winter," said Theobald on a mild February morning at one of his bee yards in Niwot, a sleepy town in Boulder County on Colorado's Front Range.

He was standing amidst a collection of silent white bee boxes, located on a corner of a friend's property. Some were stacked two levels high, reaching about waist-height. Each had a brick on the lid.

"I started with 24 colonies here. By the end of winter I'll be lucky to have six left," he said.

Behind the wire fence separating the home from the neighboring ranch, a herd of horses grazed on the brown grass. Miles behind them the highest mountains peaks were capped with snow. The intermittent sounds of traffic on the highway punctured the clean morning air.

Earlier that morning, over a breakfast of chicken-fried steak with rye toast at a local restaurant, Theobald explained that save for his early years as a beekeeper, his 2010 honey crop was the smallest he has produced in 35 years of beekeeping. He has since stopped supplying his two regular honey buyers, the Niwot Market and Willow River Natural Cheese, a company in nearby Longmont that sells local and imported cheese.

"I had to cut them off at the end of the year," he said. ***"There's no honey being sold. There's no money coming in."***

Theobald said he could probably survive two more seasons of bad losses.

Theobald is not alone in his slim harvest. Beekeepers across the United States have reported higher than average overwintering losses since at least 2006. A [survey](#) of beekeepers who together operated nearly 18 percent of all the managed colonies in the



Tom Theobald, a beekeeper from Niwot, Colorado, believes a popular pesticide is a key factor in the honeybee die-offs he and other beekeepers have witnessed in recent years. "The fact that he's taken this fight on and he thinks it's important should scare the hell out of everybody else, because he doesn't fool around with stuff like that lightly," says a fellow beekeeper. Photo by Brendon Bosworth.

U.S. by Penn State University entomologist Dennis vanEngelsdorp indicates that in the 2009-10 winter, the beekeepers lost 42.2 percent of their colonies on average. After the 2006-07 winter beekeepers reported losses of 32 percent, according to the study.

Losses of roughly 14.5 percent are generally considered acceptable amongst beekeepers.

Scientists are investigating various pathogens, parasites, environmental stresses – including the impacts of pesticides – and management issues as likely contributors to the widespread die-offs. The [U.S. Department of Agriculture emphasizes](#) that it's unlikely a single factor is responsible and an interplay between factors is probably to blame.

While major losses hurt community beekeepers like Theobald, who sell honey locally to make a living, they also impact the commercial bee industry, which profits from using bees to pollinate crops for farmers. In fact, bee pollination is responsible for about \$15 billion in crop value, chiefly for crops such as almonds, nuts, berries and fruits, according to the USDA. Bees are also responsible for pollinating the source of one of every three mouthfuls of food the average person eats.

“What we know is the sick bees are very sick,” vanEngelsdorp said in a telephone interview.

“They have a lot of the viruses and other pathogens that bees can get, all at one time. That suggests to us that there is something that’s compromising their immune system – making them susceptible to all these. And we haven’t been able to find the cause for that,” he said.

Chemical Concerns

While scientists and beekeepers have been puzzling over the cocktail of factors that could be driving the die-offs, Theobald suspects that a group of pesticides called neonicotinoids, which attack insects’ central nervous systems, paralyzing and killing them, play a key role.

Theobald has been instrumental in a [campaign](#), along with organizations including the National Honey Bee Advisory Board and advocacy groups [Beyond Pesticides](#) and the [Pesticide Action Network](#), to get an insecticide called [clothianidin](#) – produced by Bayer CropScience and sold under the trade name Poncho – suspended from the market until the Environmental Protection Agency has fully assessed its potential for toxic effects on honeybees.

The chemical in question is used to treat corn, canola, sunflower, sorghum and sugar beet seeds against an array of pests.

Like other neonicotinoids, clothianidin is what’s known as a systemic insecticide. Instead of being sprayed onto a plant’s leaves, it is coated onto seeds, which can be bought pre-treated. As the plant grows, the chemical works its way into the plant’s tissues, taking hold from the inside and making the plant poisonous to pests.

Clothianidin can manifest in the plant’s pollen, nectar and the tiny drops of water or sap found on its tips. This opens the opportunity for bees to be exposed to the insecticide when foraging on pollen and nectar, both of which are taken back to their hives. Nectar is used to make honey, while pollen, which is stored until needed, is mixed with honey and fed to growing larvae.

Neonicotinoids, in general, are a popular class of chemical. Over 90 percent of American corn is treated with neonicotinoids, the largest being Bayer’s clothianidin and Syngenta’s thiamethoxam – which goes by the trade name Cruiser – said Jack Boyne, Bayer CropScience’s director of communications, in a telephone interview.

Studies Implicate Neonicotinoids in Weakening Bees’ Immunity

To date, much of the research into the potential effects of neonicotinoids on honeybees has focused on clothianidin's cousin and Bayer's top selling seed treatment, imidacloprid – sold under the trade name Gaucho – which works in a similar way.

Last year a team of French scientists published a [study](#) that shows imidacloprid working in concert with a common bee pathogen, Nosema, to significantly weaken bees' health. The researchers fed bees the chemical and exposed them to the pathogen. The bees infected with the pathogen and exposed to the insecticide at concentrations that would generally be encountered in the environment showed the highest death rate, according to the researchers.

Jeff Pettis, research leader at the USDA's Agricultural Research Services Bee Research Laboratory in Beltsville, Maryland, performed a small but [similar lab study](#), which is unpublished. In a telephone interview Pettis said the study is very much supportive of the French study.

Dr. Henk Tennekes, a Dutch cancer researcher and toxicologist, has written a [book](#) that raises concerns about the long-term, cumulative effects of neonicotinoids on insects and the birds that feed on them. In an [interview on the Organic View radio show](#) he said there may be no safe level of exposure to these insecticides because of their potential to accumulate within animals.

“New research has shown that tiny doses of these insecticides are capable of producing a breakdown of the immune system of honeybees,” he said during the interview. ***“Very small quantities of neonicotinoid insecticides are sufficient to cause collapse of bee colonies in the long run.”***

On scientific grounds, the chemicals should be banned immediately, he said.

In a statement released by [Beyond Pesticides](#), an organization dedicated to eliminating toxic pesticides, James Frazier, professor of entomology at Penn State's College of Agricultural Sciences, said: “Among the neonicotinoids, clothianidin is among those most toxic for honeybees; and this combined with its systemic movement in plants has produced a troubling mix of scientific results pointing to its potential risk for honeybees through current agricultural practices.”

“Our own research indicates that systemic pesticides occur in pollen and nectar in much greater quantities than has been previously thought, and that interactions among pesticides occurs often and should be of wide concern,” he said.

With regards to clothianidin, vanEngelsdorp said he doesn't think there is enough evidence to warrant removing the insecticide from the market.

“I think it's growing. I think we have laboratory data that's suggestive, but laboratory data doesn't always translate into field data,” he said. ***“I think we have more data to show that fungicides have a negative effect than this right now.”***

A lot of farmers depend on these pesticides, and the pesticides that would replace them are also, and sometimes more, toxic to bees, said vanEngelsdorp.

“It's a delicate act. I'm glad I'm not the one having to make that call,” he said.

vanEngelsdorp was the lead researcher for a [study](#) published in 2009 which analyzed colonies afflicted with [colony collapse disorder](#), or CCD as it's known. The mysterious phenomenon results in beekeepers opening their bee boxes to find skeletal colonies with very few or no live adult bees. The worker bees have practically disappeared, since their dead bodies are not in the hive or nearby. At the same time, the queen remains along with developing bees and a store of honey and pollen.

The researchers analyzed bees, wax comb and pollen in healthy and CCD-afflicted colonies for pesticides, parasites and other agents. According to vanEngelsdorp, they found no levels of clothianidin in any of the samples.

But, as the researchers highlight in the study, there is uncertainty at play: If pollen tainted with a pesticide were responsible for CCD, the bees would have eaten that pollen before the samples were collected and it would not show up in the testing. Also, since most bees die away from the hive those dead bees would not be analyzed.

Pettis explained that bees have a long history of being exposed to pesticides, in agricultural and urban settings, and sometimes they've died as a result.

“We’ve had a long, bad association with pesticides and beekeepers and growers try to do things to minimize that,” he said.

“There’s certainly cause for concern, but I don’t know that singling out one product is the way to go,” Pettis said.

Another [study](#), which Frazier, vanEngelsdorp and Pettis co-authored along with others, shows that bees around the country are exposed to a plethora of pesticides. Drawing 887 samples from hives in 23 states and one Canadian province, the scientists found two or more pesticides in 92.3 percent of a total of 749 bee, pollen and wax samples. They detected at least one systemic pesticide in almost half of the 749 samples. The systemics were found more frequently in pollen and wax than in bees.

However, researchers only found imidacloprid, Bayer’s top-selling seed treatment, in less than 3 percent of pollen samples and 1 percent of wax samples. It was not detected in bees. Clothianidin was not detected at all in the samples at the detection level set by the researchers.

“The high frequency of multiple pesticides in bee collected pollen and wax indicates that pesticide interactions need thorough investigation before their roles in decreasing bee health can be either supported or refuted,” the researchers concluded.

vanEngelsdorp stressed the need to re-evaluate the way in which pesticides are tested. He emphasized the importance of testing for pesticides’ synergistic effects – the way they can act in concert with other chemicals to enhance or decrease toxicity, even at low levels. Pesticides’ sub-lethal effects – the impacts that result from doses that don’t kill insects – also need to be accounted for, he said.

In lab studies researchers have demonstrated the [sublethal effects](#) of exposure to imidacloprid to include impaired brain functioning and abnormal [foraging behavior](#) in bees.

Some European Countries Prefer the Precautionary Principle

Boyne maintains that there is no documented support behind the claims that Bayer’s products are responsible for causing reported bee declines.

Nevertheless, some European countries have banned or suspended neonicotinoid seed treatments, including clothianidin and imidacloprid, on certain crops because of the suspected implications for honeybees.

In Germany, clothianidin was whisked off the market as a seed treatment for corn in 2008 after beekeepers in the Baden-Württemberg region in southwest Germany reported losses of up to two-thirds of their colonies after the pesticide was applied to maize seeds planted nearby. A September 2008 [statement by Bayer](#) states that the product was incorrectly applied, which led to the active ingredient attaching to dust particles and being blown into the environment, where it was taken up by bees. Clothianidin remains banned for use on corn seed in Germany, although it is registered for use on other seed types.

In France, imidacloprid has been suspended for use on sunflower seeds since 1999 and on corn seeds since 2003. Clothianidin was denied registration in France. Clothianidin and other neonicotinoids are banned for use on corn seed in Italy, too.

But this hasn't put too much of a dent in Bayer's annual sales. In 2010, global sales of imidacloprid earned Bayer Cropscience \$830 million, while clothianidin pulled in \$267 million.

EPA Reclassified Bee Health Study and Questions Remain

While researchers continue to investigate the potential toxic effects of neonicotinoids on bees, Theobald and others have taken the Environmental Protection Agency to task about the status of the scientific study used to satisfy the registration requirements for clothianidin.

Last year Theobald publicized an [EPA memo, dated Nov. 2, 2010](#), which he says was supplied to him by a source within the EPA. The memo highlights that the EPA reclassified a [Bayer-sponsored study](#) to evaluate clothianidin's effects on honeybees and clear the chemical for [registration](#) as "supplemental" instead of "acceptable." (The memo has since been [posted](#) on the EPA's website.)

The study, performed in Canada, involved placing bee colonies in the middle of 2.5-acre fields for three weeks. Some fields contained clothianidin seed-treated canola, while others contained non-treated canola, both in bloom. Researchers later moved the bees to a bee yard. They assessed the health of the bees and tested their honey, wax, pollen and nectar for clothianidin residues for 130 days after initial contact with the canola. They compared bees who had been placed in fields of treated canola to those from non-treated fields.

The researchers concluded that "honeybee colonies will, in the long-term, be unaffected by exposure to clothianidin seed-treated canola."

The study was accepted in 2007, but the EPA has since reclassified it because it did not fulfill the agency's required [guidelines](#). On its website, the EPA notes that deficiencies include "some cross contamination between treated and non-treated (control) experimental plots and inadequate separation between treated and control portions of the study."

Besides being downgraded last year by the EPA, the study has been criticized by some beekeepers. In an [article for Bee Culture magazine](#), Theobald described the study like this:

"Let's say you had a noxious weed that was affecting your cattle and you wanted to assess the dangers. So you plant two and a half acres of the suspect weed in the middle of 2,000 acres of lush Wyoming grassland and put four cows on the test plot. The cows aren't fenced in, however, and are free to roam over the entire 2,000 acres. What do you think is going to happen? How long do you think your four cows are going to stay on your dinky little test plot? How significantly is that noxious weed going to be represented in their diet?"...

"Here's what the life cycle study of bees and canola consisted of: four colonies of bees were set in the middle of one hectare (2.5 acres) of canola planted from treated seed, with the bees free to forage over thousands of surrounding acres in bloom with untreated canola, which they most surely did. What do you think the results were? They were exactly what Bayer wanted of course."

The EPA has called for another study to evaluate the effects of clothianidin on bees, yet the chemical remains on the market. This despite the fact that the memo reads:

“Information from standard tests and field studies, as well as incident reports involving other neonicotinoid insecticides (e.g., imidacloprid) suggest the potential for long-term toxic risk to honeybees and other beneficial insects.”

While calling for another study, the memo also states that ***“exposure through contaminated pollen and nectar and potential toxic effects therefore remains an uncertainty for pollinators.”***

Frazier, the Penn State entomology professor, said the most prudent course of action would be to take the pesticide off the market while the flawed study is being redone, according to a statement released by Beyond Pesticides.

New West sent questions on March 9 to the EPA regarding the reclassification of the lifecycle study, the anticipated deadline for a new study, and the reasons for clothianidin's conditional registration. Despite multiple requests for a response, the agency had not replied by March 14.

Boyne said the EPA has not yet given Bayer a requirement for a new study, but the company aims to begin fieldwork for a new study in 2012 that will continue through the spring of 2013.

In a [letter](#) dated Dec. 8, 2010, a coalition of groups asked EPA administrator Lisa Jackson to put an immediate ban on sales of clothianidin until a satisfactory study has been completed.

The EPA responded 10 weeks later with a [letter](#) confirming that clothianidin's registration would not be suspended or canceled, because clothianidin does not pose an imminent hazard. The agency said it would open a [registration review](#) docket, which involves re-evaluating the safety of the product, for clothianidin in 2011.

“That letter was written by George Orwell,” said Theobald, referencing the author whose work birthed the concept of 'double-speak'.

“It's ridiculous. They need to step up to their responsibilities, in my view, and they want to play word games. That letter was totally unacceptable,” he said.

Conditional Registration Allows Product Onto Market Before All Testing Completed

Clothianidin's protracted registration process provides an insight into the EPA's practice of conditional registration, which essentially allows pesticides onto the market even though certain issues still need to be resolved. Conditional registration of pesticides is not uncommon. The National Resources Defense Council estimates that 68 percent of the 16,000 pesticides currently registered in the U.S. were conditionally registered.

In April 2003 the EPA [granted](#) Bayer CropScience a conditional registration for clothianidin for use as a seed treatment on corn and canola. At this time the EPA was aware of the possible risks to bees and called for the now reclassified study to assess the possible chronic exposure of the insecticide to bees across the period of two life cycles.

The EPA had initially proposed that a label for clothianidin-treated corn seeds would read: “This compound is toxic to honeybees. The persistence of residues and the expression of clothianidin in nectar and pollen suggests the possibility of chronic toxic risk to honeybee larvae and the eventual stability of the hive.” But, along with the conditional registration, it was decided that this label be deferred until after the life-cycle study had been reviewed.

Bayer was given until December 2004 to provide the EPA with the life-cycle study. But this deadline was later extended to May 2005. The study was completed in August 2006, but the EPA only approved it in November 2007. Clothianidin was given full registration in 2010.

It is not unusual that there would be some give and take, since the study was not considered a “core” registration requirement, Boyne said in a telephone interview.

However, Beyond Pesticides has [challenged the idea](#) that the EPA did not consider the study a core requirement, since it was listed as part of the registration requirements from the outset.

Boyne said Bayer provided the EPA with a draft protocol for the field study in 2003, which was required before the company could begin the study, but didn’t receive feedback until April 2004.

Stepping Into the Public Eye

Theobald finds the concept of conditional registrations for products like clothianidin, where questions remain at the time of putting the chemical on the market, unacceptable.

“What the EPA has done is turn the environment into the experiment. And we’ve become the experimental subjects,” he said. “I think most EPA employees want to do the right thing, but I think this is an enormous management failure.”

Corporations, such as Bayer, need to be reined in, said Theobald.

“A new word has come into my vocabulary – corporatism – which in my understanding is the flipside of fascism,” he said. “Fascism would be the takeover of industry by government; corporatism is the takeover of government by industry.”

At the same time, Theobald, who worked for IBM for 10 years after graduating from the University of Wisconsin, said he is not against corporations and believes the corporate model is a good one when managed properly.

“But corporations are like children,” he said. “They pursue their interests very narrowly without consideration to the potential collateral consequences. They’re in pursuit of profit.”

Theobald said he would continue to raise public awareness about the EPA’s decision to keep clothianidin on the market.

“I think they have an obligation to explain themselves and the basis for their decisions to the American people,” he said in an email.

As president of the Boulder County Beekeepers’ Association, an organization he helped found, for 30 years until 2006 and formerly the Boulder County Bee Inspector until the position was retired in 2000, Theobald is well experienced in the bee world. He has mentored many beekeepers and taught beekeeping courses at the Colorado State University Extension.

“In this area he’s like a guru,” said Miles McGaughey, who has been a beekeeper for 25 years. A friend of Theobald, McGaughey is a martial arts instructor and bee extractor – a person who removes and relocates unwanted swarms from people’s homes.

“He was the bee inspector when I started, who was like the law,” said McGaughey, who jokingly admitted that he spent his first few years of beekeeping evading Theobald.

“Really, he’s the most helpful guy in the universe if you’re interested in bees,” he said.

Theobald is a very trustworthy person, McGaughey said.

“The fact that he’s taken this fight on and he thinks it’s important should scare the hell out of everybody else, because he doesn’t fool around with stuff like that lightly,” he said.

“And people are just, like, ignorant of the fact that we’re talking about our food supply. Nobody cares about bugs, but everybody likes to eat three nice meals a day and that’s what we’re really talking about,” he said.

Laura Tyler, a Boulder beekeeper and documentary filmmaker, is making a documentary about Theobald, which she stressed is not an activist film. She first met Theobald 11 years ago when she took one of his beekeeping classes.

Over a cup of honey-sweetened black Earl Gray tea, she explained that Theobald hasn’t always put himself “up front,” but has recently become a spokesperson for the pesticide issue. She referred to him as a citizen journalist who has done extensive research.

“He’s the only person doing this work. I’m totally serious about that,” she said.

“There are other people who hold pieces and parts of it, but he’s the one person who has been kind of obsessive with it, like a dog with a bone.”

Brendon Bosworth is based in Boulder, Colorado.