

What Kills our Bees and Pollinators?

Prepared by Paule Hjertaas, 5 April 2007

1. When people refer to GMO crops causing insect damage they usually refer to crops with Btk bacterial insecticide inserted. In Saskatchewan, we don't yet commercially grow those types (cotton, corn), but we grow herbicide-resistant crops such as canola (glyphosate-resistant).
2. Known reasons for pollinator decline encompass parasites and diseases, habitat loss, as well as herbicides and insecticides. Over 70 pesticides are known to kill pollinators.¹
3. In France, massive hive die-offs were linked to the use of **imidacloprid** [Gaucho (Bayer), Regent (Aventis)] for seed treatment, as there are residues in pollen and nectar.²

*"A spokesman for Bayer said that **its studies confirmed that Gaucho left a small residue in nectar and pollen**, but there was no evidence of a link with the drop in France's bee population. **"It is impossible to have zero residue,"** said Gerard Eyries, marketing manager for Bayer's agricultural division in France. **"What is important is to know whether the very feeble quantities which have been found have a negative effect on bees."** (2)*

Imidacloprid was first licensed in Canada in 1995, under temporary registration for the control on insecticide-resistant Colorado Potato Beetle on potatoes in Eastern Canada. By 2001, there was enough concerns for pollinator die-off from use of imidacloprid that the PMRA ordered studies, but re-registered the chemical anyway. (3) Regulatory Note REG2001-11³. At that time, it was registered for the following crops: Potato, Tomato, Apple, Field Lettuce. Seed Treatment in Canola and Corn, and for turf in Ontario and Quebec. In addition, imidacloprid was registered for greenhouse use, and as Flea Adulticide (cats and dogs). In April 2006, Bayer registered it for melons.⁴

To my knowledge, apples, canola and melons are in great need of pollinator.

4. Fipronil was also banned in France in 2004 for its negative effect on bees. (see point 5). It is not currently licensed in Canada.

5. After Imidacloprid and Fipronil were banned, bee populations rebounded in several areas but not all.⁵ *"The long-term persistence of Imidacloprid and Fipronil in soils where the pesticides were freely used over a number of years, is the cause of continuing bee-losses even after the ban, according to beekeepers. In addition, 'Gaucho' is still allowed for use on cereal crops such as wheat, barley and oats. UNAF is demanding a total ban on the use of Gaucho for cereal crops."*(5) see⁶ as well.

6. A Canadian study indicates that **Spinosad** can also affect bees at environmental concentrations.⁷

"Spinosad is a natural pesticide derived from the bacteria Actinomycetes. It is used in over 30 countries including North America, Canada and the UK to combat common crop pests such as caterpillars and thrips...Colonies exposed to more realistic levels of spinosad in pollen did not show any lethal effects and only minimal immediate colony health effects."

"However, bees that were fed realistic levels of spinosad during larval development were slower foragers. "

"They took longer to access complex flowers, resulting in longer handling times and lower foraging rates. The bees also displayed "trembling", which impaired their ability to land on the flowers and enter the flower tubes."

References

¹ **Pollinators Need Protection from Pesticides**

(Beyond Pesticides, July 4, 2003) With the summer heating up and the pesticide sprayers out in full force fighting the never-ending battle against mosquitoes and lawn and agricultural pests, we cringe at the thought of what these chemicals are doing to our families and neighbors. But there is another susceptible population that we need to protect: bees and other animals that pollinate the plants that we and other species eat. **According to Ohio State University, over 75 commonly used pesticides are highly or moderately toxic to bees.** According to the United Nations Food and Agriculture Organization (FAO), at least one-third of agricultural crops depend on bees and other animals for pollination.

FAO describes the assumption that pollination is a "**free ecological service**" provided by nature as "**erroneous.**" **Effective pollination requires resources such as refuges of pristine natural vegetation and suitable habitat for pollinators.** Where these are reduced or lost, pollinators are becoming limited and adaptive management practices are required to sustain their livelihoods. In fact, **throughout the world, agricultural production and agro-ecosystem diversity are threatened by declining populations of pollinators.** For example, in 1994 California almond producers were forced to import honey bees from other states to ensure that their crop was pollinated. The major contributors to the problem are considered to be habitat fragmentation, agricultural and industrial chemicals, parasites and diseases, and the introduction of alien species.

In June 2001, Beyond Pesticides Daily News reported that environmental biologist Peter Kevan, a professor from the University of Guelph in Canada, discovered that, **due in part to pesticide use, there is a growing global scarcity of bees and insects, the pollinators** required to produce the world's food supply. According to Dr. Kevan, the world's pollinator shortage is the result of a series of complicated factors that go beyond a simple lack of bees, but that is where the problem starts. "The changes in agricultural styles, chemicals and pesticides have taken a tremendous toll," explains Dr. Kevan. **"And even if the pollinators survive, there are fewer and fewer places for them to live.** Most of their natural places - holes, logs - have been cleaned up. Their natural habitat was gone a long time ago."

French journalist Michel Dogna recently wrote about the situation of declining pollinators in Europe, **blaming much of the problem on imidacloprid**, manufactured by the Bayer Corporation and sold to farmers to coat the seeds and to protect them from certain diseases. According to Mr. Dogna, imidacloprid paralyzes the insects, which cannot join the hive and therefore die. If they **do succeed, the honey that results from it is toxic.** In less than three years, 450,000 hives were thus lost and the production of honey fell from 45,000 tons to 25,000 tons in France alone. In Alsace, the bee-keepers are regarded as disaster victims because of the Bayer products.

Gary Paul Nabhan, director of the Center for Sustainable Environments at Northern Arizona University and Co-author of **The Forgotten Pollinators**, puts the issue in perspective by stressing the importance of interactions and relationships between species in our environment. "We tend to think and grieve a lot about endangered species, **but endangered interactions, endangered relationships, are just as important, but harder to visualize.** They remind us that every single one of our lives is dependent on other lives around us."

According to Ohio State University, the following pesticides are **highly toxic to bees:** 2,4-D (Weed-B-Gone), abamectin (Zephyr), acephate (Orthene), azinphos-methyl (Guthion), bifenthrin (Capture), carbaryl (Sevin), carbosulfan (Advantage), chlormephos (Dotan), chlorpyrifos (Lorsban, Dursban), cyfluthrin (Baythroid), d-phenothrin (Sumithrin), demeton-s-methyl (Metasystox (i), (50-% Premix), diazinon (Spectracide), dichlorvos (DDVP), dicotophos (Bibrin), dimethoate (Cygon, De-Fend), esfenvalerate (Asana XL), ethion (tech), (Ethanox), etrimfos

(Ekamet), fenitrothion (Sumithion), fenpropathrin (Farmatox), fensulfothion (Dasanit), fenthion (Baytex), fenvalerate (DMSO), (Belmark), flucythrinate (Pay-Off), fonofos (Dyfonate), heptachlor (Fennotox), lindane (Lindane), malathion (Malathion 50, Malathion ULV), methamidophos (Monitor, Tamaron), methidathion (Supracide), methiocarb (Mesuro), methyl parathion (Penncap-M), mevinphos (Phosdrin), monocrotophos (Azodrin), naled (Dibrom), omethoate (Folimat), oxydemeton-methyl (Metasystox-R), oxydisulfoton (Disyston S), parathion (Bladan), permethrin (Ambush, Pounce), phosmet (Imidan), phosphamidon (Dimecron), propoxur (Baygon), pyrazophos (Afugan), resmethrin (Chryson), tetrachlorvinphos (Gardona), and tralomethrin (Scout X-TRA).

The following are **moderately toxic**: Acetochlor (Acenit), Aclonifen (Challenge), allethrin (Pynamin), alphacypermethrin (Fastac), ametryn (Evik), bromopropylate (Acarol), cinmethylin (Argold), crotoxyphos (Ciodrin, Decrotox), DCPA (Dacthal), diphenamid (Dymid), disulfoton (DiSyston, Ekanon), endosulfan (Thiodan), endrin (Hexadrin), ethoprop (Mocap), flufenoxuron (Cascade), fluvalinate (tau-fluvalinate), (Mavrik, Spur), formetanate hydrochloride (Carzol), mancozeb (Manzate, Dithane, Fore), methanearsonic acid (MAA), neburon (Granurex, Propuron), pebulate (Tillam), phorate (Geomet, Thimet), pirimiphos-methyl (Acetellic), sethoxydim (Poast), sulfosate (Touchdown), terbufos (Counter), thiocyclam hydrogen oxalate (Evisect), thiodicarb (Larvin, Nivral), and triforine (Denarin, Funginex).

<http://www.beyondpesticides.org/>

² 2. a. French honey makers in a buzz over pesticides

<http://www.planetark.org/dailynewsstory.cfm?newsid?92>

FRANCE: October 18, 2000

PARIS - French honey makers yesterday demanded a ban on pesticides which they alleged were decimating the local bee population by making plants so toxic that even the slightest contact could damage the insects' nervous system.

Beekeepers want the Farm Ministry to **outlaw so-called systemic pesticides**, which are used to coat seeds at the time of sowing and are then spread via the sap into the plant, they said in a joint statement.

They say that contact with large doses of the pesticides, used by wheat, barley, maize and sugar beet growers to protect against greenflies, causes bees to **become disoriented** and, unable to return to their hives, die.

"**It's enough for the insect to alight on the plant to receive a dose of neurotoxicity**," said Maurice Mary, vice-president of the National Union of French Beekeepers (UNAF). "All the auxiliary fauna is decimated."

The Farm Ministry, responding to concerns about so-called "mad bee disease", in January 1999 **suspended use of chemical giant Bayer AG's pesticide Gaucho on sunseeds as a precautionary measure.**

But beekeepers said the measure was insufficient, as studies found that Gaucho left a residue which meant that **even after two years, plants sowed on the same spot as the crop originally treated contained traces of the product.**

Honey makers planned to stage a protest on October 25 in front of Bayer's plant in the central French town of Cormery to demand that **systemic pesticides - including Gaucho and rival Aventis's Regent - be banned for use on all crops.**

2.b BAYER DENIES LINK

A spokesman for Bayer said that **its studies confirmed that Gaucho left a small residue in nectar and pollen**, but there was no evidence of a link with the drop in France's bee population.

"It is impossible to have zero residue," said Gerard Eyries, marketing manager for Bayer's agricultural division in France. **"What is important is to know whether the very feeble quantities which have been found have a negative effect on bees."**

The product was sold in 70 countries with no reported side-effects on bees, he added.

Eyries said Bayer had submitted its findings to the Farm Ministry's Toxicology Commission, which was due to rule in the next few months whether to lift the temporary ban on Gaucho use for sunseed crops.

Its recommendation will be passed to Farm Minister Jean Glavany, who has final say in the matter. Farm Ministry officials were not immediately available to comment on the case.

The Bayer spokesman **called for a broad study to determine the cause of disorientation in bees, which has affected mainly three departments in central and eastern France: Indre, Vendee and Deux-Sevres.**

"There are many regions where Gaucho is not used and where there are beekeepers, and where beekeepers have considerable problems of declining honey production," he said, adding that acarids could also be to blame for the problem.

According to UNAF, French honey production fell to around 25,000 tonnes in 1999 from 35,000 tonnes before systemic pesticides were introduced in the early 1990s. The number of hives has plummeted to one million from 1.45 million in 1996.

Story by Joelle Diderich

REUTERS NEWS SERVICE

Note: Bayer was formally part of IG Farben-RL

2.c. FRENCH HONEY MAKERS IN A BUZZ OVER PESTICIDES

Oct 17/00

Reuters

By Joelle Diderich

PARIS - French honey makers on Tuesday were cited as demanding a ban on pesticides which they alleged were decimating the local bee population by making plants so toxic that even the slightest contact could damage the insects' nervous system.

The story says that beekeepers want the Farm Ministry to outlaw so-called systemic pesticides, which are used to coat seeds at the time of sowing and are then spread via the sap into the plant, they said in a joint statement. They say that contact with large doses of the pesticides, used by wheat, barley, maize and sugar beet growers to protect against greenflies, causes bees to become disoriented and, unable to return to their hives, die. Maurice Mary, vice-president of the National Union of French Beekeepers (UNAF) was quoted as saying, "It's enough for the insect to alight on the plant to receive a dose of neurotoxicity. All the auxiliary fauna is decimated."

The Farm Ministry, responding to concerns about so-called **"mad bee disease,"** in January 1999 suspended use of chemical giant Bayer AG's pesticide Gaucho on sunseeds as a precautionary measure. But beekeepers were cited as saying the measure was insufficient, as studies found

that Gaucho left a residue which meant that even after two years, plants sowed on the same spot as the crop originally treated contained traces of the product.

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Gerard Eyries, marketing manager for Bayer's agricultural division in France was cited as saying that its studies confirmed that Gaucho left a small residue in nectar and pollen, but there was no evidence of a link with the drop in France's bee population, adding, "It is impossible to have zero residue. What is important is to know whether the very feeble quantities which have been found have a negative effect on bees."

The product was sold in 70 countries with no reported side-effects on bees, he added.

³ <http://www.pmr-arla.gc.ca/english/pdf/reg/reg2001-11-e.pdf>).

⁴ http://www.pmr-arla.gc.ca/english/pdf/plansandreports/reg_activities_122006-e.pdf

⁵ imidacloprid ban in France:
http://www.bbka.org.uk/freefiles/imidacloprid/french_imidacloprid_ban_update_2005.pdf

⁶ <http://extoxnet.orst.edu/pips/imidaclo.htm>

⁷ . Natural Pesticide Impairs Bumble Bee Foraging Ability

Libraries

Science News Keywords

PESTICIDES BEES APICARY CROP PROTECTION SPINOSAD PEST

Contact Information

Available for logged-in reporters only

Description

Pesticide levels previously thought to be safe for pollinators may prove harmful to wild bee health, according to research.

Newswise - Pesticide levels previously thought to be safe for pollinators may prove harmful to wild bee health, according to research published in Pest Management Science this month.

The **Canadian** study shows that adult bumble bees exposed to the **pesticide spinosad during larval development - at levels they could encounter in the environment - have impaired foraging ability.**

Bees are important pollinators of crops. In developed countries, approximately a third of human food is reliant on pollinating activity. Wild bees are thought to contribute significantly to this quantity.

But although many pesticides are known to be toxic to bees, **toxicity testing is largely restricted to direct lethal effects on adult honey bees, if tested on bees at all.**

The researchers say **sub-lethal effects on honey bees could be going unnoticed, and that different bee species could be also be affected.**

Lora Morandin and colleagues at Canada's Simon Fraser University tested the effects of different levels of spinosad on bumble bee colony health and foraging ability.

Spinosad is a natural pesticide derived from the bacteria Actinomycetes. It is used in over 30 countries including North America, Canada and the UK to combat common crop pests such as caterpillars and thrips.

Bee colonies were fed the pesticide in a manner that mimicked contact in an agricultural setting. Adult bees and developing larva were exposed to spinosad in pollen.

The bees' foraging ability on an array of 'complex' artificial flowers made of centrifuge tubes was then evaluated.

High levels of spinosad residues (about 10 times what bees should experience in the environment) caused rapid colony death. Colonies exposed to more realistic levels of spinosad in pollen did not show any lethal effects and only minimal immediate colony health effects.

However, bees that were fed realistic levels of spinosad during larval development were slower foragers.

They took longer to access complex flowers, resulting in longer handling times and lower foraging rates. The bees also displayed "trembling", which impaired their ability to land on the flowers and enter the flower tubes.

This impaired foraging ability in bumble bees could result in weaker colonies and lower pollination of crop plants, according to Morandin.

"Adult bees that have been exposed to a pesticide during larval development may display symptoms of poisoning that are not detected with current tests required by regulatory agencies," she says.

"In order to ensure sustainable food production, agricultural pesticides need to be safe for wild pollinators."

The authors conclude that **testing of new pesticides should include examination of lethal and sub-lethal effects on wild bees.**

"Testing new pesticides on some species of wild bees will aid in developing pesticides and use recommendations that minimize impact on wild bees, leading to healthier populations of bees and potentially better crop yields," says Morandin.

Notes for editors:

Lethal and sublethal effects of spinosad on bumble bees (*Bombus impatiens* Cresson) Morandin et al

Pest Management Science

DOI: 10.1002/ps.1058

About Pest Management Science

Pest Management Science (PMSci) is an international peer-reviewed journal that publishes scientific contributions in areas relevant to pest management ranging from chemical synthesis directed towards improved chemicals to the use of natural predators in biological control.

PMSci is an SCI journal, published by John Wiley & Sons, on behalf of the Society of Chemical Industry, and is available in print (ISSN: 1526-498X) and online (ISSN: 1526-4998) via Wiley InterScience <http://www.interscience.wiley.com>. For further information about the journal go to <http://www.interscience.wiley.com/pestmanagementscience>

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