Canadian researchers use bees to drop pesticides on crops

Bumblebees and honeybees distribute fungi, bacteria, viruses while pollinating

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The survival of the struggling bee population could soon be doubly important to agriculture.

While bees pollinate crops, Canadian researchers have found they can also be used to control pest insects and manage disease by dropping off pest control agents while they work.

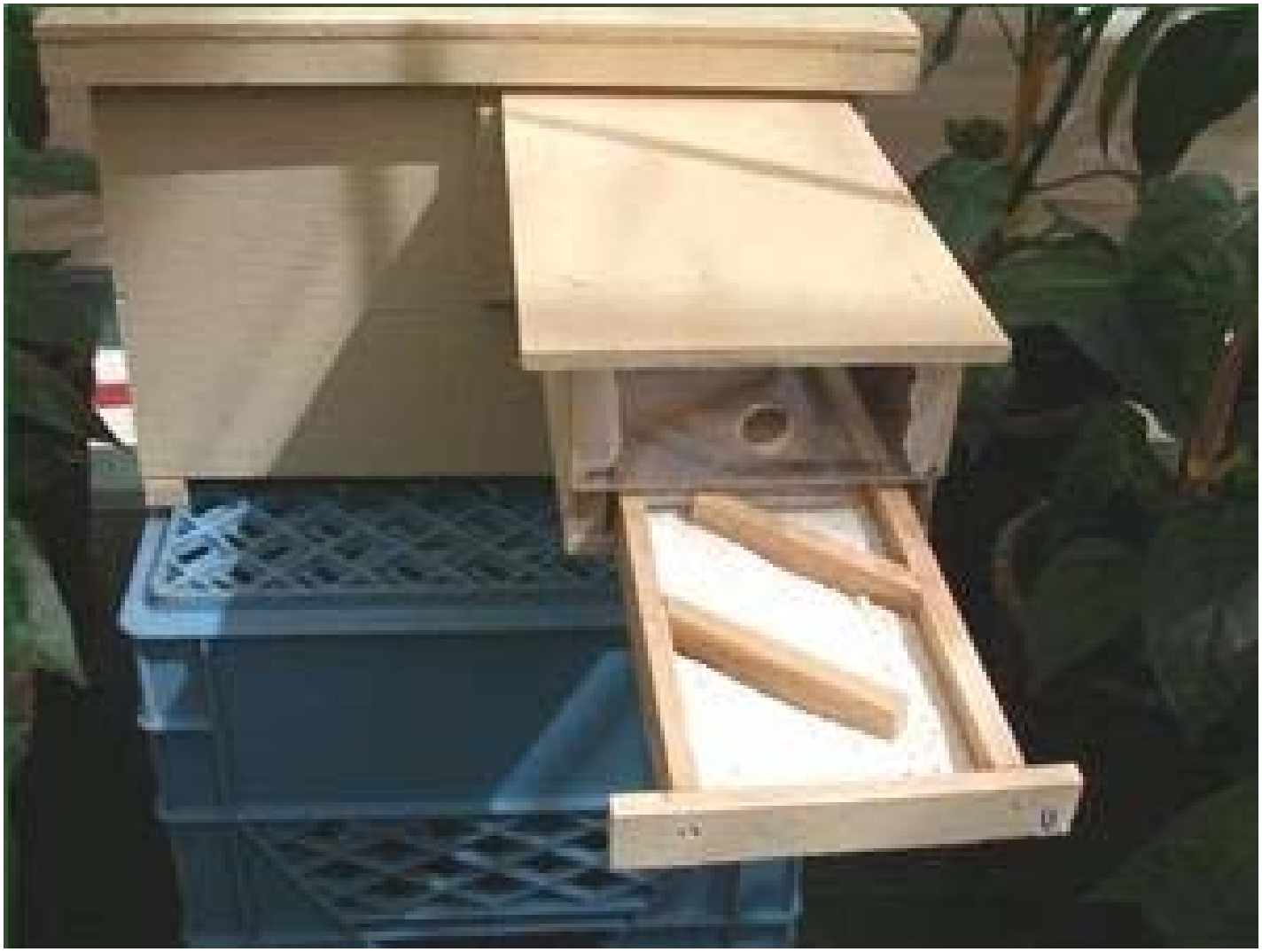
“We thought we can give added value to the bees by having them deliver microbial control agents,” said Les Shipp, a federal senior research scientist based in Harrow, Ont., outside Windsor.

Shipp found that bees leaving their hives could be forced to walk through a tray of organic pest controls. The pest control sticks to the bee's legs and hair. Through pollination, the bees then deliver a fungus, bacterium or virus to its intended destination.

Both bumblebees and honeybees have successfully distributed the fungus *Beauveria bassiana* to greenhouse sweet peppers and field canola. The fungus kills pests like whiteflies, aphids and Lygus.

- Windsor Morning host Tony Doucette will have full interview with Shipp at 7:15 a.m. Monday on 97.5 FM.

According to Shipp, the *Beauveria bassiana* spores attach to the body of the pest, germinate and penetrate the body of the insect, eventually killing them.



Bees are forced to walk through a tray of organic pesticide when they leave the hive. (Courtesy of Agriculture and Agri-Food Canada)

“We’ve been able to use these to control pest and fungal diseases. We’re able to reduce some diseases by 80 per cent,” Shipp said.

The method is called “bee vectoring.” Research was initiated at the University of Guelph years ago and continued in Harrow.

Bee vectoring of *Beauveria bassiana* received government approval in early 2013. Interest in the method is growing.

'Excitement' among greenhouse owners

Leanne Wilson, science co-ordinator for the Ontario Greenhouse Vegetable Growers, said bee vectoring was emphasized at the Canadian Greenhouse Conference in Niagara Falls earlier this month.

"There was a lot of excitement about it. I think it’s definitely a growing option," Wilson said.

She said greenhouse operators currently spray their peppers for pests. Bees already pollinate the greenhouse crops, so giving them double duty would save operators time and money..

"For larger greenhouses of, say, 50 acres, that’s a lot of area to cover [with spray]," Wilson said.

Another advantage is that the bees deliver the pest control directly to the flower Sprays on the other hand cover the entire plant, from flower to leaf to stem.

According to the Agriculture and Agri-Food Canada, the benefits of vectoring biological insecticides with bees include:

- Use of reduced-risk pest control products to control insects and diseases that are potentially devastating to greenhouse crops.

- Considerable savings in labour costs for greenhouse operators.
- Targeting of very small volumes of product precisely to where it is needed, so less product is used.
- Environment benefits, as the bio pesticide replaces older chemical pesticides.

'Hope it reduces spray'

“They’re out there working seven days a week. You’re getting continuous introduction of control agents,” Shipp said. “If you sprayed, you’re only spraying at one point in time, but the bees are there constantly delivering this.

“I wouldn’t look at it as a silver bullet. It’s another tool to control pests and diseases. We hope it drastically reduces sprays.”

The cutting-edge research led to the creation Bee Vectoring Technology in Brampton, Ont. According to Bloomberg, Bee Vectoring Technology was purchased last month by CT Developers, a publicly traded company on the Toronto Stock Exchange.

Bee Vectoring Technology is actively working across Canada to produce and commercialize the new pest management technologies.

A call to Bee Vectoring Technology wasn’t immediately returned.

Shipp said bee vectoring can be used on indoor and outdoor crops, including strawberries, sunflowers, blueberries, canola, peppers and tomatoes.

"There's work being done now on outdoor crops, and the potential there is huge,” Shipp said.

Is using bees to deliver organic pesticides to crops a good idea?

- Yes
- No

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Dengue Fever Makes Inroads into the U.S.

The mosquito-borne infection is cropping up in Florida, but mysteriously not in similar regions in the nation

By Dina Fine Maron | Friday, November 15, 2013 | 2 comments

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Image: James Gathany/Wikimedia Commons/CDC

Most Americans lose little sleep over dengue fever. The mosquito-borne infection is a leading killer in the tropics and subtropics, but it's been a long-held belief that ubiquitous air-conditioning, few open windows and limited time outdoors protects us from dengue. And in fact, for the past century most U.S. cases (except those near the Texas–Mexico border) were isolated to immigrants or travelers. In recent years, however, locally acquired cases of the disease have started to appear in pockets of the U.S. Now, researchers fear dengue could be gaining a significant foothold here.

One geographic mystery in particular has forced some epidemiological detective work. Despite that fact that large populations of dengue-carrying mosquitoes are found in certain parts of the U.S., outbreaks have yet to be detected in some of those locations—and scientists are questioning these patterns. Answers could help avert future outbreaks. More than 2.5 billion people—almost 40 percent of the world's population—are now at risk from dengue, and the World Health Organization currently estimates there may be 50 million to 100 million dengue infections worldwide every year.

Tucson, Ariz., and Key West, Fla., each have had sustained populations of *Aedes aegypti*, a dengue-carrying mosquito, for some 20 years. And yet, whereas the virus rippled through southern Florida, documented cases in Tucson are still unknown. The interest is not just academic—answers could help avert future bouts of the virus**.** Right now, with no vaccine against the virus, the best defense available is reducing mosquito habitat in areas where dengue fever is common. New clues about why some communities appear dengue-hardened could yield better protective measures.

One research group is now scouring data for new insights. The team conducted door-to-door surveys in the summer of 2010 in Tucson and Key West, hunting for clues about what went wrong in the latter, which in 2009 to 2010 experienced the first dengue outbreak in the continental U.S. since the end of World War II (outside of the Texas–Mexico border). The answer: a big shrug. Both communities had similar figures for screens on windows and central air-conditioning usage, so it was unlikely different numbers of mosquitoes were entering their homes. In both communities similar numbers of people spent at least an hour outdoors most days and reported similar habits in applying mosquito repellant. The researchers talked to 400 households in Key West and 372 in Tucson and found that economic and behavioral factors were similar. So what gives?

A leading hypothesis, says study author Mary Hayden, a behavioral scientist at the National Center for Atmospheric Research in Boulder, Colo., is that in Tucson the climate may be too hot or dry for long-term mosquito survival. Although mosquitoes live to adulthood in both communities, those in Tucson might be dying before the virus can incubate in their bodies. Hayden's research team plans to test this thinking. "We have just finished our first season of collecting mosquitoes but they are still being processed in the lab," she says. Whereas public health officials in most cases track the number of reported dengue patients, there is typically no surveillance

of mosquitoes carrying the virus. And because it takes four to 10 days for an infected mosquito to be capable of transmitting the virus, Key West might provide more favorable climatic conditions for mosquitoes, she posits.

There may be other clues arising from the differences between the two locales. Dengue fever can be relatively mild (with flulike symptoms, headache, joint pain, fever), so it is possible that people in Tucson may have been less sickened but did not seek care as much as patients in Key West did—or the cases were not verified, Hayden says. Another issue could be health care access—perhaps people in Tucson did not have as many health services available or chose not to take advantage of them.

A similar geographical medical mystery is playing out in Mexico right now. In Nogales, Sonora, on the U.S.–Mexico border, dengue-laden mosquitoes are all-too-common but apparently there's no dengue present. There, too, the risk is heightened because there are fewer barriers to human contact. For example, people in Sonora are less likely to use air-conditioning than in areas of the U.S., Hayden says.

Overall, dengue is challenging to combat. Bed nets, for example, a key tool when it comes to malaria prevention, are relatively useless against dengue, even though in both cases the vector is mosquitoes. The difference is bite timing. Whereas malarial mosquitoes feed at night (when nets around sleeping space are useful), the dengue-carrying variety typically feed during the two post-dawn hours and the two hours before sunset, Hayden says. As for therapy, it's basically limited to painkillers. Physicians instruct patients to pop a couple Tylenols (not aspirin because that could exacerbate bleeding, a symptom of dengue).

The problem may soon become more challenging, however. There are four confirmed strains of the virus in the world, but this past year a research group presented findings that suggest the possible presence of a fifth strain in Malaysia. Understanding the absence of dengue in Tucson, especially with so few medical treatment tools currently at hand, would be quite an advance.

Oregon permanently restricts some pesticide applications to protect bees

Nov. 21, 2013 | 0 Comments

Bees. / Statesman Journal file

Written by
Tracy Loew
Statesman Journal

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Update

Oregon will permanently ban certain pesticides from being used on linden trees after a massive bee die-off in Wilsonville last summer.

In June, about 50,000 bumblebees were found dead and dying in a Target parking lot under linden trees that had been sprayed with dinotefuran, part of a class of pesticides called neonicotinoids.

An investigation into the incident won't be completed until mid-December, Katy Coba, director of the Oregon Department of Agriculture, told a legislative committee this afternoon.

But ODA already has taken steps to protect bees from neonicotinoids, Coba said.

Immediately following the incident, ODA issued a temporary restriction on 18 pesticides containing dinotefuran . That ban expires Dec. 24.

And next year, products containing dinotefuran or imidacloprid sold or distributed in Oregon must have a label prohibiting their application on Tilia species, including linden and basswood.

“This is a fairly aggressive approach by the department,” Coba said.

GAMENEWS

White Paper Outlines New Approach to Endangered Species Act Pesticide Review

Written by Press Release Category: Environmental

Washington, DC--(ENEWSPF)--November 19, 2013. Last week, the Environmental Protection Agency (EPA), the U .S. Department of Agriculture (USDA), Fish and Wildlife Service (FWS), and National Marine Fisheries Service (NMFS) released a white paper identifying how they plan to reconfigure the pesticide review process to meet the pesticide approval requirements for the Endangered Species Act (ESA). The new approach outlined in the white paper incorporates suggestions from the National Academy of Sciences' Research Council (NRC) report released last May. The white paper is a step towards overhauling a deeply flawed process, though there will be several challenges to implementing this new approach for the agencies moving forward.

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), before a pesticide can be sold, distributed, or used in the U.S., EPA is required to determine that the pesticide does not cause unreasonable adverse effects on the environment. However, in the case of species listed as endangered or threatened under the ESA, all federal agencies, including EPA, are required to ensure that their actions will not jeopardize the continued existence of a listed species by diminishing the species' numbers and reproduction. To do this, in its pesticide registration process, EPA is required to consult with FWS and NMFS when a federal action may adversely affect a listed species or its habitat. Over the last decade, questions have been raised regarding the best approaches or methods for determining the risks pesticides pose to listed species and their habitats. EPA, FWS, and NMFS have developed different approaches to evaluating environmental risks because their legal mandates, responsibilities, institutional cultures, and expertise vary. As a result, NRC was asked to examine the scientific and technical issues related to determining risks posed to listed species by pesticides.

After reviewing the NRC's report, Evaluating Risks That Pesticides Pose to Endangered, Threatened Species – New Report, the agencies worked together to develop a shared scientific approach that reflects the advice provided by the NRC. The interim approach, designed to guide the consultation process, uses a three step risk assessment process to determine whether a pesticide is likely to pose a threat to listed species. Each step assesses risk through problem formulation, exposure analysis, affect analysis, and risk characterization.

Step one of the proposed risk assessment process is to determine whether pesticide use "may affect" a listed species by determining if pesticide use and off-site transport areas overlap geographically with listed species ranges and their critical habitats. These use pattern sties will be mapped out by using the National USDA National Agricultural Statistics Service (NASS) Census of Agriculture data, The National Land Cover Database (NLCD), and The Cropland Data Layer (CDL). The Agricultural Dispersal Model (AGDISP), and the Variable Volume Pond Model will be used to evaluate off-site pesticide transport.

If it is determined through the first step that pesticides may affect listed species, the pesticide is then

evaluated by step two. The purpose of step two is to determine if pesticide use is "likely to adversely affect" listed species or their designated critical habitats. This step examines if species are exposed to thresholds of the direct effects, indirect effects, and sub-lethal effects of pesticides. These determinations will utilize a weight-of-evidence approach that considers pesticide tank mixtures, formulations (including adjuvants, other active and inert ingredients), and environmental mixtures. The weight-of-evidence approach will also consider the ECOTOXicology database along with data submitted by pesticide registrations as a source for "best available" toxicity data.

If there is agreement between agencies that the pesticide is "likely to adversely affect" species or if there is disagreement between agencies the pesticides moves to step three of the interim risk assessment process. This step determines if pesticide labels for an active ingredient do not cause "jeopardy" to listed species and their designated critical habitat is not modified. This step builds off of steps one and two, and reconsiders the weight-of-evidence and population effects pesticides can have on species. If there is agreement between agencies that a pesticide causes jeopardy or adverse modification EPA must decide whether and under what conditions to register the pesticide so it complies with ESA.

The white paper acknowledges that there are several followup tasks, such as sharing information and developing a common approach to weight of evidence analyses, to define and improve techniques over time. A presentation put together by the agencies for a stake holder workshop, held last Friday, also outlines several challenges the agencies will face while implementing this interim plan. In terms of step one, some pesticide use sites are not well represented with existing data such as the use of pesticides on right-of-ways. Another important challenge is how the agencies will incorporate formulations and mixtures in the weight-of-evidence. Currently, inert ingredients are minimally tested and the EPA does not test for synergistic effects of pesticide mixtures.

Though this proposed risk assessment process is an important step forward toward greater cooperation between agencies, EPA's risk assessment process does not function to protect the most vulnerable in biological systems, but institutes restrictions intended to mitigate risks. The mandated consultations with FWS and NMFS could present the opportunity to evaluate alternative practices that would avoid harm to listed species, but is largely limited to the risk management framework that has so long dominated EPA's approach to regulating pesticides.

Background

Prior to 2004, EPA believed the extensive environmental risk assessments required in the registration process also would include impacts on listed species. However, represented by the public interest law group Earthjustice, several stakeholder organizations including the Northwest Coalition for Alternatives to Pesticides (NCAP) and the Pacific Coast Federation of Fishermen's Associations (PCFFA), filed suit in January 2001 to force EPA to fulfill the distinct ESA requirements. Specifically, the lawsuit challenged EPA's decision to register 54 pesticides without first consulting with federal fish biologists regarding the potential impact on protected salmon and steelhead species in the Northwest. The judge, in a lawsuit initiated in 2002, called EPA's "wholesale non-compliance" with its ESA obligations "patently unlawful" and ordered the agency to consult with NMFS regarding adverse impacts on the Northwest runs. More recently, EPA's failure to consult with FWS on the impacts of hundreds of pesticides known to be harmful to more than 200 listed species prompted a 2011 lawsuit.

All unattributed positions and opinions in this piece are those of Beyond Pesticides

Sources: Politico, http://www.beyondpesticides.org