



# Chemically Speaking

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## Mixed Smells Slow Whitefly

Bombarding pests with smells from many different plants temporarily confuses them and hinders their ability to feed, new research has shown. Biologists at Newcastle University, UK, have been exploring the potential of harmless plant volatiles as an alternative to pesticides in greenhouses. Testing a phenomenon known as the ‘confusion effect’ whereby animals and humans become inefficient at a task when they are bombarded with lots of distracting information, the team pumped a mixture of plant smells into a greenhouse growing tomato plants.

Whitefly feeds by pushing its long stylet into the leaf until it reaches the plant’s main source of nutrients traveling through the phloem. Weaving their way between the plant cells to reach the sap is technically challenging for the pest and the team

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found the whiteflies failed to feed while they were being bombarded with the different plant chemicals. Research leads Dr. Colin Tosh and Dr. Barry Brogan said this method of control could be an important step towards a more sustainable method of pest control. “It’s like trying to concentrate on work while the TV’s on and the radio’s blaring out and someone’s talking to you,” explains Dr. Tosh, based in Newcastle University’s School of Biology. “You can’t do it – or at least not properly or efficiently – and it’s the same for the whitefly.”

Whiteflies use their sense of smell to locate tomato plants. By bombarding its senses with a range of different smells ‘sensory confusion’ ensues and the result is that the insect becomes disorientated and is unable to feed. “Because the effect is temporary – we saw it last no more than 15 hours – it’s unlikely this method alone could be used to control crop pests. But this is an easy and safe way of buying the plants time until their own chemical defense mechanisms kick in. Used in conjunction with other methods, sensory confusion opens up a whole new area in sustainable pest control.”

*Trialeurodes vaporariorum* – or whitefly – is a major worldwide pest of greenhouse crops and is traditionally controlled using chemical pesticides or biological methods such as parasites. Previous studies have shown that whitefly becomes ‘restless’ when a number of plant species are mixed together rather than being exposed to a single crop. The aim of this latest research was to artificially create this mixed environment for a single crop greenhouse.

Measuring the time it took from the insect settling on a plant to accessing the plant sap, the team showed that hardly any of the whiteflies exposed to a range of smells started feeding from the

phloem within 15 hours from the time of exposure. By comparison, the majority of whiteflies exposed to just the single smell released by the tomato plants started feeding within this time.

Dr. Brogan, also based in the School of Biology, adds: “Plants talk to each other when they are under attack – producing chemicals which warn other plants close by of the threat. At the same time, they produce a chemical which is unpleasant to the predator. But this response doesn’t happen immediately, so if we can confuse the insects long enough to give the plants time to defend themselves this may go some way to reducing crop losses.” (*Alpha Galileo*, 4/28/14).

## CAST Releases Labeling Report

A new issues paper addressing the topic of labeling foods produced with GM products has been released by the Council for Agricultural Science and Technologies (CAST). The paper, titled “The Potential Impacts of Mandatory Labeling for Genetically Engineered Foods in the United States,” examines the scientific, legal and economic ramifications of requiring that food containing genetically engineered ingredients be labeled as such. It comes on the heels of the April 23 passage by the Vermont legislature of a bill that would make that state the first to mandate labeling of “GMO” or genetically engineered foods.

Lead author on the paper is Alison Van Eenennaam, a geneticist and Cooperative Extension specialist in animal genomics and biotechnology at

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the University of California, Davis. “Mandating process-based food labeling is a very complex topic with nuanced marketing, economic and trade implications depending upon how the labeling laws are written and how the market responds,” Van Eenennaam said. Co-authors on the paper are Bruce M. Chassy, a food science professor emeritus at the University of Illinois at Urbana-Champaign; Nicholas Kalaitzandonakes, an economics professor at the University of Missouri, Columbia; and lawyer Thomas P. Redick from Global Environmental Ethics Counsel, LLC.

Noting that such labeling would be based not on differences in the content of the crop or food product but on the way it was produced, Van Eenennaam and her co-authors conclude that there is no scientific reason for singling out the process of genetic engineering for mandatory process-based labeling. They maintain that voluntary labeling programs, such as the Non-GMO Project, motivated by market influences rather than government regulation, currently provide interested consumers with the choice to select non-genetically engineered foods in the United States. They suggest that state-based labeling laws may run into legal challenges related to interstate commerce, international trade, federal authority over food labeling and First Amendment protection of “commercial speech.”

In terms of economics, they project that mandatory labeling of genetically engineered foods would increase U.S. food costs. Just how much food prices might rise would depend on how food manufacturers and retailers respond to mandatory labeling. The authors project that the impact on food prices would be substantial if food processors decide to switch to non-GMO ingredients to avoid labeling requirements, as has been the case in other countries following the introduction of mandatory

GE labeling. The cost increases would be less if processors instead opt to label all of their food products as containing genetically engineered ingredients. (UC Davis, 4/28/14).

## New Harvard Bee CCD Study

Studies on two widely used nicotinoid insecticides conducted by researchers at the Harvard School of Public Health suggest that the pesticides may be doing harm to honey bee colonies over the winter, particularly during colder winters. The new study replicated a 2012 finding from the same research group. The group had previously established a link between low doses of imidacloprid and Colony Collapse Disorder (CCD), in which bees abandon their hives over the winter and eventually die.

The causes behind Colony Collapse Disorder are unknown, but they are thought to be varied. Although habitat loss, disease and climate are contributors behind bee declines seen across the Northern Hemisphere, an increasing body of evidence suggests that use of certain pesticides may also be playing a part in pollinator decline and CCD. As well as looking at imidacloprid, the new study also found that low doses of a second nicotinoid, clothianidin, had the same effect.

Some studies have suggested that CCD – and related mortality rates in honey bee colonies – may be a result of pesticides reducing bees' resistance to mites or parasites, the Harvard study found that bees in the hives exhibiting CCD had almost identical levels of parasites and disease as a group of control hives, most of which survived the winter. This

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suggests that the nicotinoids examined may be causing some other kind of biological mechanism in bees that in turn leads to CCD.

As part of the Harvard study, the lead Harvard researcher and co-authors from the Worcester County Beekeepers Association studied the health of 18 bee colonies in three locations in central Massachusetts from October 2012 to April 2013. At each location, the researchers separated six colonies into three groups - one treated with imidacloprid, one with clothianidin, and one untreated. There was a steady decline in the size of all the bee colonies through the beginning of winter. Beginning in January 2013, bee populations in the control colonies began to increase as expected, but populations in the nicotinoid-treated hives continued to decline. By April 2013, 6 out of 12 of the nicotinoid-treated colonies were lost, with abandoned hives showing signs typical of CCD. Only one of the control colonies was lost - thousands of dead bees were found inside the hive - with what appeared to be symptoms of a common intestinal parasite called *Nosema ceranae*.

While the 12 pesticide-treated hives in the more recent study experienced a 50 percent mortality rate, the authors noted that, in their 2012 study, bees in pesticide-treated hives had a much higher rate of collapse (94%). That earlier bee die-off occurred during the particularly cold and prolonged winter of 2010-2011 in central Massachusetts, leading the authors to speculate that colder temperatures, in combination with nicotinoids, may play a role in the severity of CCD. (*Farming Online*, 5/12/14).

## **Pesticide Registrations and Actions**

### **Other Actions**

- Speaking to a conference of the crop protection industry, William Jordan, deputy director for programs at the EPA's Office of Pesticide Programs, said the agency's proposed revisions to its worker protection standard would result in "fairly modest" cost increases for industry that would be outweighed by the benefits of reducing pesticide exposures. The worker protection standard proposal, released in February, would increase the frequency of mandatory training from once every five years to annually, prohibit children under the age of 16 years from handling pesticides, establish no-entry buffer areas surrounding pesticide-treated fields to prevent exposure, and expand safety training. Jordan said the EPA estimates that the proposed rule to update the worker protection standard would cost nationally between \$62 million and \$73 million annually with the cost to large farms approximately \$340-400 per year and small farms \$130-150 per year. The Agency is estimating that about 3,000 incidents per year could be eliminated if the proposed revisions to the worker protection standard are adopted and followed, resulting in \$5 million to \$14 million in benefits from preventing acute pesticide exposures. Jordan was questioned about these estimates, as EPA's preamble to the proposed rule states repeatedly that the agency cannot quantify the benefits of the proposed revisions. The comment period on the worker protection standard proposal

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currently is scheduled to close on June 17 but the agency already has been asked to extend the deadline by 90 days. (*Western Farm Press*, 4/21/14).

- Farmers in France will be banned from spraying pesticides during daylight hours to protect bees, under plans unveiled by agriculture minister Stéphane Le Foll. Spraying there is already technically banned in the early morning, but many farmers have waivers, protecting them from sanction if they ignore the regulations. The new law will prevent spraying during daylight hours and there will be no exceptions. Mr. Le Foll's announcement will delight France's beekeepers and honey producers. Last year's honey production was just 15,000 tonnes, compared to 33,000 in 1995, and mortality rates among bee colonies have been rising, averaging between 15% and 30% per year depending on the region. Mr. Le Foll said that an inter-ministerial ban is being drafted and should be published in the *Official Journal* within the next three or four months. He said: "Light is what makes the bees come out and all that is spraying in the morning has important consequences." He said traces of pesticide left on plants and on early morning dew may disturb the bees during flowering periods of spring and summer. "Everyone must be aware that it takes effort," he said, adding the new ban will protect "agricultural production and at the same time to protect pollination and honey production." (*The Connexion*, 4/29/14).
- During the recent National Organic Standards Board (NOSB) meeting in San Antonio, Texas, the board voted to uphold the phase out in apple and pear production of the antibiotic streptomycin, which is set to expire on October 21, 2014. Since petitions to allow the use of all synthetic materials in organic production require a decisive, or 2/3's, vote under the Organic Foods Production Act (OFPA), the apple and pear industry's petition to extend was voted down with a vote of 8-7. This vote comes after a similar proposal to extend an exemption for oxytetracycline, another antibiotic used in apple and pear production, was rejected at the 2013 NOSB meeting. At the same meeting, activists came to protest the U.S. Department of Agriculture (USDA) National Organic Program's (NOP) changes to the sunset process for removing non-organic ingredients and materials from the NOP's National List of substances allowed and prohibited in products certified as organic. The sunset policy, adopted by the NOP without public comment or input, reverses the phase out of synthetics unless recommended for relisting by the NOSB, allowing synthetics to remain on the market unless they are voted off by a 2/3's vote. The previous policy of a 2/3's vote to retain use, subjected synthetics to the same rigorous standard of review. (*Beyond Pesticides*, 5/5/14).

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## Pesticide Potpourri

- Roundworms defend palm trees against red palm weevils, and minute wasps protect corn against European corn worms. Using natural tiny warriors to preserve agricultural fields is known as biological control, or biocontrol and it is working its way around the world.. Today, less than 5% of cultivated lands are protected this way, but the practice is growing and is expected to increase over the next five years. “These eco-friendly products have proved they are effective,” says Jean-Pierre Princen, president of the French branch of the International Biocontrol Manufacturers’ Association (IBMA). “We noted the enthusiasm of big companies that produce chemical pesticides because they actually invest in this sector.” InVivo, which is a French farming cooperative, distributes pesticides but also produces its own insects with its Biotop branch. InVivo development manager Antoine Poupart says the “two methods must be used in a complementary way.” Biocontrol has interested some of the biggest chemical corporations such as Bayer and Monsanto. Syngenta created the Bioline range 25 years ago. “In the Netherlands, Spain and France, they protect tomatoes under greenhouses by using 70% biocontrol and only 30% classic pesticides,” says Gérard Thomas, technical manager of Syngenta. For the experts of the French Institute of Research for Development (IRD), biocontrol is a major issue. “Despite the increasing use of pesticides since the 1960s, the rate of harvest loss stays high: between 40% to 50% in emerging countries
- and 25% to 30% in industrialized countries,” the Institute notes. (*WorldCrunch*, 4/23/14).
- According to a new market report published by Transparency Market Research "Crop Protection Chemicals Market - Global Industry Size, Market Share, Trends, Analysis and Forecast, 2011 - 2018," the global crop protection market was worth \$48.0 billion in the year 2011 and is expected to reach \$71.3 billion by 2018, growing at rate of 5.4% from 2011 to 2018. Herbicides formed the largest category in the overall crop protection market, contributing about \$19.9 billion for the year 2011. Herbicides, fungicides and insecticides are the foremost product segments in the global crop protection market. The herbicides market will experience both the highest growth rate as well as highest volume traded in the near future. The expected growth rate of herbicides for the given period is computed to be 6.1%, which is followed by fungicides with 5.6% of growth rate over the year 2011 to 2018. The major influencing factors in the crop protection market are shrinking arable land, the paradigm shift in farming practices, increased purchasing power and the resultant improvement in the standard of living. Pesticides protect the plants from various weeds, nematodes and fungus, thus raising the yield production. Increased awareness for crop protection in developed nations like the U.S, better and effective utilization of pesticides along with adoption of high end technologies are key growth drivers for the market. Asia Pacific accounted for majority of the global crop protection market growth in 2011 and is expected to do so till 2018; however Latin

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America and North America markets are expected to grow at a higher rate. (*SBWire*, 4/23/14).

- A collaborative effort among soybean researchers in the United States and Canada found that glyphosate does not increase Sudden Death Syndrome severity or adversely affect yields in soybean fields. The syndrome is caused by a fungus that lives in the soil and enters plants through their roots, causing them to rot. Toxins cause yellow and brown lesions on leaves, and pod fill is compromised. SDS is more prevalent if soil is wet, cold and compacted during germination and early reproductive stages. Fifteen field experiments were conducted in Iowa, Illinois, Indiana, Michigan, Wisconsin and Ontario, Canada from 2011-13. Six herbicide combinations of non-glyphosate and glyphosate, including pre- and post-emergence, were tested. Single and multiple applications were also compared. There were no statistically significant effects of herbicide treatments or interactions on SDS severity. SDS has

been on the rise the last decade. It came to a head in Iowa in 2010, when yield losses in some infected areas reached 40 percent or more. (*AGProfessional.com*, 5/6/14).



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