Why Tree Fruit Growers Should Implement a Pollinator Stewardship Plan

Julianna Wilson
Tree Fruit Integrator
Michigan State University
East Lansing, MI

This work was supported by the Michigan Apple Committee

Honey bees are by far the most important crop pollinator for a variety of fruits and vegetables grown in the Great Lakes region and around the world. The pollination services they provide have been estimated to contribute more than $20 billion to the US economy annually. There are also more than 4000 species of wild, unmanaged pollinators in North America, more than 400 of which are found in Michigan alone. The majority of these species are primarily solitary, ground-nesting bees, but there are also colony-forming bumble bees, and above-ground nesting, solitary mason and leafcutting bees. As many as fifty species may contribute to tree fruit pollination, more or less depending on the crop and the surrounding habitat of a particular farm.

"The plight of bees has been a recurring news item, starting around 2006 with the first reports of "colony collapse disorder" (CCD), and more recently with concerns about pesticides. Since Honeybees are so essential to fruit production it is in the best interest of the tree fruit industry, to make pollinator stewardship a priority to show that the wellbeing of the honey bee is part of a successful orchard IPM program."

The plight of bees has been a recurring news item, starting around 2006 with the first reports of "colony collapse disorder" (CCD), and more recently with concerns about pesticides. One highly publicized story regarding bees and pesticide use came out of Oregon when a misapplication by a landscaping company of dinotefuron to linden trees in full bloom occurred in a retail parking lot, killing thousands of bees as they foraged for nectar on those trees. Since that story broke, the greenhouse and ornamental industries in North America have been faced with consumer pressure to stop using neonicotinoid insecticides, with some localities temporarily banning their use.

When insecticides in the neonicotinoid class were first introduced in the 1990s, they were intended to replace older classes of insecticides that were much more toxic to humans and other non-target organisms. The US Environmental Protection Agency (USEPA) has been actively weighing the science before bowing to political pressure to ban all neonicotinoids. In the meantime, consumers have been applying direct pressure on home and garden retailers through protests that were organized online through social networking sites. Unfortunately for bees, banning pesticides will not solve all of their troubles. Regardless, consumer perceptions can wield a lot of power and have already impacted the greenhouse and ornamental industries.

Consumer perceptions about pesticides in one industry can easily start a ripple effect into other industries that rely on similar tools to manage pests. Pesticides are an easy target and are emotionally charged as a source of risk to the general public – a general public that is often lacking in knowledge of basic scientific concepts, but having deep mistrust of scientists, farmers, who they perceive as being cavalier in their use of pesticides, and the pesticide industry in general.

Their fears are not entirely unfounded. There is evidence that pesticides play a role in honey bee health – in particular by making it harder for bees to cope with disease. Most researchers now agree that a combination of factors are contributing to the plight of honey bees, including pesticide exposure, parasitic mites and the diseases that they transmit, and poor nutrition due to lack of quality habitat. Just like any other animal, poor nutrition makes it harder for honey bees to battle disease and to metabolize toxins that they may encounter in the environment. However, since it is extremely difficult to regulate parasites and nearly as impossible to regulate habitat loss through government oversight (although the USDA NRCS offers incentives for planting pollinator habitat: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ny/ technical/ ?cid=nrcs144p2_027389).

Pollinator Stewardship Plan

Most fruit growers probably think about bees when they need them for pollination during the spring, but otherwise, they are far down on the list of priorities. Part of the reason is because pollination alone does not guarantee a marketable crop, and bloom time relative to the entire growing season is a hectic time for growers and often only a few weeks long. However, it is in the best interest of the tree fruit industry that relies on the pollination services of bees, to make pollinator stewardship a priority to show that the wellbeing of the honey bee is part of a successful orchard IPM program. An IPM program is a set of best management practices that rely on what we know about the biology of a cropping system, and how it interacts with the environment, to select and implement management strategies when they will be most effective against a particular pest, and do the least harm to humans and the environ-

ment. Pollinator stewardship is an important component of tree fruit IPM.

Fortunately, most of the work toward producing a pollinator stewardship plan for tree fruit has already been done. Last April, a meeting of Michigan tree fruit growers, Michigan State University (MSU) extension educators and specialists, representatives from Michigan Department of Ag and Rural Development, the USEPA, the Natural Resource Conservation Service (NRCS), and the Michigan state apiarist was organized to discuss best management practices (BMPs) for protecting bees in orchards. We discussed at length, current management practices that might impact bees either positively or negatively and came up with a set of practices that we thought would be both practical and effective for protecting bees to the extent possible in a commercially managed orchard. A summary of those practices is listed in the table below. Probably the most important conclusion that came out of that meeting was that better communication between growers and beekeepers would go a long way towards preventing and solving issues that might arise when honey bees are out in the orchard.

Now the United States Department of Ag (USDA) and the USEPA are asking all industries that intersect with honey bees to produce BMPs so that as they feel the pressure from advocacy groups, they will be able to refer to these practices to know what the possible repercussions may be as they consider new regulations or restrictions for particular classes of pesticides. As new pesticide restrictions are set, label language will refer to exceptions spelled out in Managed Pollinator Protection Plans or MP3s that are based on BMPs developed at the state level for specific crops. The best management practices document that we developed for tree fruit here in Michigan for protecting bees in orchards is being used as a model to develop a crop-specific MP3 for tree fruit and other related industries.

A new MSU Extension Bulletin E3245 titled, Minimizing Pesticide Risk to Bees in Fruit Crops, was published (a link to download a copy is here: http://msue.anr.msu.edu/

Summary of Best Management Practices for Pesticide Use and Bee Safety in Orchards

Pre-bloom

- Draft a written contract with your beekeeper to clarify expectations on both sides, including record keeping, when the hives will be delivered, where the hives will be placed on the farm, and then when they will be removed.
- Keep good records of all pesticide applications so that if a complaint arises, the record shows that everything was done according to label.
- Provide sufficient time between pre-bloom sprays and placement of hives to avoid exposing bees to lethal residues. Remember that re-entry intervals (REIs) on pesticide labels should not be violated by a beekeeper placing colonies or removing them from your crop.

When honey bees are delivered

- Select a location for hives on the farm that is protected from potential spray drift. Honey bees are highly mobile, so for maximum safety, hives should be placed on the perimeter of plantings rather than along drive lanes within the planting. Make sure that pesticide applicators know where these locations are so that they can be avoided.
- In the company of the beekeeper, examine delivered hives to know the health and strength of the hives you are renting. Hives with 6-8 frames containing 70-75% brood per frame are considered to be a reasonable expectation at the beginning of pollination season in Michigan.

During bloom

- At all times, follow the current label for pesticides being applied. New EPA pesticide labels have bee-specific language and it is anticipated that more pesticide labels will include bee-specific labeling in the future.
- Select pesticides that are least toxic to bees whenever possible.
- Provide notice of planned pesticide applications so that the beekeeper has time to close hives if he or she feels the need to do so prior to an application.
- Avoid applying insecticides permitted for use during crop bloom while bees are foraging, and avoid tank mixes that include insecticides to control pests in the immediate post-bloom period – even when not labeled as bee toxic.
- Bees are less active in cool temperatures and low light, so spraying pesticides after sunset can greatly reduce the risk of direct exposure, as can spraying when temperatures are below 55 degrees Fahrenheit.
- Drift prevention should include turning off the sprayer near hives, avoiding spraying under windy conditions, and using equipment calibrated or designed to produce low drift.
- Clean equipment and dispose of pesticide products safely – do not leave contaminated water where bees can access it. Prevent pesticide contamination of open water sources that bees might use consume for regulating in-hive temperatures.

Petal-fall and post-bloom

- Do not apply bee-toxic insecticides until crop flowering is complete and all petals have fallen; if you are unsure whether bees have finished foraging in your crop or not, spray after sunset or when air temperatures are below 55 degrees Fahrenheit to minimize exposure of remaining bees to pesticides.
- Use selective herbicides to eliminate flowering weeds from drive lanes or mow before spraying to reduce flowering weeds in the orchard.
- Provide non-crop flowering plants elsewhere on the farm to divert bees from fruit plantings (i.e., meadows that contain bee-attractive plants or summer-flowering cover crops like buckwheat) and prevent drift of pesticides off target.

uploads/236/68700/E-3245.pdf) this spring, co-authored by Emily May, Rufus Isaacs, and myself. It has been written for all fruit growers east of the Mississippi and can serve as a practical guide for protecting bees while managing pests on farms that produce fruit. The publication includes tables at the back that list insecticides, miticides, and fungicides that are registered for use on fruit in Michigan and how hazardous to bees they are considered to be based on published toxicological studies.

Pesticides Issues

The goal of the scientific method is to find out the truth about how things work, without the interference of our own biases, whatever they may be, and attempting to leave emotions out of the equation. But emotions have become central to the issue of honey bees and their perceived plight – with potential consequences that could affect aspects of tree fruit production other than simply pollination. Neonicotinoids certainly have a target on their back as a class of insecticides, but fungicides, in particular chlorothalonil, are starting to get some attention as well. There is some evidence to suggest that in combination with other pesticide residues in the hive, some fungicides may be more toxic than otherwise on their own or they may be affecting larval development by interfering with the natural fermentation of pollen into beebread – the protein source fed to developing honey bees.

Fungicides are essential tools for managing diseases that infect tree fruit during bloom, which is why George Sundin and I developed a project that was recently funded by the USDA NIFA Critical Agricultural Research and Extension program to determine under field level exposures, how much residue in ending up in honey bee hives when they are exposed to standard disease management practices during bloom in cherry. Restricting the use of fungicides during bloom because of a perceived risk to honey bees would be detrimental to our ability to produce quality fruit in the Great Lakes region – but if we can show that the practices we use do no harm, then that will be to our benefit. On the flip side, if we find that we need to make new recommendations to better protect pollinators, we will be able to make those recommendations based on scientific evidence.

Pollinator Habitat

In the meantime, one of the most important pieces of the puzzle that is pollinator health is the issue of quality forage for bees throughout the Midwest. That is, there has a been a significant loss of quality habitats that bees would have used, but are no longer available due in large part to how field crops are currently grown and managed. Last October, the USDA organized a Honey Bee Forage and Nutrition Summit in Washington DC. The commercial beekeepers in attendance said that they were only there out of shear desperation – they were losing hives after every winter and knew that they could not solve this problem on their own. The main source of their problems in maintaining hives through the winter, in their opinion, was a diminishing source of mid-summer forage – particularly in the upper Midwest.

In mid-summer, mass flowering crops such as canola, sunflower, and alfalfa and land set aside in the Crop Reserve Program (CRP) containing yellow sweet clover were favored bee pastures until the price of corn increased with the demand for ethanol. Crop rotations became simply corn and soy or no rotations at all with corn followed by corn, and thousands of acres of CRP land were put back into production. This significant drop in floral diversity and abundance across a fairly vast landscape has been blamed for much of the colony losses that beekeepers have been experiencing in those areas – colonies that are malnourished or unable to produce adequate honey stores going into the winter are much more likely to perish than well-fed bees.

To address this habitat loss issue, the White House recently announced a national strategy to promote the health of pollinators through the restoration or enhancement of 7 million acres of land through public/private partnerships. Some of these programs, funded by the USDA NRCS, such as CRP and EQIP, are already underway and being utilized by fruit growers in Michigan to enhance their farms (http://www.xerces.org/wp-content/uploads/2013/04/using-farmbill-programs-for-pollinator-conservation-2ndEd.pdf). There are also incentives available for landowners who do not keep bees themselves, but who allow access to their land by beekeepers in the form of a livestock tax credit. These activities have the potential to help honey bees over the long term by providing incentives to landowners to set aside land for pollinator habitat. Michigan has been one of the most active states in promoting the planting of pollinator habitat through NRCS programs like EQIP.

When you go to the literature or even if you ask commercial beekeepers themselves how much of the land do they need to be planted or maintained as bee forage in order to remain economically sustainable, the minimum is just three percent. That is, 3% of land planted or maintained in a combination of habitats containing mass flowering crops or grasslands rich in flowering plants. Three percent is really not all that much land. But the trick lies in convincing growers who specialize in field crops that do not require the services of honey bees, that what they do also impacts bee health. As part of a pollinator stewardship plan, fruit growers can help beekeepers in their area, by setting aside portions of their farm to allow for the planting of non-crop flowering perennial bee pastures or summer-blooming mass-flowering annual crops.

Conclusions

John Muir once wrote: "When we try to pick out anything by itself, we find it hitched to everything else in the Universe." This quote could be applied to so many facets of this story – all the interrelated factors that affect honey bee health – how the orchard management practices we choose and when we choose to do them can have rippling effects on other aspects of the system – how one misuse of an insecticide by a landscape company can spark a wave of petitions to ban their use for everyone else. There are no isolated events – especially not with the speed at which information moves online. Developing a pollinator stewardship plan based on current science and the practical needs of the tree fruit industry may not be the only way, but I think it is the best way to protect bees and the fruit industries that rely upon them.

Julianna Wilson is a tree fruit IPM outreach specialist in the Entomology Department at Michigan State University.