The Plant Doctor's LANDSCAPE TIPS

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PROTECTING POLLINATORS AND OTHER BENEFICIAL LIFE FORMS PART 1: PROTOCOLS FOR PLANT DISEASE MANAGEMENT

INTRODUCTION:

Honey bee populations have experienced a sharp decline in population in recent decades. Often referred to as "Colony Collapse Disorder" (CCD), scientific studies have delved into its cause(s). Many of our human food sources depend upon bee pollination (fruit, vegetables, etc.). At the time of this writing, scientists have found a variety of factors they believe are contributing to the destruction of honey bees. These factors include pesticides, predators, parasites and pathogens.

It is not surprising that honey bees would be affected by pesticides, especially insecticides. . ., because they are insects. As research has progressed however, an unexpected discovery to many of us is that fungicides have been shown to negatively impact bees. In fact, some scientists believe fungicides may have a greater impact on bees than insecticides….at least in some situations.

Photo 1: There are approximately 4000 species of bees in the U.S. As with the "imported" honey bee, many bee species are important for pollinating the foods that we as humans often take for granted. Note the pollen sack on the abdomen of the bee in this photo. (Photo Credit: USDA ARS)

WHAT IS BEE BREAD AND THE IMPACT OF FUNGICIDES?:

To understand why fungicides can negatively impact upon bees, we need to look briefly into the lifecycle of bees…and the beer making. As most of us know, bees collect pollen and nectar to manufacture their basic foods (Photo 1); many of us derive and enjoy the benefit of some of their products such as honey (Photo 2). However, perhaps many of us have never considered that bees also manufacture another product often referred to as "Bee Bread" (Photo 3). Bee Bread is an enzymatic-active and lacto-fermented food product of nectar (about 20% for carbohydrate) and pollen (about 70% for protein) and bee saliva. The fermentation occurs from naturally occurring yeasts (and bacteria), just as our ancestors made bread, beer, wine, cheeses and so forth from naturally occurring yeasts; within the past several decades, humans have learned to "capitalize" upon certain strains of yeasts (often patented and highly protected) to ensure quality control and consistency of the desired product, as evidence by the plethora of different beers from numerous microbreweries that have popped up around the United States. Because bees rely upon fermentation to produce the highly nutritious bee bread (pollen is largely indigestible without fermentation) for themselves and their young, anything that affects the fermentation process can also negatively impact the bee hive and the survival of its inhabitants. Because yeasts are fungi, the widespread use of fungicides in our agricultural

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Photo 2: Bees make a plethora of honey products with quite a range in color, texture and taste. Note in the back, right of this photo a bottle of honey advertising "Autumn Olive". Perhaps there is some benefit from this objectionable, invasive plant!

Photo 3: Bee Bread is not only nutritious for honey bees but for humans as well. Because the pollen is fermented, the proteins are more easily digestible by humans and bees. Enzymes, vitamins and other nutrients are also readily available in Bee Bread.

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industries (including traditional agriculture as well as arboriculture and landscape) can have an alarming deleterious effect upon bees and other beneficial organisms in our environment.

PROTOCOLS FOR PROTECTING POLLINATORS AND BENEFICIAL ARTHROPODS:

Some companies in the Plant Healthcare Industry rely upon routine broadcast cover sprays for managing diseases and pests in our landscapes; this "one size fits all" corporate practice is often easier and more profitable when aimed at some clients who want no living critter in their landscape or spot on the foliage of their maple tree. These broadcast cover sprays usually fail in their objective to eradicate all plant problems and creepy, crawly critters, and often result in more severe or other unforeseen issues. A more tailored pest and disease management scheme that tries to encourage the use of Integrated Pest Management (IPM: also known as Integrated Disease Management or Integrated Plant Problems Management (IDM and IPPM respectively)) for protecting our environment, while hopefully reducing the use of pesticides, fertilizers etc., has been proposed for several decades. Its implementation has been met with varying degrees of skepticism and hence, success. While best IPM practices can undoubtedly work, public acceptance and willingness to pay more for the implementation of IMP practices are continual challenges for plant healthcare providers in our industry. In regards to bees and other beneficial arthropods in our environment, some states (and countries) have already adopted regulations that prohibit the use of certain chemicals and/or their use at certain times. I think we can only expect these regulations to expand both in geographical and pragmatic terms as time progresses.

As the public becomes more aware of issues with pollinators and other beneficial organisms, it is probable that they will begin demanding measures from and patronize those companies that are implementing environmentally-friendly protocols. As an industry, I believe it is better for us to lead by adopting common sense IPM practices that protect pollinators and other beneficial organisms rather than have our public clientele and/or our governments force us into adopting appropriate policies.

Following are some protocols and precautions that can help us "bee" sensitive to the plight of bees and other pollinators.

1. **Don't Spray Flowers:** Pollinators visit trees and other plants to collect nectar and pollen when plants are flowering. Spraying flowers will also likely cause bees to come in direct contact with the pesticide, whether insecticide or fungicide. If bees (and other pollinators) are not killed outright, they will likely take some of the pesticide back to the hive, which in turn will probably cause harm to the fermentation process and decline/starvation of bees (Photos 4 & 5, Schematic 1 & 2).

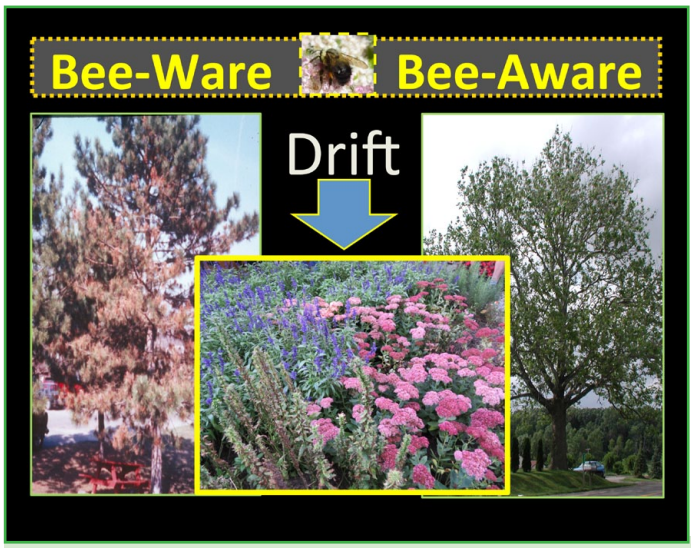
Photo 4: Unfortunately for many plant diseases, the correct timing of fungicide applications is in the early spring during flowering. Spraying flowers with fungicides (or insecticides) may kill the bees outright or may cause a decline in the hive if the pesticide is carried back to the hive.

Photo 5: In addition to bees, many critters such as birds, moths and butterflies may pollinate flowers. Can you find the moth/butterfly in this photo?

Schematic 1: For many diseases such as Trellis Rust, the typical time for treating pears would be in the spring when the galls on the juniper alternate host (left and upper left) have opened and are releasing spores that are windborne to pears. Unfortunately, that period is exactly the same time the pear flowers are being worked over by bees. Treatments during this period will likely harm bees.

Schematic 2: An alternative schedule for Trellis rust might be to treat junipers in the fall when spores are being released from the undersides of the pear leaf (right), as the fungus transfers back to the juniper (left).

2. **Avoid Certain Fungicides (?):** It is likely that most fungicides have the potential to impact the fermentation process in the production of Bee Bread. However, Captan, Ziram, Iprodione, Chlorothalonil and Mancozeb have been shown to be particularly toxic to bees and the fermentation process. While it is not necessarily advisable to absolutely avoid these fungicides, it should be our obligation to avoid the exposure of bees to them (see below).



Schematic 3: When applying any treatments that contain pesticides, be cognizant of potential drift issues to nearby plants that may be flowering and attracting bees and various pollinators.

3. **Systemic vs. Contact Fungicides:** It is important to understand which fungicides are systemic and which are contacts. Applying contact fungicides such as (above) Captan, Ziram, Chlorothalonil and Mancozeb before or after flowering should minimize the risk of exposure to bees and their food sources (nectar & pollen). Applying systemic fungicides, such as Thiophanate Methyl/Ethyl, Propiconazole, Mycoblutanil, and Iprodione (limited systemic activity), before flowering will likely result in translocation of the fungicide into the nectar and pollen; this should be avoided. Likewise, trunk injections of systemic fungicides before flowering will probably result in fungicide contamination of nectar and pollen. Trunk injections after flowering will likely not result in as much contamination, even into the following spring flowering period.

4. **Avoid the DMIs (?):** Dimethylation Inhibitors, also known as Sterol Inhibitors, such as propiconazole, myclobutanil, and triflumazole, are systemic fungicides that are very toxic to bees. Again, limiting exposure to bees and their food sources will be very beneficial. Hence, applying these fungicides after flowering will not likely result in exposure or sufficient carryover to the following year to impact bees.

5. **Avoid Propiconazole mixed with Pyrethroid Insecticides:** It turns out that mixtures of propiconazole and pyrethroids result in a product that is 5X more toxic to bees than either ingredient alone.

6. **Avoid Drift:** When spraying trees and shrubs (or lawns), be very cognizant of nearby flowering plants that may be attracting bee and other beneficial arthropod activity (Schematic 3).

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7. **Monocyclic vs. Multi-cyclic Diseases:** Diseases such as Trellis Rust on pear and Tar Spot on maple are termed monocyclic diseases because the fungi that cause them attack newly emerging foliage in the spring during a relatively narrow window of time….unfortunately that infection period often coincides with the flowering of many plants. By comparison, scab on apple and crabapple is a multi-cyclic disease that infects early spring, followed by continuing cycles of re-infection throughout the spring and summer. We can adapt our protective fungicide applications to avoid exposure to flowers and, hence, to bees and other pollinators.

8. **Timing of Fungicides:** As alluded to in the previous precautions, the proper timing of fungicides can positively impact our treatment of bees and other pollinators. Apply a contact fungicide before or after flowering will minimize the exposure of bees to these fungicides. Applying systemic fungicides before flowering will likely result in systemic translocation of the fungicide to the nectar and pollen, which in turn will likely result in transfer of the fungicide to the bee hive and accompanying detrimental outcomes.

9. **Conifers No Worry:** From what we know at this time, treatments for conifers do not greatly impact bee populations because bees generally do not visit conifers for pollen despite the abundant pollen production by conifers. This may change as our knowledge about various pollinators increases. However, we should still adopt best IPM practices and not spray conifers willy-nilly due to concerns for our environment.

10. **People and "The Stingers":** Because bees can sting people, our society generally possesses the attitude that "the only good bee is a dead bee". That's why we are eager to employ the "Nuclear Option" when we reach for that can of "Sure Shot Hornet Destructor" with a 25 feet range (Photo 6). Personally, I have generally found that as long as we do not disturb them, the stingers will usually leave us alone.

So, why should we care about the wellbeing of bees, wasps and other objectionable critters? Every living entity (yes, even mosquitos: I HATE MOSQUITOS) has its purpose and place in this complex environment. As we know, pollinators are vital for the growing of many foods upon which we humans depend; hence, we need to protect them as vital contributors to this piece of rock we call Planet Earth. While this may sound like some hysterical speech from one of those flaming left-wing liberal environmentalists, I don't think we should scoff at the importance of nature in helping to deliver a safe, plentiful food supply for "we humans". The research on pollinators is advancing at a prodigious pace. The foregoing advice on protecting pollinators is relevant at this time but may be altered in the future as we learn more. Please stay tuned… L

Photo 6: With climate change, life on this planet can become confused. These bees emerged during a warming trend in February and began scrounging for food (protein); they were especially pleased when they happened upon this discarded batch of oatmeal. A curious friend who would never reach for that can of Sure Shot Hornet Spray snapped this photo. (Photo credit: Debbie Jaworski)

Note: For more information on Pollinator and Pesticide interactions, please refer to: "**Protecting and Enhancing Pollinators in Managed Urban Landscapes.**" MSU Extension bulletin E3314

The author, MSU and MGIA do not endorse any particular products. If using pesticides, be sure to read and follow label directions.