Protecting honey bees and other pollinators from agricultural insecticides in field crops

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No one will argue the positive impact pollinators have on agricultural crop production. Although several factors have contributed to their decline, pesticide exposure can be a contributing factor. The risk of exposure can be reduced by implementing and understanding the following practices outlined in this publication.

Effective insecticide use

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Insecticides play an important role in reducing the risk associated with agricultural crop production. However, insecticide use can have a negative impact on pollinator health. The first mitigating practice to consider is to make sure the insecticide application is necessary. Although insecticides are an important pest management tool, they should be viewed as a last resort to control insect damage. Consider all applicable management techniques (cultural, mechanical, biological, sanitary, etc.) before contemplating insecticide use.

Economic thresholds have been developed for several field crop insect pests. Their use allows crop advisers to decide when is the most economical time to use an insecticide. Economic thresholds are conservative by design. Economic yield loss would not be expected at or below threshold levels. Waiting until the economic threshold is exceeded assures the insecticide treatment is necessary. If an insecticide treatment is deemed necessary based on the economic threshold, pollinator exposure can be reduced by applying an insecticide in the evening, when the bees are done foraging. This will decrease direct exposure to pollinators and also allow the pesticide to dry on the plant overnight, thus decreasing residue exposure to pollinators.

Field scouting techniques and economic thresholds are available in the UW Field Crop Scout Training Manual, and the University of Wisconsin-Extension publications (A3646) Field Crop Pest Management in Wisconsin and (A3422) Commercial Vegetable Production in Wisconsin.

Pesticide drift

To help determine if honey bee hives may be present near the application site, consider using DriftWatch

https://driftwatch.org/map

By law, the applicator is responsible for off-site movement of pesticides. Off-site movement can be the result of overspray, which is always preventable (and illegal), or drift. Drift is defined as aerial movement of pesticide particles from the site of application. Drift can be in the form of water droplets, vapor or dust.

The risks associated with neonicotinoid seed treatments are not completely understood. Sub-lethal effects resulting from the translocation of these products into pollen and nectar is unclear. What is known, however, is that dust from planting operations may contain trace amounts of these seed treatments. If contaminated dust is allowed to drift onto hives, pollen and/or nectar sources, then acute poisonings can result. Avoid planting fields when drift could carry dust particles towards honey bee colonies or over non-cropland where bees could be foraging.

Controlling liquid particle drift onto honey bee colonies is also important. Monitoring weather conditions including wind speed, direction, temperature and humidity prior to spraying sensitive areas can reduce the potential for drift. Consult manufacturer's recommendation for appropriate nozzles, boom height and pressure settings to minimize drift.

Honey bee colonies are not always painted a color that is easy to see like these pictured; they may be hidden from view behind buildings, trees or other vegetation.

Honey bee colonies are not always painted a color that is easy to see. Others may be hidden from view behind buildings, trees or other vegetation. Knowing that hives are present prior to application allows the applicator to take precautions. To help determine if honey bee hives may be present near the application site, consider using DriftWatch (https://driftwatch.org/map). DriftWatch is an online interactive mapping program that allows commercial beekeepers (and specialty crop producers) to voluntarily register sensitive sites on a map. Applicators can use this information to determine if a risk exists prior to an application and develop a plan to avoid drift. Registration is voluntary and not all beekeepers upload their bee yard locations. However, several hundred apiaries are registered each year. DriftWatch allows applicators to zoom in on planned application sites and identify the precise positioning of bee yards. Applicators may also obtain contact information for the beekeeper and give advance warning of an application. Do not underestimate the important of communication between beekeepers and applicators.

Beekeepers who do upload bee yard locations are required to do so each year in an effort to keep maps current. 'Data Stewards', employed by the state's Department of Agriculture, approve or deny requests for beekeepers who upload locations of their bee yard. This process helps verify requests are legitimate. DriftWatch is free and viewable by the public.

Avoid spraying near water sources. Pollinators often use free water sources such as ditches, ponds or dew for drinking water. Avoid spraying crops with flowing weeds if pollinators are actively foraging for pollen and/or nectar. For similar reasons, avoid insecticide drift onto flowering weeds and crops.

Insecticide selection

Beekeepers can request a 24-hour advanced notice if a pesticide labeled as 'Highly Toxic to Bees', is to be applied within 1½ miles of their bee yards.

The person who owns or controls the land where the application is to be made is legally responsible for making this notification.

Choosing a suitable insecticide is not always an easy decision when pollinator protection is a goal. To help with the decision making process, the Environmental Protection Agency (EPA) has implemented the use of a Bee Advisory Box on the labels of those pesticides that have been identified as potentially harmful to pollinators. The icon (shown at left) not only identifies those pesticides but also highlights that specific management practices are required to mitigate harmful effects to pollinators.

According to Wisconsin statues, beekeepers can request a 24-hour advanced notice if a pesticide labeled as 'Highly Toxic to Bees', is to be applied within 1½ miles of their bee yards. The person who owns or controls the land where the application is to be made is legally responsible for making this notification. Communication between the applicator and landowner is important to convey label information to the beekeeper.

While active ingredients arguably play a big role, pesticide formulations can also affect toxicity to pollinators. In general, wettable powders, dusts and micro-encapsulated insecticides have a greater potential for toxicity than the same active ingredient in a different formulation. These formulations can be carried back to the hive and expose other members of the colony.

The speed in which an insecticide kills can also play a role in exposure. A slow acting insecticide may allow that adult to return to the hive with residues that expose more individuals than if it had died in the treated field.

Applications timing can have some influence on insecticide exposure to pollinators. Typically, honey bees are actively foraging until 4-5 pm and bumble bees a bit later. Applying a short residual pesticide after bees have completed foraging for the day will help reduce exposure. Although this may serve as a useful guideline, honey bee foraging can and may occur much later in the day. Always check the field for foraging honey bees before application.

Read and follow label directions before applying an insecticide

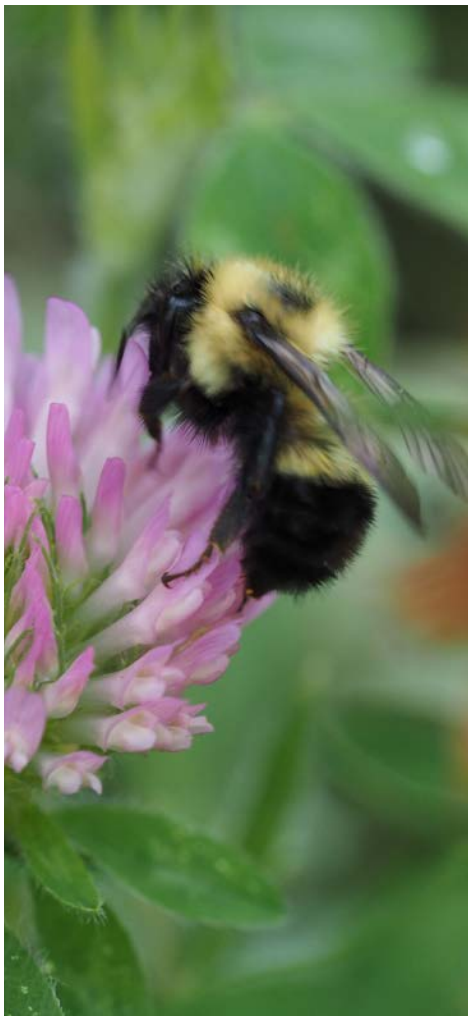
The pesticide label is a very important method of communicating the safe use of a pesticide. **Labels are a legally binding document and failure to follow directions is a violation of federal law and can result in legal action.** Labels may be several pages long. You are required to follow all directions that apply to your application.

Recently, the EPA has expanded labeling of some insecticides used on crops that are attractive to pollinators and which pose a significant risk to pollinator health. For crops under a contracted pollination service, insecticides that fall under these regulations may not be sprayed while bees are foraging and not until flowering is complete and all petals have fallen, unless the beekeeper has been contacted at least 48 hours in advance of the planned application so that bees can be removed, covered or otherwise protected.

For food, feed and commercially grown ornamental crops not under a pollination contract, applications of insecticides that fall under these new labeling laws may not be made while bees are foraging and all petals have fallen, unless one of the following conditions have been met (according to EPA labeling language):

- The application is made to the target site after sunset.
- The application is made to the target site when temperatures are below 55°F.
- The application is made in accordance with a government-initiated public health response.
- The application is made in accordance with an active state-administered apiary registry program where beekeepers are notified no less than 48 hours prior to the time of the planned application so that bees can be removed, covered or otherwise protected prior to spraying.
- The application is made due to an imminent threat of significant crop loss, and a documented determination consistent with an IPM plan or predetermined economic threshold is met. Every effort should be made to notify beekeepers no less than 48 hours prior to the time of the planned application so that the bees can be removed, covered or otherwise protected prior to spraying.

Attractiveness of field and forage crops to pollinators



A crop's attractiveness to pollinators can have an impact on the potential for pesticide exposure to pollinators. Understanding this attractiveness may help predict if pollinators are likely to be exposed to insecticide residues.

Alfalfa and soybean are considered a nectar and pollen source for honey bees. Corn is only a pollen source, while wheat is neither. However, that only reveals part of the story. Crop attractiveness is limited to the flowering period, which can be variable and be dependent on crop use.

Most of Wisconsin's alfalfa is grown for dairy production. It is cut 4-5 times during the growing season and is harvested pre-bloom when cut on the desired schedule. Therefore, it is unlikely to be attractive to pollinators. Alfalfa grown as a forage for other livestock is cut less frequently and typically allowed to flower before it is harvested. Under these circumstances, it can be very attractive to pollinators. Soybeans flower over a long period of time (last week of June through mid-August) and therefore are attractive to pollinators over an extended period of time. Field and sweet corn pollination is variable, and a precise time for pollination is difficult to determine. Field corn that is planted during the desired early spring planting time will pollinate for a 10 to 14-day period during early to late July. Sweet corn is planted on a schedule determined by the processor to ensure the processing plant has a continuous supply of sweet corn. Although the length of pollination time is similar to field corn, individual sweet corn fields can be pollinating from late June through August. Therefore, in areas where sweet corn is grown, attractiveness to pollinators will be difficult to predict on an annual basis.

Crop attractiveness to a pollinator is also dependent on other nectar or pollen sources within their foraging radius. For example, a crop plant that is not considered an important pollen or nectar source (soybean) may become an important resource if no other food sources are available in the area. **Always check for foraging bees prior to applying an insecticide.**

Attractiveness of weeds to pollinators

Weeds present within a field must also be considered before treating a field with an insecticide. Broadleaf weeds such as dandelion, milkweed, white clovers, asters, bindweed, mustards, ragweed, sow thistle and wild buckwheat can be attractive to pollinators even though the crop is not. Many other weeds are likely to serve as either a pollen or nectar source. **Always scout fields for actively foraging pollinators prior to spraying.** Be aware that weeds often grow in patches, making thorough scouting very important.

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