

Honey Bees and Agricultural Sprays

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Growers of conventional and organic crops are faced with choices concerning controlling invertebrate pests and crop diseases in their fields and orchards. Often the chemicals of choice are applied to the crops in aqueous sprays, delivered by ground rigs or by air. Although essential for crop protection, those applications can be detrimental to honey bees. The following information pertains to those problems.

Honey bees normally forage during daylight hours, when the temperature reaches or exceeds 55o Fahrenheit. Rain, heavy dew, or wind velocities of 12 miles per hour or higher tend to keep bees in the hive. In order to fly, honey bees have to maintain a body temperature above 80oF. Although honey bees create heat in their bodies, when air temperatures drop below 54oF they cannot retain enough warmth to fly. At 50oF, a honey bee eventually will fall into a cold comatose condition and die. When temperatures are at or near the threshold for flight, bees that come into contact with agricultural sprays will not be able to fly due to the weight of spray droplets on their wings. If they fall to the ground, in the shade, they are likely to die of chilling.

Under warmer conditions, wetted bees can wait until their wings dry out in order to fly again. However, recovery depends upon the toxicity of the spray to the bees, as well. Insecticides are most toxic to honey bees. The bees can come into contact with insecticides by flying through the application, having the spray drift onto the hives, or by visiting contaminated blooms while the residue remains toxic. Previous studies suggest that the toxicity of most insecticides to honey bees decreases by 50% if the spray has an opportunity to dry prior to contact by the bees. However, each insecticide has an intrinsic period of time when the dried residue remains toxic to honey bees in the field, varying from an hour to a week or more.* Obviously, honey bees should not encounter such residues within the field or orchard for which the grower has rented the bees. However, the fact that honey bees forage up to four miles away from their hive means that they cover a potential foraging area of 50 square miles of potentially toxic areas.

Honey bee poisoning by herbicides and fungicides is not common. However, in some cases in which the adult bees suffer no direct consequences of contacting fungicides, residues of the chemicals can be returned to the colony as field-contaminated pollen or as pollen contaminated by the hairs of bees that flew through the sprays or walked on contaminated blossoms. Incorporated into the larval food, some formulations of captan have killed honey bee larvae or led to malformed pupae and emerging adult bees. The fact that all formulations of captan do not appear to be equally toxic suggests that it may be the “inactive ingredients” and not the parent compound that causes the toxicity. Contamination of pollen by Rovral® also causes death of pupae during the molt to adult bees.

Obviously, when applying this information in the field, growers should attempt to limit fungicide contamination of pollen or pollen collecting bees. In the case of almonds, on a good foraging day the pollen collectors have removed nearly all of the pollen from the field by mid-afternoon. At this time of day, examination of blossoms reveals no exposed pollen grains. Examination of foraging bees reveals very tiny pollen loads and bees tending to flit from blossom to blossom very quickly. At this time, the sprays should not damage the bees. Also, pollen grains do not germinate well on wet stigmatal surfaces, so not spraying when fresh pollen is being deposited on the blossoms is wise.

* Information on the toxicity of pesticides to honey bees and the persistence of their residues in the field may be obtained from PNW518: How to Reduce Bee Poisoning from Pesticides, a Pacific Northwest Publication. To obtain a free PDF copy of this publication, go to www.pubs.wsu.edu. In the left Browse Box click on ANIMALS, then click on Bees, etc. and view the list of publication titles. There is a PDF link of the 15-page document, ready to print. Otherwise, call the Washington State University Bulletin Room at (800) 723-1763 to purchase a copy.