

Pollination

Vine Crops

Most vine crops need pollination by bees for fruit production. Most vegetable growers find it advantageous to rent honey bees by contract rather than managing their own bees. The exact number of hives needed for a particular crop depends upon the strength and condition of the colonies, the amount of wildflower or other crop competition, the crop to be pollinated, and the attractiveness of the crop to the bees. Guidelines include:

Cucumber: 1 colony/50,000 plants.

Muskmelon: 1-3 colonies/A.

Pumpkin: 1-3 colonies/A.

Squash: 1-3 colonies/A.

Watermelon: 1 colony/A.

Hives should not be placed in the field until the crop's flowers are available to visit. If the hives are placed before the flowers are available, the bees will forage to surrounding areas and may not forage sufficiently in the crop that needs pollination. Bees forage best within about 100 yards of the colony. Therefore, if the field is large, the bees should be distributed in clusters around the field.

The bees also require a source of clean water. If not available nearby, a container with fresh water should be made readily available.

Protecting Bees

Prevent killing bees by:

- Spraying when bees are least active. For some crops, this means spraying during the evening or early morning. For crops that close their flowers during mid-day, it may mean spraying during mid-day or the afternoon.
- Notifying beekeepers if bees are in danger.
- Avoiding spray puddles when the rig is emptied or cleaned.
- Choosing pesticides and formulations that are the least injurious to bees.

For more information on protecting bees, see Extension fact sheet HYG-2161, "Protecting Honey Bees from Pesticides."

Notification of Insecticide Spraying to Apiaries

Ohio regulations state in 901:5-11-04 of the Ohio Administrative Code "No pesticide which is required to carry a special warning on its label indicating that it is especially toxic to honey bees, shall be dispensed over an area of one-half acre or more in which the crop plant is in flower unless the owner or caretaker of any registered apiary located within one-half mile of the treatment site shall be notified by the person who applies for himself or engages a pesticide applicator no less than twenty-four hours in advance of such intended treatment; provided, however, that these locations are registered and identified as required by section 909.02 of the Revised Code of Ohio, and that such apiary locations have been posted with the name and telephone number of the owner or a responsible caretaker." The names and addresses of registered apiaries are available at the Ohio Department of Agriculture at 1-800-282-1955. Growers should be advised to follow all label directions and state regulations; it is the grower's responsibility!

Toxicity of Insecticides to Honey Bees

Some insecticides are more toxic to bees than others. It is important to realize the degree of toxicity and apply pesticides correctly. Application should be made when bees are not present—at night, very early in the morning or late in the evening.

Formulation affects the toxicity of an insecticide to bees. **Wettable powders are more toxic than emulsifiable concentrates.** For example, carbaryl in a 50WP formulation is much more toxic than carbaryl in a 4EC formulation.

Very high toxicity. Do not apply these to blooming crops or weeds at any time of day or night.	High toxicity. Apply only during late evening (6 pm to midnight).	Moderate toxicity. Apply only during late evening, night or early morning (6 pm to 7 am).	Low toxicity. Can be applied at any time with reasonable safety to bees.
*Actara (thiamethoxam) Agri-Mek (abamectin), >21 fl oz/A Ambush (permethrin) Ammo (cypermethrin), >1.28 fl oz/A Asana (esfenvalerate), 7.3 fl oz/A Baythroid (cyfluthrin) Capture 2EC (bifenthrin), >23.8 fl oz/A Danitol (fenpropathrin) Diazinon (diazinon) Dibrom WP or D (naled) Dimethoate (dimethoate) Furadan F (carbofuran) Guthion (azinphosmethyl) Imidan (phosmet) Lorsban (chlorpyrifos) Malathion WP (malathion) Malathion ULV (malathion), >8 fl oz/A Monitor (methamidaphos) Mustang (zeta-cypermethrin) Orthene (acephate) Penncap-M (methyl parathion) Pounce (permethrin) *Proaxis (gamma-cyhalothrin), 3.84 fl oz/A Sevin 50WP (carbaryl) Sevin XLR-Plus, >48 fl oz/A Warrior (lambda-cyhalothrin), 3.84 fl oz/A	Agri-Mek (abamectin) Asana (esfenvalerate), 4.8 fl oz/A Capture 2EC (bifenthrin), 2.56 fl oz/A Confirm (tebufenozide) ≤21 fl oz/A Dibrom EC (naled) Di-Syston 8EC, 16 fl oz/A Malathion EC (malathion) *Proaxis (gamma-cyhalothrin), 2.56 fl oz/A Provado (imidacloprid), 8 fl oz/A Sevin XLR+, ≤48 fl oz/A Thimet EC (phorate) Thiodan (endosulfan), >85 fl oz/A Vydate (oxamyl), ≥64 fl oz/A Warrior (lambda-cyhalothrin), 2.56 fl oz/A	*Acramite (bifenazate) Ammo (cypermethrin), ≤1.28 fl oz/A *Assail (acetamiprid) *Avaunt (indoxacarb) Azatin (neem) Capture 2EC (bifenthrin), <2.56 fl oz/A *Decis (deltamethrin) Diatect (diatomaceous earth) Di-Syston EC (disulfoton), 8 fl oz/A Fulfill (pymetrozine) Lannate (methomyl) Larvin (thiodicarb) Malathion ULV (malathion), <3 fl oz/A Metasystox-R (oxydemeton methyl) Neemix (neem) Proclaim (emamectin benzoate) Rotenone (rotenone) SpinTor (spinosad) Thimet G (phorate) Thiodan (endosulfan), ≤85 fl oz/A Trigard (cyromazine) Vydate (oxamyl), ≤32 fl oz/A	*Beleaf (flonicamid) *Courier (buprofezin) Cryolite (cryolite) *Dimilin (diflubenzuron) DiPel (<i>Bacillus thuringiensis</i>) Diazinon G (diazinon) Di-Syston G (disulfoton) *Esteem (pyriproxyfen) Furadan G (carbofuran) Garlic Barrier Hot Pepper Wax (capsaicin) *Intrepid (methoxyfenozide) Kelthane (dicofol) Kryocide (cryolite) Malathion G (malathion) Metaldehyde Bait (metaldehyde) Mocap G (ethoprop) M-Pede (soap) Mycotrol (<i>Beauveria</i>) Sevin G (carbaryl) Sevin Bait G (carbaryl) Sulfur (sulfur) *Surround (kaolin) Vendex (fenbutatin-oxide)

Source: Mayer, D. F., Johansen, C. A., and Baird, C. R. 1999. How to reduce bee poisoning from pesticides. Pacific Northwest Extension Publication PNW518.

*Products marked are relatively new and do not appear in the source cited, but information on their toxicity was taken from various Extension sources.