Protecting honey bees from pesticide poisoning

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PROTECTING HONEY BEES FROM PESTICIDE POISONING

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Honey bees are required for the pollination of many vegetable and fruit crops. Without adequate populations of bees, the production of these and other crops would be impossible. In addition, bee colonies are maintained for their honey and wax production.

Serious honey bee kills and hive decimations in Connecticut and other states have been attributed to the use of certain pesticides, especially insecticides in sweet corn fields and apple orchards. Since honey bees are insects, many insecticides used for pest control are toxic to them. The relative toxicities of various pesticides to honey bees are presented in Table 1. For information on mammalian toxicities contact your local county agent.

Honey bees will fly two to three miles from their hive to find sources of food (nectar and pollen). They will usually forage during daylight when temperatures are above 55 to 60 degrees F. Foraging does not occur at night. Pollen and nectar are collected from certain flowering plants, carried back to the hive, stored in wax cells, and used as a protein-rich food source for the colony members. Stored pollen, along with honey, also serves to sustain the hive through the winter. Although sweet corn is a wind pollinated crop, its pollen is highly attractive to foraging honey bees. Generally, honey bees visit sweet corn fields during the morning and early afternoon, but this may vary according to temperature and relative humidity. They gather fresh pollen which is shed from the corn tassels daily throughout the blooming period. In orchards, pollen is gathered from the flowers of fruit trees during bloom. Many wildflowers and weeds on the orchard floor and within spray drift range may also serve as pollen sources.

Bees may be killed while foraging on blooming plants that have been treated by certain pesticides. The greatest hazard, however, is from insecticides, such as carbaryl (Sevin), Penncap-M and others, that

may be unintentionally carried with pollen back to the hive.

Penncap-M is a microencapsulated formulation of methyl parathion. Microencapsulation allows the chemical to be released slowly over a period of several days, thereby increasing the residual activity of the material and significantly reducing the toxicity and hazard to the applicator. The microcapsules are approximately the same size as many pollen grains. Therefore, Penncap-M applied to sweet corn that is shedding pollen or to other plants in bloom, may be gathered by foraging bees and carried back to the hive and fed to other members of the colony. Such exposures have resulted in the loss of a few bees and sometimes in the death of entire hives. Dust and wettable powder formulations of other insecticides may be carried back to the hive in a similar fashion.

In Connecticut, Penncap-M can legally be used on tree fruits only for the control of San Jose scale, and on whorl stage sweet corn only for the control of first generation European corn borer. The material can be used on sweet corn only between January 1 and June 30, inclusively. Penncap-M applications should not be made to fields or orchards when: honey bees are foraging, fruit trees are blooming, groundcover or bordering plants contain more than five flowers per square yard, or when sweet corn tassels and silks are present. It cannot legally be used for second generation European corn borer, fall armyworm or corn earworm control. Other materials are faster acting, more effective, and safer to bees than Penncap-M for control of these later season pests of sweet corn. Refer to the current Cooperative Extension Service recommendations for additional control suggestions.

How Bees Can Be Protected From Pesticide Poisoning

Read the pesticide label. Pesticides and formulations which pose a special hazard to bees are required to include a notification on the label.

Choose an insecticide of low toxicity to bees that will provide the needed pest control. (See Table 1).

Dust and wettable powder formulations tend to be more hazardous to bees than granules and emulsifiable concentrates.

Whenever possible, do not treat crops in bloom. If treatments are needed during bloom, such as for silking sweet corn, choose a short-residual material. Make applications during the evening, when fresh pollen is enclosed within corn anthers and protected from insecticide contamination.

Apply pesticides when bees are not actively foraging. Honey bees are active primarily during the morning and early afternoon. Many pesticides can be effectively applied in the late afternoon or evening with relative safety to bees. Evening treatments may also help control the moths (adult stage) of many sweet corn pests that are active and laying their eggs at night.

Remove weed blooms in orchard groundcover and in field edges before spraying. Flowering weeds may be removed by mowing or with an herbicide.

Minimize spray drift onto adjacent crops or other plants in bloom.

Honey bee hives should not be placed next to fields or orchards that are likely to be treated with pesticides toxic to bees. A small number of hives may be protected from pesticides by covering the colonies with wet burlap for a period of one to two days. In some cases it may be practical to move hives to a less exposed site. Beekeepers should inform farmers of the location of hives.

Inform local beekeepers of your spray plans for the growing season. Beekeepers and growers will then be able to develop a plan for providing effective pest control and honey bee protection. Beekeepers are required by Connecticut law to register their hives with the town clerks in the towns where bees are kept. A listing of registered beekeepers is available from the Connecticut Agricultural Experiment Station, New Haven.

Utilize Integrated Pest Management (IPM) methods. The University of Connecticut Cooperative Extension Service has implemented sweet corn and tree fruit IPM programs. IPM methods target the timing of needed sprays and help to eliminate those that are not needed. This approach often saves the grower money, and reduces the potential exposure of honey bees to pesticides. For more IPM information, refer to the bulletins *Integrated Pest Management for Connecticut Sweet Corn* and *Integrated Pest Management for*

Connecticut Apple Orchards. These publications are available from The University of Connecticut Cooperative Extension Service, Storrs.

PESTICIDES GROUPED ACCORDING TO THEIR RELATIVE HAZARDS SPECIFIC TO HONEY BEES[1,2]

(Arranged in Alphabetical Order Within Groups)

Group 1 — Highly Toxic to Honey Bees

Acephate (Orthene*)[8]
Aldicarb (Temik*)[5]
Avermectin*
Azinphosmethyl (Guthion*)
Bendiocarb (Ficam*)
Bufencarb (Bux*)
Carbaryl (Sevin*)[8,9]
Carbofuran (Furadan*)
Carbosulfan (Advantage*)
Chlorpyrifos (Lorsban*, Dursban*)
Deltamethrin (Decis*)
d-phenothrin (Sumithrin*)
Diazinon (Spectracide*)[8]
Dichlorvos (DDVP*, Vapona*)
Dicrotophos (Bidrin*)
Dimecron (Phosphamidon*)
Dimethoate (Cygon*, DE-FEND*)
Fenitrothion (Sumithion*)
Fensulfothion (Dasanit*)
Fenthion (Baytex*)
Fenvalerate (Pydrin*)
Flucythrinate (Pay-Off*)
Lindane
Malathion (Cythion*)[8,10]
Methyl parathion (Penncap-M*)[4,8]
Methamidophos (Monitor*, Tamaron*)
Methidathion (Supracide*)
Methiocarb (Mesurol*)
Methomyl (Lannate*, Nudrin*)
Mevinphos (Phosdrin*)
Naled (Dibrom*)[7]
Parathion
Permethrin (Ambush*, Pounce*)
Phosmet (Imidan*)
Propoxur (Baygon*)
Resmethrin (Synthrin*)
Tepp[7]

Group 2 — Moderately Toxic to Honey Bees

Carbaryl (Sevimol*, Sevin 4-oil*)[9]
Chlordane[8]
Coumaphos (Co-Ral*)
Demeton (Systox*)
Disulfoton (Di-Syston*)
Endosulfan (Thiodan*)[8]
Ethoprop (Mocap*)
Fonofos (Dyfonate*)
Formetanate hydrochloride (Carzol*)
Leptophos (Phosvel*)
Oxamyl (Vydate*)
Oxydemeton Methyl (Metasystox-R*)
Phorate (Thimet*)
Phoslone (Zolone*)
Ronnel (Korlan*)
Terbufos (Counter*)
Thiodicarb (Larvin*)

Group 3 — Relatively Nontoxic to Honey Bees

Acifluorfen (Blazer*)
Alachlor (Lasso*)
Ametryn (Evik*)
Amitraz (Baam*, Mitac*)
Amitrole
AMS (Ammate*)
Anilazine (Dyrene*)
Atrazine (AAtrex*)
Bacillus thuringiensis (Bactur*, Bactospeine*, Dipel*, SOK*, Thuricide*)
Benefin (Balan*)
Benomyl (Benlate*)
Bentazon (Basagran*)
Bifenox (Modown*)
Binapacryl (morocide*)
Bordeaux mixture
Bromacil (Hyvar*)
Butylate (Sutan* +)
Cacodylic Acid (Phytar 138*)
Captafol (Difolatan*)
Captan[6]
Carbaryl (Sevin SL*, Sevin SLR*)[9]
Carboxin (Vitavax*)
Chlorfenvinphos (Birlane*)
CDAA (Randox*)
CDEC (Vegadex*)
Chloramben (Amiben*)
Chlorbromuron (Maloran*)
Chloroxuron (Tenoran*)
Chlorothalonil (Bravo*)
Chlorpropham (Chloro IPC*)
Copper oxychloride sulfate
Copper 8-quinolinolate
Copper sulfate (monohydrated)
Cryolite (Kryocide*)
Cupric hydroxide (Kocide*)
Cyanazine (Bladex*)
Cyhexatin (Plictran*)
2,4-D
Dalapon
Dialifor (Torak*)
Dibromochloropropane (Nemagon*)
Dicamba (Banvel*)
Dichlobenil (Casoron*)
Dichlone (Phygon*)
Dichlorprop (2,4-DP)
Dicofol (Kelthane*)
Dienochlor (Pentac*)
Difenzoquat (Avenge*)
Diflubenzuron (Dimilin*)
Dinitrocyclohexylphenol (DNOCHP)
Dinocap (Karathane*)
Dinoseb, dinitro
Dioxathion (Delnav*)
Diquat
Diuron (Karmex*)
Dodine (Cyprex*)
DSMA (Methar*)
Endothall (Endothal*)
EPTC (Eptam*)
Ethion
EXD (herbisan*)
Fenaminosulf (Dexon*, Lesan*)
Fentin hydroxide (Du-Ter*)
Ferbam
Fluvalinate (Mavrik*)
Folex*
Folpet (Phaltan*)
Glyodin (Glyoxide*)
Glyphosate (Roundup*)
Linuron (Lorox*)
Mancozeb (Dithane M-45*, Fore*)
Maneb (Dithane* M-22)
MCPA (Weedar*)
Metalaxyl (Ridomil)
Methazole (Probe*)
Methoprene (Altosid*)
Methoxychlor (Marlate*)[8]
Metiram (Polyram*)
Metolachlor (Dual*)
Metribuzin (Sencor*)
Monuron (Telvar*)
MSMA (Daconate*)
Nabam (Dithane* D-14, Parzate*)
Napropamide (Devrinol*)
Naptalam (Alanap*)
Nicotine
Nitrofen (TOK*)
Oryzalin (Surflan*)
Oxadiazon (Ronstar*)
Oxyfluorfen (Goal*)
Oxythioquinox (Morestan*)
Paraquat[7]
Pendimethalin (Prowl*)
Pentac*
Phenmedipham (Betanal*)
Picloram (Tordon*)
Pirimicarb (Pirimor*)
Plictran*
Prometon (Pramitol*)
Pronamide (Kerb*)
Propachlor (Ramrod*)
Propanil (Rogue*)
Propargite (Omite*, Comite*)
Propham (IPC*)
Pyrethrins (natural)
Rotenone
Ryania
Sabadilla
Simazine (Princep*)
Sodium azide (Smite*)
Sulfur
Terbacil (Sinbar*)
Tetradifon (Tedion*)
Terbutryn (Igran*)
Thioquinox (Eradex*)
Thiram (Arasan*, Thylate*)
Trichlorfon (Dylox* Dipterex*)
Triadimefon (Bayleton*)
Trifluralin (Treflan*)
Zineb (Dithane* Z-78)
Ziram (Zerlate*)

[1]*Information supplied by E.L. Atkins, D. Kellum and K.W. Atkins, Univ. of CA, in cooperation with U.S. Dept. of Ag.*
[2]*Terms followed by an asterisk (*) are trade names.*
[3]*These pesticides, although toxic to bees as foliage residues or contact poisons, are not toxic to honey bees when applied as granules on or in the soil.*
[4]*The microencapsulated formulation of methyl parathion, known as Penncap-M, is highly toxic to bees and their brood.*
[5]*Temik* (aldicarb), although highly toxic to bees as a contact poison, is used only in granular form, and extensive field usage has not caused bee losses.*
[6]*Field doses have caused brood damage.*
[7]*Highly toxic when sprayed on honey bee colonies.*
[8]*Pesticides known to have poisoned honey bees in Connecticut. J.F. Anderson and W. Glowa. 1984. Insecticidal poisoning of honey bees in CT. Environ. Entomol. 13:70-74.*
[9]*Certain formulations (wettable powders and dusts) of carbaryl (Sevin) may be more toxic to honey bees than others (Sevin SL, Sevin SLR, Sevin 4-oil, or Sevimol).*
[10]*Malathion has been applied on thousands of acres of alfalfa in bloom without loss of bees. However, occasional heavy losses have occurred, particularly under high temperature conditions. If applied to alfalfa in bloom, it should be only as a spray, and application should be made during the night or early in the morning when bees are not foraging in the field.*