

Clemson University Department of Pesticide Regulation

How to Protect Honeybees from Pesticides

A Guide for Beekeepers and Applicators



Department of

Pesticide Regulation

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Bulletin 5



Practically every agricultural crop has insect pests that sometimes require treatment. Unfortunately, beneficial insects such as honeybees are also susceptible to pesticides. This bulletin emphasizes ways to control pests while protecting honeybees, which contribute an estimated \$20 billion annually to agricultural production in the US by pollinating crops.

The Department of Pesticide Regulation at Clemson University is the state agency responsible for enforcing pesticide regulations. Pesticide applicators are required by law to comply with all pesticide label instructions and directions. For those pesticides toxic to bees, label language designed by the Environmental Protection Agency (EPA) varies from the vague to the specific, such as, “protect bees,” to, “Do not apply while bees are actively foraging.”

Pesticide applicators may be subject to enforcement actions for label violations. Actions may range from warning letters to civil penalties, depending on the severity of the offense. Violations of bee-protection requirements are considered a serious offense by the Department of Pesticide Regulation; therefore, these violations often draw substantial monetary penalties.



Most label language prohibits applications to areas where bees are foraging or where plants are blooming (within the treatment zone) that bees may forage on while toxic pesticide residues are present. It is vital that applicators be aware of the environmental conditions at their application sites, especially with respect to blooming plants and the presence of foraging honeybees.

Conflicts between growers, applicators, and beekeepers can be avoided by simple communication. There are management techniques available to both applicators and beekeepers that can minimize or prevent honeybee mortality. Several of these measures are listed below:

Precautions for Pesticide Applicators

1. Always read and follow any warning statements regarding honeybees on the pesticide label.
2. If more than one product gives good control of the target pest, select a pesticide from Group 2 or 3 instead of Group 1 from the following section “Relative Toxicity of Pesticides to Honeybees.” (See Pages 3—4.)
3. Avoid applying any bee-toxic pesticides on blooming plants that attract bees. Keep pesticide drift from nearby blooming weeds that are attracting bees.
4. The time of pesticide application is very important. Apply pesticides that are toxic to bees in the late afternoon (after 3 p.m.) or in the evening, if possible. Most honeybees have stopped foraging and have returned to their hives by 3 p.m. This allows the maximum time for the pesticide to decompose before the bees come into contact with it the next day.

5. Select the safest formulation of the pesticide that is available for the intended use. "Drifting" of the pesticide from the target pest and/or crop to areas frequented by bees should be minimized:
- Dusts almost always drift more than other formulations and are generally more dangerous to bees than are sprays or granular application.
 - Spray formulations are usually safer to bees than dusts, but there are differences among spray types. Generally, water soluble formulations are safer than emulsifiable formulations, and fine sprays are less dangerous than coarse sprays. Sprays of undiluted technical pesticides (ULV) may be more dangerous than diluted sprays.
 - Granular applications are generally the least likely to drift and accidentally kill bees. Consider a granular application if it is suitable for destroying the target pest.
 - Microencapsulated pesticides present a very distinct and serious threat to honeybees. The particle size of this formulation is very similar to that of pollen, and adult honeybees may carry this pesticide back to the hive, where it will be combined with pollen that is being stored in the hive. This pesticide will not kill the adult bees that collected it, but it will kill the immature stages of the bees and the young adult nurse bees that feed the brood. Bees have little protection from this product. A special permit is required for the use of microencapsulated pesticides.
6. The mode of pesticide application is also important, particularly when it comes to drift. Aerial applications are generally more dangerous than applications by ground equipment, because of the location of target pests and/or crops to foraging bees or beehives.
- Never apply a pesticide directly over beehive.
 - Notify beekeeper who have beehives near an area to be treated with a pesticide so that they may attempt to protect their bees.
 - Follow proper precautions in disposing of unused pesticides and pesticide containers. Be particularly careful not to contaminate was with pesticides, as the water may be collected by bees and result in bee kills.

Regulations for Micro-Encapsulated Pesticides

The South Carolina General Assembly adopted a regulation in 1998 governing the distribution, sale, and use of micro-encapsulated insecticides that are labeled for agricultural use. This regulation requires that micro-encapsulated pesticides can only be sold to certified applicators who have been issued a special permit by the Department of Pesticide Regulation to possess and apply such insecticide. Sales of micro-encapsulated insecticides for agricultural use to anyone without a DPR permit is a violation of law. The maximum penalty per violation is a fine not to exceed \$1000 and/or modification, suspension, or revocation of the license.

Precautions for Beekeepers

- If your bees are located in any area where pesticides are commonly used, then identify yourself as a beekeeper to any neighbors who may use pesticides.
- Identify your apiaries with your name, phone number, and address if the apiary is not associated with your residence so that you may be notified if pesticides are going to be applied by any neighbors.
- Explain to growers the importance of your honeybees in the pollination of crops being grown in nearby fields so that they may consider the value of bees in pollination before applying any pesticides that may kill the pollinating insects.
- Be aware of the precautions that apply to the pesticide applicator so that you can serve as a resource in providing solutions to reducing bee kills.
- Do not place apiaries in areas that are used to grow crops that require heavy and frequent usage of pesticides.
- Cover (with wet burlap) or move your beehives if possible when bee-toxic pesticides are being applied near your apiary.

A Short Lesson on Honeybees

Honey bees get their name from the sweet treat that they make and use for food. These hardworking insects not only produce honey and wax, but they also serve as very important pollinators. Despite being the State insect for many states, they are not native to North America.

Honey bees live in hives, and they are social insects. The populace of an entire honey bee hive will overwinter together. Only one queen will be in a hive, and she is the only one that will lay eggs. A honey bee mates only once and can lay over 1000 eggs per day. The queen will usually make only one mating flight, but she may mate with 15 – 20 drones during her brief escapade. Hives are usually located in crevices such as hollow trees or walls (or anything that provides adequate weatherproofed shelter). Honey bees will attack only when the hive is threatened. They do not search out victims to assault. **Honey bee control is only warranted when there is a hive located near human activity or in a home.**

Relative Toxicity of Pesticides to Honeybees

Group 1—HIGHLY TOXIC. Severe bee losses may be expected if the following pesticides are used when bees are present, if the product is applied near beehives, or if bees forage in the application area within a day after treatment.

Acephate (Orthene) Aldicarb (Temik) Arsenicals Avermectin Azinphos-methyl (Guthion) Bifenthrin (Brigade, Capture) Bioethanomethrin Carbaryl (Sevin 80 S) Carbofuran (Furaden) Carbosulfan (Vantage) Chlorpyrifos (Dursba, Lorsban) Clothianidin (Poncho 600) Cyfluthrin (Baythroid) Cyhalothrin (Karate) Cypermethrin (Ammo, Cymbush) D-phenothrin (Sumithrin) Decamethrin (Decis) Diazinon (Spectracide) Dichlorvos (DDVP, Vapona) Dicrotophos (Bidrin)	Dimethoate (Cygon, DE-FEND) Famoxadone (Famoxate) Famphur (Fampohos) Fenitrothion (Sumithion) Fenpropathrin (Danitol, Dansnit) Fenthion (Baytex) Flucythrinate (Pay-Off) Famoxadone (Famoxate) Heptachlor Indoxacarb (Steward, Avaunt) Lindane LPOS (sulfotone, RAID TVK) Malathion (Cythion) Methamidophos (Monitor, Tamaron) Methidathion (Supracide) Methiocarb (Mesurol) Methomyl (Lannate, Nudrin) Methoprene Methyl parathion (Pennacp-M) Mevinphos (Phosdrin)	Mexacarbate (Zectran) Monocrotophos (Azodrin) Maled (Dibrom) Parathion Permethrin (Ambush, Pounce) Phosmet (Imidan) Phosphamidon (Dimecron) Prallethrin (ETOC) Propoxur (Baygon) Pyrazophos (Afugan) Resmethrin (Synthrin) Spinosad (XE-105, Tracer) TEPP Tetrachlorvinphos (Appex, Gardona) Tralomethrin (Scout)
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Group 2—MODERATELY TOXIC—These pesticides can be used in the vicinity of bees if dosage, timing, and method of application are correct, but these products should NEVER be applied directly on bees in the field or at the colony locations (apiaries).

Acetamprid Aldicarb sulfoxide Bifenazale (Floramite) Aluminum phosphide (Phostoxin) <i>Bacillus thuringiensis</i> (Di-Beta) Biothion Carbophenothion Coumphaos (Co-Ral) Crotoxyphos Demeton (Systox) Disulfoton (Di-Syston) Endosulfan (Thiodian) Endothion Endrin Ethoprop (Mocap) Fonofos (Carzol) Oxamyl (Vydate) Oxydemeton-methyl (Metasystox-R) Phorate (Thimet)	Phosalone (Zolone) Profenox (Curacron) Propamocarb (Carbamult) Propamocarb hydrochloride (Banol) Pyrethrum Ronnel Sulprofox (Bolstar) Sumithrin (Anvillollo) Tartar emetic Temephos (Abate) Terbufos (Counter) Thiacloprid (Calypso, YRC-2894) Thiazopyr (MANDATE, VISOR) Thiodicarb (Larvin) Zepphyr
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Group 3—RELATIVELY NONTOXIC. These pesticides can be used around bees with a minimum of injury if dosage, timing, and method of application are correct. Never apply pesticides directly to the beehive.

Acaricides, Diseases, IGRs, and Insecticides		
<p>Aldoxycarb (Standak) Allethrin Amitraz (Mitac) Azadirachtin (Margosan-O) <i>Bacillus thuringiensis</i> (Biotrol) <i>Bacillus thuringiensis</i> (Dipel) <i>Bacillus thuringiensis</i> (Thuricide) <i>B.t. kurstaki</i> (Dipel 4L) <i>B.t. kurstaki</i> (Javelin) <i>B.t. tenebrionis</i> Chlordimeform (Fundal) Chlordimeform (Galecron) Chlorobenzilate (Acaraben) Chlorobenzilate (Folbex)</p>	<p>Cryolite (kyocide) Cyromazine (Trigard) Dibromochloropropane (Nemagon) Dicofol (Kelthane) Diflubenzuron (Dimlin) Dinobuton (Dessin) Dioxathion (Delnav) Esfenvalerate (Asana) Ethion (Ethiol) Heliothis virus Methoxychlor (Marlate) Multimethylalkenois (Stirrup) Nicotine Nosema locusate fungus (Canning)</p>	<p>Pirimicarb (Primor) Polynactins Propargite (Comite, Omite) Prethrum Pyriproxyfen Rotenone Ryania Tetadifon (Tedion) Tetraflubenzuron (CME) Toxaphene Trichlorfon (Dylox) Z-11-hexadecanol (tomato pinworm pheromone)</p>
Fungicides		
<p>Acibenzolar-S-methyl (Actigard) Anilazine (Dyrene) Anilaine (Kemate) Azoxystrobin Benomyl (Benlate) Bordeaux mixture Captafol (Difolatan) Captan (Orthocide) Chloropicrin Copper 8-quinolate Copper hydroxide Copper sulfate—monohydrated Cuprous oxide Cyclanilide (FINISH) Cymoyanil (Curzate 60DF) Cyrodinil (Vangard WP)</p>	<p>Dazomet (Mylone) Dicholone Dimethomorph (Acrobat MZ) Diniconazole (Spotless) Dinocap (Karathene) Dithianon (Thyron) Dodine (Cyprex) Fenamiosulf (Lesan) Fenhexamid (Elevate 50 WDG) Fluazinam (Omega 500F) Folpet (Phaltan) Glyodin (Glyoxide) Mancozeb Maneb (Manzate) Metriam (Polnam) Nabam (Parzate)</p>	<p>Mancozeb Maneb (Manzate) Metriam (Polnam) Nabam (Parzate) Polyphase P-100 (Troyson) Prochloraz Prochloraz/carbendazim (Sportac) Sulfur Thiram Thiram/methoxychlor (Atasan) Trifloxystrobin (Flint, Stratego, Compass) Triforine (Funginex) Triphenyltin hydroxide (Du-Ter) Ziram (Zerlate) Zoxamide (Zoxium 80W)</p>
Herbicides, Defoliants, Desiccants, and PGRs		
<p>2,3,6-TBA (Trysben) 2,4,5-T 2,4-D 2,4-DB (Butyrac) Acetochlor Alachlor (Lasso) Amitrole Ammonium sulfate Atrazine (Aatrex) Benomyl (Benlate) Bentazon (Basagran) Bromacil (Hyvar) Butifos (DEF) Chlorbromuron (Maloran) Chloroxuron (Tenoran) Clodinafop-propargyl (Discover) Clofencet (Genesis) Cloproxydim (Select) Cloransulam-methyl (First-Rate) Cyanazine (Bladex) Cyhalofop-butyl (Clincher) Dalapon Dicamba (Banvel) Dichlobenil (Casoron) Diflufenzopr (Distinct) EPTC (Eptam) Etephon (Ethrel)</p>	<p>Ethalfurian (Sonalan) EXD (Herbisan) Flufenacet (Axion DF) Fluometuron (Cotoran) Flumioxazin (Valor WDG) Fluridone (BRAKE, Sonar) Fluroxypur (Starane EC) Fluthiacet-methyl (Action) Foramsulfuron (Option) Glyphosate (Roundup) Hydrogen cyanamide (Dormex) Imadaglylin (Arsenal) Imazamox (Raptor) Isoxaflutole (Balance) Linuron (Lorox) MCPA (Mapica) Metaldehyde propazine (Milogard) Methazole (Probe) Metribuzin (Lexone) Metribuzin (Sencor) Mesotrione (Callisto) Metolachlor Monuron Naptalam (Alanap) Nitrofen (TOK) Norflurazon (Zorial) Ovasyn</p>	<p>Paraquat Pendamithalin Phenemedipham (Betanal) Picloram (Tordon) Prohexadone calcium (Apogee PGR, Baseline) Prometryn (Caparol) Pronamide (Kerb) Propanil (Stam F-34) Propazine (Miloguard) Propham (Ban-Hoe, IPC) PT807-HCl (Ecolyst) Quinochlorac (FACET) Simazine (Princep) Sodium chlorate (KNOCK 'UM OFF) Terbacil (Sinbar) Terbutryn (Igran) Thiadiazuron (DROPP) Tralkoxydim (Achieve 40DG) Tribufos (DEF) Tribuphos (6EC) Tribuphos (Folex) Tributyl phosphorotrihote (Folex) Trifluralin</p>