

Protecting Honey Bees

Richard D. Fell, Entomologist, Virginia Tech

The poisoning of honey bees and other beneficial insects by pesticides can be a serious problem. Honey bees provide a valuable service to agriculture because they are the most important pollinators of cultivated crops. They also produce honey and beeswax. Efforts should be made to protect honey bees whenever pesticides are used. The protection of honeybees has become even more critical in recent years because of increased colony loss due to mite parasites and Colony Collapse Disorder (CCD)

Causes of Bee Poisoning

1. Most bee poisoning occurs when insecticides are applied to crops in bloom. This includes crop plants such as sweet corn, which is routinely sprayed when in tassel. Honey bees collect pollen from corn tassels.
2. The application of insecticides to fields with weeds that are in bloom. The spring application of insecticides to alfalfa fields with flowering weeds is a particular problem in Virginia.
3. Drift of toxic sprays or dusts onto adjoining crops or weeds that are in bloom.
4. The contamination of flowering ground-cover crops in orchards when spray applications are made.
5. The contamination of water. This includes water collected by bees for drinking and cooling the hive as well as contact with contaminated water or dew on foliage or flowers.
6. The use of systemic insecticides and the possible contamination of nectar and pollen. This is a concern with the use of neonicotinoid insecticides, such as clothianidin, imidacloprid, and thiamethoxam, although more research is needed.

The most serious problems occur when bees collect contaminated pollen or nectar and carry these materials back to the hive. Insecticidal dusts (particularly Sevin) and encapsulated insecticides are especially dangerous because they adhere to foraging bees and may be collected and stored in the hive with pollen. Such materials can cause serious bee kills within the hive for many months.

Ways to Reduce Bee Poisoning

1. When using pesticides that are hazardous to bees, notify the beekeeper so that he may move or protect his hives.
2. Do not apply insecticides that are toxic to bees to crops in bloom.
3. Use insecticides that are less toxic to bees when such choices are consistent with pest control recommendations (see the table of relative toxicities).
4. Choose the least hazardous formulations when possible. Dusts and encapsulated insecticides are more toxic than sprays of the same material. Wettable powder sprays tend to have a longer residual effect (and are more toxic) than emulsifiable concentrate sprays. Granular applications are usually the safest method of treatment around bees.
5. Avoid drift of toxic sprays onto ground-cover plants, weeds, and crops in nearby fields.
6. Control weeds in fields and avoid direct insecticide applications to flowering weeds whenever possible.
7. If ground-cover plants in orchards are in bloom, mow before spraying.
8. Apply insecticides when bees are not actively foraging, either in the late evening or early morning. This is particularly important with crops such as corn where evening applications avoid many problems since pollen release occurs in the morning. In general, evening applications are least hazardous.
9. Do not apply insecticides when temperatures are expected to be unusually low following treatment. Residues remain toxic to bees for a longer time under such conditions.
10. Avoid direct treatment over colonies.
11. Contact beekeepers with nearby colonies before treatment so that they can move the hives or confine the bees if potential bee losses might occur.

Relative Toxicity of Pesticides to Honey Bees by Laboratory and Field Tests

Group I. Highly Toxic

Severe losses may be expected if these pesticides are used when bees are present at treatment time or within a day *thereafter*.

Abamectin	Baygon (propoxur)	Decis (decamethrin)	Folimat	Parathion	Sniper
Acetamiprid, Assail, Tristar	Baytex (fenthion)	Delegate, Radiant (spinetoram)	Fipronil	Pay Off (flucythrinate)	Spectracide
Acramite (bifenazate)	Baythroid (cyfluthrin)	Denim (emamectin benzoate)	Furadan F (carbofuran)	Phoshamidon	Steward (indoxacarb)
Actara, Centric, Platinum, Helix, Cruiser, Adage (thiamethoxam)	Bidrin (dicrotophos)	Dibrom (naled)	Fury (zeta-cypermethrin) ¹	Poncho, Titan, Clutch, Acceleron, Arena, Belay, Celero (clothianidin)	Sumithion (fenitrothion)
Acephate	Capture, Annex, Brigade (bifenthrin)	De-fend, Dimate (dimethoate)	Guard Star (permethrin) ¹	Supracide	
Admire, Advantage, Gaucho, Merit, Premise, Touchstone (imidacloprid)	Carzol	Diazinon (spectracide)	Guthion (azinphos-methyl)	Pounce (permethrin)	Swat (bonyl)
Advantage	Cidial (phenthroate)	Dimecron (phosmet)	Imidan	Proaxis (gamma-cyhalothrin)	Synthrin (resmethrin)
Ambush (permethrin)	Clutch (clothianidin)	Dinotefuran	Karate	Proclaim (emamectin)	Talstar
Ammo (Fury) (>.025 lb/acre)	Commodore (lambda-cyhalothrin)	Dursban, Eradex (chlorpyrifos)	Lannate D (methomyl)	Provado (imidacloprid)	Temik (aldicarb)
(cypermethrin)	Comply (fenoxy carb)	Ectrin (fenvalerate)	Lindane	Vapona (dichlorvos)	Trimax
Curacron (profenofos)	Endigo	Malathion	Pydrin (fenvalerate 0.1	Venom (dinotefuran)	
Apollo, Ovation (clofentezine)	Envidor (spirodiclofen)	Matacil (aminocarb)	Ib/A) ²	Warrior (lambda-cyhalothrin)	
Cygon (dimethoate)	EPN	Mesurol (methiocarb)	Pylon, Phantom (chlorenapyr)	Zectran (mexacarbate)	
Asana (esfenvalerate)	Ethyl guthion (azinphos-ethyl)	Monitor (methamidophos)	Pyramite	Zephyr (Agri-Mek) (abamectin)	
Avaunt (Advion) (indoxacarb)	Cymbush	Nexter (pyridaben)	Rebelate (dimethoate)		
Danitol (fenopropothrin)	Famphos (famphur)	Nudrin (methomyl)	Resmethrin		
Avid (avermectin)	Dasanit (fensulfothion)	Ficam (bendiocarb)	Scout (tralomethrin)		
Azodrin (monocrotophos)	DDVP (dichlorvos)	Flagship (thiamethoxam)	Orthene (acephate)	Sevin (carbaryl) ³	

¹Can be applied to ground in front of beehives for the control of small hive beetles.

²Can be applied in the late evening at rate of 0.1 lb/A or less.

³Some formulations of Sevin XLR are rated as moderately toxic.

Group II. Moderately Toxic

These can be used around bees if dosage, timing, and method of application are correct, but should not be applied directly on bees in the field or at the colonies.

Abate (temephos)	Calypso (thiacloprid)	Decis, Battalion (deltamethrin)	Ethodan (Ethion)	Mocap (ethoprop)	Trigard (cyromazine)
Acramite, Floramite (bifenazate)	Carzol (formetanate)	Di-Syston (disulfoton)	Larvin (thiocarb)	Oil sprays (superior type)	Thimet (phorate) ²
Assail (acetamiprid)	Chlordane	Dyfonate (fonofos)	Metasystox	Rimon, Pedestal (novaluron)	Thionex (endosulfan)
Banol (carbanolate)	Ciodrin (crotoxyphos)	Elgetol (dinitrocresol)	(demeton-s-methyl)	SpinTor, Conserve SC, Entrust, Success	Trithion, Thiodan (carbophenothion)
Bolstar (sulprofos)	Counter (terbufos)	endrin Esteem (pyriproxyfen)	Metasystox R (oxydemeton-methyl)	(spinosad)	Vydate (oxamyl)
				Systox (demeton)	

¹Checkmite (coumaphos) strip can be used in beehives to treat for varroa mites and small hive beetles.

²Thimet EC should only be applied during late evening.

Group III. Relatively Nontoxic

These can be used around bees with a minimum of injury

Acaraben (chlorobenzilate)	Calypso (thiacloprid)	Ethrel (ethephon)	Mavrik (fluvalinate) ¹	Pyrellin (rotenone/pyrithrin)	Tedion (tetradifon)
Acarol (bromopropylate)	Chlorantraniliprole	Esteem (pyriproxyfen)	methoxychlor (Marlate)	pyrethrum (natural)	tetram
Agri-Mek (avermectin)	Chloroparacide (chlorbenside)	Fujimite, Akari (fenpyroximate)	Mitac (amitraz)	rotenone	Tetrasan
Allethrin	Confirm, Mimic (tebufenozide)	Fulfill (pymetrozine)	Morocide (binapacyl)	ryania	Torak (dialifor)
Altosid (methoprene)	Cyd-X (CM granulovirus)	Fundal, Galecron (chlordimeform)	Murvesco (fenson)	sabadilla	Trigard (cyromazine)
Amitraz	cyrolite	Heliothis polyh- drosis virus	Neemix, Align (azidirachtin)	Saphos (menazon)	Vendex (fenbutatin oxide)
Apollo, Ovation (clofentezine)	Delnav (dioxathion)	Herculex	Neotran	Savey, Onager (hexythiazox)	Yieldgard
Applaud, Centaur (buprofezin)	Demize (D-Limonene)	Hexagon	nicotine	Shuttle	Zeal (etoxazole)
Aza-direct (azadirachtin)	Dessin (dinobuton)	Intrepid (methoxyfenozide)	Omite (propargite)	Smite (sodium azide)	
Baam (amitraz)	Dimilin (diflubenzuron)	Isomate	Ovotran (ovex)	Spur (fluvalinale)	
Bacillus thuringiensis (Accoate, Biotrol, Dipel, Thuricide)	Dinocap (Karathane)	Kanemite (acequinocyl)	Pentac (dienochlor)	Sucrocide (sucrose octano- ate esters)	
Birlane (chlorfenvinphos)	Dylox (trichlorfon)	Kelthane (dicofol)	Plictran [mitacid]	Surround (kaolin)	
	Endeavor	Mach 2 (halofenozi de)	(cyhexatin)	Talus	
			Pynamin	(buprofezin)	

¹Fluvalinate is used in Apistan strips to treat beehives for varroa mites. It is illegal to use Mavrik in hives.

1-48 Regulations and Basic Information: Protecting Honey Bees

Fungicides

As a general rule, fungicides are safe to use around honey bees.

Arasan (thiram)	copper oxychloride sulfate	Dithane M45 (maneb, mancozeb)	Maneb Mancozeb	Plantvax (oxycarboxin)	Terraguard ¹ , Procure (triflumizole)
Bayleton (triadimefon)	copper sulfate	Du-Ter (fentin hydroxide)	Metiram	Ridomil	Thiram
bordeaux mixture	cupric hydroxide (Kocide)	ferbam	Morestan (oxythioquinox)	Rovral (iprodione) ²	Vitavax (carboxin)
Bravo (chlorothalonil)	Daconil (chlorothalonil)	Hinosan (edifenphos)	Morocide (binapicryl)	sulfur	Zineb
Captan	Dessin (dinobuton)	Lesan (fenaminosulf)	Mylone (dazomet)	Syllit (dodine)	
copper oxides					

¹ May increase the toxicity of neonicotinoid insecticides to honeybees if used together.

² May cause loss of honeybee larvae. Use with caution where bees are foraging.

Herbicides, Defoliants and Desiccants

2,4-D	Basagran (bentazon)	DSMA	Hoelon (diclofop-methyl)	Mylone (dazomet)	Ronstar (oxadiazon)
2,4-DB		Dual			
2,4-DP (dichlorprop)	Betanal AM (bentanex)	(metolachlor)	Hyvar (bromacil)	Nortron (ethofumesate)	Sancap (dipropetryn)
Alachlor	Bladex (cyanazine)	Endothall (endothall)	IPC (propham)	Paarlan (isopropalin)	Sencor (metribuzin)
Alanap (naptalam)	Blazer (acifluorfen)	Eptam	Karmex (diuron)	paraquat	Sinbar (terbacil)
Alopex (clofop-isobutyl)	cacodylic acid	Evik (ametryn)	Kerb (proamide)	Pendimethalin (Prowl)	Surflan (oryzalin)
Amiben (chloramben)	Cambilene (2,3,6-TBA)	Exhalt 800	Lasso (alachlor)	Phenmedipham (Betanal)	Sutan (butylate)
Amitrol	Caparol (prometryn)	Folex (desmedipham)	Lorox (linuron)	Pramitol (prometone)	Telvar (monuran)
Ammate	Chloro-IPC (chlorpropham)	Garlon (triclopyr)	MCPA	Princep (simazine)	Tolban (profluralin)
Atrex (atrazine)	Cotoran (fluometuron)	Glyphosate	Methar, DSMA	Probe (methazole)	Tordon (picloram)
Avenge (difenoquat)	Daconate (MSMA)	Gramoxone (paraquat)	Milogard (propazine)	Prowl (pendimethalin)	Treflan (trifluralin)
Balan (benefin)	dalapon	Herbisan (EXD)	Modown (bitenox)	Pyramin (chlordazon)	Vegadex
Banvel (dicamba)	diquat		MSMA	Ramrod (propachlor)	Zorial (norflurazon)
				Randox	