



# Protecting Honeybees From Pesticides

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Beekeeping is an important industry in North Dakota. Bees produce honey and they are equally important as pollinators so they aid in the production of fruits, vegetables, legume seeds and pasture crops.

The honey bee is the only insect that can be moved quickly and in the desired numbers to effect the pollination of cultivated crops, commercial gardens and orchards.

Many pesticides used to control weeds, plant diseases and insects can be poisonous to bees and other beneficial insects. Most insecticides are especially injurious.

Fortunately, pesticides and other agricultural chemicals are not incorporated into the honey. Bees that collect pesticide-contaminated nectar or pollen usually die away from the hive. If foraging bees return to the hive with contaminated nectar or pollen, there are natural provisions that protect the honey from contamination. Bees will usually leave the hive if they become poisoned. Pollen is stored in combs for feeding the brood (young bees). Contaminated pollen may kill the nurse bees and the brood.

Colonies of bees can be affected severely by improper use of pesticides. It may require several weeks before the working force (field bees) can return to suitable numbers. This can reduce honey production, especially if the bees are killed during a heavy nectar flow. To protect bees and other beneficial insects, always use the safest recommended pesticides.

## Grower Precautions

Use insecticides with low hazard to bees for pest control.

Farmers hiring an aerial applicator to spray their fields should alert beekeepers with hives in the intended spray area so they can take appropriate protective measures. Since the hives may have to be moved, the beekeeper should be given notice at least one to two days before spraying.

If hives cannot be adequately protected (moved or covered) before spraying begins, the aerial applicator should be alerted to the exact location of the hives so that they will not be contaminated by direct spraying or drift.

Timing of insecticide application is important. Never spray a crop in bloom unless it's absolutely necessary. If spraying a crop in bloom is necessary, do the spraying when there is minimal bee activity, preferably during the evening hours. During most summer evenings, honeybees leave fields by 8 p.m. and do not return until 8 a.m. or later the following day.

Hazards to bees can be reduced by controlling weeds in crop areas. Bees often forage on wild mustard and other weeds in bloom. Elimination of weeds will thus reduce bee kills during peak weed bloom.

All too frequently fields in North Dakota are sprayed unnecessarily with insecticides when insect population levels are not serious enough to warrant such treatment. Several sites in any given field should be accurately and carefully sampled to be absolutely sure that insect pest population levels are high enough to warrant control measures.

### Bee Alert



Know beehive locations before spraying.

## Applicator Precautions

Use insecticides that have low hazard to bees.

Timing of insecticide application: Never spray a crop in bloom unless it's absolutely necessary. If spraying a crop in bloom is necessary, spray when there will be minimal bee activity, preferably during the evening hours. Evening spraying also allows the insecticide to dry on the crop before bee activity begins the next morning.

Modify control programs according to weather. Cold temperatures prolong the residual of insecticide while warm temperatures break down insecticides more rapidly. Warm temperatures in late afternoon, early evening or early morning can "hold" bees in blooming fields for longer periods. Pay attention to wind direction and velocity in relation to nearby beeyard locations.

Applicators who are unsure of where beehives are located should find out by consulting with farmer-customers or contacting the state apiary inspector, North Dakota Department of Agriculture, in Bismarck. (Phone: 701/224-4997 or 701/224-2231)

When spraying close to beeyards when the hives cannot be moved or covered, use a drift reducing additive such as Nalco-Trol to minimize drift.

Bee research investigations in the state of Washington demonstrated that stickers such as Bond or Surstix will improve the safety of emulsifiable concentrate insecticides relative to bees (and other non-target organisms).

## Beekeeper Precautions

If an insecticide with high toxicity to bees is to be used in an area where your bees are foraging, be prepared to take steps to reduce the poisoning risk:

Select an apiary location with low pesticide risk whenever possible.

Notify growers and commercial applicators in the area as well as the county agent and the office of the state apiary inspector at the North Dakota Department of Agriculture in Bismarck (phone: 701/224-4997 or 701/224-2231) of the exact location of your hives. Make sure your hive locations are registered with the North Dakota Department of Agriculture.

Make sure that your current address and phone number are legibly printed on your hives so that you can be quickly contacted prior to a pesticide spraying in the area of your apiary location.

Learn as much as you can about the pesticides being used in your area. If long residual pesticides with high bee toxicity are being applied to area crops, it may be best to move your hives out of the area if possible. The new site should be at least three miles away from the spray area.

If the pesticide being used has a short residual life, you may be able to confine your bees until the danger has passed. Be sure the hive does not overheat if you choose this method.

Pollen traps may help reduce the amount of contaminated pollen admitted to the hives and thus minimize losses.

Get to know the aerial applicators that spray near your beeyards. They are as interested in protecting your bees as you are.

**Table 1. Relative toxicity of pesticides to honey bees determined by laboratory and field tests.**

(CALIFORNIA, 1950 through 1980) (Number-keyed notes on their uses can be found at the end of this section)

**Group 1****Highly toxic:** Severe losses may be expected if used when bees are present at treatment time or within a day thereafter, except where noted to the contrary.

<b>Pesticides (trade name and/or common name)</b>		
aldrin <sup>2</sup>	De-Fend <sup>®2</sup> , dimethoate	methyl parathion <sup>1,2,11,12</sup>
Ambush <sup>®2,18</sup> , permethrin	diazinon <sup>2</sup> , Spectracide <sup>®</sup>	Monitor <sup>®2</sup> , methamidophos
arsenicals <sup>1,2</sup>	dieldrin <sup>1,2</sup>	Nemacur <sup>®5</sup> , fenamiphos
Asana <sup>®</sup> , esfenvalerate	Dimecron <sup>®2</sup> , phosphamidon	Nudrin <sup>®2</sup> , methomyl
Avermectin <sup>®17</sup>	Dursban <sup>®2</sup> , chlorpyrifos	Orthene <sup>®2</sup> , acephate
Azodrin <sup>®1,2</sup> , monocrotophos	Ekamet <sup>®</sup> , etrimfos	parathion <sup>1,2</sup>
Baygon <sup>®2</sup> , propoxur	EPN <sup>1,2</sup>	Pay-Off <sup>®</sup>
Baytex <sup>®2</sup> , fenthion	Ethyl Guthion <sup>®</sup> , azinphos-ethyl	Phosdrin <sup>®1,2,3</sup> , mevinphos
Bidrin <sup>®1,2</sup> , dicrotophos	Famophos <sup>®</sup> , famphur	phosphamidon <sup>2</sup> , Dimecron <sup>®</sup>
Bux <sup>®</sup> , bufencarb	Ficam <sup>®</sup> , bendiocarb	Pounce <sup>®2,18</sup> , permethrin
carbosulfan <sup>2</sup> , FMC-35001	Folithion <sup>®</sup> , fenitrothion	Pydrin <sup>®2</sup> , fenvalerate
Cygon <sup>®2</sup> , dimethoate	Furadan <sup>®2,5</sup> , carbofuran	resmethrin, Synthrin <sup>®</sup>
Cythion <sup>®2,4</sup> , malathion	Gardona <sup>®1,2</sup> , stirofos	Sevin <sup>®2</sup> , carbaryl
Dasanit <sup>®5</sup> , fensulfthion	Guthion <sup>®1,2</sup> , azinphos-methyl	Spectracide <sup>2</sup> , diazinon
DDVP <sup>®2</sup> , dichlorvos	heptachlor <sup>1,2</sup>	Sumithion <sup>®</sup> , fenitrothion
Dibrom <sup>®2,3</sup> , naled	Imidan <sup>®2</sup> , phosmet	Sumithrin <sup>®</sup> , d-phenothrin
Decis <sup>®2</sup> , decamethrin	Lannate <sup>®2</sup> , methomyl	Supracide <sup>®2</sup> , methidathion
	Lorsban <sup>®</sup> , chlorpyrifos	Tamaron <sup>®2</sup> , methamidophos
	malathion <sup>2,4</sup>	Temik <sup>®1,2,5,7</sup> , aldicarb
	Matacil <sup>®</sup> , aminocarb	tepp <sup>1,2,3</sup>
	Mesuro <sup>®</sup> , methiocarb	Vapona <sup>®2</sup> , dichlorvos TM

**Group II****Moderately toxic:** 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 on the hives.

<b>Insecticides (trade name and/or common name)</b>	
Abate <sup>®2</sup> , temephos	endrin <sup>1,2</sup>
Agritox <sup>®</sup> , trichloronate	Korlan <sup>®</sup> , ronnel
Bolstar <sup>®</sup> , sulprophos	Larvin <sup>®2</sup> , thiodicarb
Carzol <sup>®2</sup> , formetanate hydrochloride	Metasystox-R <sup>®2</sup> , oxydemeton-methyl
chlordane <sup>2</sup>	Mocap <sup>®</sup> , ethoprop
Ciodrin <sup>®</sup> , crotoxyphos	Perthane <sup>®</sup> , ethylan
Counter <sup>®</sup> , terbufos	Pyramat <sup>®</sup>
Croneton <sup>®</sup> , ethiofencarb	Sevin <sup>®4</sup> -Oil <sup>2</sup> , carbaryl
Curacron <sup>®</sup> , profenofos	Sevimol <sup>®2</sup> , carbaryl
DDT <sup>1,2,10</sup>	Syston <sup>®1,2,18</sup> , demeton
Di-Syston <sup>®1,2,6,18</sup> , disulfoton	Thimet <sup>®1,2,6</sup> , phorate
Dyfonate <sup>®</sup> , fonofos	Thiodan <sup>®2</sup> , endosulfan
	Trithion <sup>®2</sup> , carbophenothion
	Vydate <sup>®2</sup> , oxamyl
	Zolone <sup>®</sup> , phosalone

## Group III

**Relatively nontoxic:** Can be used around bees with minimum injury.

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### Insecticides and Acaracides (trade name and/or common name)

Acaraben®, chlorobenzilate  
allethrin, Pynamin®  
Altosid®<sup>17</sup>, methoprene  
Baam®, amitraz  
*Bacillus thuringiensis*<sup>17</sup>, Bactur®  
Bactospeine®, Bakthane®,  
Dipel®, Thuricide®  
Birlane®, chlorfenvinphos  
Comite®, propargite  
cryolite<sup>2</sup>, Kryocide®  
Delnav®, dioxathion  
Dessin®, dinobuton  
Dimilin®<sup>17</sup>, diflubenzuron  
Dylox®<sup>2</sup>, trichlorfon  
ethion  
Fundal®, chlordimeform  
Galecron®, chlordimeform  
Heliothis polyhedrosis virus  
Kelthane®<sup>1</sup>, dicofol  
Mavrik®<sup>2</sup>, fluvalinate  
methoxychlor<sup>2</sup>, Marlate®  
Mitac®, amitraz  
Morestan®, oxythioquinox  
Morocide®, binapacryl  
Murvesco®, fenson  
nicotine<sup>2</sup>  
Omite®, propargite  
Pentac®, dienochlor  
pirimor®<sup>2</sup>, pirimicarb  
Plictran®<sup>2</sup>, cyhexatin  
pyrethrum (natural)  
rotenone<sup>2</sup>  
sabadilla<sup>2</sup>  
Sayfos®, menazon  
Sevin®, SL<sup>2</sup>, carbaryl  
Sevin®SLR<sup>2</sup>, carbaryl  
Smite®, sodium azide  
Tedion®, tetradifon  
Tetram®  
Tokuthion®, prothiophos  
Torak®, dialifor  
toxaphene<sup>1,2</sup>  
Zardex®, cycloprate

### Fungicides (trade and/or common name)

Afugan®<sup>2</sup>, pyrazophos  
Arasan®, thiram  
Bayleton®, triadimefon  
Benlate®, benomyl  
Bordeaux mixture<sup>2</sup>  
Bravo®, chlorothalonil  
captan<sup>11</sup>  
copper oxychloride sulfate  
copper 8-quinolinolate  
copper sulfate  
cuprex®, dodine  
cupric oxide  
cupric hydroxide, Kocide®  
Delan®, dithianon  
Dessin®, dinobuton  
Difolatan®, captafol  
Dithane®D-14, nabam  
Dithane®M-22, maneb  
Dithane®M-45, manzeb  
Dithane®Z-78, zineb  
Du-Ter®, fentin hydroxide  
Dyrene®, anilazine  
ferbam  
glyodin  
Hinosan®, edifenphos  
Indar®, butrizol  
Karathane®, dinocap  
Lesan®, fenaminosulf  
Morestan®, oxythioquinox  
Morocide®, binapacryl  
Mylone®, dazomet  
Phaltan®, folpet  
Plantvax®, oxycarboxin  
Polyram®, metiram  
Ridomil®  
Sisthane®, fenapanil  
Smite®, sodium azide  
sulfur<sup>2</sup>  
Thiram, Thylate®  
Thyfural  
Vitavax®, carboxin  
ziram, Zerlate®

### Herbicides, Defoliants, and Desiccants (trade and/or common name)

Aatrex®, atrazine  
Alachlor  
Alanap®, naptalam  
Alopex®, clofop-isobutyl  
Amex®820, butralin  
Amiben®, chloramben  
amitrole  
Ammate®, AMS  
Aquathol K®, endothall, dipotassium  
Avenge®, difenzoquat  
Balan®, benefin  
Banvel, dacamba  
Basagran®, bentazon  
Basalin®, fluchloralin  
Betanal®, phenmedipham  
Betanex®, desmedipham  
Bladex®, cyanazine  
Blazer®, acifluorfen  
butachlor  
butam  
cacodylic acid<sup>1</sup>  
Cambilene®<sup>1</sup>, 2,3,6-TBA  
Caparol®, prometryn  
Casoron®, dichlobenil  
Chloro IPC®, chlorpropham  
Cotoran®, fluometuron  
2,4-D<sup>1,2</sup>  
DEF®<sup>8</sup>  
Desiccant L-10®<sup>1,9</sup>, arsenic acid  
Devrinol®, napromamide  
Dichlorprop<sup>1</sup>, 2,4-DP  
dinoseb<sup>9</sup>, dinitrobutylphenol  
diquat®<sup>8,9</sup>  
Dual®, metalachlor  
endothall, sodium salt, Accelerate®  
Eptam®, EPTC  
Eradicane®, EPTC+safener  
Evik®, ametryn  
Evital®, norflurazon  
Folex®<sup>1,8</sup>, merphos  
Garlon®, triclopyr  
Goal®, oxyfluorfen  
Hoelon®, diclofop-methyl  
Hydrothol 191®, endothall  
monopotassium salt  
Hyvar®, bromacil  
Igran®, terbutryn  
IPC®, propham  
Karmex®, diuron

**Herbicides, Defoliants, and Desiccants (trade and/or common name) continued**

Kerb®, pronamide  
 Lasso®, alachlor  
 Lorox®, linuron  
 Maloran®, chlorbromuron  
 MCPA<sup>1</sup>  
 Methar®<sup>1</sup>, DSMA  
 Milogard®, propazine  
 Modown®, bifenox  
 MSMA<sup>1</sup>  
 Mylone®, dazomet  
 Nortron®, ethofumesate  
 Paarlant®, isopropalin  
 paraquat<sup>1,9</sup>  
 Planavin®, nitralin  
 Pramitol®, prometon  
 Preforan®, fluorodife  
 princep®, simazine  
 Probe®, methazole  
 Prowl®, pendimethalin  
 Ramrod®, propachlor  
 Randox®, CDAA  
 Ronstar®, oxydiazon  
 Roundup®, glyphosate  
 Sancap®, dipropetryn  
 Sencor®, metribuzin  
 silvex<sup>1</sup>, 2,4,5-TP  
 Sinbar®, terbacil  
 Smite®, sodium azide  
 Surflan®, oryzalin  
 Sutan®+, butylate  
 2,4,5-T<sup>1,2</sup>  
 Telvar®, monuron  
 Tenoran®, chloroxuron  
 TOK®, nitrofen  
 Tolban®, profluralin  
 Tordon®, picloram  
 Treflan®, tribluralin  
 Turf Herbicide®, endothall, disodium  
 Vegadex®, CDEC  
 Zorial®, norflurazon

**Nematicides and Miscellaneous (trade and/or common name)**

endothall<sup>13</sup>  
 Exhalt®800<sup>14</sup>  
 gibberellic acid<sup>13</sup>  
 Mocap®<sup>5</sup>, ethoprop  
 Mylone®<sup>5</sup>, dazomet  
 N-Serve®<sup>15</sup>, nitrapyrin  
 Polaris®<sup>16</sup>, glyphosine  
 Smite®<sup>5</sup>, sodium azide  
 Sustar®<sup>13,16</sup>

**Number-keyed Notes on Pesticide Use**

1. California state regulations require permits for most uses of these chemicals, also for 2,4-D and 2,4,5-T as herbicides but not as sprays on citrus.
2. Laboratory- and field-tested mainly on alfalfa, citrus, cotton, ladino clover, milo and sweet corn; all other chemicals were laboratory-tested only.
3. Dibrom®, Phosdrin®, and tepp have such short residual activity that they kill only bees contacted at treatment time or shortly thereafter. Usually safe to use when bees are not in flight; not safe to use around colonies.
4. Malathion has been applied on thousands of acres of alfalfa in bloom without serious 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. Undiluted technical malathion spray (ULV) should not be used around bees.
5. Nematicide.
6. Di-Syston® (disulfoton) and other systemic pesticides used as seed treatments have not caused bee losses.
7. 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.
8. Defoliant.
9. Desiccant.
10. DDT has been withdrawn for most uses in U.S.A.
11. Field doses have caused brood damage.
12. The microencapsulated formulation of methyl parathion, known as Penncap-M® is highly toxic to foraging bees, young hive bees, and brood. Overall, it is 13 times more hazardous to honey bees than the EC (emulsifiable concentrate) formulation. Penncap-M® is too hazardous to be applied to any area or within 1 mile of any area where and when bees are present.
13. Plant growth regulator.
14. Sticker/extender.
15. Nitrification inhibitor.
16. Chemical ripener.
17. Insect growth regulator.
18. Honey bee repellent.

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