

How to Reduce Bee Poisonings from Pesticides

Farmers in Alberta use a number of pesticides which, if used improperly or under the wrong conditions, can cause bee losses. This publication provides information enabling the commercial applicator, farmer and beekeeper to make sound decisions on the safe use of pesticides where bees are at risk.

Causes of Bee Poisoning

Most bee poisoning occurs when Insecticides are applied directly to crops or weeds in bloom. Other hazards are:

- drift of insecticide onto blooming crops or weeds adjoining treated fields
- insecticidal dusts being gathered with the pollen and taken back to the hive by foraging bees. This is especially hazardous with open blooming flowers such as dandelions, narrow-leaved hawk's-beard, etc.
- bees drinking or contacting water on foliage or flowers which contains pesticides

Bee Poisoning Indicators

- larger than normal numbers of dead bees in front of the hives
- a sudden increase in the aggressiveness of bees
- regurgitation of the nectar from the bees' honey stomach (often caused by organophosphorous insecticides)
- confusion and fighting at the entrance to hives.
- slow moving or immobile bees which die in two or three days
- dead brood in the comb or in front of the hive
- queen death or replacement of queens in cases where the hive is severely disrupted by a pesticide.

Beekeeper - Grower Cooperation

Bee poisonings usually result from lack of farmer beekeeper cooperation. Many cases occur because farmers are not aware of the hazard of insecticides to bees. The timing of application or selection of insecticide used in insect control programs can usually be changed to reduce bee poisonings without increasing the cost or inconvenience to the farmer.

Beekeepers should be in close contact with the farmer on whose land they have hives. They should also become familiar with local insect pest problems and control practices so bees can be protected when spraying becomes necessary. In some circumstances, the only solution to avoiding a bee poisoning is to move the bees. Although difficult, such action can be taken only if the beekeeper knows where and when spraying will occur. Most bee poisonings occur as a result of poor communication. The technology to prevent bee kills exists, but cooperation between the farmer and beekeeper is necessary to prevent damage from pesticides.

When a farmer and beekeeper agree on an arrangement for placement of bees, (verbal or written) it should

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clearly understood what procedures will be followed in the event spraying becomes necessary. Arrangements may be necessary between a beekeeper and several farmers if bees are expected to forage on neighboring fields.

Reduction of Bee Poisoning

What the pesticide applicator can do

- Do not apply insecticides that are toxic to bees on crops in bloom, including crops containing weeds in bloom. Historically, applications of insecticides to crops containing blooming weeds have caused the greatest kills in Alberta.
- Spray planes should not turn over fields containing blooming crops or weeds. Ground application is generally less hazardous than aerial application because there is less drift and smaller acreages are treated at one time.
- Apply insecticides in late evening, night or early morning while bees are not foraging (generally between 8 p.m. and 8 a.m.) Evening applications are less hazardous to bees than early morning applications. Warm days and nights can extend the foraging period; therefore applications may be necessary later in the evening or earlier in the morning under unusually warm conditions.
- Do not apply insecticides when cool temperatures are expected after treatment. Residues will remain toxic to bees for a much longer time under cool conditions.
- Use insecticides that are least toxic to bees.
- Choose the least hazardous insecticide formulation. Emulsifiable formulations normally have a **shorter residual toxicity** to bees than wettable powders and flowables which, in addition to having residual characteristics can be **more easily picked up** from the flowering plant while bees are gathering pollen.
- Contact the beekeeper and inform him or her of your pesticide application plans so he/she can confine or move the colonies before pesticides are applied and losses incurred.
- When roadside and other weed control programs involve 2,4-D applications to blooming plants, select the least toxic formulation. U.S. research shows that high dosages of amines are more toxic than other forms. Oily formulations seem to be more hazardous to bees. Spraying late in the day also reduces the hazard, since bees will not visit the blossoms after they begin to wilt.

What the Farmer can Do

- Use mechanical or cultural weed control when possible.
- Where grasshoppers are a problem in bee-sensitive areas, use baits. Baits do not pose a hazard to bees.
- When insect pests are perennial, use a preventative program of early season control where possible. Such a program is usually less dangerous to pollinating bees as well other beneficial insects.
- Control weeds which bloom during the period when insect control is essential.
- Learn about the beekeeper's problems with pesticide poisoning and negotiate terms which will satisfy the needs of both parties.

What the Beekeeper Can Do

- Establish a local beekeeper-farmer-applicator communication network prior to the spray season.
- Do not leave unmarked colonies of bees next to fields which may be sprayed with pesticides. Post your name, address and phone number in large letters in each apiary so you can be contacted before pesticides are applied. Regulations under *The Bee Act* make this compulsory in Alberta.
- Move bees back into treated areas according to the guidelines provided later in this article.
- Choose apiary sites away from intensively sprayed areas. Establish holding yards for honey bees in safe areas so hives can be moved there and fed if necessary during periods when apiaries are at risk.

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- Learn about the farmer's pest control problems and programs and develop terms agreeable to both parties regarding procedures which will be followed before a pesticide is applied.
- Be careful when controlling insect pests around beekeeping facilities or apiaries. Vapona "No Pest Strips" and Chlordane should not be used anywhere around bees or beekeeping facilities.
- If spraying is necessary and the bees are at risk, move the bees out of the treatment area. In some cases, for example when Furadan is used at high rates, there appears to be no safe option but to remove the bees prior to treatment.

Poisoning of Leafcutter Bees

Alfalfa leafcutter bees can be safeguarded during the pollination period by removing the nests from the shelters and storing them in a cool place for a few days while the field is being treated. Move the nests in at night while females are in the tunnels. This bee is nearly inactive at 20°C (68°F) and completely inactive at 16°C (60°F). Applying insecticides before leafcutters are released in the field is the safest method of pest control. Leaving a one-week period between application of insecticides and bee release should protect bees from almost all insecticides. If a pesticide application is necessary just before releasing leafcutter bees, consider delaying the release. If treatment is necessary during the pollination period use insecticides with short residual periods.

Alfalfa leafcutter bees are much more sensitive to all chemicals after the bees have been in the field for three or more weeks. If spraying is necessary try to delay application until the pollination period is near completion, otherwise bee kill and reduced pollination may be costlier than the savings from pest control. As with honey bees, if a spray is necessary during the pollination period, cover the shelters to prevent their contamination and treat the field late in the evening when bees are in the nests. If the bees do not return to the shelters at night, as can be the case in northern Alberta, those left in the field will likely be killed even by a late evening application.

Dealing with a Pesticide Poisoning

1. If a pesticide application results in a bee kill, follow this procedure:
2. Contact both applicator and farmer immediately to determine whether a less toxic pesticide can be applied or whether spraying can be terminated to stop further damage and allow time to move hives to safe areas.
3. Contact your local rural advisory specialist or agricultural fieldman and the apiculture office in Falher, Alberta, for assistance in terminating further damage and evaluating losses.
4. Collect several samples of dead bees from in front of the hives as soon as damage is noticed. A 200 g (0.5 lb) sample of bees is required for analysis. The bees should be collected in a paper bag and placed in an ordinary home freezer to prevent the breakdown of any residues. The samples should be collected by or in the presence of a third party to insure the sampling is not suspect.
5. Mark the affected hives so action can be taken to reduce future losses if a significant residue problem is found in pollen, wax or honey.
6. Record the date, actions taken, pesticides used, and weather conditions during and after the suspected pesticide application occurred.

Toxicity of Pesticides to Bees

Data on the toxicity of pesticides to bees has not been developed under Canadian conditions. The hazard from pesticides is known to vary with dosage and weather conditions during and after application. Normally, in cooler weather, the residue lasts longer. The following information is based on work from the northwest U.S.A. and is **only** a guideline for assessing the hazard of various pesticides to bees.

Insecticides

Toxicity of Insecticides to honey bees (length of residual toxic effect in hours or days)

Do not apply on blooming crops or weeds.

Ambush (permethrin)	1 - 2 days
Cygon (dimethoate)	3 days

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Cymbush (cypermethrin)	>3 days
Decis EC (deltamethrin)	1 day
Furadan F (carbofuran)	7 - 10 days
Guthion (azinphos-methyl)	2.5 days
Lorsban (chlorpyrifos)	4 - 6 days
Malathion ULV (225 mL/acre or more)	5.5 days
Monitor (methamidophos)	1 day
Orthene (acephate)	> 3 days
Pounce (permethrin)	1 - 2 days
Sevin WP (carbaryl)	3 - 7 days
Sevin XLR (carbaryl) (more than 1.4 L/ac)	> 1 day
Temik G (aldicarb) (applied at least 4 weeks before bloom)	

Apply **only** during late evening.

Malathion EC	2 - 6 hours
Thiodan (endosulfan) (more than 0.6 L/ac)	8 hours
Sevin XLR (carbaryl) 1.4 L/ac or less (not 1:19 dilution)	8 hours

Apply **only** during late evening, night, or early morning.

Dylox (trichlorfon)	3-6 hours
Lannate LS (methomyl)	2 hours
Malathion ULV (85 mL/ac or less)	3 hours
Oil sprays (superior type)	< 3 hours
Thiodan (endosulfan)(0.6 L/ac or less)	2- 3 hours

Can be applied at any time with reasonable safety to bees.

NOTE: Granular insecticides and baits are safe to bees except where noted for Temik

Bacillus thuringiensis (Thuricide, etc.)

sulfur

Vendex (fenbutatin-oxide)

Caution: Abnormal weather conditions can drastically modify the bee poisoning hazard. If temperatures are unusually low following treatment, residues on the crop may remain toxic to bees for up to 20 times as long as during warm weather. Conversely, if abnormally high temperatures occur during late evening or early morning, bees may actively forage on the treated crop later in the evening and earlier in the morning.

Fungicides

Fungicides are generally considered safe to bees and do not pose a hazard.

Herbicides, Desiccants, and Plant Growth Regulators

Toxicity of herbicides, desiccants, and plant growth regulators to honey bees

Apply **only** during late evening, night, or early morning on blooming crops or weeds.

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Amine Triazo 1 e (amitrole)

2,4-D (alkanolamine)

2,4-D (isopropyl ester)

Hyvar X (bromacil)

Simazine

Weedone LV4 (butoxyethanal ester of 2,4-D)*

Can be applied with reasonable safety to bees.

Alar (diminozide)

atrazine

Avenge (difenzoquat)

Banvel (dicamba)

2,4-D (isooctyl ester)

2,4-D (sodium salts)

2,4-D B

diquat

Eptam (EPTC)

Kerb (pronamide)

MCPA

paraquat

Roundup (glyphosate)

Sencor (metribuzin)

Tordon (picloram)

Treflan (trifluralin)

* There is field evidence that butyl derivatives of 2,4-D have long term chronic toxicity to bees, especially in cool weather and where nectar forage plants are treated.

Insecticides on Leafcutter Bees

Toxicity of insecticides to alfalfa leafcutter bees (Length of residual toxic effect in hours or days)

Do **not** apply on blooming crops or weeds.

Ambush (permethrin)	> 2 days
Cygon (dimethoate)	>3 days
Cymbush (cypermethrin)	>3 days
Decis E.C. (deltamethrin)	1 day
diazinon	2 days
Furadan F (carbofuran)	7 - 10 days
Guthion (azinphosmethyl)	> 3 days
Lannate (methomyl)(1 L/ac or more)	6- 15 hours
Lorsban (chlorpyrifos)	6 - 7 days
malathion	>2 days
Malathion LILV	7 days
Monitor (methamidophos)	1 day
Orthene (acephate)	>3 days

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Pounce (permethrin)	>2 days
Sevin W.P. (carbaryl)	3 - 7 days
Supracide (methidathion)	1 - 3 days
Thiodan (endosulfan)(0.6 L/ac)	1 - 3 days

Apply **only** during late evening.

Lannate (methomyl)(0.5 L/ac or less) 4 hours

Apply **only** during late evening, night, or early morning.

Dylox (Trichlorfon) 2 -5 hours

Sevin XLR (carbaryl)(1.4 L/ac or less) 3 hours

Note: Granular insecticides and baits can be applied without hazard except where noted for Temik G. Observe caution noted in this article.

Reference: C. Johansen, 1984. *How to Reduce Bee Poisoning From Pesticides.*

Source: Agdex 616-5