

Integrated Pest Management Program - IPM Manual for Home & Garden Pests in B.C. - Chapter 7

Integrated Pest Management

IPM Manual for Home and Garden Pests in British Columbia

Chapter 7: Insecticides

Learning Objectives

When you have completed this chapter, you should be able to:

1. Describe the properties of common insecticides available for home and garden pests, including:
 - insects controlled
 - areas of use
 - activity and residual effects
 - toxicity to people, wildlife or pets
2. List "preferred" insecticides that should generally be recommended for home and garden use.
3. List higher risk insecticides and describe precautions for using them.

[↑ Top](#)

Introduction

This chapter lists the key characteristics of 14 commonly used insecticide active ingredients. The active ingredient is shown on every pesticide product label after the word Guarantee. Dispensers should have a good understanding of this group of pesticides because it includes commonly used insecticides (according to a survey of BC pesticide vendors) and preferred insecticides.

Dispensers should be able to explain how each pesticide works, the pests it controls, and safety precautions.



Preferred Insecticides: Dispensers should know which insecticides are "preferred" for use by home and garden customers and why. These insecticides should be the first choice because they include products that:

- present the least short and long-term health risks to humans
- have the lowest environmental impact, due to short residual effects and specificity to target pests

Other Insecticides: Products containing more toxic or persistent chemicals (such as organophosphorous and carbamate insecticides) are in this chapter under Other Insecticides. In general, these are products of last resort, due to their toxicity, risk of harming non-target organisms and problems with storage and disposal. It is essential that customers know what safety equipment is recommended for using these insecticides.

There are also many, less frequently used, insecticides that are not described here. Dispensers should be able to look up information on these in other reference resources as needed.

If a customer has not selected a pesticide and wants to know what to use for a particular pest problem, see Section III on Pest Management, in this manual.

**Information in this chapter is intended only as a guide.
Always apply pesticides according to directions on the
label.**

[↑ Top](#)

Preferred Insecticides

Bacillus thuringiensis (Kurstaki) or BTK

General Description

- Common species of soil bacteria that produce spores and protein crystals that infect and kill caterpillars.
- Causes caterpillars to stop feeding and eventually starve to death.
- Affects some species of caterpillars only (larvae of moths and butterflies).
- Sold as liquid concentrate or wettable powder.
- Non-toxic to other insects, animals and people. Residual effects are short, lasting only several days in the environment.

Insects Controlled



Leaf-eating caterpillars: armyworms, cabbage loopers, cankerworms, cutworms, diamond back moth larvae, European corn borers, imported cabbageworms, leafrollers, spruce budworms, tent caterpillars, and tomato fruitworms.

Areas of Use

- Use BTK in greenhouses, and on outdoor vegetables, shade trees, fruit trees and ornamentals.

Application Notes

- Caterpillars must eat sprayed foliage to be affected.
- Caterpillars stop feeding immediately after eating sprayed foliage, but may not die for 2-5 days.
- Avoid application before rain or irrigation as it will be washed off.
- Non-phytotoxic.

Precautions

- Shake sprayer periodically during use to ensure product is properly mixed.

Health and Environmental Information

- Non-toxic to mammals because bacteria does not grow in warm-blooded creatures.
- Non-toxic to birds that eat sprayed caterpillars.
- Does not harm fish, bees, other insects, or earthworms.
- Non-persistent, as spores and protein crystals break down in a few days.
- May be used up until day of harvest on edible crops.

[↑ Top](#)

Boric Acid (for Herbicidal Borates, see [Chapter 8, Herbicides](#))

General Description

- Manufactured from borax, which is mined from deposits in the earth.
- Acts as a stomach-poison.
- Formulated in dusts, baits, and ready-to-use liquids.
- Extremely long residual effects if kept dry.

Insects Controlled

- **Structural pests:** carpenter ants, other ants, cockroaches, silverfish, and other crawling insects.

Areas of Use

- Indoors and outdoor living areas.

Application Notes

- Place baits along ant runs and in cracks where ants are seen.



- Apply as a very fine layer of dust in protected locations, where insects are known to travel.
- Dusts must be kept dry.



Precautions

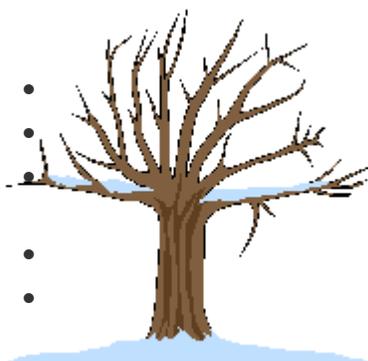
- Apply baits out of reach of children and pets.
- Do not apply around growing plants, including trees and shrubs, as it may kill or seriously retard plant growth.
- Do not apply near stored food or where food is handled, such as cupboards and kitchen counters.

Health and Environment Information

- Low toxicity to people and animals.
- No long-term environmental hazards associated with use indoors.
- Remains toxic to insects until removed or washed away.

[↑ Top](#)

Horticultural (Supreme) Oils: Dormant and Summer Oils



General Description

- Mineral oil, emulsified to mix in water.
- Broad-spectrum insecticide and miticide.
- Acts upon contact, by suffocation and by disrupting other physical processes.
- Sold as liquid concentrates.
- No residual effects.

Insects Controlled

- **Dormant Oil:** overwintering eggs of aphids and some moths, mealybugs, pear psylla, pear and rose slugs, scales, and spider mites.
- **Summer Oil:** mealybugs, rust mites, scales, spider mites, and whiteflies.

Areas of Use

- Outdoors on woody ornamentals and fruit trees, including roses, shade trees, fruit trees, bushes, some evergreens, and other hardy shrubs.
- Use dormant oils when deciduous woody trees and shrubs are dormant, after leaves drop in the fall or before growth starts in the spring.
- Use summer oils on evergreens, (with some exceptions) deciduous trees, and shrubs during the growing season.

Application Notes

- Mix with lime sulphur as a pre-foliar or dormant spray for the control of insect, mites, and fungus diseases.
- Apply oils only to healthy plants, not suffering from disease, heat or drought stress.
- Phytotoxic to some plants, such as apricots, blue spruce, maple, and ferns (check labels for list of plants that cannot tolerate oil sprays).

Precautions

- Do not use oil sprays or lime sulphur sprays within 30 days of each other during the growing season.
- Do not use dormant sprays when freezing weather is predicted or when foliage is wet (spray should have time to dry before rainfall or heavy dew forms).
- Do not use summer oils in hot weather (over 30°C), under dry conditions, or when temperatures below freezing are expected within a few weeks.
- To prevent injury to plants, agitate the mix while spraying to keep the oil properly emulsified.
- Do not over apply oil as injury to plants may result.

Health and Environmental Information

- Low mammalian toxicity, but harmful if swallowed.
- Summer oils reduce the populations of some beneficial insects and mites.
- Low toxicity to fish and wildlife.
- Non-persistent.

[↑ Top](#)

Insecticidal Soap

General Description

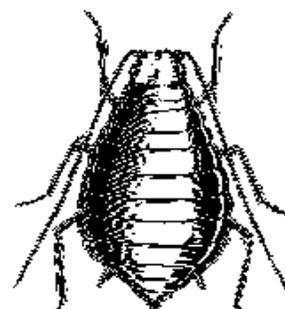
- Biodegradable fatty acids, similar to those in household soaps.
- Acts upon contact action against insects and mites.
- Broad-spectrum control.
- Sold as ready-to-use products and liquid concentrates.
- Also sold mixed with other insecticides, such as pyrethrins.
- No residual effects.

Insects Controlled

- **Plant pests:** aphids, earwigs, mealybugs, pear and rose slugs, psyllids, scales, spider mites, whiteflies and other insects.

Areas of Use

- On foliage of vegetables, flowers, fruit trees, and ornamentals, which are outdoors.
- On indoor houseplants.



Application Notes

- Must contact insects at time of application to work.
- Thoroughly spray all plant surfaces.
- Repeat applications may be necessary.

Precautions

- Limit number of times soap is applied to the same foliage as it can damage leaves of some plants.
- Phytotoxic to bleeding heart, crown of thorns, gardenia, horse chestnut, Japanese maple, maidenhair fern, mountain ash, poinsettias, and sweet peas (check label for plants that cannot tolerate soap sprays).

Health and Environmental Information

- Low toxicity, but eye and mucous membrane exposure may cause irritation.
- Kills beneficial insects as well as pests upon contact.
- Non-toxic to fish and wildlife.
- Non-persistent (may be used up until day of harvest on edible crops).

[↑ Top](#)

Lime Sulphur

See [Preferred Fungicides](#). This is a fungicide as well as an insecticide and miticide.

Pyrethrins

General Description

- Extracted from pyrethrum daisies.
- Acts upon contact.
- Broad-spectrum control of crawling and flying insects.
- Sold as ready-to-use liquids, liquid concentrates, and dusts.
- Also sold in mixtures with other insecticides and fungicides.
- No residual effects.

Insects Controlled

- **Plant pests:** aphids, caterpillars, flea beetles, leafhoppers, beetles, thrips, spider mites, stinkbugs, whiteflies, and boxelder bugs.
- **Structural pests:** ants, cockroaches, earwigs, fleas, flies, mosquitoes, gnats, and yellowjackets.
- **Pet pests:** fleas and ticks.

Areas of Use



- Outdoors on vegetables, fruit, and ornamentals.
- Indoors for structural and houseplant pests.
- On pets.



Application Notes

- Do not apply in direct sunlight or when temperature exceeds 32° C.
- Apply in the evening or on a cloudy day.
- Apply when air is still to avoid drift.
- Apply dust products as very thin coating (thick dust repels insects).
- Generally non-phytotoxic with a few exceptions.

Precautions

- Contact with skin or inhalation may cause allergic reactions in sensitive people.
- Do not use products formulated for plants on pets and visa versa.
- May be phytotoxic to maidenhair fern, other delicate ornamentals, and seedlings.

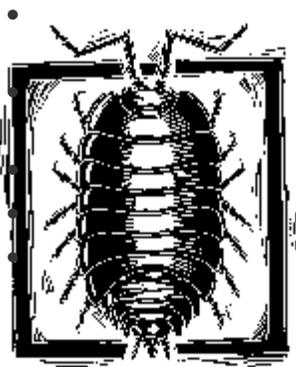
Health and Environmental Information

- Moderate toxicity to mammals, avoid contact with skin and eyes.
- Toxic to fish and beneficial insects.
- Low toxicity to other wildlife.
- Non-persistent (may be used up until day of harvest on edible crops).

[↑ Top](#)

Silicon Dioxide (Diatomaceous Earth)

General Description



Ground up, fossilized shells of diatoms (a type of algae) from natural deposits

Acts upon contact against insects by causing them to dry up

Broad-spectrum control, kills most insects that contact it
Most products are dusts, some are wettable powders
Long residual effects, if kept dry and not dispersed

Insects Controlled

- **Structural and nuisance pests:** ants, beetles, cockroaches, fleas, earwigs, silverfish, sowbugs, and other crawling insects.
- Plant pests.

Areas of Use

- Indoors and outdoor living areas.
- Outdoors on plants (spot application only recommended).

Application Notes

- Apply dusts in very thin coating (thick dust repels insects).
- Non-phytotoxic

Precautions

- Kills beneficial insects.
- Limit use on outdoor plants to spot treatments (around stems of cabbage to control cabbage root flies, or around seedlings to control sowbugs).
- Avoid inhalation, as dust can irritate mucous membranes.

Health and Environmental Information

- Non-toxic to people, other mammals, birds, fish, and earthworms.
- May be used up until day of harvest on edible crops.
- As long as dust is present, will remain active against insects, including beneficial insects.
- Persists for years if kept dry (for example, inside wall voids).
- Short residual effects where dusts become wet or dispersed.

[↑ Top](#)

Other Insecticides

Carbaryl

General Description

- Synthetic insecticide with broad-spectrum effect.
- Acts upon contact by disrupting nervous system of insects.
- Sold as dusts, ready-to-use liquids, liquid concentrates, wettable powders and baits.
- Also sold mixed in products with fungicides and other insecticides.
- Relatively short residual effects.

Insects Controlled

- **Plant pests:** aphids, beetles, caterpillars, earwigs, leafhoppers, leafminer adults, tarnished plant bugs, peach borers, pear psylla, scales, and sod webworms.
- **Structural pests:** ants and yellowjackets.

Areas of Use

- Outdoors on lawns, ornamentals, fruit trees, vegetable gardens, flowers, and as a pre-planting soil treatment.
- Outdoors on exterior of buildings for structural pests.

Precautions

- Do not use during bloom or when bees are present as it is highly toxic to bees.
- Carbaryl is phytotoxic to sensitive ornamentals such as maidenhair fern.
- Do not apply to tender or wet foliage as leaf injury may occur.
- Damage will occur if several days of rain or high humidity follow application.
- Delay use until at least 30 days after full bloom to avoid undesired apple thinning.

Health and Environmental Information

- Moderate mammalian toxicity, but a suspected endocrine disrupting chemical.
- Very toxic to bees, beneficial insects, earthworms, and fish.
- Low toxicity to birds.
- Moderately persistent (product labels list minimum 7 days to harvest for edible crops).

 [Top](#)

Chlorpyrifos

General Description

- Synthetic insecticide with broad-spectrum effect.
- Acts upon contact by disrupting the nervous systems of insects and mites.
- Sold as granules, dusts, ready-to-use liquids and liquid concentrates.
- Also sold in mixed products with other insecticides.
- Longer residual effect than most pesticides.

Alert

Chlorpyrifos was the first organophosphate pesticide re-evaluated in Canada under a review process announced in 1999 by the Pest Management Regulatory Agency. On the basis of the review, which included using a larger safety factor to protect the health of children, the PMRA is limiting the uses of chlorpyrifos.

In an agreement with the PMRA, the manufacturers are discontinuing the production and sale of products containing chlorpyrifos. All residential uses of Domestic and Commercial products containing chlorpyrifos will be discontinued both for indoor and outdoor uses. This will help reduce human and environmental exposure and allow for the transition to other means of managing pests.

- Retail sales of chlorpyrifos products for use in and around homes and in other areas children may be exposed ends December 31, 2001.

Precautions

- Do not use during bloom or when bees are present as it is highly toxic to bees.
- Chlorpyrifos is phytotoxic to some tender ornamentals such as poinsettias, azaleas, camellias, roses, and variegated ivy.
- The long days-to-harvest interval is required (30-70 days) on most edible plants.
- Check labels carefully, as some products are not for use on, or near, edible crops.

Some product labels advise no more than one application per season on edible plants, two applications per year on ornamentals and at least two months between applications for structural pests.

Health and Environmental Information

- Moderate mammalian toxicity and a suspected endocrine disrupting chemical.
- Extremely toxic to birds, fish, bees, and other wildlife.
- Relatively long persistence (product labels list 30-70 days to harvest for most edible crops).

 [Top](#)

Diazinon

General Description

- Synthetic insecticide with broad-spectrum effect.
- Acts upon contact by disrupting nervous system of insects and mites.
- Sold as ready-to-use liquids, liquid concentrates, dusts, granules, and wettable powders.
- Moderate residual effects.

Alert

Diazinon was one of the organophosphate pesticides re-evaluated in Canada under a review process announced in 1999 by the Pest Management Regulatory Agency. On the basis of the review, which included using a larger safety factor to protect the health of children, the PMRA is limiting the uses of diazinon.

In an agreement with the PMRA, the manufacturers are discontinuing the production and sale of products containing diazinon for all indoor and non-agricultural uses. This will help reduce human and environmental exposure and allow for the transition to other means of managing pests.

- Diazinon products for indoor uses are being phased out and production will stop in 2001.
- Domestic lawn care products containing diazinon are being phased out in 2002.

Precautions

- Do not use during bloom or when bees are present as it is highly toxic to bees.
- Do not apply granular products for application to soil as there is a high risk of killing birds.
- Use liquid soil-drench formulations.
- Products packaged in glass are a breakage hazard.
- Phytotoxic to stephanotis, African violets, some ferns, tropical plants, and some lettuce varieties.

Health and Environmental Information

- Careless handling and widespread use made diazinon poisonings four times higher than any other reported pesticide poisoning in BC in 1991 (44 cases).
- Moderate toxicity to mammals.
- Highly toxic to bees and other beneficial insects, birds, fish, and wildlife.
- Moderately persistent (product labels list 5-20 days to harvest for most edible crops).

 [Top](#)

Dimethoate

General Description

- Synthetic insecticide with broad-spectrum effect.
- Contact and systemic actions against insects and mites.
- Only common insecticide with systemic activity.
- Sold as liquid concentrates.
- Long residual effects.

Insects Controlled

- **Plant pests:** aphids, beetles, leafhoppers, leafminers, scales, spider mites, tarnished plant bugs, thrips, and whiteflies.

Areas of Use

- Outdoors on foliage of flowers, fruit trees, ornamental trees and shrubs.
- Outdoors as a paint-on application to tree trunks or as a soil drench to control birch leafminers.

Application Notes

- Use only on plants listed on label.

Precautions

- Do not use during bloom or when bees are present—it is highly toxic to bees.

- Do not use as a foliar spray when temperatures are excessively high.
- Place well above the reach of children when applying to tree bark.
- Keep children and pets away from treated area when applying into ground as a soil drench.
- Phytotoxic to some maples, elms, walnuts, apples, pines, some ornamentals.
- Check for tolerance on individual plants before it is applied to the entire plant or planting.
- Avoid breathing vapour or spray mist.
- Avoid contact with skin, eyes, clothing—in short: be cautious when using this pesticide.

Health and Environmental Information

- High mammalian toxicity.
- Highly toxic to birds, bees, and other wildlife.
- Moderately persistent (some product labels list 14 - 21 days to harvest for tree fruit).

 [Top](#)

Malathon

General Description

- Synthetic insecticide with broad-spectrum effect.
- Contact action against insects and mites.
- Sold as ready-to-use and concentrated liquids, dusts, and wettable powders.
- Also sold in mixed products with other insecticides.
- Relatively short residual effect.

Insects Controlled

- **Plant pests:** aphids, caterpillars, leafhoppers, leafminers, mealybugs, root weevils, scales, spider mites, tarnished plant bugs, thrips, and whiteflies.
- **Structural pests:** flies, mosquitoes, hornets, and wasps.

Areas of Use

- Outdoors on vegetables, fruit trees, shrubs, and other ornamentals.
- Outdoors on exteriors of structures and outdoor living areas.

Application Notes

- Use only on plants listed on labels.

Precautions

- Do not use during bloom or when bees are present as it is highly toxic to bees.

- Phytotoxic to many plants, including hickory, viburnum spp., Some junipers, spirea spp., White pines, maples, elms, petunias, orchids, ferns, some apple, pear and grape varieties.
- Do not apply within three weeks of blossom fall or thinning of apples may result.

Health and Environmental Information

- Low mammalian toxicity.
- Extremely toxic to bees and fish.
- Moderately toxic to birds.
- Moderately persistent (product labels list 7-21 days to harvest for most edible crops).

 [Top](#)

Methoxychor

General Description

- Synthetic insecticide with broad-spectrum effect.
- Acts upon contact.
- Commonly sold as ready-to-use and concentrated liquids, dusts.
- Also sold as a mix with other insecticides and/or fungicides.
- Moderate residual effects.

Insects Controlled

- **Plant pests:** caterpillars, beetles, fruit flies, leafhoppers, leafrollers, tarnished plant bugs, root weevils, and thrips.
- **Structural pests:** ants, blackflies, carpet beetles, fleas, flies, flying moths, gnats, hornets, yellowjackets, and mosquitoes.

Areas of Use

- Outdoors on vegetables, flowers, ornamentals, fruit trees and berry plants.
- Outdoors on exterior of structures and outdoor living areas.
- Indoors for structural pests.

Application Notes

- Use only on plants listed on labels.

Precautions

- Do not use during bloom or when bees are present as it is highly toxic to bees.
- Phytotoxic to some cucumber and squash varieties, petunia, African violets, crassula, some varieties of Juniper, elm, other evergreens, and ornamentals.

Health and Environmental Information

- Low mammalian toxicity, but a suspected endocrine disrupting chemical.
- Slightly irritating to skin.
- Highly toxic to fish, bees and wildlife.
- Moderately persistent (product labels list 7-21 days to harvest for most edible crops).

 [Top](#)

Propoxur

General Description

- Synthetic insecticide with broad-spectrum effect.
- Acts on contact (has rapid knock-down ability).
- Sold as ready-to-use sprays, indoor baits such as ant traps.
- Also sold as a mix with other insecticides.
- Long residual effects.

Insects Controlled

- **Structural pests:** ants, carpenter ants, carpet beetles, cockroaches, earwigs, silverfish, spiders, sowbugs, and yellowjackets.
- **Pet pests:** fleas and ticks.

Areas of Use

- Outdoors on exterior of structures, outdoor living areas, and wasp and hornet nests.
- Indoors for structural pests.
- Some products for pet pests.

Application Notes

- No domestic products are available for use on plants.

Precautions

- Use only pet product formulations on pets.
- Do not spray plants or grass.

Be cautious when using this product.

Health and Environmental Information

- Moderate mammalian toxicity.
- Highly toxic to bees, fish, and birds.
- Persists for several weeks to months.

 [Top](#)

Pyrethroids, Synthetic

General Description

- Synthetic insecticides that chemically resemble natural pyrethrins, such as permethrin, allethrin, resmethrin, and tetramethrin.
- Broad-spectrum effect.
- Acts upon contact on insects and mites.
- Sold as ready-to-use and concentrated liquids and also sold mixed with other insecticides.
- Moderate residual effects.

Insects Controlled

- **Plant pests:** including aphids, beetles, boxelder bugs caterpillars, flea beetles, fungus gnats, leafhoppers, sawflies, tarnished plant bugs, and whiteflies.
- **Structural pests:** ants, carpet beetles, clothes moths, cockroaches, earwigs, flies, silverfish, spiders, yellowjackets, and hornets.
- **Pet pests:** fleas and ticks.

Areas of Use

- Some products containing permethrin are also for use on edible plants.
- Outdoors on exteriors of structures, outdoor living areas, and for wasp and hornet control.
- Indoors for structural, houseplant, and pet pests, outdoors on ornamentals.

Application Notes

Synthetic pyrethroid products are of three types: application to surfaces (indoors or outdoors), application to plants, or application on pets. Many products are only for one type of application, therefore check labels carefully before selecting.

- Only a few Domestic products (and these only contain permethrin) are registered for use on edible crops.
- Spray on cloudy days or in evening to prevent leaf burn.

Precautions

- Do not use during bloom or when bees are present as it is highly toxic to bees.
- Some formulations are phytotoxic to delicate plants such as coleus and African violet.
- Phytotoxic to other plants when applied in full sun and high temperatures.
- Test tree and shrub species for phytotoxicity prior to application on whole plants.

Health and Environmental Information

- Low to moderate toxicity to mammals and birds, depending on the specific pyrethroid.
- Can cause eye and skin irritation.

- Highly toxic to fish and bees.
- Moderately persistent (labels list 3-21 days to harvest for most edible crops).

 [Top](#)

STUDY QUESTIONS

Answers are provided [here](#).

1. Which pesticide(s) would be the preferred choice for controlling:
 - a) imported cabbageworm on cabbage?
 - b) scale insects on an ornamental tree?
 - c) silverfish in a bathroom?
2. Choose the list with the most insecticides that are highly toxic to bees:
 - a) boric acid, chlorpyrifos, diazinon, propoxur, glyphosate
 - b) carbaryl, chlorpyrifos, dimethoate, malathion, permethrin
 - c) chlorpyrifos, diazinon, dimethoate, propoxur, silicon dioxide
 - d) diazinon, dimethoate, insecticidal soap, methoxychlor, propoxur
 - e) none of the above
3. Identify which insecticide(s) is (are) phytotoxic to at least some plants:
 - a) *Bacillus thuringiensis*
 - b) dimethoate
 - c) diazinon
 - d) pyrethrins
 - e) (b) and (d)
 - f) (c) and (d)

[Print and Close](#)

[Cancel](#)