# Integrated Pest Management Program - IPM Manual for Home&Garden Pests in B.C. - Chapter 12

## Integrated Pest Management

## IPM Manual for Home and Garden Pests in British Columbia

## Chapter 12: Insects and Other Plant Pests

### Learning Objectives

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

1. List the common plant pests and describe their general appearance, damage they may cause, and the key features of their biology important for their management.
2. List methods to prevent these animals from becoming pests.
3. List preferred and other control measures for these animals.

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## Introduction

One of the best methods of controlling insect pests of plants is to enlist the aid of their natural enemies, the beneficial insects. A ladybird beetle, for example, may eat over 2400 aphids during her lifespan. Beneficial insects include predatory bugs, beetles, flies, lacewings, midges, and numerous tiny parasitic insects. The best protection for these insects is to minimize the use of pesticides in the garden. Many beneficial insects can also be attracted to gardens by planting mixtures of flowers and herbs to provide them with pollen and nectar.

Gardeners can minimize pest damage to plants by using the following preventive methods:

- Plant pest and disease-resistant cultivars.
- Ensure plants are healthy and pest-free before purchasing.
- Maintain fertile soils, optimum watering and air circulation.
- Time planting of annuals to avoid the main generations of certain pests.

- Plant a mixture of vegetables, flowers, herbs, and ornamentals.

If pests begin to cause unacceptable damage, use prevention and alternative controls where possible. When choosing pesticides, use the least-toxic products and only apply them to plants requiring treatment, not as a routine or broadcast measure. Broadcast applications of insecticides kill off the beneficial insects as well as the pests, which can lead to more serious pest problems later.

**Note:** When selling pesticides for use on home garden plants, it is particularly important to recommend non-toxic controls and preventive methods to reduce the risks to the consumer from unsafely or incorrectly applied pesticides. Always check labels carefully as not all formulations are meant for use on edible plants. If registered for food plants, check the "days to harvest" information to ensure the product can be used as planned and make sure the customer understands this information.

**"When you kill off the natural enemies of the pests, you inherit their work"**

**C. Huffacker**

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

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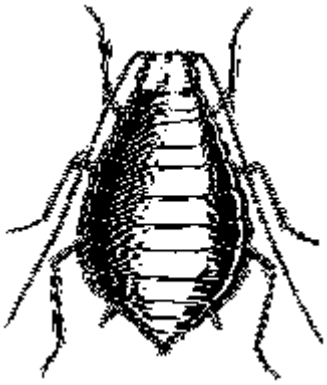
## Aphids

### Description



- Tiny (2-3 mm long) soft, pear-shaped insects, often green, also grey, black or other colours.
- Often in crowded colonies on undersides of leaves, on new foliage and branch tips.

### Damage

- Aphids suck plant sap, causing curled and distorted leaves and buds.
- Aphids secrete sticky honeydew onto leaves then black sooty mold grows on the honeydew, which can be washed off.
- Some aphids spread plant viruses.

### Biology

- Aphids give birth to live nymphs continuously, thus colonies develop very quickly.
- Overwintering eggs are laid on woody stems or in crevices in bark.

- Aphids can reproduce year-round in greenhouses.
- Aphids are difficult to control with insecticides, one survivor can reproduce a new colony.
- Many species attack only one kind of plant and do not spread to other plants.

### Prevention

- Avoid over-fertilizing plants with nitrogen because succulent growth attracts aphids.

### Preferred Controls

- Wash aphids off of plants with a strong stream of water, repeating as needed.
- Spray plants with insecticidal soap or pyrethrins.
- Spray horticultural oil for summer use, on trees and shrubs during growing season.
- Spray dormant oil on dormant trees and shrubs to kill overwintering eggs.
- Release biological control aphid midges (*Aphidoletes aphidimyza*), available from local suppliers for aphids in trees, shrubs, roses, and vegetables.

**Note:** Purchasing lady beetles is not recommended as they fly away from the release site.

### Other Measures

- On some mature ornamental trees, apply a band of systemic insecticides, such as dimethoate, to the bark of the trunk (in accordance with the label instructions).

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## Beet Leafminers

### Description

- Beet leafminer larvae are pale green maggots that tunnel between the upper and lower surface of leaves, causing brownish blotchy patches on leaves.


### Damage

Beet leafminers attack leaves of beet, chard, spinach, and related plants.

High numbers can kill seedlings, however, older plants with damaged leaves are not likely to be killed.


### Biology

- Adults are small flies that lay eggs on underside of leaves.
- Eggs hatch into larvae that mine leaves for 1-3 weeks, there are 2-3 generations per year.

### Prevention

- Remove nearby dock and lamb’s quarters, which are host plants for the beet leafminer.
- Cover plants with floating row covers (with edges firmly tucked into soil) to prevent adults from reaching leaves to lay eggs.

### Preferred Controls

- Check plants for eggs (clusters of tiny white eggs laid parallel to each other).
- Destroy damaged leaves as soon as noticed to reduce the next generation's numbers.

### Other Controls

- Once miners are inside leaves they are not affected by insecticides registered for use on food crops.

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## Caterpillars, Leaf-eating

### Description

- Caterpillars have elongated, soft, segmented, bodies with very short legs.
- Some are smooth, others have sparse or dense spines or hairs.

### Damage

Generally, caterpillars chew large, ragged holes in leaves and/or buds. The presence of droppings (frass) with the damaged leaves or the presence of silken webbing indicates caterpillar attack. Common caterpillars and their host plants are:

**Leaf rollers**: fruit trees, hawthorn, and roses

**Ermine moth**: apple and hawthorn

**Cabbage looper, imported cabbageworm** (white butterfly): cabbage family plants

**Winter moth, Bruce spanwor**m: blueberries, birch, apple, cherry, plum, poplar, oak and other trees

**Tent caterpillars**: deciduous trees and shrubs

**Tomato hornworm**: tomato, peppers, and related plants

**Climbing cutworms**: wide range of vegetables and flowers

**Spruce budworm**: balsam fir, spruce, and other conifers

Damage to leaves is unsightly, but unless plants are small, there is usually little long-term harm. For example, deciduous ornamentals soon grow new leaves even if defoliated in a severe infestation. However, caterpillars can seriously damage conifers because damaged needles are not replaced. Caterpillars on fruits and vegetables are more likely to require treatment to protect the crop.

## Biology

- Caterpillars are the immature stage of moths and butterflies.
- Populations of some species, such as tent caterpillars, reach high numbers every 6-10 years, then become scarce again as their natural enemies control the population.

## Prevention

- Remove crop residues and weeds that harbour caterpillars.
- For tent caterpillars, scrape egg masses from branches when trees are dormant. For cabbage loopers or imported cabbageworm, cover small plants with floating row cover fabric.

## Preferred Controls

- Handpick caterpillars or prune out infested branches.
- Spray BTK (which controls caterpillars exclusively) or pyrethrins on attacked plants.
- Spray dormant oil to kill overwintering eggs on trees.
- For winter moth, in October place sticky bands on tree trunks to catch female moths as they crawl up trees to lay eggs; remove the bands in February.
- For tent caterpillars, pull down tent caterpillar nests (use gloves) and drown them in soapy water.

## Other Measures

- Caterpillars seriously defoliating tall trees may be difficult to reach with a home sprayer and may require the services of a licensed tree care professional.

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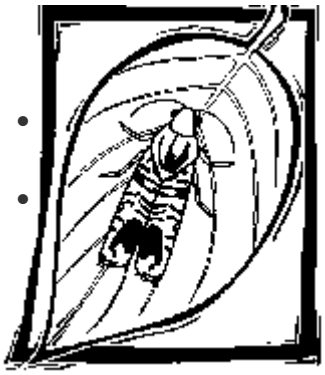
## Codling Moths



### Description

Apples or pears have an obvious entry hole, usually near the blossom end, plugged with brown crumbly droppings.

Caterpillars are pinkish (up to 1.2 cm long) with brown heads, found inside the fruit near the core.

### Damage

- Caterpillars tunnel inside apples, crabapples, and pears. Damaged fruit cannot be stored or shipped, but undamaged portions can be used for sauces or cooking.

### Biology

- Caterpillars overwinter in cocoons under tree bark or in ground litter.
- Adult moths lay eggs on fruit and leaves when apple trees bloom (May, June).
- When the caterpillars hatch in 1-3 weeks, they immediately bore into fruit.
- When finished developing they exit the fruit and crawl down the tree trunk to pupate.
- There are 2-3 generations per year, 5-8 weeks apart.

### Prevention

- Pick up and dispose of all dropped fruit immediately to prevent larvae from exiting to pupate in soil.
- Attract birds to the garden in winter as they will eat overwintering cocoons.

### Preferred Controls

- Wrap corrugated cardboard or burlap bands (10-20 cm wide) around tree trunks starting in mid-July to intercept first generation of caterpillars as they leave the fruit to pupate. Check daily until October and destroy caterpillars and pupae to reduce the size of the next generation.

### Other Measures

- Codling moth populations cause serious fruit loss annually, therefore it is important to inspect developing fruit from the time the first petals fall.
- Apply insecticides registered for use on codling moths, such as permethrin (which is the least toxic of the insecticides registered for this use).
- Apply as soon as the first larval entrance holes are found in developing fruit and again 2-4 weeks later.
- To control the second generation, apply insecticides when fresh entry holes are seen from mid-July onward.
- In parts of the Okanagan and Similkameen Valleys under the Sterile Insect Release program, it is imperative that home orchardists comply with all codling moth control efforts in effect for the local area, including applying insecticides, stripping fruit, replacing trees, and other measures.

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## Cutworms

### Description

- Cutworms are fat, greasy gray caterpillars that live in the soil (for climbing cutworms, see Caterpillars, Leaf-eating).

### Damage

- Cutworms eat seedlings and chew off small plants at the soil line.

### Biology

- Cutworms are the larvae of various species of moths that lay their eggs in late summer (September) in the soil under weeds and debris.
- Cutworms are most damaging from early May to the end of June.

### Prevention

- Protect transplants by placing "collars" around the stem. These can be tin cans or plastic containers with both ends removed or cardboard or tarpaper strips stapled into a circle. The collar should be pressed at least 2 cm deep into the soil around the seedling.
- Avoid cutworms by planting as late as possible in the season.
- Turn over soil several weeks before planting to allow birds to find exposed cutworms.
- In August and September, prevent moths from laying eggs by removing all plant debris and cultivating garden beds to keep them weed free.
- For peas, beans, and other direct seeded plants, sow extra seeds to ensure enough survive to fill the row.

### Preferred Controls

- During the day, search for cutworms just under the soil surface around damaged plants. Usually only a few cutworms are present and once they are removed no further damage results.
- When soil is warm enough for tomatoes, apply insect parasitic nematodes (for example, Microkil®) to soil one week before setting out transplants, water in well.

### Other Measures

- Where cutworm populations are severely damaging seedlings, soil drenches of diazinon insecticides registered for cutworm control can be applied around the base of plants.

**Note:** Do not recommend baits mixed with insecticides, such carbaryl, as these are attractive and highly toxic to birds.

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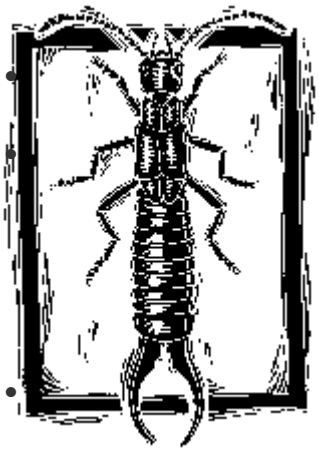
## Earwigs

### Description

- Earwigs are elongate, reddish-brown to black (1.5 cm long) with prominent rear pinchers.



### Damage

Seldom more than a nuisance, and generally do not require control.

In high numbers and at certain times of the year, they damage tender plant material, including flowers, corn silks, and ripe fruit.

### Biology

- They are scavengers and predators that help control pests, such as aphids in fruit trees.
- They feed at night and hide under leaves, planters, and rocks during the day.

### Prevention

- Eliminate daytime hiding places such as woodpiles, empty flowerpots, and piles of debris near garden beds or along house foundations.

- Keep earwigs out of the house by caulking cracks in siding, foundations, and around plumbing fixtures.
- Use screens and weather-stripping on windows and doors.

### Preferred Controls

- Make traps from tightly rolled up lengths of corrugated cardboard or newspaper, or
  half-metre lengths of old garden hose.
- Place the traps near plants being eaten, check daily, and shake accumulated earwigs
  into a bucket of soapy water to kill them.
- Apply a mulch around garden plants being damaged. This gives earwigs an alternative
  food supply.
- Use floating row covers to protect seedlings.
- Spray insecticidal soap directly on earwigs. Apply pyrethrins to plants being damaged.
- Apply silicon dioxide (diatomaceous earth) dust to cracks, crevices in buildings, and
  around foundations.

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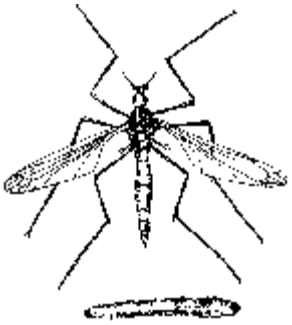
## European Crane Fly (Leatherjackets)

### Description

- Leatherjackets are the brown, shiny larval stage of European crane flies (2-3 cm long).
- Adult craneflies resemble giant brown mosquitoes (2.5 cm long) with very long legs (they are entirely harmless).

### Damage



- Larvae feed on decaying vegetation, fungi and turf roots in the soil from April to mid-May, severely affected lawns develop sparse-looking patches in May or June.
- Larvae must be present in high numbers to damage healthy lawns (over 250/$m^2$ or 25/ $ft^2$), unhealthy lawns may show damage from smaller populations.
- It is rare for lawns to be damaged as populations are kept in check by natural enemies.

### Biology

- Adults emerge in summer and lay eggs on grass or soil; there is one generation per year.
- Larvae feed on grass roots in the early fall and remain in the soil for the winter.
- When weather warms, larvae resume feeding through May and June, then pupate in the soil.

### Prevention

- Maintain a vigorous, healthy lawn (see Lawn Weeds, for tips on healthy lawn care).

### Preferred Controls

- Use a mechanical lawn aerator to improves the health of the turf and kill some larvae.
- Sample for leatherjackets if a lawn has continuing damage by folding back sections of turf to expose roots and then count exposed leatherjackets.
- Sample for leatherjackets if a lawn has continuing damage by using a "soap drench" of
non-phosphate biodegradable soap in water on a small section of lawn. Count the leatherjackets that emerge in 5-10 minutes.
- Use insect parasitic nematodes (for example, Microkil®) in May, if sampling indicates high numbers (more than 250/$m^2$) of leatherjackets.

**Note:** Microkil® is most effective when spring weather has been warm enough to raise soil temperatures to 12ºC.

### Other Controls

- If sampling shows more than 300 larvae/$m^2$, apply diazinon as a spring soil drench on a cool, cloudy day in March to mid-April; poorly-timed treatments are of no value.

**Note:** Routine annual applications of diazinon are wasteful and can make the problem worse in future, as this kills the beneficial insects that control the crane fly larvae in the soil.

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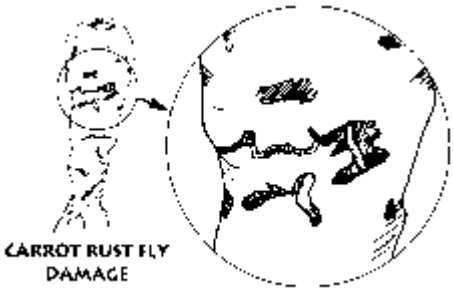
## Root Maggots (Cabbage Maggots, Carrot Rust Fly, and Onion Maggot)

### Description

- These are larvae of various species of small flies
- The whitish larvae (6 mm long), called maggots, tunnel in the roots of host plants.

## Damage




- Maggots tunnel in roots, which kills a plant directly or by allowing disease organisms to enter through injury.
- Affected plants wilt in the sun though sufficient moisture is present.
- Plants attacked:
    - Cabbage maggot: cabbage family plants, including turnip, radish, alyssum, stocks, and mustard.
    - Carrot rust fly: carrots, celery, parsnips, and related plants; the tunnels in the roots are filled with rusty brown castings.
    - Onion maggot: onions, shallots, and occasionally garlic or leeks.

## Biology

- Eggs are laid in soil, close to roots of host plants, and larvae tunnel in roots for 2 -4 weeks.
- There are 2-3 generations per year, depending on the weather.
- The first adult flies emerge from the soil from mid-April to May.
- Each generation takes 4-6 weeks, if the fall is warm there may be a third generation in September.
- Adults fly close to the ground.

## Prevention

- If crops are rotated, so susceptible plants are not grown in the same soil the following year, then the following barriers stop flies from laying eggs near roots:
    - **Floating row covers** (for example, Reemay®): cover seedlings and transplants, and then hold down edges of cloth with soil or boards. Covers can be left in place over smaller vegetables such as carrots, onions, turnips, and Chinese cabbage, until harvest.
    - **Nylon window screen fence:** fence around susceptible plants with the top edge flopped over to the outside.
    - **Tar paper:** set out cabbage family transplants with a square of tar paper, about 20 cm x 20 cm, flat to the soil around the stem (cut a slit to the centre and slide paper around stem).
- Time planting to avoid main generation of pests. For example:
    - Plant radishes as early as soil can be worked.
    - Set out fall cabbages after the first week of July.
    - Harvest early carrots before mid-July.
    - Sow mid-season carrots after mid-May.
    - Sow fall carrots for early spring harvest before flies appear (in coastal regions).

- Plant onion sets in mid-May to avoid first generation of flies.
- Remove crop debris immediately after harvest and burn or dispose of infested roots.

### Preferred Controls

- Apply insect parasitic nematodes (for example, Microkil®) to soil around the roots of susceptible plants when the soil is over 12°C; water in well.

### Other Controls

- **Note**: Although diazinon is registered for this use, it is not recommended for home gardeners due to the toxicity and persistence of the pesticide.

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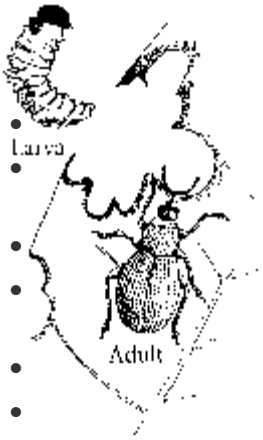
## Root Weevils (Black Vine Weevils, Strawberry Root Weevils)




### Description

- Weevils are oval, hard-shelled beetles with short snouts.
- Black vine weevils are brownish grey or black with small yellow patches on their backs (8 mm long).
- Strawberry root weevils are shiny, nearly black (6 mm long).
- Root weevil larvae are cream-coloured grubs with brown heads (1 cm long).
- They live in the roots of host plants.
- Unless numerous their damage rarely harms plants.

### Damage

- Root weevils attack berry plants and ornamentals including rhododendron, azalea, rose, viburnum, and conifers.
- Larval feeding on roots stunts or kills plants directly or by allowing disease organisms
to enter.
- Adults chew characteristic semi-circular notches along the edges of leaves at night, they
hide in the soil during the day.

### Biology

- There is one generation per year.

- Larvae feed on roots until mid-May, then pupate.
- Adults emerge in early June and feed for about a month, then lay eggs in soil or in crowns of host plants
- Larvae burrow into roots to feed, where they will also spend the winter.
- Some adults also overwinter in roots and nearby weedy or brushy areas.

## Prevention

- Eliminate overwintering sites for adults, such as piles of garden trash near strawberry beds.
- Plant rhododendron cultivars resistant to black vine weevil leaf injury.

## Preferred Controls

- Drench soil around susceptible plants with insect parasitic nematodes in May when soil warms, and again in August, well watered in.
- Spray pyrethrins on plants as soon as the leaf damage is noticed (inspect plants daily for damage from June 1$^{st}$, onward), repeating if fresh leaf injury is seen.
- Knock weevils off plants, at night, onto a ground sheet, then drop them in soapy water.
- Attract adult black vine weevils to hiding places during the day, then check and destroy any weevils. Traps include: short pieces of board laid flat under plants, or bands of corrugated cardboard wrapped around stakes driven into the ground beside the plants.
- Catch adults in sticky traps of Tanglefoot on trunks of shrubs with a single stem. Apply glue to a band of tape or plastic around the trunk.

**Weevil Resistant Rhodondendron Cultivars**

Tested in Washington State: P.J. Messit, Jock, Sapphire, Rose Elf, Cilpinense, Lucky Strike, Exbury Naomi, Virginia Richards, Cowslip, Pride of Leonards Lee, Vanessa, Oceanlake, Dora Amateis, Crest, Rainbow, Point Defiance, Naomi, Pilgrim, Letty Edwards, and Odee Wright.

**Note:** These, and other resistant cultivars, have rolled-under leaf edges, which prevent the weevils from being able to feed on the leaf edge.

## Other Controls

- Insect parasitic nematodes are the only control for weevil larvae. If these are not available, growers must depend on controlling adults through foliar sprays.
- Malathion can be used for adult weevil control, but due to the toxicity and persistence of the product it is not recommended for use by home gardeners.

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# Scales

## Description

- Round or oval, waxy, or shell-like bumps (1-5 mm long) without legs or wings.
- They can be grey, yellow, white, or brown.
- Some have a distinct dimple in the centre or secrete a coating of wax.
- The nymphs (mobile young crawlers) are extremely tiny, making a scale infestation hard to detect before adults start reproducing.

## Damage

- Scales suck sap from stems and leaves of many houseplants, shrubs, berries, fruit, and ornamental trees.
- Feeding weakens plants and stunts growth. In severe infestations, leaves may yellow and drop, and branches or entire plants may die.
- Some scales secrete sticky honeydew onto leaves and fruit, which supports growth of unsightly sooty molds.

## Biology

- Most scales overwinter as eggs or nymphs on the bark of trees.
- Nymphs wander for several hours or days over plants before they settle and become immobile, this is the stage most susceptible to control by sprays.
- There are up to six generations of nymphs per year on indoor plants.

## Prevention

- Inspect houseplants, ornamentals, and nursery stock very carefully before buying them to avoid importing a problem.
- **Note**: One infested houseplant can infect the others, resulting in a very difficult control problem.

## Preferred Controls

**On trees:**

- Apply a dormant oil spray just before bud break in spring to kill overwintering scales.
- Spray summer oil (horticultural oils for growing season use) on fruit and ornamental trees that can tolerate summer oils.
- Prune and destroy severely infested branches and twigs.

- Spray insecticidal soap or pyrethrins when nymphs are crawling on branches in spring.

**On houseplants:**

- Scrub off scales using a swab or toothbrush moistened with water or insecticidal soap.
- Set houseplants outdoors for the summer, where beneficial insects often control scales.
- Discard infested house plants rather than risk spreading the infestation.

### Other Measures

- On mature ornamental trees (check label for species), apply a band of a systemic insecticide, such as dimethoate, to the bark of the trunk in accordance with the instructions.

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## Slugs

### Description

- Garden slugs are 3-25 mm long.
- Banana slugs are 10-15 cm long.
- They can be grey, tan, green, or black; some have darker spots or patterns.
- They leave silvery slimy trails where they have traveled.
- Slugs mainly feed at night and on overcast or wet days; on bright days they hide in
moist, dark places.

### Damage

- Slugs feed on decaying matter as well as tender plants.
- They make large holes in foliage, stems, and bulbs and can completely consume seedlings and early shoots of garden plants.
- Slugs are most numerous and damaging in wet years and in coastal regions, where they may be active most of the year.

### Biology

- Slugs can overwinter at any stage of development.

- Some species overwinter as eggs, others survive as young or mature slugs.
- Eggs are clear, oval or round and laid in jelly-like masses under rocks and in garden debris.

### Prevention

- Protect and attract predators, such as ground beetles, garter snakes, toads, lizards, and centipedes. To attract predators maintain permanent walkways of clover, sod, or mulch between garden beds to provide refuges for predators.
- Protect seedlings, early shoots, and small plants with floating row covers or fine screen, but first make sure no slugs will be trapped under the mesh.
- Repel slugs by using copper strips around tree trunks and shrubs. Place copper or zinc screen around cold frames, legs of greenhouse benches, and edges of raised garden beds. Make sure there are no other routes slugs can use to reach plants and that all slugs are removed from area inside barrier. This is an expensive but semi-permanent way to get rid of slugs.

### Preferred Controls

- Attract slugs to hide under raised flower pots, boards, grapefruit rinds, cabbage leaves, or cut raw potatoes. Turn these over and destroy the slugs every morning until their numbers drop, then check weekly.
- Make traps by burying shallow pans with the pan lip flush to soil surface. Fill with beer or other fermenting liquids.
- Use commercially available slug traps with baits containing fermenting grains or yeasts.
- Apply slug bait containing ferric phosphate around plants and along seedling rows. Renew at 2-week intervals as required.

### Other Controls

- Apply liquid formulations or slug tapes containing metaldehyde around plants, plantings, or beds where slug trails are seen. Do not apply liquids to edible parts of plants. Keep children and pets away from treated areas. Pelleted metaldehyde bait formulations are available, but these should only be used in bait stations, out of reach of children or pets. For example, place bait in the bottom of a metal coffee can that has four or five holes punched around the bottom edge and replace the plastic lid.

- **Note:** Dogs and cats are attracted to metaldehyde and fatal poisoning can result from ingestion. It is also toxic to wildlife and birds, which may be killed if they feed on the bait or treated areas. Some products have bitter flavouring added (bitrex) to reduce the attraction for pets, making them a preferred choice.

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## Spider Mites (Two-spotted Spider Mites, European Red Mites)

## Description

- Spider mites are minute (only 0.3-0.5 mm long).
- They have eight legs and are red, pale green, or yellowish and resemble fine specks of dust.
- Two-spotted mites spin fine webs on the undersides of leaves and around tips of new growth.

## Damage

- Spider mites attack houseplants, ornamentals, vegetables, fruit and nut trees, berries, and grapes.
- Adults and nymphs suck juice from plant tissue.
- Damage first appears as yellow speckled areas on leaves.
- In severe infestations, leaves turn bronze or yellowed, with brown edges and become brittle.
- New leaves and buds are deformed, plants are weakened, leaves drop, and fruit may be stunted.
- Damage is most severe in hot, dry conditions.

## Biology

- Eggs and adults overwinter in garden debris and crevices in tree bark.
- Mites increase very quickly during hot, dry weather; a generation may take only 7 days.
- Mites move between plants by crawling and by "ballooning" on silken strands in the wind.

## Prevention

- Rinse plants with water or mist them daily to suppress mite reproduction. In summer, lower temperatures and increase humidity in greenhouses as much as possible.
- Preserve native predatory mites in orchards by avoiding the use of pesticides, including sulphur, as much as possible during the growing season.
- Spray dormant oil/lime sulphur on dormant fruit trees to kill overwintering eggs.
- Inspect houseplants and nursery stock for mites before purchasing them to avoid importing a problem.

## Preferred Controls

- Spray infested plants regularly with water to knock off mites and webs and raise humidity.
- Spray plants with insecticidal soap.

- Spray summer oils (horticultural oils) on fruit trees and ornamentals that can tolerate
an oil spray.
- Release biological control predator mites, such as: *Metaseiulus occidentalis* for European red mites on fruit trees, *Phytoseiulus persimilis* for two-spotted mites on vegetables, strawberries, flowers, and indoor plants; other species are available from suppliers.

### Other Measures

- On some mature ornamental trees (check label), apply a band of systemic insecticides, such as dimethoate, to the bark of the trunk in accordance with label instruction.

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## Whiteflies

### Description

- Tiny, delicate insects with powdery white wings (1 mm long).
- They congregate in large numbers on the undersides of upper foliage and fly upwards when disturbed.

### Damage

- Whiteflies feed on many houseplants, ornamentals, and vegetables, especially cucumber and tomatoes.
- Both nymphs (young) and adults suck plant juices.
- They excrete honeydew, which supports the growth of unsightly sooty molds on leaves and fruit.
- Infested leaves become pale or discoloured.
- Plants may wilt, lose leaves, and become stunted and weakened.
- Whiteflies can spread plant viruses.

### Biology

- Eggs are laid on the undersides of lower leaves; one generation takes 20-30 days.
- There are numerous, overlapping generations during warmer seasons.
- In warm greenhouses, populations may reproduce all winter.

## Prevention

- Inspect all seedlings and plants from nurseries before purchase to ensure they are free of whitefly adults and nymphs.

## Preferred Controls

- Hang yellow sticky traps near tops of indoor plants to capture adults.
- Vacuum whitefly adults from leaves of indoor plants.
- Use biological controls, such as the tiny parasitic wasp, *Encarsia formosa*, in greenhouses, in the spring and summer.
- Apply insecticidal soap or pyrethrins to control adults to the undersurfaces of the newer leaves; if the problem is severe, spray plants every three days.
- Spray summer oil on woody ornamentals (horticultural oils for growing season use), that can tolerate summer oils (check label).

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**STUDY QUESTIONS**

Answers are provided here.

1. For control of root weevils such as black fine weevils, at what time of year should you start to check for adults on plants?

2. Describe the appearance of scale insects.

3. Describe how to make a trap to catch slugs.