

CATERPILLARS

Cabbage loopers (*Trichoplusia ni*) and other caterpillars may become serious pests in greenhouse crops if their numbers are allowed to build up.

Damage

Caterpillars feed on leaves and when they are numerous can eat relatively large amounts of leaf area and damage fruit.

Description

Caterpillars are soft bodied, segmented larvae, pale green or other colours, depending on the species. Most are the larvae of various species of moths; the imported cabbageworm is the larvae of the white cabbage butterfly.

Life Cycle

The adult female moths lay eggs on plant leaves. The young larvae do little damage at first, but as they grow to full size they chew progressively larger holes in leaves.

Monitoring Tips

Check plants regularly for leaf damage, presence of caterpillar excrement (small, dark green pellets) and caterpillars.

Controls

- Hand pick and destroy any larvae found on young plants as soon as they are seen.
- Hang up an ultra-violet light trap to catch adult moths (for a simple trap design, see Sheet 500).
- If intake fans are used, screen with 5-mm (1/4 inch) mesh screen to keep moths out of the greenhouse.

Biological Controls

- Spray *Bacillus thuringiensis* (Dipel® or Foray®) at label rates every 3 days, for several weeks, as soon as caterpillars are first detected. Ensure good coverage of both upper and lower leaf surfaces.
- 'Trichogramma': These parasitic wasps (see Sheet 270) attack moth eggs and can assist in control.
- 'Podisus' (see Sheet 280) and 'Orius' (see Sheet 222) are predatory bugs that attack eggs and small stages of caterpillar larvae.
- 'Cotesia': The parasitic wasp, *Cotesia marginiventris* (see Sheet 280), attacks caterpillars and may be available for release.

MEALYBUGS

Of the approximately 15 species found in ornamentals in greenhouses, the most common species are citrus mealybug (*Planococcus citri*) and long-tailed mealybug (*Pseudococcus longispinus*). Their host range is extensive and includes most foliage plants grown in plantscapes; they have even been found on vegetable crops such as cucumber. Citrus mealybug prefers soft-stemmed plants, but can also be a problem on woody plants. Other species that may occur are obscure, citrophilus, grape and ground mealybugs.

Damage

Mealybugs damage plants by sucking the sap. Their feeding causes distortions, stunting and yellowing of foliage. They also produce honeydew, which supports the growth of

unsightly sooty molds on leaves and attracts ants. Some mealybug species can also transmit viruses.

Description

Mealybugs are segmented, soft-bodied insects, covered with white waxy hairs. They are usually found on the growing tips of plants.

Life Cycle

A complete life cycle takes from one month up to a year, depending on temperature. Females of most species lay eggs in a cottony white mass. These hatch into a crawling nymphs that migrate over the plant in search of feeding sites. The female nymphs develop through 3 growth stages. Long-tailed mealybugs give birth to live young and do not produce this cottony material.

Monitoring Tips

Check the progress of biological controls by inspecting the new growth for signs that mealybugs are disappearing

Controls

Before releasing biological controls:

- Prune out and destroy infested foliage.
- Hose plants with a strong stream of water to reduce mealybug numbers.

Biological Controls

- 'Cryptolaemus': The mealybug destroyer, *Cryptolaemus montrouzieri* (see Sheet 250) is an effective control for citrus mealybugs in interior plantscapes. They are less effective on longtailed mealybug because this species lacks the cottony masses *Cryptolaemus* requires for egg-laying.
- 'Leptomastix': The parasitic wasp *Leptomastix dactylopii* (see Sheet 280) can be used to assist *Cryptolaemus* with control of citrus mealybug. To determine parasitism, look for parasite exit holes in citrus mealybug nymphs.
- Parasitic wasps that attack other species are sometimes available, such as *Anagyrus fusciventris* for the long-tailed mealybug.
- 'Hypoaspis': The soil-dwelling predator mite 'Hypoaspis' (see Sheet 230) has been reported to control mealybug found in plant roots by attacking the crawler stage.

SCALES: SOFT (COCCIDAE) & ARMoured (DIASPIDAE)

Black scale, hemispherical scale, brown scale and nigra scale are common soft scales that attack a variety of foliage plants. California red scale and purple scale are examples of armoured scales. It is important to correctly identify the scale species because some biological controls are specific to a particular species or group of scales.

Damage

Scales suck plant sap, attacking both old and new growth. Their feeding causes distortions, stunting and yellowing of foliage. They also produce large amounts of honeydew, which supports the growth of unsightly sooty molds on leaves.

Description

Female scales look like circular or oval bumps (2-4 mm, 1/10th inch) on stems and the under surface of leaves. Adult males are winged and rarely seen.

Life Cycle

Scales have 3-6 generations per year indoors. Each female lays up to 2,000 eggs, sheltered under her outer shell. The eggs hatch after several days into minute crawlers, which migrate over the plants looking for feeding sites. Females die once they have laid their eggs. Scales develop fastest in warm, humid conditions, especially in the shade.

Monitoring Tips

Close examination with a hand lens is necessary to detect scales. They often go unnoticed until the honeydew they produce is conspicuous, or until plant growth is stunted or distorted.

Controls

Before releasing biological controls:

- Prune out and destroy severely infested branches before releasing biological controls.
- Treat infested plants with insecticidal soap sprays to reduce scale numbers. This is most effective on the crawler stage of scales.
- Mist plants with water to remove excessive honeydew.

Biological Controls

Scale outbreaks often occur in early January or February, which means that biological controls should be released in the summer or by late November. The lady beetles listed feed on various species of scales, whereas the parasitic wasp 'Helvolus' only attacks a few species of soft scale.

- 'Chilocorus': Both adults and larvae of the lady beetle *Chilocorus nigritus* (see Sheet 280) feed on all stages and many species of soft scales. It may take 2-3 months before *Chilocorus* provide adequate control of scales.
- 'Lindorus': Both larvae and adults of the lady beetle *Rhyzobius (=Lindorus) lophanthae* (see Sheet 280) feed on California red scale, purple scale, and other armoured scales with a relatively thin scale cover. Excessive amounts of honeydew on leaves hinders the movement of both adults and larvae, therefore spray leaves with water or soap and water to remove honeydew before releasing beetles.
- 'Harmonia': The multicoloured Asian lady beetle, *Harmonia axyridis*, is a scale feeder and can be released for the control of scale (see Sheet 244). The convergent lady beetle, *Hippodamia convergens* (see Sheet 244) may provide some control if they are released in large numbers (10,000-30,000 beetles at one time). This species tends to migrate to windows and disperse out open vents.
- 'Helvolus': The tiny parasitic wasp *Metaphycus helvolus* (see Sheet 280) is effective on a limited number of soft scale species, including soft brown scale, black scale, hemispherical and nigra scale.