FACT SHEET

No: 07/04

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Government of South Australia
Primary Industries and Resources SA

Lightbrown apple moth

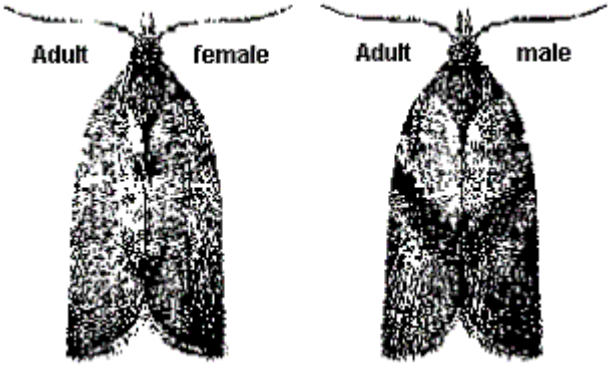
Introduction

Lightbrown apple moth (LBAM) *Epiphyas postvittana is* a native insect with a very wide host range. In SA it is the major pest of bearing grapevines, an important pest of pome fruit and citrus, and also attacks a wide range of vegetable crops, broadleaf weeds, some pasture species and ornamentals.

LBAM occurs throughout the main agricultural areas of SA. It is a more serious pest in cooler regions than in warmer areas. It is favoured by conditions that cause lush growth in its host plants, and by the extension of cool conditions well into the summer months. In cool seasons it can cause injury from spring until harvest in autumn.

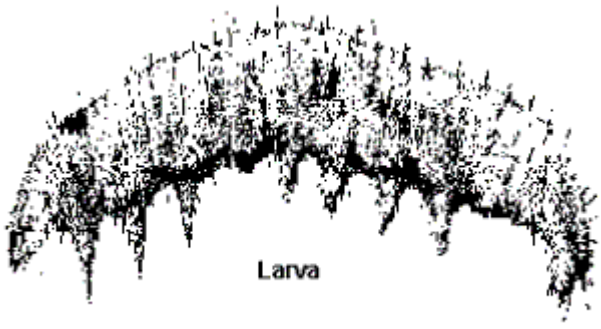
Description

The buff-coloured moths are about 10 mm long and seldom seen. They remain concealed under leaves during the day, and towards dusk become active.



The female moths lay scale-like eggs in batches on the upper surfaces of leaves. These egg batches are an aqua colour and difficult for the untrained eye to detect. The eggs darken before hatching.

The young larvae are pale yellow and small (about 1 mm long), and disperse by crawling or dropping on silk threads. They then settle, usually on the undersurface of a leaf, and spin a protective web in which they feed. The larvae abandon their webs after their first moult and construct a sheltered nest by webbing together the sides of a leaf, two adjacent leaves, leaves to a fruit, several fruits, or flowers or berries within a grape-bunch.



The larvae pass through six development stages, increasing in length to about 18 mm. The mature larvae are pale to medium green, with a darker green central stripe. If disturbed they wriggle rapidly and either move further into their shelter, drop to the ground or hang suspended by a silk thread.

Pupation occurs at the feeding site. The newly formed pupa turns from green to brown. The moth emerges a few weeks later.

Damage

Grapevines

The numbers of LBAM larvae at budburst are usually very low. However, over-wintering larvae can migrate from undergrowth vegetation on to the vines and damage the emerging shoots. If a shoot is destroyed the fruitfulness of that potential cane is usually lost. Therefore, such damage is significant.

As the vine begins its spring growth the majority of LBAM larvae feed on the foliage, especially the newly expanding leaves. However, in SA vine defoliation by LBAM larvae is never sufficient to affect yield.

From mid-spring the larvae feed on immature flower buds, flowers and young berries. Each larva destroys an average of 25 potential berries while feeding. Little visual evidence of this damage remains at harvest.

As the season advances and the berries enlarge, the number of berries destroyed by each larva decreases to about 15. Differences in berry loss between cultivars are negligible.

LBAM larval feeding on the inflorescences and bunches can create sites for the infection arm development of Botrytis fungal rots.

Pome fruit and stone fruit

As the annual growth of weeds and pasture dries off from October to January, the moths that lay the spring and summer generations of eggs search for other suitable host plants. This is when fruit crops may be attacked. The larvae feed on new shoots, foliage and fruit.

Although apples and pears can be attacked from setting to maturity, peaches and apricots become infested mostly in the last few weeks before the fruit ripens. Peaches suffer further damage from mould (botrytis rot, brown rot) developing where larvae feed.

During spring, the young growing tips of apple trees are most susceptible to damage, and heavy infestations can result in severe damage to the growing laterals, especially on young trees. Young larvae construct leaf rolls by webbing together the sides of a leaf, two adjacent leaves, leaves to a fruit, or make nests among clusters of fruit, so damaging the fruit surface and sometimes tunnelling into the fruit.

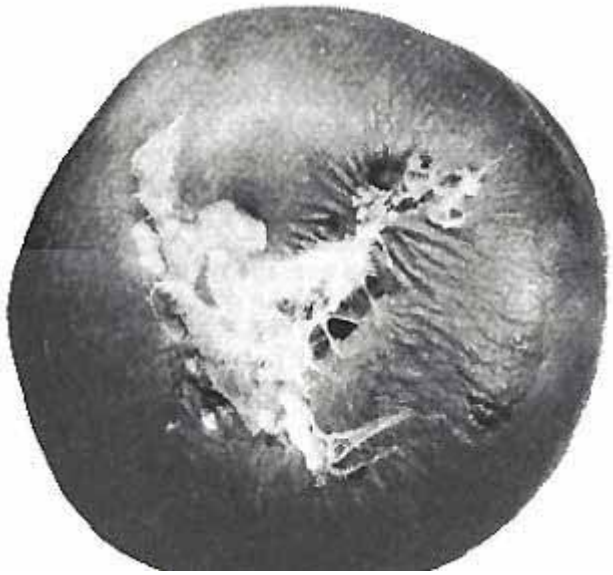


Fig 1: Stone fruit with pitted scars and webbing from larval feeding

Citrus

LBAM can cause substantial damage to citrus fruit, especially Valencia and naval oranges. Damage from the spring generation/can occur any time from about September to early December. On the mature crop the larvae bore into the rind but usually do not penetrate in the fruit's flesh. On young fruitlets, after flowering, the larvae channel on the surface of the fruit, especially under the calyx. The young fruitlets often drop following attack, and on fruit that does not drop, extensive scarring occurs where the larvae have been feeding.

LBAM is a quarantinable pest in a number of countries which import Australian citrus e.g. USA, Japan.

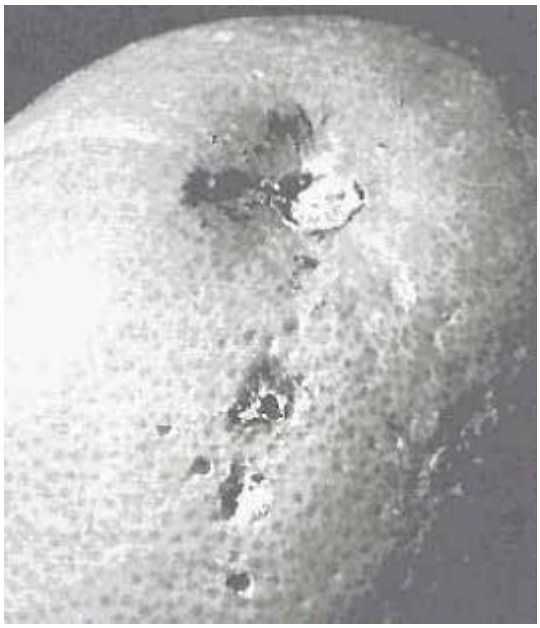


Fig 2: Holes in citrus from larval feeding

Vegetables

A variety of vegetables, including cucurbits, crucifers, potato, tomato and capsicum are hosts to LBAM, but in SA celery alone is seriously damaged. The scars left on the celery stalks by the superficial feeding of the larvae are unsightly and downgrade the marketed product.

Ornamentals

Many ornamental annuals, shrubs and trees, both native and exotic, are attacked by LBAM. New foliage growth and tender shoots are preferred.

Their characteristic leaf rolls are especially common during the spring flush of growth.

Life cycle

Three generations occur each year. There is usually some overlap of these generations, and variation in their timing occurs as a result of climatic differences between years.

LBAM develop slowly during winter as larvae feeding on weeds and pasture cover, preferring hosts such as capeweed, dock and medics. In vineyards in early spring the maturing larvae of this autumn-winter generation may migrate to the emerging vine shoots. Adults emerge in midspring and lay eggs that give rise to the spring generation of larvae. This is generally the most abundant of the three generations of LBAM larvae that feed on grapevines. The greatest larval numbers usually occur in late November at the time of crop set. These larvae develop into adults in December.

The summer generation of larvae emerges in mid January and grows rapidly. They are generally scarce on grapevines. Pupation occurs during early autumn, and the adults that emerge in April produce the over-wintering generation.

Cultural control

Pest management guidelines for grapevines

(The following guidelines are in large part taken from the IPM Viticulture Research to Practice Training Workshop manual.)

There are three principle periods of risk from attack by LBAM larvae: immediately after budburst, in November when peak numbers of the spring generation of larvae and the crop's flowering period coincide, and to a lesser extent in January - February when the summer generation of larvae may feed on the maturing bunches.

During budburst inspect vines for the presence of mature larvae on the emerging shoots, and spray if larvae are present.

Timing of egg mass monitoring

Begin egg monitoring in spring when the first leaves are expanded. Weekly sampling is advised.

Pheromone trap catches can be used to indicate male moth activity but they are not always related to an egg-laying episode.

Where to sample

Egg masses are most commonly found on the upper surface of fully expanded leaves and numbers can be patchy. It may be found, for example, that some varieties, particularly Chardonnary and Pinot Noir, and some parts of blocks have higher numbers.

There is often an 'edge effect' where LBAM eggs are found in higher number along the ends of rows or in sheltered locations, so it is important to take this into account when trying to choose a representative sampling area. Similarly, the presence of less susceptible varieties like Shiraz and Cabernet Sauvignon must be considered.

Monitoring over a broad area may initially be required to develop a sampling strategy, which may finally involve a random selection of sampling points within sections of a property or revisiting the same panels in a set pattern. Efficient use of time may mean going back to the same areas where egg masses were previously tagged.

Try to alternate between sides of the vine.

How to sample for egg masses

Inspect 50 leaves per panel of three or four vines from 20 panels within the block, walking slowly. That is, a total of 1,000 leaves per block will be covered. Examine the top side of fully expanded leaves in a 0.5 m band along the base of the shoots. Leaves don't need to be handled unless it is desired to check spots with a hand lens. Experience, of course, makes this part of the job easier and more accurate.

A hand counter will assist in keeping a tally of leaf counts.

Mark egg masses on the leaf by circling with a black permanent ink felt tip pen. Tag the leaf with coloured tape, write the date of inspection on the tag and record the colour of the egg mass. This will track egg development during weekly inspections.

On monitoring sheets the egg masses recorded tells a lot about development. Green indicated eggs are newly laid, yellow with black spots shows eggs are about to hatch, those which are black all over are parasited eggs and a white/clear appearance is evidence that the egg mass has hatched.

Thresholds considerations in egg mass monitoring

Field trials indicate that three unparasitised egg masses per 1,000 leaves represent a sufficient level of the pest to instigate control measures.

A large population of natural predators, such a lacewing larvae and spiders, in the vineyard may influence threshold levels. There is not enough information on this interaction, however, for clear guidelines to be given.

Monitoring caterpillars

Count caterpillars to check effectiveness of control measures if there has been a break in the egg sampling program.

If using *Bacillus thuringiensis*, eg Delfin, Biobit, or Dipel, the larvae won't show visible effects for two to three days.

First and second instar larvae can be found nearly anywhere on shoots and bunches but are easiest to find in terminal tips. Young larvae often move directly into bunches, especially in mid summer, so tip counts may not always give a good indication of larval numbers. In this case, examine bunches instead.

Shoot examination covers the tips and the first three or four leaves on 50 shoots per block. The tip must be prised apart to find the first instar and second instar caterpillars sheltering inside the folded tip.

Clusters and bunches should be checked at the rate of 50 per block when it is suspected that control measures have not been successful and caterpillars are getting large (about 10 mm or fourth instar onwards). Younger caterpillars go into bunches and are difficult to see. If bunches are cut apart and examined carefully with a hand lens it is easier to locate first and second instar larvae.

Caterpillar thresholds

Thresholds normally used to determine the need for control are more than 10 caterpillars per 50 shoots or more than five caterpillars per 50 bunches.

In vineyards where there is a consistent *Botrytis* rot problem, or a problem occurred the previous season, or *Botrytis* was observed to infect shoots, leaves or inflorescences early in the season, special attention should be given to monitoring the summer LBAM generation.

Pest management instructions for citrus

In most seasons damage is slight and control is not necessary. However, when large numbers of caterpillars are present, damage can be severe. In orchards which frequently experience damage or produce fruit for export, monitoring is essential. Examine fruit for the presence of caterpillars. If more than about 5 per cent (navels) or 10 per cent (other varieties) of fruit is infested in spring or early summer, control is worthwhile. Carefully monitor during autumn and early winter those orchards producing for export. Check with the packing shed for LBAM management advice.

Biological control

Natural enemies of the egg, larva and pupa can limit the buildup of LBAM populations. Minute Trichogramma wasps parasitize and kill the eggs, and a wide array of wasp and fly parasites, lacewing and spider predators and a virus disease control the larvae and pupae.

Chemical control

Because the larvae always feed under shelter, spraying must be thorough.

In pome-fruit orchards, the care normally given to achieve adequate coverage and correct

timing with codling moth sprays results in excellent control of LBAM. If the interval between the final codling moth spray and harvest is greater than two or three weeks, young LBAM larvae emerging from eggs may survive and establish on the near-mature crop. Watch for this development, especially in seasons favouring LBAM activity and, if necessary, spray with a short withholding-period insecticide.

On citrus Bacillus *thuringiensis* sprays may be used for control of LBAM in orchards where parasites are used to control red scale. This insecticide is a bacterial disease of moth larvae, and will not disrupt the biological control of other insect pests.

Last update: March, 2005

Agdex: 200/622

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