Control of the Omnivorous Leaf Tier on Strawberries and Nursery Stock

R. G. Rosenstiel

Agricultural Experiment Station
Oregon State College
Corvallis

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R. G. ROSENSTIEL
Associate Entomologist

The omnivorous leaf tier has been called "strawberry worm," "flax worm" and "tie worm" by growers who have noticed its injury to various crops in Oregon. The larvae tunnel into the strawberry fruits, eat away the tops of growing flax and feed on the developing seeds and tips of common vetch. They also injure tips of small fruit trees and ornamental plants in nursery rows and feed on low-growing plants such as pansies and iris around homes.

Chemical control measures have been worked out only for strawberry growers and nurseymen to date. The flax and common vetch seed growers may be able to use some of the following information on control of the pest where they have serious infestations. The value and efficiency of chemical control on flax and common vetch remain to be studied in relation to the value of the respective crops.

The Insect

Appearance of the larvae

The larvae of the omnivorous leaf tier grow up to five-eighths of an inch in length. Their heads are tan in color and the general body color of the mature larvae is light cream. They have a distinctive lighter-colored stripe running lengthwise on each side of the back.

Adults and their habits

The moths emerge in June from the brown, cigar-shaped pupae. The pupae may be found inside strawberry fruits, in webbing around a feeding place, or in host-plant leaf axils. The male moth is tan in color and about half an inch long while the females are tan with brown spots on their forewings. The moths fly mostly in the evenings just after sunset when the air is still and warm. The females lay their eggs in June and July on the rough bark of trees such as oaks or Douglas-fir and on unpainted wooden buildings. The females will lay eggs only in or beside a crevice on such upright, rough objects.

Overwintering larvae

The eggs hatch in 12 to 14 days and the tiny, orange-colored larvae with black heads appear. They are only about a thirty-second of an inch in length. Just after hatching the larvae crawl into crevices in the bark or wood and spin a silken cover around themselves. The covering is waterproof and protects them from the weather so that they can remain safely in the bark crevices during the fall and winter.
Spring "ballooning" of the larvae

In March the tiny overwintering larvae leave their resting places and crawl out to the bark surface. When the weather warms up a little and the rain stops, they attach a bit of silk to the bark and thrust themselves away from the tree. As they fall away they spin out a silken strand from their mouths. If there is little or no wind the larvae swing back to the tree trunk and later repeat the performance. When the wind is blowing it whips the larvae away from the tree and they continue to produce their silken strand. After the larvae produce one or two feet of silken strand the wind strength breaks the silk at the tree end and they sail away on the breeze. Each larva is held up for a time by the buoyancy of its tiny body and the light silk and is carried through the air just like a bit of dry paper.

Mining activity of the larvae

After a while each larva floats to the ground and then it makes a mine in the leaves of almost any of our low-growing plants except grasses. The second instar larval stage is spent in mines where the larvae are safe from predators and insecticides. The mines are long, narrow, twisting, and brown in color.

General larval injury

As the larvae become too large to remain in the mines they leave their shelter and ascend to the tender growing tip of their host plant. There they spin a little silk around the foliage and feed within the rough enclosure. Again, as in their mines, they are partly protected in their feeding place from predators and insecticides. When they finish feeding on the tender growth at one location they leave it and move to another growing tip where they repeat their actions. On some nursery stock the tip injury causes abnormal growth which disfigures the plant.

Injury to strawberries

The larvae first feed on strawberry plants in leaf mines or in between the folded leaflets before they open. Later they fasten down a petal or two of a flower and feed on the surface of the developing fruit beneath the petal. They apparently do not relish this last food very much and they wander to some extent from flower to flower. As soon as even one side of a berry becomes ripe the larvae begin to feed at the point of greatest ripeness. The usual entrance point in a berry is between the calyx (cap) and the fruit base. They tunnel into the fruit and defile it to some extent with their droppings. Canneries object to the presence of the larvae in the fruit and to the rot which often starts at the injured place. Larvae may injure more than one berry unless they find a very ripe fruit at the beginning of their feeding.

Detection of the larvae

When a grower wishes to know whether or not he will have leaf tier injury in a field he can put up some flypapers on his rough-barked trees at the edge of his field and trap the larvae when they emerge in March and early April. The flypaper can be obtained in 8- by 14-inch sheets from some wholesale grocers or from the Tanglefoot Company, Grand Rapids, Michigan. When the papers are tacked to the tree trunks at shoulder height the larvae from the tree usually will be caught at the edges of the sticky paper when they try to move across it.
The flypapers should be examined for the tiny, orange-colored larvae at weekly intervals and a new sheet should be placed on top of the old one after each examination. Catches of 5 to 10 larvae in any one week probably would justify control measures on strawberries, especially when the trees are close to the west side of the patch. A dozen flypapers around an average field should give the grower an idea of the local abundance and source of larvae.

In severe infestations on strawberries, growers will be able to find the small larvae beneath the webbed petals of the flowers. In 1950, an average larval population in the first flowers of one larva per bearing-age plant resulted in severe injury at the time of the first picking. Growers can examine their fields at blossom time and tell roughly where the larvae will be most numerous. In nurseries the larvae may be found in early spring in plant tips among the new leaves.

Control Measures

Cultural control

Growers who plan to raise crops susceptible to the omnivorous leaf tier, such as strawberries, flax, common vetch seed or nursery stock, over a period of years would probably benefit from careful consideration of the following cultural control practices which are based on the known habits of the leaf tier.

The tiny larvae spread in the early spring from trees having rough bark, such as Douglas-fir and valley oak, so the removal of such trees should decrease the local larval population. Isolated, rough-barked trees will have a much greater number of larvae per unit of surface than similar trees in groups. Smooth-barked trees such as English walnut, cottonwood, or willow are relatively free of larvae. The larvae usually are blown eastward from trees for distances up to some 250 yards. Of course most of them will be carried by the wind for only to 100 yards. Where the rough-barked source trees cannot be removed the growers may avoid planting susceptible crops east of such trees to reduce the injury.

From a 6-year study of 170 fields it has been determined that the leaf tier population will increase much more on legumes than it will on other crops. Unfortunately, the host most favorable to the leaf tier among the legumes is our common vetch which is often needed for building up soil fertility. O.S.C. Agricultural Experiment Station Bulletin 442 gives additional information on fertility needs for strawberries. The increased population resulting from planting legumes results in an increase of larvae the following year in the vicinity where the legume crop was grown. If the grower plans to raise strawberries in an area where leaf tier infestations are known to be serious he may wish to grow a nonlegume such as a grass, grain or cultivated crop on the ground during the year immediately preceding the strawberries.

Growers should not expect the above cultural control measures to give them 100 per cent protection for the leaf tier as a few larvae may be carried for long distances by strong spring winds. They should, however, consider the permanent advantages of tree removal and the value of growing nonlegumes in order to decrease the leaf tier population in situations where chemical control is not practical, or where the infestation may be severe and it is desired to supplement chemical control with cultural control measures.
Chemical control

When a crop with a high value per acre like strawberries or nursery stock is being grown, it seems logical to employ chemical control measures against the leaf tier even though the procedure is expensive.

The first time for applying the chemicals is in the spring about 15 days after the Marsnall strawberry blossoms begin to appear. In normal years this period has been about the first of May.

A second chemical application should be applied about three weeks after the first one. At the time of the second application many of the strawberry petals will have fallen and the largest green berries will be about a quarter of an inch in diameter. The normal date of the second application is about May 20.

The insecticide which has been found to be most effective against the leaf tier larvae is a 5 per cent Methoxychlor dust. This material should be applied with a power duster equipped with a hood over each row to confine the dust and thus insure coverage of all the plant surfaces. The rate should be 50 pounds per acre. The chemical Methoxychlor is not considered to be very toxic to mammals but it is a poison and should not be applied to fruit within 2 weeks of picking time.

Control Summary

1. Remove trees with rough bark from the vicinity of susceptible crops such as strawberries, nursery stock, flax and common vetch grown for seed.

2. If rough trees cannot be removed, avoid planting susceptible crops east of them.

3. If practical, grow a nonlegume crop ahead of a susceptible one to reduce the subsequent leaf tier population on the susceptible crop.

4. Chemical control measures for leaf tier larvae on strawberries and nursery stock:
   - Apply a 5 per cent Methoxychlor dust about 15 days after blossoms appear. That will be about May 1 in normal years.
   - Apply a second Methoxychlor dust about 3 weeks after the first one, which will be about May 20.
   - Avoid applying insecticides closer than 2 weeks before harvest time.