LEAFROLLERS ON ORNAMENTAL AND FRUIT TREES

Integrated Pest Management for Home Gardeners and Landscape Professionals

Leafrollers, the larvae of certain tortricid moths, often feed and pupate within the protection of rolled-up leaves. Several species can cause problems on fruit and ornamental trees in California. The fruittree leafroller, *Archips argyrospila*, is the most common leafroller pest in landscapes throughout the state. It occurs on many ornamental trees—including ash, birch, California buckeye, box elder, elm, locust, maple, poplar, rose, and willow—and is particularly damaging to deciduous and live oaks. It also attacks numerous fruit and nut trees including almond, apple, apricot, caneberries, cherry, citrus, pear, plum, prune, quince, and walnut.

Other leafrollers include the obliquebanded leafroller, *Choristoneura rosaceana,* and the omnivorous leafroller, *Platynota stultana*, which are serious problems on fruit trees. The orange tortrix, *Argyrotaenia franciscana*, and apple pandemis, *Pandemis pyrusana*, are pests that occur throughout the year primarily on fruit trees and vines in coastal areas of California.

A new invader, the light brown apple moth (LBAM), *Epiphyas postvittana,* recently has invaded the northern coastal areas of the state, and high populations are found in areas with cool summers with high humidity such as the San Francisco Bay Area and the Santa Cruz-Monterey region, where it is causing damage to ornamental and fruit trees.

Damage and management for all species is similar.

IDENTIFICATION

Leafrollers go through four stages of development—egg, larva (or caterpillar), pupa, and adult (or moth). Adults lay eggs in irregular, flat masses on smooth surfaces. The fruittree leafroller usually lays its egg mass on twigs or smaller branches. At first a dark gray or brown "cement" coats the mass; this later bleaches to white. Pinholes perforate this covering in spring as larvae hatch and emerge through it (Fig. 1). Omnivorous and obliquebanded leafrollers sometimes lay their eggs on weeds or leaves as well as on twigs. Most leafrollers lay eggs in overlapping rows that resemble fish scales (Fig. 2).

Figure 1. Unhatched (top) and hatched (at bottom with holes) fruittree leafroller eggs.

Figure 2. Omnivorous leafroller eggs.

Larvae of these leafrollers feed inside the protective shelter of leaves that they roll or web together (Fig. 3). When disturbed, the larvae wriggle vigorously and quickly drop to the ground on a silken thread (Fig. 4). Newly hatched fruittree and obliquebanded leafroller larvae are entirely green except for a black head and small, hard plate just behind the head. As the larva matures, its head turns dark brown, and the plate becomes tan to olive green (Fig. 5). At

Figure 3. Fruittree leafroller larva feeding inside a leaf it has rolled, or webbed, together.

Figure 4. Fruittree leafroller larva descending on its silken thread.

Figure 5. Obliquebanded leafroller larva.

PEST NOTES Publication 7473

University of California
Statewide Integrated Pest Management Program
Agriculture and Natural Resources

September 2010

maturity larvae are 3/4 to 1 inch long. Omnivorous leafroller larvae are pale green or light brown with brown or black heads and are a little more than 1/2 inch long when full grown (Fig. 6). The larvae of the light brown apple moth are very similar to other leafrollers—pale to medium green with a light tan head (Fig. 7)—and cannot be reliably distinguished from some other leafroller species in the field. If you are not in or near an area where this pest occurs, it is likely another species; however, take suspicious specimens to your County Agricultural Commissioner for identification. For the most current information about this invader, visit the California Department of Food and Agriculture's Web page, www.cdfa.ca.gov/phpps/PDEP/lbam/lbam_main.html.

When mature, leafrollers pupate within a rolled leaf. Silk webbing lines the area around each pupa. Adult moths are about 1/2 inch long with a wingspan of about 5/8 to 7/8 inch. Wings of leafrollers have a bell-shaped outline when viewed from above. The forewings of the fruittree leafroller are mottled shades of brown and tan with gold-colored flecks (Fig. 8) while the hind wings are whitish to gray. It is difficult to distinguish between adults of various leafroller species, although the omnivorous leafroller has a longer snout (Fig. 9).

Leafrollers are difficult to distinguish in the field. However, information related to geographical location and the plant being attacked can be helpful in determining which species is attacking the host specimen (Table 1).

LIFE CYCLE

The fruittree leafroller spends the winter in the egg stage and has only one generation a year. Other leafrollers spend the winter as larva in protected places on the host and have two or more generations.

The fruittree leafroller overwinters as eggs laid on branches or twigs. Eggs hatch into tiny larvae from March to as late as mid-May in cooler areas. Larvae feed on leaves for about 30 days then pupate in a loose cocoon, which they form in a rolled leaf or similar shelter. Eight to 11 days later the adult emerges from the pupa. The moths live only about a week, during which time they mate and lay eggs. They fly from May to June, depending on locality, and in any one area the flight usually lasts about three weeks. These moths lay eggs on twigs and branches, and the eggs will remain there until they hatch the next spring.

Omnivorous, obliquebanded, light brown apple moth, and most other problem leafrollers overwinter primarily as larvae in protected places in trees. For example, omnivorous leafroller often overwinters in or on old, unharvested fruit, whereas obliquebanded leafroller often is found as second- or third-stage larvae under bud scales. They pupate in spring, emerge as adults, and sometimes lay their first eggs on weeds. The second generation of these leafrollers, which occurs in June or July, is more likely to occur on trees, causing damage later in the season than the fruittree leafroller.

Figure 6. Omnivorous leafroller mature larva.

Figure 7. Light brown apple moth larva.

Figure 8. Fruittree leafroller adult.

Figure 9. Omnivorous leafroller adult.

Table 1.

Common Leafroller Species, Distribution, and Hosts.

Leafroller	Where most commonly a pest	Most common hosts
Fruittree leafroller	Warm inland valleys and coast	Ornamentals and fruit trees
Omnivorous leafroller	Warm inland valleys	Fruit trees and vines
Obliquebanded leafroller	Warm inland valleys	Fruit trees and vines
Light brown apple moth	Cool coastal areas	Ornamentals, vines, fruit trees, and many other plants
Orange tortrix	Cool coastal areas	Vines, fruit trees, and many noncrop plants
Apple pandemis	Cool coastal areas	Apples and pears

DAMAGE

Leafroller larvae feed on tender, new leaves, giving them a ragged appearance; they also roll and tie leaves together with silken threads to form compact hiding places. Some years very large populations develop. In severe cases larvae can partially or completely defoliate trees, and their numerous silken threads can cover the entire tree and the ground below. Also, larvae frequently drop to the ground on their silken threads and can defoliate other plants beneath the trees. However, even completely defoliated trees can recover if they are otherwise healthy, with the exception of newly planted and first-leaf trees.

Oaks in the Central Valley can be particularly hard hit by the fruittree leafroller. Some people mistake this leafroller for California oakworm (Fig. 10) because of its prevalence on oaks. However, oakworm is a more serious pest in coastal areas, while the fruittree leafroller does the bulk of its defoliation damage to oaks in the Central Valley. The two caterpillars are easy to distinguish—the fruittree leafroller is green with a black head, while California oakworm has yellow, black, and gray stripes on its side and a large, brown head. For more information, see *Pest Notes: California Oakworm* listed in the References section.

The larvae of all leafroller species also attack fruit on trees, and young fruit might fall because of deep feeding grooves larvae make just after the fruit has formed. Less severely damaged fruit remain on the tree and develop characteristically deep, bronze-colored scars with roughened, netlike surfaces that are mostly cosmetic, although the fruit can become deformed (Fig. 11). They do not enter the fruit as do codling moth or Oriental fruit moth.

MANAGEMENT

Biological Control

A number of insects eat leafrollers including certain tachinid flies and ichneumonid wasps, which parasitize the larvae. After consuming the leafroller larvae, the braconid wasp forms a white cocoon next to the shriveled up worm inside its nest. A white cocoon is an indication that the parasite is present and might provide control. Lacewing larvae, assassin bugs, and certain beetles also are common predators. Birds sometimes feed on the larvae and pupae, although they usually prefer other insects. These natural enemies often help to keep leafrollers at low, nondamaging levels, but even if natural enemies are present, large outbreaks of leafrollers occasionally occur.

Chemical Control

Sprays for leafrollers seldom are necessary. Apply them only when there is evidence of a damaging leafroller population, such as large numbers of larvae early in the spring or large numbers of egg masses. Because the fruittree leafroller—the most common leafroller attacking oak and other ornamentals—has only one generation a year, by the time trees are severely defoliated, the caterpillar stage might be almost completed, and sprays will be of no benefit. Also, a single defoliation, unless the tree is very small, will not kill the tree. Insecticidal oil sprays applied in dormancy for scales and other insects will help control leafroller eggs on fruit trees.

The microbial insecticide *Bacillus thuringiensis*, which is sold as a variety of products, is effective against the larval stages of leafrollers. Bt, as it is commonly known, is a bacterial preparation that causes a disease in many kinds of caterpillars but does not harm beneficial insects, birds, humans, or other organisms. Leafrollers stop eating within hours after feeding on a sprayed leaf and die several days later. Thorough spray coverage of the tree is required for control. Bt is most effective on leafroller larvae when they are small (less than $^1/_2$ inch long) and usually requires more than one application. Caterpillars must ingest the pesticide to be killed. Bt is available for use on ornamental trees, vines, and some fruit and nut trees. Check labels for uses. Spinosad (Monterey Garden Insect Control) is another, organically acceptable insecticide that is effective against leafrollers and widely available.

Optimum control and a minimum amount of damage by fruittree leafrollers occur when a spray is applied at the time of larval hatching or shortly afterward. To determine this time, inspect twigs showing flushes of new foliage and look for feeding injury and the small caterpillars. If you see egg masses, check them regularly for signs of larval exit holes. Fruit trees must be sprayed no later than petal fall to prevent larvae from injuring the young fruit. Use a high-pressure power or hose-end sprayer to force the material into the leaf rolls and other protected areas where larvae are found.

Figure 10. Like the fruittree leafroller, the California oakworm attacks oak trees; however, it is not a leafroller and is more likely to be a problem in coastal areas.

Figure 11. Pear damaged by a fruittree leafroller.

REFERENCES

Dreistadt, S. H., J. K. Clark, and M. L. Flint. 2004. *Pests of Landscape Trees and Shrubs: An Integrated Pest Management Guide, 2nd ed*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 3359.

Flint, M. L. 1998. *Pests of the Garden and Small Farm: A Grower's Guide to Using Less Pesticide. 2nd ed*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 3332.

Swain, S. V., S. A. Tjosvold, and S. H. Dreistadt. April 2009. *Pest Notes: California Oakworm*. Oakland: Univ. Calif. Agric. Nat. Res. Publ. 7422. Also available online, www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7422.html. ❖

AUTHOR: W. J. Bentley, UC Statewide IPM Program, Kearney Agricultural Center, Parlier.

TECHNICAL EDITOR: M. L. Flint

EDITOR: M. L. Fayard

ILLUSTRATIONS: Figs. 1-11, J. K. Clark.

University of California scientists and other qualified professionals have anonymously peer reviewed this publication for technical accuracy. The ANR Associate Editor for Urban Pest Management managed this review process.

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

This material is partially based upon work supported by the Extension Service, U.S. Department of Agriculture, under special project Section 3(d), Integrated Pest Management.

Produced by **UC Statewide**
Integrated Pest Management Program
University of California, Davis, CA 95616

This and other Pest Notes are available at www.ipm.ucdavis.edu.

For more information, contact the University of California Cooperative Extension office in your county. See your telephone directory for addresses and phone numbers, or visit http://ucanr.org/ce.cfm.

University of California
Agriculture and Natural Resources Program