Almond

Leafrollers

Scientific names: Fruittree leafroller: *Archips argyrospila*
Obliquebanded leafroller: *Choristoneura rosaceana*

(Reviewed 3/09, updated 3/09)

In this Guideline:

DESCRIPTION OF THE PESTS

Fruittree leafrollers overwinter in the egg stage on limbs. Eggs hatch in early spring. Larvae are dark green with black heads and are about 1 inch long when fully grown; they are difficult to distinguish from obliquebanded leafroller. Adult moths emerge in June or July and deposit overwintering eggs. Adults appear bell shaped when at rest and have dark brown bands running at oblique angles across their wings. The wings are mottled with gold and white flecks. There is one generation a year.

Obliquebanded leafrollers occur on a wide range of plants. These leafrollers overwinter as either a second- or third-stage larva within a silken case or hibernaculum. These hibernacula can be found in protected areas of the scaffold limbs, such as pruning scars. The overwintered larvae become active as the buds begin to open. They begin to feed by tying together a number of leaves with silk. They first feed on watersprouts and then move throughout the tree. Those feeding on developing flower buds do so before bloom and continue to consume floral parts throughout the blossom period. This is when they cause the most damage to the almond crop. After petal fall, these larvae continue to feed on developing fruit. Pupation occurs within these sheltered areas and the adult moths generally appear during late May and early June. Eggs are laid in flattened, overlapping masses of up to 300 on the upper surface of leaves. Emerging larvae are greenish yellow caterpillars, usually with black heads but sometimes with lighter-colored heads. Adults are reddish brown moths with alternating light and dark brown bands on the wings; the bands are oblique or chevron shaped. There are two or three generations a year in the Central Valley.

DAMAGE

Leafrollers are occasional pests of almonds. The primary damage occurs early in the season when larvae of the overwintered generation feed on developing nuts and hollow them out. Many of the damaged nuts are lost in the June drop, presumably reducing yield. The summer generation of the obliquebanded leafroller ties leaves and nuts together and feed on the hulls. Leafroller feeding on the hulls increases later nut infestation by navel orangeworm.

MANAGEMENT

Treatment is not normally needed for leafrollers unless populations are high. If treatment is required, *Bacillus thuringiensis* and spinosad (Entrust, Success) are environmentally sound insecticides that control leafrollers with less negative impact on natural enemies.

Biological Control
The parasitic wasp *Macrocentrus iridescens* has been observed attacking obliquebanded leafroller larvae in the Central Valley, often with multiple cocoons on one host caterpillar.

Organically Acceptable Methods
Bacillus thuringiensis and the Entrust formulation of spinosad are organically acceptable materials.

Monitoring and Treatment Decisions Degree-day calculator Degree-day table
If bloom time sprays for peach twig borer are applied, both leafroller species will be controlled.

In orchards with a history of obliquebanded leafroller problems, monitor after bloom by putting out pheromone traps and sampling developing fruit. Put out pheromone traps by mid-April. (The lower load rate pheromone lures are the best indicators of population levels.) Begin accumulating degree-days once moths have been caught in pheromone traps on two or more consecutive observation dates (the biofix). Use a lower threshold of 43°F and an upper threshold of 85°F (vertical cutoff). (For assistance in calculating degree-days, see "Degree-days".) Begin sampling for larval feeding or for leaves that are tied together at 930 degree-days from the biofix. Apply a treatment when larval activity is first detected; larvae are difficult to control once they are sheltered in leaves that are webbed together.

Common name (trade name)	Amount/Acre** (conc.)	(dilute)	R.E.I.+ (hours)	P.H.I.+ (days)

The following materials are listed in order of usefulness in an IPM program, taking into account efficacy and impact on natural enemies and honey bees. When choosing a pesticide, also consider information relating to environmental impact. Not all registered pesticides are listed. Always read label of product being used.

EARLY SPRING—MARCH

A. BACILLUS THURINGIENSIS ssp. KURSTAKI#

(various products)		Label rates	4	0

MODE OF ACTION GROUP NUMBER[1]: 11.B2
COMMENTS: Make 2 applications during bloom: the first between popcorn and the beginning of bloom and the second 7–10 days later, but no later than petal fall. Compatible with fungicides sprays and can be tank mixed with them. Good coverage is essential. Ground application using a concentrate rate (80–100 gal water maximum) is preferred. If aerial applications must be made because conditions do not permit ground application, a concentrate rate (5 gal or less) is preferred. Fly material on at a height of about 20 feet over the canopy using appropriate nozzles to allow better deposition on the tree tops.

B. SPINOSAD

(Entrust)#	1.25–3 oz	0.3–0.75 oz	4	14
(Success)	4–8 oz	1–2 oz	4	14

MODE OF ACTION GROUP NUMBER[1]: 5
COMMENTS: A fermentation-derived insect control product. Does not appear to be disruptive of natural enemies except predaceous thrips.

C. SPINETORAM

(Delegate) WG	3–7 oz	0.75–1.75 oz	4	14

MODE OF ACTION GROUP NUMBER[1]: 5

D. METHOXYFENOZIDE

(Intrepid) 2F	1.5 pt	—	4	14

MODE OF ACTION GROUP NUMBER[1]: 18A

POSTBLOOM

A. SPINOSAD

(Entrust)#	1.25–3 oz	0.3–0.75 oz	4	14
(Success)	4–8 oz	1–2 oz	4	14

MODE OF ACTION GROUP NUMBER[1]: 5

COMMENTS: A fermentation-derived insect control product. Does not appear to be disruptive of natural enemies except predaceous thrips.

B. SPINETORAM

(Delegate) WG	3–7 oz	0.75–1.75 oz	4	14

MODE OF ACTION GROUP NUMBER[1]: 5

C. METHOXYFENOZIDE

(Intrepid) 2F	1.5 pt	—	4	14

MODE OF ACTION GROUP NUMBER[1]: 18A

** For dilute applications, rate is per 100 gal water to be applied in 300–500 gal water/acre, depending on the label; for concentrate applications, use 80–100 gal water/acre, or lower if the label allows.

\+ Restricted entry interval (R.E.I.) is the number of hours (unless otherwise noted) from treatment until the treated area can be safely entered without protective clothing. Preharvest interval (P.H.I.) is the number of days from treatment to harvest. In some cases the REI exceeds the PHI. The longer of these two intervals is the minimum time that must elapse before harvest may occur.

\# Acceptable for use on organically grown produce.

1 Rotate chemicals with a different mode-of-action Group number, and do not use products with the same mode-of-action Group number more than twice per season to help prevent the development of resistance. For example, the organophosphates have a Group number of 1B; chemicals with a 1B Group number should be alternated with chemicals that have a Group number other than 1B. Mode of action Group numbers are assigned by IRAC (Insecticide Resistance Action Committee). For additional information, see their Web site at http://www.irac-online.org/.

— Not recommended or not on label.

PRECAUTIONS

PUBLICATION

UC PEER REVIEWED

UC IPM Pest Management Guidelines: Almond
UC ANR Publication 3431
Insects and Mites
F. G. Zalom, Entomology, UC Davis
C. Pickel, UC IPM Program, UC Cooperative Extension, Sutter/Yuba counties
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http://www.ipm.ucdavis.edu/PMG/r3302111.html