

# Almond

## Peach Twig Borer

Scientific name: *Anarsia lineatella*

(Reviewed 3/09, updated 3/09)



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### DESCRIPTION OF THE PEST

Peach twig borer is a major pest in several tree crops. [Adult moths](#) have steel gray mottled forewings. Females lay [eggs](#) on twigs, fruit, and leaves. Eggs hatch in 4 to 18 days. Larvae are small, brown caterpillars with white intersegmental bands and a black head capsule. They go through four to five instars. Overwintering larvae are sheltered in tiny cells ([hibernacula](#)) that they bore under the bark of [limb crotches](#) on 1- to 4-year-old wood or in bark cracks on larger limbs and the trunk. Pupae are dark brown, without a cocoon and are found in tree crevices, between hull and shell, curled leaves, or in debris on the ground. There are [four generations per year](#).

### DAMAGE

Larvae damage both [growing shoots](#) and nuts, causing shallow channels and [surface grooves](#) on the nutmeat. Peach twig borer damage can be masked by navel orangeworm feeding, which often occurs on nuts previously damaged by peach twig borer.

### MANAGEMENT [Degree-day calculator](#) [Degree-day table](#)

Some orchards will require a treatment for peach twig borer. Use past history or [harvest samples](#) to determine if your orchard will require treatment. Preferred treatment timing is at full bloom and petal fall. Treatments during the dormant season with environmentally sound insecticides such as spinosad (Entrust, Success) and diflubenzuron (Dimilin) are also acceptable. Avoid applications of organophosphates during the dormant season as these applications threaten water quality when they run off during winter rainfall. At the beginning of bloom, monitor hibernacula to determine when larvae are emerging. Place pheromone traps out around April 1, and monitor for shoot strikes to catch any inseason problems.

### Biological Control

Peach twig borer has about 30 species of natural enemies. Among those commonly found in California are the chalcid wasps, [Paralitomastix varicornis](#) and [Hyperteles lividus](#). Another commonly found parasite is [Macrocentrus ancyllivorus](#), which attacks both peach twig borer and Oriental fruit moth. In some years and orchards, these natural enemies destroy a significant portion of larvae, but they may not reduce twig borer populations below economically damaging levels. Ants, [Formica spp.](#), also can be found preying on peach twig borer larvae.

### Organically Acceptable Methods

The use of *Bacillus thuringiensis* or spinosad (Entrust) sprays at bloom, preceded by a delayed dormant

oil treatment for the control of scale and mite eggs are organically acceptable methods of managing this pest.

### **Monitoring and Treatment Decisions**

Peach twig borer can be successfully managed with environmentally sound insecticides such as spinosad (Entrust, Success), diflubenzuron (Dimilin), *Bacillus thuringiensis*, methoxyfenozide (Intrepid), and spinetoram (Delegate). Although dormant treatments with organophosphate insecticides are effective and easy to time, they should be avoided because of their potential negative impacts on water quality.

*Bloom sprays.* To effectively time bloom sprays, [monitor](#) to determine when larvae are emerging from overwintering hibernacula on limb crotches or on tree trunks. The first application must be made when 20 to 40% of larvae have emerged and the second application 7 to 10 days later or when 80 to 100% of larvae have emerged from overwintering hibernacula. If emergence is spread out, a third spray may be needed when emergence finally reaches 80 to 100%. A less precise method is to apply the first spray between popcorn and full bloom on Nonpareil and a second spray at Nonpareil petal fall, unless there is an extended bloom period in which case a third application may be needed.

Peach twig borer can be very damaging to developing scaffolds in the second growing season so a dormant spray is recommended in the first dormant season when monitoring indicates peach twig borer hibernacula.

*Spring sprays.* Spring sprays are usually not needed if the dormant spray or bloom spray has been successful or there is no history of peach twig borer problems. If broad-spectrum insecticides are applied in May, they can cause outbreaks of mites and other secondary pests. Softer pesticides (spinosad-Entrust, Success; methoxyfenozide-Intrepid; and diflubenzuron-Dimilin) have recently become available that have less impact on natural enemies.

Place peach twig borer [pheromone traps](#) in orchards, one per 20 acres (but never less than two traps in smaller orchards) by March 20 in the southern Central Valley and April 1 in northern areas. Hang traps 6 to 7 feet high in the northern quadrant of the tree, 1 to 3 feet from the outer canopy. Monitor twice a week; replace pheromone caps at the interval recommended by the manufacturer and trap bottoms after 100 moths have been counted and removed.

If shoot strike monitoring (below) indicates treatment is necessary, use trap catches and degree days to time a May spray. Optimum timing for first generation larvae (the May spray) is between 400 and 500 degree-days after the first male is trapped in April when using spinosad (Entrust, Success), spinetoram (Delegate), or the organophosphates; when using an IGR (Intrepid), make the application at 300-400 degree-days. Accumulate degree-days for peach twig borer using a lower threshold of 50°F and an upper threshold of 88°F. (For assistance in calculating degree-days, see "[Degree-days](#)".)

Monitor trees of any age for [shoot strikes](#) in mid-April. Shoot strikes are easiest to see on young trees and on water sprouts. If several strikes are seen in each tree by late April, a spring spray timed with pheromone traps and degree-days may be required. When examining shoot strikes, determine if they are caused by peach twig borer or Oriental fruit moth by looking for the larvae. Although Oriental fruit moth larvae mine deeper into a shoot than peach twig borer larvae, distinguishing the damage can be difficult. Cut the shoot lengthwise to find the larva and identify it: Oriental fruit moth larvae are white or pink with a brown head and peach twig borer larvae are dark brown with white portions between each body segment and a black head. Also, peach twig borer shoot strikes occur earlier in the season than do Oriental fruit moth strikes.

If navel orangeworm is also a problem, it may be possible to time the May spray to control both pests if navel orangeworm egg hatch occurs at about the same time as optimum time for the peach twig borer spray. If not, wait and spray the navel orangeworm at hull split and time the May spray for peach twig borer. (Control of peach twig borer during hull split is difficult.)

- [Summary of Important Links](#)

Common name (trade name)	Amount/Acre** (conc.)	Amount/Acre** (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.**

#### DORMANT

##### A. SPINOSAD

(Entrust) #	2–3 oz	0.5–0.75 oz	4	14
(Success)	6–8 oz	1.5–2 oz	4	14
MODE OF ACTION GROUP NUMBER <sup>1</sup> : 5				

COMMENTS: Apply with a narrow range oil to suppress overwintering mite and scale populations.

##### B. SPINETORAM

(Delegate) WG	1.5–3.5 oz	0.375–0.9 oz	4	14
MODE OF ACTION GROUP NUMBER <sup>1</sup> : 5				

COMMENTS: Apply with a narrow range oil to suppress overwintering mite and scale populations.

##### C. NARROW RANGE OIL

(Superior, Supreme)	4–8 gal	1.5–2 gal	see label	0
MODE OF ACTION: Contact including smothering and barrier effects.				

COMMENTS: Cover all parts of the tree. Do not use oil on water-stressed trees or following periods of dry winds.

... PLUS...

##### DIFLUBENZURON\*

(Dimilin) 2L	16 oz	4 oz	12	28
MODE OF ACTION GROUP NUMBER <sup>1</sup> : 15				

COMMENTS: Apply at volume sufficient to ensure good coverage; use with a narrow range oil at 1.5 to 4% by volume.

##### D. ESFENVALERATE\*

(Asana XL)	8–9.6 oz	2–2.2 oz	12	21
MODE OF ACTION GROUP NUMBER <sup>1</sup> : 3				

COMMENTS: Residue has been shown to impact predatory mites into the growing season.

##### E. BIFENTHRIN\*

(Brigade) WSB	0.5 lb	0.125 lb	12	7
MODE OF ACTION GROUP NUMBER <sup>1</sup> : 3				

COMMENTS: Pyrethroid insecticides have a broad spectrum of activity against nontarget organisms.

##### F. CYFLUTHRIN\*

(Baythroid) XL	2.8 oz	0.7 oz	12	14
MODE OF ACTION GROUP NUMBER <sup>1</sup> : 3				

COMMENTS: Pyrethroid insecticides have a broad spectrum of activity against nontarget organisms.

##### G. PERMETHRIN\*

(Ambush)	10 oz	2.5 oz	12	7
MODE OF ACTION GROUP NUMBER <sup>1</sup> : 3				

**MODE OF ACTION GROUP NUMBER<sup>1</sup>: 3**

COMMENTS: Pyrethroid insecticides have a broad spectrum of activity against nontarget organisms.

**H. LAMBDA CYHALOTHRIN\***

(Warrior with Zeon)	3.84 fl oz	0.96 fl oz	24	14
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 3

COMMENTS: Pyrethroid insecticides have a broad spectrum of activity against nontarget organisms.

**DELAYED DORMANT OR PINK BUD**

**A. METHOXYFENOZIDE**

(Intrepid) 2F	12 oz	—	4	14
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 18A

COMMENTS: Apply in sufficient water to ensure good coverage. Apply with Latron or similar surfactant at 0.125 % volume by volume.

**B. DIFLUBENZURON\***

(Dimilin) 2L	12 oz	3 oz	12	28
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 15

COMMENTS: Apply in sufficient water to ensure good coverage. Apply with Latron or similar surfactant at 0.125 % volume by volume.

**BLOOM**

**A. BACILLUS THURINGIENSIS ssp. KURSTAKI#**

(various products)	Label rates	4	0
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 11.B2

COMMENTS: Best if applied by ground because thorough coverage of the shoot tips is essential. If it must be applied by air because of wet ground or other factors that preclude ground spray, fly about 20 ft over the tree canopy to allow better spray deposition on treetops. Make 2 applications during bloom: the first between popcorn and full bloom on Nonpareil, and the second at Nonpareil petal fall. Compatible with fungicide sprays. Will not control San Jose scale or European red mite eggs, or other pests normally controlled with oil sprays during the dormant or delayed dormant periods.

**B. METHOXYFENOZIDE**

(Intrepid) 2F	12 oz	—	4	14
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 18A

COMMENTS: Apply by 20% bloom at sufficient volume to ensure good coverage.

**C. DIFLUBENZURON\***

(Dimilin) 2L	12 oz	3 oz	12	28
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 15

COMMENTS: Apply at sufficient volume to ensure good coverage from 20% bloom to full bloom.

**D. SPINETORAM**

(Delegate) WG	3–7 oz	0.75–1.75 oz	4	14
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 5

**E. SPINOSAD**

(Entrust)#	1.25–3 oz	0.3–0.75 oz	4	14
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(Success)	4–8 oz	1–2 oz	4	14
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 5

COMMENTS: Apply in early morning or evening when bees are not actively foraging.

**SPRING**

**A. SPINETORAM**

(Delegate) WG	3–7 oz	0.75–1.75 oz	4	14
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MODE OF ACTION GROUP NUMBER<sup>1</sup>: 5

<b>B. SPINOSAD</b>					
(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 <sup>1</sup> :	5				
COMMENTS:	A fermentation-derived insect control product. This material is not as disruptive of natural enemies as the organophosphates.				
<b>C. METHOXYFENOZIDE</b>					
(Intrepid) 2F	1.5 pt	—	4	14	
MODE OF ACTION GROUP NUMBER <sup>1</sup> :	18A				
COMMENTS:	Apply by 20% at sufficient volume to ensure good coverage.				
<b>D. BACILLUS THURINGIENSIS ssp. KURSTAKI#</b>					
(various products)	Label rates		4	0	
MODE OF ACTION:	A microbial (Group 11.B2) <sup>1</sup> insecticide.				
COMMENTS:	Make two applications: one at 300–350 DD from biofix and the other at 450–500 DD. Compatible with fungicide 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.				
<b>E. CHLORPYRIFOS*</b>					
(Lorsban) 4E	2 qt	—	24	14	
MODE OF ACTION GROUP NUMBER <sup>1</sup> :	1B				
COMMENTS:	Do not apply more than 3 foliar applications/season. Do not allow livestock to graze in treated orchards. Avoid drift or tailwater runoff into surface waters.				
<b>F. AZINPHOSMETHYL*</b>					
(Guthion) 50WP	4 lb	1 lb	30 days	30	
MODE OF ACTION GROUP NUMBER <sup>1</sup> :	1B				
COMMENTS:	Do not apply more than twice following bloom.				
<b>G. BIFENTHRIN*</b>					
(Brigade) WSB	0.5 lb	0.125 lb	12	7	
MODE OF ACTION GROUP NUMBER <sup>1</sup> :	3				
COMMENTS:	If used early in the season, will induce outbreaks of secondary pests, especially spider mites.				
<b>H. METHIDATHION*</b>					
(Supracide) 25W	4 lb	1 lb	48	80	
MODE OF ACTION GROUP NUMBER <sup>1</sup> :	1B				
COMMENTS:	Do not apply more than once/season on foliage. This material may be phytotoxic to some almond varieties when used inseason.				

\*\* 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.

\* Permit required from county agricultural commissioner for purchase or use.

# Acceptable for use on organically grown produce.

<sup>1</sup> 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 IPM Pest Management Guidelines: Almond*

UC ANR Publication 3431

Insects and Mites

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