Apple

Fire Blight

Pathogen: *Erwinia amylovora*

(Reviewed 8/06, updated 3/09)

In this Guideline:

SYMPTOMS AND SIGNS

Fire blight causes blossom clusters to wilt and collapse in late spring. A brownish, sticky exudate is produced from diseased tissue. The tips of infected young succulent shoots curve into a characteristic shepherd's hook.

COMMENTS ON THE DISEASE

Erwinia amylovora overwinters in twig and branch cankers, is spread by rain splash and insects, and favored by warm, humid weather during bloom. Overhead sprinklers may aggravate the problem, especially in fire blight susceptible cultivars. Damage ranges from individual flower or shoot infections to death of limbs.

Apple cultivars vary in susceptibility and extent of damage. For example, in Granny Smith, infections are usually limited and do not cause severe structural damage to the tree whereas Gala and Fuji trees may be devastated. The rootstocks M26 and M9 are very susceptible to this disease, and infections of these rootstocks can cause the trees to die.

MANAGEMENT

Fire blight development is influenced primarily by seasonal weather. Warm spring weather, accompanied by intermittent rain and hail, is ideal for disease development. Other influences on disease development are the varieties and rootstocks used in the orchard, location of the orchard, application of too much nitrogen fertilizer, heavy pruning, or over-irrigation. Management relies on maintaining trees in the proper range of vigor, applying blossom sprays of antibiotics or copper, and most importantly, promptly finding, removing, and destroying blight strikes. Remove holdover cankers by cutting back to healthy wood. This disease can be difficult to control.

Organically Acceptable Methods
Cutting out diseased wood and treatment with Bordeaux or approved fixed copper materials are organically acceptable methods.

Monitoring and Treatment Decisions
Blossom applications of copper materials or the antibiotic streptomycin are necessary in some apple-growing areas to reduce the spread of fire blight bacteria. The timing of the first application is critical. In California, average daily temperatures of or degree-hours are used to schedule fire blight sprays. Several

mean temperature and degree-hour models are available to assist in predicting infection periods and the need for control. These models can be used to time antibiotic and copper treatments.

The UC model recommends the first spray when bloom and mean temperatures reach 62°F in March, 60°F in April, and 58°F in May. This model recommends treating every 3 to 5 days until the end of rattail bloom regardless of changes in weather that would inhibit bacterial growth and infection.

Newer degree-hour models are based on assessing actual conditions for bacterial growth and infection and also indicate when treatment is unnecessary. One such model is the degree-hour model, which takes into account early bloom and periods of continuous cool weather, allowing adjustments in treatment timings. Use of the degree-hour method requires a recording thermograph to obtain a continuous temperature reading in your orchard. One degree-hour equals 1 degree above 65°F for 1 hour. For example, a temperature of 70°F for 2 hours generates 10 degree-hours. Accumulate degree-hours each hour of the day unless 3 consecutive days below 66°F occur. In this case, the accumulation of degree-hours is then reduced to zero until temperatures again exceed 65°F. The accumulated degree-hour total is not reduced by continuous cool temperatures if the total has surpassed 400 degree-hours and has coincided with precipitation or simultaneous warm, humid infection periods of at least 57°F and 90% relative humidity. If the orchard is being irrigated, the humidity threshold is reduced to 80% relative humidity as measured outside the orchard. If possible, start the season with a full soil water profile so irrigation during bloom can be avoided.

In the Sacramento Valley, treat within 24 hours preceding rain if 1 to 150 degree-hours have accumulated. In the North Coast region, treat within 24 hours preceding rain when more than 150 degree-hours have accumulated. Treatment for both areas are recommended every 3 to 4 days when accumulation exceeds 150 degree-hours (Sacramento Valley) or 250 degree-hours (North Coast). Alternate day treatments are recommended in the Sacramento Valley whenever more than 500 degree-hours occur in conjunction with major bloom periods.

Rain or hail may require immediate respray of the orchard if temperatures conducive to fire blight development exist. If conditions conducive to fire blight development have occurred and frost conditions develop that are severe enough to cause the pear skin to rupture, retreat immediately. Varying degrees of bacterial resistance to streptomycin exist in California.

Common name (trade name)	Amount to Use	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. When choosing a pesticide, also consider information relating to environmental quality. Not all registered pesticides are listed. Always read label of product being used.

A. STREPTOMYCIN SULFATE# 4.8 oz/100 gal 12 50
(Agri-Mycin 17)
COMMENTS: Streptomycin-resistant strains of fire blight bacteria are present in some areas. Provides both contact and systemic control. Do not exceed 48 oz/acre/application.

B. BORDEAUX MIXTURE#
0.5:0.5:100 Label rates see comments see comments
MODE OF ACTION GROUP NAME (NUMBER[1]): Multi-site contact (M1)
COMMENTS: In some years, application of copper-containing materials, beginning at or about green tip, may cause fruit russetting on some cultivars, including Granny Smith. Provides contact control. When used on organically grown produce, all ingredients must be certified by the organic grower's certifying agent. Observe the most restrictive label precautions and limitations among all the Bordeaux mixture ingredients, including the most restrictive PHI and REI. For more information on creating a Bordeaux mixture, see *UC IPM Pest Note: Bordeaux Mixture*, ANR Publication 7481 .

C. FIXED COPPER# Label rates 24 0
MODE OF ACTION GROUP NAME (NUMBER[1]): Multi-site contact (M1)
COMMENTS: In some years application of copper-containing materials beginning at or about green tip may cause fruit russetting on some cultivars, including Granny Smith. Provides contact control. Not all copper compounds are approved for use in organic production; be sure to check individual products.

\+ 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 two intervals is the minimum time that must elapse before harvest.

\# Acceptable for use on organically grown produce.

[1] Group numbers are assigned by the Fungicide Resistance Action Committee (FRAC) according to different modes of actions (for more information, see http://www.frac.info/). Fungicides with a different group number are suitable to alternate in a resistance management program. In California, make no more than one application of fungicides with mode of action Group numbers 1,4,9,11, or 17 before rotating to a fungicide with a different mode of action Group number; for fungicides with other Group numbers, make no more than two consecutive applications before rotating to fungicide with a different mode of action Group number.

PUBLICATION

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UC IPM Pest Management Guidelines: Apple
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Diseases
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http://www.ipm.ucdavis.edu/PMG/r4100211.html