

Use pesticides safely!

- **Wear** protective clothing and safety devices as recommended on the label. **Bathe or shower** after each use.
- **Read** the pesticide label—even if you've used the pesticide before. **Follow closely** the instructions on the label (and any other directions you have).
- **Be cautious** when you apply pesticides. **Know** your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.



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## DETECTING AND CONTROLLING EASTERN FILBERT BLIGHT

*Anisogramma anomala*

Oregon State University  
Extension Service

**E**astern filbert blight (EFB) is a fungal disease that has infected many hazelnut orchards in Oregon and Washington. Historically, the pathogen had been restricted to the Great Lakes and Appalachian regions of North America; but in 1970, EFB was found in a hazelnut orchard near Vancouver, Washington, and since then it has spread southward into the Willamette Valley of Oregon.

Heaviest infestations in Oregon have been detected in Clackamas and Washington counties. Infected orchards also have been discovered as far west and east of Portland as filberts are grown, and as far south as Keizer. All hazelnut trees, including commercial orchards, backyard trees, and escaped seedlings, are at risk of contracting this disease.

### Symptoms and signs

Eastern filbert blight is difficult to find by casual inspection. Usually, the fungus has been in an orchard for 4 to 5 years before it's first detected. Symptoms can occur on any portion of the tree, from the top of the canopy to the main scaffold limbs. However, the first cankers usually are located on small branches near the top of the canopy.

Elongated, raised bumps begin to form on infected twigs and branches during June. When the bark is removed, the cambium below these bumps is chocolate brown.



Figure 1.—The stroma forms in July and August.

These bumps continue to expand until the fungus breaks through the outer bark in July and August (Figure 1). A white, oval-to football-shaped fungal structure called a stroma then can be seen. As the stroma continues to mature from August to October, it turns black and is raised about  $\frac{1}{8}$  inch above the branch (photo on front cover). Stromata occur in

relatively straight rows lengthwise along the branch. Cankers can occur on branches of any size.

Infected branches may appear to die suddenly during July to September. Dead leaves may remain attached to the branch (Figure 2).

Eastern filbert blight may be confused with *Eutypella cerviculata*, which produces smaller, black, fruiting bodies on dead branches. This fungus produces diagnostic black rings under the bark, which can be detected using a pocket knife. Cicada egg-laying scars also can look somewhat like EFB, but they are not black, and they look stitched.



Figure 2.—In summer, it's easy to see dead leaves on infected branches.

## Detecting and Controlling Eastern Filbert Blight *Anisogramma anomala*

J.W. Pscheidt

### Disease cycle

The disease cycle (see Figure 3) for eastern filbert blight requires 2 or more years, including a 12- to 15-month latent period when no visible symptoms can be detected (Figure 3b). In the spring, spores are ejected forcibly (squirted) into the wind and rain. These spores then spread to young, developing shoots. Infection occurs during wet weather from budbreak through shoot elongation (Figure 3a).

Spores penetrate immature epidermal cells just below the meristem where cell elongation occurs. Neither wounds nor natural openings on hazelnut trees have been shown to be sites of entry for this fungus. The fungus is not spread via the nuts.

The stromata begin to develop during the second summer after infection (Figure 3c). Embedded within the black stroma are 50 to 100 flask-shaped perithecia (Figure 4). About 5,000 sacs (asci), each with 8 spores (ascospores), are produced within each perithecium.

Figure 3.—Life cycle of eastern filbert blight.

- A Spores infect breaking buds and young shoot tips.
- B 15-month latent period
- C Stromata first visible during the spring and early summer
- D Stromata with mature spores in early fall
- E Spores actively discharged during rainy periods
- F Expansion of perennial cankers



The ascospores begin to mature in the fall as the rainy season begins in the Pacific Northwest (Figure 3d). Several hours of continuous rain are needed for release of ascospores (Figure 3e). Stromata continue to sporulate, even after the diseased branch has been removed from the tree, until the canker has dried out completely.

Ascospores are ejected into the air all winter long but cannot infect hazelnuts until the spring. Heavy rains during the dormant period have been associated with reduced spore catches in the spring.

New stromata develop each year as the canker continues to expand around and along the branch (Figure 3f). Cankers enlarge along the branch each year, anywhere from a few inches on small branches to 3 feet on larger branches of susceptible trees. Branch dieback occurs when expanding cankers

girdle branches and limbs. Numerous new infections also occur each succeeding spring.

Vigor and health of an infected orchard decline slowly at first. Most of the canopy dies on susceptible trees within 7 to 15 years after the first infection, though suckers may be produced for many years.

Tree productivity also declines slowly at first, but then declines sharply after 3 to 10 years, depending on the cultivar. The orchard becomes economically unproductive because the more susceptible pollinizers or main cultivars die out, resulting in poor nut set.

### Cultivar susceptibility

The pollinizer 'Daviana' and the cultivar 'Ennis' are highly susceptible to this disease. Most wild seedlings also are susceptible, since they may have 'Daviana' as a parent. 'Barcelona,' 'Butler,' 'Casina,' and 'Du Chilly' are moderately susceptible. 'Hall's Giant,' 'Lewis,' and 'Willamette' are more resistant than Barcelona, but can become infected through repeated exposure to EFB. Contorted ornamental hazelnuts can be infected also; these have been found in Pendleton, Portland, Corvallis, and Eugene. The native wild hazel, *Corylus cornuta* var. *californica*, does not appear to be susceptible to this disease.

### Control methods

An integrated approach using several cultural and chemical techniques is needed to control this disease adequately. Scouting for cankers is very useful, since early detection aids overall control efforts.

### Cultural

1. Replace susceptible pollinizers with resistant pollinizers. For example, replace 'Daviana' in 'Barcelona' orchards with 'Hall's Giant' or one of the VR series.
2. Remove or destroy escaped seedlings and trees beyond the perimeter of your orchard.

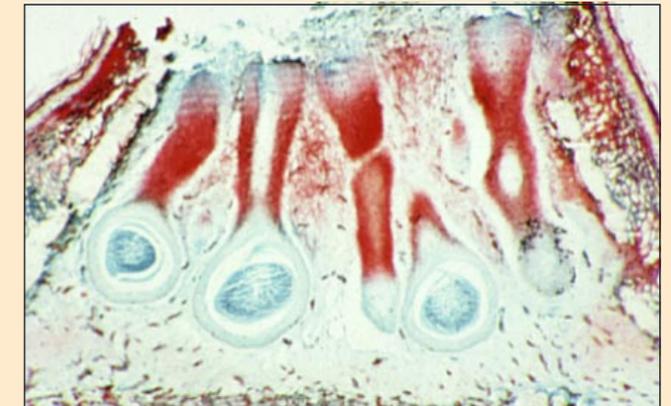


Figure 4.—In this enlarged cross-section, you can see the flask-shaped perithecia.

3. Remove infected branches at least 3 feet below the cankered area and burn or bury them before bud break in the spring. Severely infected trees should be removed.
4. Start sucker control early in the season.
5. In the southern Willamette Valley, growers should inspect orchards once in late summer and again in the dormant season.

### Chemical

You may need to make three to four applications to protect trees adequately. Make applications starting at budswell to budbreak, and continue at 2-week intervals until early May. Thorough coverage of all branches is essential. Each row should be sprayed. Since EFB kills trees slowly, the yield benefits obtained from fungicidal protection are not realized for 3 to 6 years after application.

Products that contain various forms of copper, chlorothalonil, fenarimol, or propiconazole have been shown to be effective against this disease. Many other fungicides are useful but may not be registered. Check the *PNW Plant Disease Control Handbook* for current information on products registered for this disease.