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Fruit Diseases

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Apple Scab on Tree Fruit in the Home Orchard

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Apple scab is caused by a fungal pathogen (*Venturia inaequalis*), and can result in severe defoliation of apple trees if poorly managed. The disease negatively affects fruit size and quality (due to blemishes and poor ripening). Over time, repeated defoliation from the disease reduces tree vigor, growth, and yield.

Photo by Janna Beckerman

Figure 1. *Early apple scab lesion development on leaves.*

Photo by Janna Beckerman

Figure 2. *Characteristic lesions of apple scab on mature leaves.*

Symptoms

Apple scab produces lesions that are most commonly observed on leaves, but may also be seen on blossoms, sepals, petioles, pedicels, and fruit. On leaves, lesions first appear on the undersides of young leaves in the spring as they unfold and are exposed to infection. These young lesions have poorly defined margins, and can be mistaken for sooty mold, or even leaf "fuzz" (Figure 1). As leaves mature, the lesions become brown to olive-green spots (Figure 2). Infected leaves become yellow, then drop — a key symptom of apple scab (Figure 3).

Fruit lesions appear similar to leaf lesions (Figure 4), but as infected fruit matures, the lesions become brown and corky. These lesions are often smaller, have distinct borders, and enlarge more slowly than foliar lesions. Early season infection can cause uneven, cracked, or deformed fruit. Late summer fruit infections may not be visible until the fruit is in storage. Although unusual, fruit may drop if an infected pedicel becomes girdled.

Disease Cycle

During the winter and early spring, *V. inaequalis* produces small, black erumpent pustules on the fallen leaves that were infected the previous year. In the spring, wind and rain spread these spores to newly emerging growth on nearby trees, beginning a new infection cycle. When initial infections mature into lesions, the fungus produces another flush of spores that infect other leaves, fruit, and surrounding trees. These secondary infections usually occur repeatedly during wet periods throughout the growing season (Figure 5).

Photo by Janna Beckerman

Figure 3. *Yellow leaves characteristic of advanced apple scab.*

Photo by Janna Beckerman

Figure 4. *Early lesion development on a Honeycrisp apple. On fruit, maturing lesions often become corky, and crack.*

Management

Successful apple scab management requires an integrated approach that depends on the grower's goals. Such an approach combines resistant cultivars, good horticultural practices, sanitation, and fungicides. Growers must decide whether to manage their apples using natural fungicides (referred to as organic) or synthetic fungicides. Often, proper crop management precludes the need to manage the disease. Management will be much simpler for growers who choose scab-resistant varieties than for growers who choose scab-susceptible varieties.

Resistant Cultivars

Most major apple cultivars are susceptible to the fungus (see Purdue Extension publication BP-132-W, *Disease Susceptibility of Common Apple Cultivars* (www.ces.purdue.edu/extmedia/BP/BP-132-W.pdf) However, there are more than 25 scab-resistant cultivars, including Akane, Freedom, Goldrush, Jonafree, Liberty, Prima, and Redfree. Scab-resistant cultivars vary in susceptibility to other early-season diseases, and all are susceptible to summer diseases. Using scab-resistant cultivars is essential if growers wish to produce organically grown fruit, as most organic fungicides will not provide adequate control against this disease in most years.

Cultural Control

Disease can be minimized, or even prevented, by good horticultural practices. These practices include selecting sites that provide more than six hours of sunlight per day, spacing trees adequately, and following proper pruning practices to open the tree canopy.

Sanitation

Preventing fruiting body formation in fallen apple leaves is a key step in disease control. Unfortunately, removing all fallen leaves is impossible, even in a home orchard. Mulch mowing or flail mowing in late autumn to shred leaves, coupled with applications of 5 percent urea to autumn foliage can increase leaf decomposition, thereby reducing the amount of fungus that will survive the winter. Urea applications must be made just before, or immediately after, leaf fall to fallen leaves to avoid stimulating tree growth and predisposing the trees to winter injury.

Fungicides

On susceptible cultivars, apple scab is primarily managed through the application of fungicides. The most critical step of the infection process is the primary infection by ascospores (Figure 5). If 100 percent ascospore control could be achieved, no other fungicide applications to control scab would be needed.

Unfortunately, this level of control is rare. Instead, fungicide application must begin in early spring from apple green tip, and continue on a 7- to 10-day schedule (7 days during wet weather, 10 days if dry) until petal fall. If dry weather persists after petal fall, a 10- to 14-day spray schedule is adequate for scab control. Most of the fungicides labeled for home use are strictly protectants which provide a protective covering on the leaf surface, but are not absorbed by leaves, meaning reapplications are required after heavy rains to maintain their efficacy.

For maximum protection, apply fungicides just before a prolonged wet period occurs, not after, to prevent infection.

More information on chemical management is available in Purdue Extension publication ID-146, *Managing Pests in Home Fruit Plantings* (www.entm.purdue.edu/entomology/ext/targets/ID/ID146pdf/ID-146.pdf).

The following fungicides are available for apple scab control:

- Captan® 50 WP. Mix 2 tablespoons per gallon of water. Do not use with oils, lime, or alkaline materials. Captan® is the primary fungicide in most multi-purpose fruit sprays.
- Immunox® (active ingredient: myclobutanil). Mix 1 tablespoon per gallon of water. This systemic fungicide also provides good control of rust and powdery mildew.
- Wettable sulfur (92 percent). Mix 5 tablespoons per gallon of water. May injure certain apple cultivars. Do not use with oil. This product is organically acceptable, but provides the least control of the fungicides listed here.
- 3336 WSP (active ingredient: thiophanate-methyl). Mix 3 teaspoons per gallon of water. This is a systemic fungicide that also provides good control of powdery mildew.
- Mancozeb® WP or DF (also sold as Penncozeb®, Dithane DF®, and Manzate-200®). This product is primarily used by commercial growers, and quantities are not readily available for home use. It can be used by home orchardists if they follow label instructions. It may not be applied within 77 days of harvest on apples.

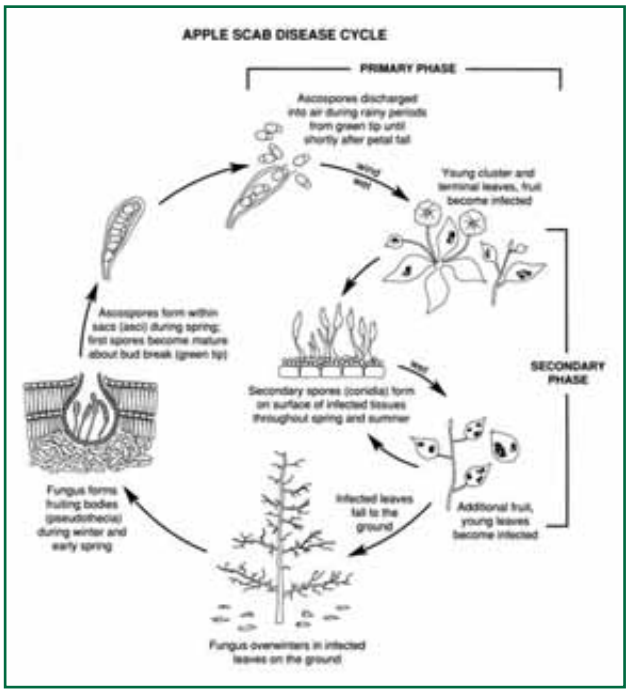

Diagram courtesy John Hartman, University of Kentucky.

Figure 5. Life cycle of the apple scab pathogen, *Venturia inaequalis*.

General purpose fruit sprays described as "home orchard spray," "all purpose fruit spray," "one package fruit spray," etc., may be used in place of the specific fungicides recommended above.

For the most current fungicide recommendations, see Purdue Extension Publication ID-168, *Commercial Tree Fruit Spray Guide* (www.extension.iastate.edu/Publications/PM1282.pdf). As always, refer to pesticide labels for directions on rate of use, method of application, and safety warnings.

Other Online Publications

M.A. Ellis, J. Chatfield, and E. Draper. 1997. *Scab of Apple and Crabapple*. The Ohio State University Extension Factsheet HYG-3003-94, http://ohioline.osu.edu/hyg-fact/3000/3003.html.

R.T. Bessin, P.S. McManus, G.R. Brown, and J.G. Strang, eds. *Midwest Tree Fruit Pest Management Handbook*. Purdue Extension Publication UKID-93, www.ca.uky.edu/agc/pubs/id/id93/id93.htm

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