

Bitter Rot of Apples

Michael A. Ellis

Department of Plant Pathology

Bitter rot is a common disease of apples and pears in practically all countries where they are commercially grown. Of the three fruit rot diseases on apple (bitter rot, white rot, and black rot), bitter rot has the potential to be the most destructive. The fungus that causes bitter rot (fruit rot) can also cause a leaf spot and canker, although the leaf spot and canker form of the disease are not common in Ohio. The disease is most common in warmer regions because high temperatures favor disease development. Before the development of effective fungicides, entire crops were lost to bitter rot during periods of warm, wet weather.

Symptoms

Fruit rot symptoms differ somewhat, depending on whether infection is initiated by spores from perithecial strains of the fungus (strains that produce ascospores and conidia) or conidial strains of the fungus (strains that produce only conidia). Initial symptoms produced by perithecial or conidial strains are similar. Lesions begin as small, slightly sunken areas, which are light brown to

dark brown (Figure 1). On mature fruit, lesions may be surrounded by a red halo.

Lesions originating from infections by conidial strains remain circular and become sunken as they enlarge (Figure 2). Copious quantities of ooze containing conidia (spores) are produced in fungal fruiting bodies called acervuli, which occur in concentric circles on rotted tissue around the point of infection. Acervuli are sparse on some lesions and very dense on others. Under moist, humid conditions, the spore masses appear creamy and are salmon to pink in color.

Lesions initiated by perithecial strains are usually not sunken and are often darker brown than those caused by conidial strains. Acervuli are widely scattered over the surface, and perithecia are found in dark brown to black clumps scattered on the surface.

Bitter rot lesions on all fruit (regardless of which strain caused infection) extend in a cone shaped manner toward the core. In cross section, the lesion appears “V” shaped (Figure 3). This is a reasonably reliable characteristic that can be used to separate bitter rot from white rot or black



Figure 1. Bitter rot on infected Golden Delicious fruit. This fruit was infected by the perithecial strain of the bitter rot fungus.



Figure 2. Fruit infected by the conidial strains of the bitter rot fungus.



Figure 3. Cross section of bitter rot infected fruit. Note the “V” shaped lesion. This characteristic distinguishes bitter rot from white rot and black rot.

rot. The rotten area is brown but much firmer than white rot. Infected fruit eventually mummify, and some may remain attached to the tree through the winter.

Leaf lesions are not common and are caused by the perithecial strain. They begin as small, red flecks, which enlarge to irregular brown spots 1/16 to 1/2 inch in diameter. Severely affected leaves may drop off the tree.

Bitter rot cankers are rare in the eastern United States. Cankers are oval, sunken, and often zonate in appearance.

Causal Organism and Disease Cycle

Bitter rot is caused by the fungus *Glomerella cingulata*. The fungus overwinters in apple orchards in dead wood or mummified fruit in the trees that were infected during the previous season. Conidia, produced in these overwintering sites, are the primary inoculum source in the spring, although ascospore inoculum is important in some orchards. Conidia are spread by splashing and wind-blown rain. Insects and birds are also involved in their dispersal. Ascospores are released after rain and are airborne. Fruit are susceptible to infection from 3 weeks after petal fall until harvest. Temperatures of 80 or 90 degrees F are most favorable for disease development. Because of the large number of conidia produced in lesions on fruit, the fungus has the potential for rapid spread within the orchard.

Control

Control of bitter rot is best achieved through an integrated program of cultural practices and chemical control measures.

1. Sanitation is critical for effective control. Piles of prunings are an important source of inoculum and should be removed from the perimeter of the orchard or burned. Prunings can be left on the orchard floor if they are chopped with a flail mower, which removes much of the bark and allows them to decompose faster.

Removal of mummified apples and pruning out dead wood in the tree are important for reducing the inoculum within the tree. Pruning out current-season shoots infected with fire blight is also important, because they can be colonized and serve as an inoculum source during the same growing season.

2. Any practice that helps to maintain trees in a healthy vigorous condition is critical for controlling the canker phase of the disease. Cankers generally develop only on stressed or weakened trees. Prune trees annually and maintain a balanced fertility program based on soil and foliar nutrient analysis. Cankers generally develop rapidly on winter-injured trees.
3. The use of fungicides combined with good sanitation is beneficial for controlling the fruit rot phase of the disease. Fungicides are not effective for controlling the canker phase of the disease on weakened trees. For the most current fungicide recommendations, commercial growers are referred to Bulletin 506-A2, *Midwest Commercial Tree Fruit Spray Guide*, and backyard growers are referred to Bulletin 780, *Controlling Diseases and Insects in Home Fruit Plantings*. Homeowners are encouraged to emphasize use of the previously described cultural practices in order to reduce or eliminate the need for fungicide use. These bulletins can be obtained from your county Extension educator or the Extension Publications Office, The Ohio State University, 216 Kottman Hall, 2021 Coffey Road, Columbus, OH 43210-1044.

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Keith L. Smith, Ph.D., Associate Vice President for Agricultural Administration and Director, Ohio State University Extension

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