

## White Rot

### *Botryosphaeria dothidea*

**I. Introduction:** The fungus causing white rot is ubiquitous in nature, occurring on a wide variety of woody plants including birch, chestnut, peach, and blueberry. White rot is often referred to as Botryosphaeria rot or Bot rot and is a serious pathogen of apple fruit and wood. Fruit rot infection is most common in areas of the southeastern U.S. where losses of up to 50 percent have been reported. The canker phase of the pathogen can also cause considerable loss in many regions of the south, midwest, and northeast. Drought stress and winter injury have also been associated with an increase in infection and canker expansion.

**II. Symptoms:** The white rot fungus only infects fruit and wood. New infections on twigs and limbs become evident in early summer and originate around lenticels, appearing as small, circular spots or blisters. As the lesions expand, the area becomes depressed and a watery exudate may appear on the bark around the blisters. In four to eight weeks, black fruiting structures can be observed within cankers. Cankers stop enlarging by late fall and are indistinguishable from black rot cankers (caused by *B. obtusa*), making isolation of the pathogen necessary for the correct identification of the causal organism. As the cankers progress, they exhibit a scaly, papery outer bark that is orange in color and often sloughs off (photo 2-35). Under favorable conditions for disease development, cankers will fuse and the girdling of large limbs can occur. The sudden appearance of bright yellow foliage on some apple limbs in late May to early June is one of the more striking symptoms of white rot and occurs when a canker associated with a wound girdles the limb.



Symptoms of fruit rot infection can be seen four to six weeks before harvest and depend on the developmental stage of the fruit. Lesions begin as small, slightly sunken brown spots that may be surrounded by a red halo. As the decayed area expands, the core becomes rotten and eventually the entire fruit rots. Black fruiting structures may be observed on the surface of the rotted fruit in advanced stages. Red-skinned apple cultivars may "bleach" during the decay process and become light brown in color. Because of this characteristic, the disease is sometimes referred to as "white rot." Decayed flesh associated with white rot is very soft and watery under warm conditions (photo 2-36). When fruit rot develops under cool conditions, however, the rotted area is much firmer and is very similar to black rot infection. On certain apple cultivars, even with these criteria, it is difficult to determine which fungus initiated the infection. Rotted fruit usually drop from the tree, but some will mummify and remain attached.



**III. Disease Cycle:** The disease cycle for white rot is almost identical to that of black rot. The host range of white rot is broad, but the role these other hosts play in the development of the disease in apples is not known. The white rot fungus overwinters in cankered wood, wood that had been previously killed by fire blight, dead bark, and in mummified fruit. Ascospores and conidia are produced on these structures throughout the growing season. The optimum temperature for germination of both spore types is 82 to 90 F (28-32 C), which can occur in as little as 90 minutes at 82 F (28 C). During wet periods, spores ooze out of fruiting structures and are dispersed by rainfall. Infection of wood can occur through lenticels and wounds. It has also been observed that moisture stress (drought) and winter injury facilitate canker development, especially on older limbs.

It is not known exactly when fruit infection occurs. Some theories propose that infection can occur anytime from the bloom period to harvest, while other theories state that fruit infection only occurs during the last six to eight weeks of the growing season, and that the degree of infection is dependent on the sugar content of fruit of individual cultivars. There are also differences in cultivar susceptibility to white rot infection. For fruit infection to occur, wounding is not necessary; however, when wounds are present, they are colonized rapidly by the fungus. Infection of wounded fruit can occur in as little as

two hours at 82 F (28 C); however, 16 hours of a wetting period is necessary for infection to occur at 46 F (8 C).

**IV. Monitoring:** Monitor each tree for cankers (photo 2-35). Cankers are a source of inoculum which can initiate leaf, fruit, and wood infections. Old fire blight cankers, winter-injured wood, and dead prunings left in the tree often serve as sources of inoculum. Remove cankered wood from the orchard or mulch the brush so that it decays over the period of a year. Inspect trees for apple mummies and remove them from the orchard if possible, since mummies remaining in the trees from the previous season can also serve as a source of inoculum.

During early midseason, observe 25 fruit on each sample tree. Fruit is most commonly infected (photo 2-36) at an injury, but infection can occur without the fruit being injured. Although there are some differences in fruit susceptibility among the varieties, all are susceptible. Where white rot has been a problem, observe 'Golden Delicious' trees for an early indication of the disease. Record the location of trees with an abundance of dead wood and cankers (photos 2-35) so these can be scheduled for intensive pruning during the dormant period.

**V. Management:** Both chemical and cultural control practices are employed to minimize white rot. The pruning and removal of all dead wood, including spurs, twigs, and branches, is essential because the fungus survives in these structures. Removing current season's fire blighted shoots is important because these are colonized rapidly by *B. dothidea*. Trees should be irrigated during periods of hot, dry weather to minimize drought stress which predisposes the tree to twig and branch infections. Cultivars do not vary greatly in their susceptibility to white rot, although Golden Delicious, Empire, and Jersey Mac appear more severely affected than others. A fungicide spray program from bloom through harvest is needed to protect against white rot infections.

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