PLANT DISEASE CONTROL NOTES
EXTENSION DIVISION ● VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

FRUIT DISEASES
APPLE ROTS AND THEIR CONTROL IN VIRGINIA

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C. R. Drake
Associate Professor of Plant Pathology and
Extension Specialist Plant Pathology

BLACK ROT (FROGEYE LEAF SPOT)

Black rot of apple caused by Physalospora obtusa occurs throughout the warmer regions of the world. The fungus attacks fruit, leaves, and limbs. The disease on the fruit has also been called "ring spot", and "blossom end rot". Infection of the fruit may occur from the time the fruit is initiated until harvest. Also, the fungus may cause postharvest decay. The disease first appears as a small brown spot any place on the surface of the fruit. Frequently, the black rot lesion occurs around the calyx end of the fruit; thus, the name, blossom end rot. The black rot infection develops slowly and complete decay of the fruit usually does not occur until the fruit is mature. As the rotted area enlarges, a series of concentric dark bands is formed in the decayed area, giving the name, ring rot (Figure 1). As the rot progresses, the decayed tissue is firm and leathery. Eventually the decayed fruit becomes shrunken and mummied. Finally, the rotted fruit turns black; hence, the common name, black rot.

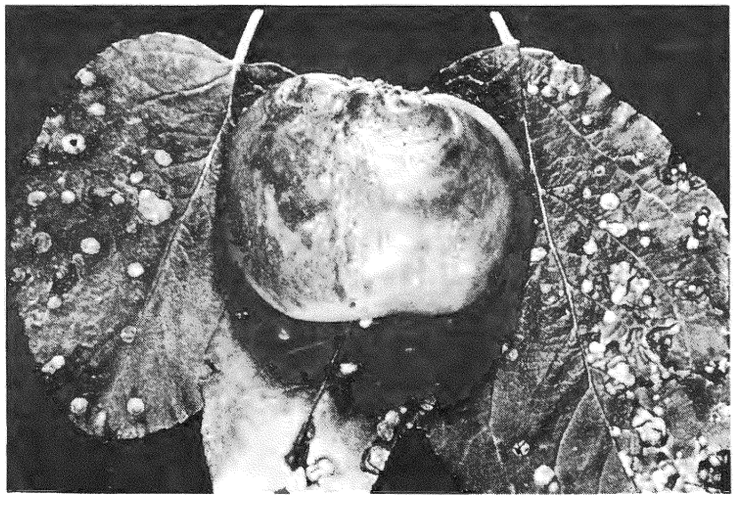

FIGURE 1. Black rot on apple and the "frogeye leaf spot stage" on the leaves.

Symptoms first appear on the leaves as small dark purplish spots. As the spots enlarge, they are irregularly shaped. The margins of the lesions retain their purple cast while the centers become brown or yellowish brown; thus, the popular common name, frogeye leaf spot. Fruiting bodies of the fungus may or may not form in the spot.

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BOTRYOSPHAERIA CANKER AND ROT OF APPLE

Botryosphaeria rot, commonly called white rot, may be confused with black rot or bitter rot. It can be distinguished from black rot in that the rotted flesh is cupped and soft, while the rotted flesh with black rot remains even with the healthy tissue and is firm and leathery. It can be distinguished from bitter rot in that no concentric rings of spores are produced on the decaying surface of the fruit.

The fungus, Botryosphaeria ribis, that causes Botryosphaeria rot of apples is widespread and attacks many host plants. It invades dead wood in apple trees; for example, old fire blighted twigs; and produces spore houses called pycnidia. The fungus also attacks living twigs, branches, and trunks of susceptible trees where it causes small depressed cankers. Pycnidia eventually form on the dead wood of the cankered area. During a rain storm, the spores ooze from the pycnidia and spread to developing fruit where they start a rot infection if weather conditions remain favorable. Fruit infection may occur from the time of initiation to harvest. The small lesions (rot infections) first appear as small, circular, brown spots surrounded by a conspicuous red area. The infections start slowly but progress rapidly as the fruit approaches maturity. The lesions on fruit of the redskinned varieties may bleach during the decaying process; thus, the disease has acquired the name "white rot". Completely rotted fruit exude droplets of a clear gummy fluid and eventually mummify. In addition, apples with no visible external lesions may break down rapidly after harvest. The origin or time of infection of the post-harvest rot is not clearly understood.

BITTER ROT

Bitter rot, caused by the fungus Glomerella cingulata, is occasionally a serious disease of apples in commercial orchards of Virginia. It is most serious during warm, moist summers. These conditions frequently exist in the eastern and southern sections of Virginia.

Bitter rot begins on the fruit as small, light brown spots just under the skin. These spots grow rapidly in warm, moist weather. Masses of spores are formed in pustules arranged in concentric rings on the surface of the spots (Figure 2). Rain disperses the spores to other fruit and branches

FIGURE 2. Different stages of bitter rot development.

below where they may start a new infection. The rotted fruit hangs on the tree and dries out. It is important that all mummied fruit and cankered branches be removed during the pruning operation, since they may supply inoculum for new infections. Bitter rot does not affect the leaves.

Black rot and bitter rot are frequently confused, but bitter rot is readily identified by the concentric ring of spore pustules in the center of the rotted area. Black rot does not begin to shrivel the fruit until rotting is complete, but bitter rot spots begin to sink as the rotting progresses.

RECOMMENDED CONTROL

Cultural Practices: Orchard sanitation is of major importance in controlling the apple rot diseases. Limbs and branches killed by fire blight are almost always invaded by the rot fungi, where they form inoculum that may cause an infection on the fruit and leaves. Thus, it is important that all dead wood be removed from the trees for a more effective control program. Further, trees should be pruned ("opened up") to allow spray and sunlight penetration.

FIGURE 3. *Dead branches left in the tree furnishes a source of inoculum to infect the developing fruit.*

Chemical: The correct application of one of the following fungicides at the proper time intervals will usually give satisfactory control of the rot diseases.

FOLPET: Use 2.0 lbs. folpet 50% WP per 100 gals. or 2 tablespoons for each gallon of spray. Apply 300 to 400 gals. of spray per acre or 5 to 8 gals. per tree, depending on tree size. Apply sprays from early pre-pink through petal-fall at 6-day intervals, and at 10-day to 2-week intervals through the rest of the growing season. The residue tolerance for folpet is 25 ppm.

CAUTION: Folpet has been reported to cause some injury to fruit finish when applied early in the season, and is therefore suggested principally for late cover applications. However, full-season usage may be necessary for maximum protection against the fruit rots. Golden Delicious is susceptible to early season spray injury, yet it frequently needs maximum protection against fruit rots.

OR

BENLATE + MANZATE 200: Use at the rate of 2.0 oz. benomyl (Benlate) 50% + 12.0 oz. Manzate 200 80% per 100 gals. Time of application and the number of gals/A, or/tree are the same as for folpet. There is a 21 day waiting period. Do not graze treated area. The residue tolerance for Benlate is 7.0 PPM and 7.0 PPM for Manzate. This combination is not registered for white rot.

OR

CAPTAN: Use at the rate of 2.0 lbs. captan 50% WP per 100 gals. or 2 tablespoons for each gallon of spray. Time of application and the number of gallons per acre or tree are the same as for folpet. The residue tolerance for captan is 25 ppm. CAUTION: Allow at least 4 days between an oil spray and the captan application.

OR

DIKAR: Use at the rate of 2.0 lbs. Dikar 80% WP per 100 gals. or 2 tablespoons for each gallon of spray. Time of application and the number of gallons per acre or tree are the same as for folpet. There is a 21-day waiting period for Dikar. Do not graze Dikar treated areas (Dikar=Dithane M-45 - Karathane). The residue tolerance for Dithane is 7.0 ppm and 0.1 ppm for Karathane. Dikar is not registered for white rot control, but if used for other rots, white rot usually will not be a problem.

OR

POLYRAM: Use at the rate of 2.0 lbs. Polyram 80% WP per 100 gals. or 2 tablespoons for each gallon of spray. Time of application and the number of gallons per acre or tree are the same as for folpet. There is a 15-day waiting period for Polyram. Do not graze Polyram treated areas. The residue tolerance for Polyram is 2.0 ppm.

OR

CAPTAN + ZINEB: (Late season application as described below). Use 1.0 lb. of captan 50% WP plus 1.0 lb. of zineb 75% WP per 100 gals. or 1 tablespoon of captan plus 1 tablespoon of zineb for each gallon of spray. Apply 300 to 400 gals. per acre or 5 to 8 gals. per tree (depending on tree size) in the late season cover sprays, from late July through August. The residue tolerance for captan is 25 ppm and 2 ppm for zineb. There is a 15-day waiting period for zineb.

CAUTION: Visible residues may persist from late application.

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KEYS TO PROPER USE OF PESTICIDES

1. **Read the label on each pesticide container before each use. Follow instructions to the letter; heed all cautions and warnings, and note precautions about residues.**
2. **Keep pesticides in the containers in which you bought them. Put them where children or animals cannot get to them, preferably under lock and away from food, feed, seed, or other material that may become harmful if contaminated.**
3. **Dispose of empty containers in the manner specified on the label.**

SEE YOUR DOCTOR IF SYMPTOMS OF ILLNESS OCCUR DURING OR AFTER USE OF PESTICIDES.