

Bot Canker — A Threat to the Apple Industry in the South

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A canker disease caused by *Botryosphaeria dothidea* (Bot canker) [Moug. ex Fr.] Ces & de not (syn. *B. ribis* Gross & Dug) has been isolated from apple wood and determined to be involved in the decline of apple trees in Georgia. Bot canker of apple was of relatively minor importance in the U. S. until 1952. The fungus was isolated from severely cankered apple trees in southwestern Indiana during 1952 and by mid-summer 1953, the loss of main scaffold limbs was severe (5). It was concluded that drought favored intense development of the disease. In 1956, Bot canker was diagnosed in New York state and winter injury was observed to precede the disease outbreak (4).

The lack of information available on the infectivity and control of *B. dothidea* of apple and the increasing disease incidence of Bot canker in Georgia led to a series of investigations. Studies were conducted to determine the mode of infection of *B. dothidea* on apple stems and the effectiveness of fungicides for control.

Conditions Favoring Disease Development:

Red and Golden Delicious cultivars are susceptible to canker injury. Golden Delicious scion on M7 root stocks were subjected to heat, cold and mechanical wounding then inoculated with the Bot canker fungus. Results confirmed that heat stress, cold injury and mechanical wounding individually increase disease susceptibility (Table 1). Pruning cuts were the first to show symptoms of infection and fungus sporulation. Cankers developed on the mechanically wounded, infected stems after two weeks. Mature fruiting bodies of the fungus were ob-

served at four weeks. Results indicate that although wounding is not necessary for fungus infection, it significantly increases the plants' susceptibility (2).

Moisture stress is the primary factor involved in disease incidence of non-wounded trees (3). The fungus is able to infect the tree through lenticles and does not move into the cortex until moisture stress is applied. This may account for the increased incidence in Bot canker since 1977. Ideal temperatures for fungus development and sporulation are 29-30C. High humidity is a key factor involved in infection. Infection can occur on pruned stems four hours following inoculation provided all requirements such as humidity and temperature are provided.

Symptoms:

Small, circular, discolored areas on the stems are the first symptoms of Bot canker expressed by the host (Figure 1). These areas become depressed and often crack rupturing the epidermis and exude a watery substance. A reddish, papery outer covering of the

Table 1. Effect of wounding on the susceptibility of apple trees to *Botryosphaeria dothidea*.

Type wound ^a	Percent cankered ^b	Canker size in mm ^c
Heat	56	35.30
Cold	100	65.10
Cut	100	133.25
Non-wound	12	3.5

^aPlants inoculated 30 minutes after wounding by atomizing 2×10^4 conidia per ml of sterile distilled water.

^bPercent of 80 trees inoculated plants over an 8 week period in the greenhouse.

^cMean canker size of the cankered trees of each treatment samples over an 8 week period.

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Fig. 1. Initial symptoms of Bot canker on apple trunk.



Fig. 2. Improper pruning provides an entrance for the Bot canker fungus.

bark peels back and fungus fruiting structures, pycnidia, may be observed on the bark. Cankers can be found at any location in the tree. Most cankers are associated with improperly pruned limbs where jagged cuts were made or stubs were left to decay (Figure 2).

Botryosphaeria dothidea also causes a fruit rot — white rot or Bot rot (1). Fruit rot infection can result in two types of symptom expression depending on the stage of development the fruit is in at the time of infection. The entire apple fruit may become soft, take on a light brown color and retain its shape (Figure 3). If the fruit is dropped, it will fall completely apart. The second type symptom of fruit rot

infection results in small, brown, circular spots similar to, but more cup-shaped than, bitter rot. Fruit infection may occur six weeks before harvest or about mid-July.

Disease Management:

Chemical control studies indicate that benomyl at 100 ppm will control *B. dothidea* in vitro. Cankered trees in four Georgia apple orchards were surveyed and sampled. Active cankers on half the trees were sprayed with 2.4 g/l (2 lbs./100 gals.) 50% wettable powder (WP) formulation of benomyl to run-off. Sampling was conducted every two weeks on the same cankers and either sprayed with benomyl or

left to develop as controls. Ten weeks following the initiation of the spray program, *B. dothidea* could not be isolated from any of the cankers that were sprayed with benomyl throughout the study. All nonsprayed control cankers were still active.

Fruit infections can result from leaving dead wood in the tree. The fungus can reproduce on the dead wood and spores are either carried by water or fall on fruit developing on the tree. Pruning out the dead wood during the growing season will help reduce disease incidence.

Conclusion

Bot canker is a real threat to the Southern apple industry. Recognizing the symptoms and conditions which favor disease development are important keys to control. If you don't have a Bot canker problem, beware. With emphasis on summer pruning following harvest, it is important to follow pruning with an application of benomyl 50% WP at 1 lb./100 gals. to protect pruning cuts from fungus infection prior to callousing. July and August are generally very active times for fungus sporulation. To clean up old cankers, five applications of benomyl 50% WP at 2 lbs./100 gals. concentration applied two weeks apart on the trunks and scaffold limb area has been shown to satisfactorily clean up active cankers. Pruning out dead or dying plant material, and disposing of properly, is as important as chemical application. This will remove much of the inoculum which presently exists in southern apple orchards. Bot canker has caused extensive injury in some apple orchards in Georgia. Recognizing disease symptoms and knowing what management practices discourage disease development can help deter disease development in your orchard.

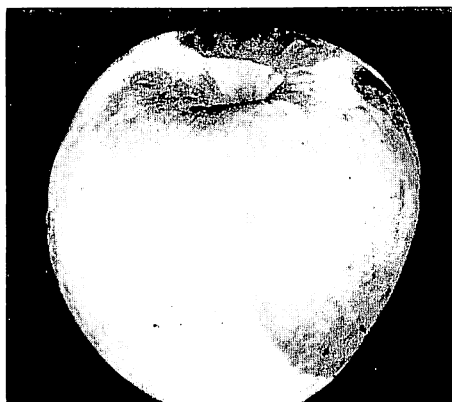


Fig. 3. The fruit rot phase of Bot canker.

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