Cankers and Decay in Red Oaks caused by Fomes robustus

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Paper No. 6324, Scientific Journal Series, Institute of Agriculture, University of Minnesota. Supported in part by McIntire Stennis funds.

ABSTRACT

Cankers caused by *Fomes robustus* were found in 0.4 – 33% of the red oaks in 80 locations in Crow Wing and Clearwater Counties, Minnesota. The average incidence was 4.3%. The cankers were associated with branch stubs and mechanical wounds in the main stem, from 0.3 – 5.2 m aboveground. The ages of infected trees averaged 47 yr (range 20-84 yr). Average age at time of infection was 29 yr and the youngest tree was 7 yr old when infected. The decay was essentially limited to the sapwood and heartwood behind the canker. In 32 trees, the average length of decayed wood was 92.7 cm and volume averaged 448.5 cm^3. Five trees without sporocarps had an average volume of decay of 51.6 cm^3 and those with sporocarps, 521.9 cm^3.

Phytopathology 64:1148-1149

Although *Fomes robustus* Karst. has been known in Minnesota for many years, it was not until 1966 that we became aware of how common this fungus is on the red oaks of northern Minnesota. Lowe (3) reported *F. robustus* on angiosperms and occasionally on gymnosperms throughout the United States, in Quebec, British Columbia, Alaska, and in tropical America; apparently the species is worldwide in distribution. *F. robustus* occurs commonly on oaks in Europe. Baxter reported heart rot caused by *F. robustus* in a plantation of red oak, *Quercus borealis maxima,* (= *Q. rubra* L.) in Michigan (1).

The object of this study was to determine the incidence of *F. robustus* in natural stands of red oaks in Minnesota and the amount of decay present in these trees.

MATERIALS AND METHODS.—The data in this report were collected in three separate studies during 1967, 1968, and 1969. In 1967, 30 plots, each 20 × 20 m, were established at random in stands of red oak, primarily northern red oak, *Q. rubra,* in Clearwater and Crow Wing Counties. In 1967, 43 infected trees were sectioned transversely at the midpoint of the canker and at both 50 cm above and below this midpoint to determine age of infections and extent of decay.

In 1968, living red oaks, with and without cankers, were counted in 50 random locations in Crow Wing County. The trees tallied were within a distance of 3 m of an arbitrarily selected compass line and a total of 9,210 trees were examined. None of these trees was sectioned. In 1969, 32 cankered trees were sectioned longitudinally. In all three studies, the type of wound which might have served as a point of entry for the fungus was noted.

RESULTS.—The incidence of oaks with cankers in the 30 plots established in 1967 ranged from 2.6 to 33%, and the average was 13%. The infected trees ranged from 9.9 to 35.6 cm (average, 21.8 cm) in diam at a height of 1.4 m; the ages ranged from 20 to 84 yr (average, 48.3); and the number of years *F. robustus* was present in the tree ranged from 6 to 28 yr (average, 17.5). The incidence of oaks with cankers in the 50 plots (9,210 total trees) established in 1968 ranged from 0.4 to 20.4%, and the average was 3.8%. Cankers caused by *F. robustus* have been found in areas other than those covered by these studies: apparently the disease occurs over much of the range of red oaks in Minnesota. The highest incidence thus far located, however, is in Crow Wing County.

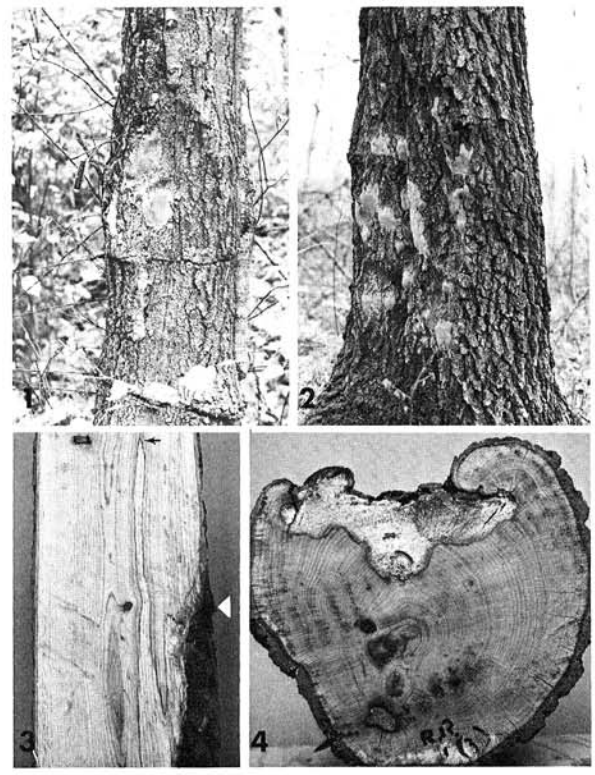

Fig. 1-4. Cankering of red oak [*Quercus borealis maxima* (=*Q. rubra* L.)] by *Fomes robustus*. **1, 2)** Cankers on living trees. **3, 4)** Longitidinal and cross-sectional views of the decay behind the cankers. The small arrow indicates furthest extent of decay above the canker and the larger arrow indicates upper end of canker.

Cankers were found only on the main stem of the 64 trees examined in 1967, ranging from 0.3 to 5.2 m aboveground, with an average height of 1.3 m to the midpoint of the canker (Fig. 1, 2). Also in our 1967 observations the fungus appeared to have entered through wounds, and many of the cankers faced trails, roads, or fence lines. The exact nature of the original wounds could not be determined in every case, but some wounds were produced by logging and fencing operations. In the 32 trees sectioned in 1969, a branch stub was present in the center of every canker.

When the 1967 and 1969 data were combined, the average age of the infected trees was 47 yr, and the average age of the trees when first invaded was 29 yr. The youngest tree at time of infection was 7 yr old. Although the trees

were infected over a range of ages, from 7 to 53 yr, a number of cankers in any one stand originated about the same time. For example, the infections in six of the seven cankered trees in one stand were 16-18 yr old, and the seventh infection was 10 yr old.

Cankers on the 32 trees sectioned in 1969 ranged 12.7 to 91.4 cm, and the average was 37.2 cm. In Itasca Park (Clearwater County), where cutting of trees is restricted, the largest canker was 1.5 m in length. As reported previously (2) the decayed portion of the tree is essentially centered behind the canker (Fig. 3, 4). The average length of the decay column was 92.7 cm and the average length of the cankers 37.2 cm. Thus the decay averaged 27.8 cm in each direction beyond the cankers. In the 43 trees sectioned in 1967, the amount of decayed wood at the midpoint of the canker ranged from 4.1 - 74.6% of the cross section of the tree and the average was 25.5%. Little, if any, decay occurred 50 cm beyond the midpoint of the 24 cankers which at their midpoint had less than 22% of the cross section decayed. In the 19 trees with more than 22% decay at the midpoint of the canker, the average decay at 50 cm above was 20.3% and 50 cm below 16.3%.

The average volume of decay in the 32 trees sectioned in 1969 was 448.4 cm^3, and the range was 29.8 to 2,300.2 cm^3. These trees averaged 19.8 cm in diam at 1.4 m aboveground and 44 yr of age. The maximum amount of loss, usually confined to the first 2.4-m (8 ft) section of the tree was less than 3%. Sporocarps were not formed on five cankers with an average amount of decay of 51.6 cm^3 as compared to 27 cankers with sporocarps which had an average volume of decay amounting to 521.9 cm^3. The five trees without sporocarps had been infected for 7-16 yr. In Russia, Skemyakin reports sporocarps develop in 2-9 yr, depending on age and size of tree (4).

DISCUSSION.—Apparently red oaks are susceptible to infection by *F. robustus* over most of their life span from an early age of about 7 yr. The amount of decay varies greatly though there is some relationship of volume of decay with size of canker. Cankers with no sporocarps have less decay than those with sporocarps. Although no mortality was found as a result of *F. robustus* and the volume of decay was not more than 3% of the butt log, infected trees are poor risks and should be eliminated where feasible to do so.

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