

First Report of *Verticicladiella procera* on Pines in Minnesota

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ABSTRACT

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Verticicladiella procera was isolated from diffuse black streaking in roots of eastern white pine (*Pinus strobus*), red pine (*P. resinosa*), and for the first time from Austrian pine (*P. nigra*). The fungus appears to be no threat to trees growing on good sites in Minnesota.

Verticicladiella procera Kendrick, the cause of white pine root decline (1), has not been reported in Minnesota. The principal host of the fungus is eastern white pine (*Pinus strobus* L.) (1,5,8,10). Other recorded hosts include *P. resinosa* Ait. (8,10), *P. banksiana* Lamb. (3), *P. taeda* (5), *P. contorta*, *P. ponderosa*, and *Pseudotsuga menziesii* (6). This paper reports the occurrence of *V. procera* in association with other diseases and insects on pine in Minnesota.

MATERIALS AND METHODS

The eastern white pine trees examined in the study were located at the Cloquet Forestry Center (Carlton County, MN), University of Minnesota College of Forestry. The total basal area for the stand was 25.3 m²/ha. The living white pine component of the stand was 21.6 m²/ha, with the remaining basal area consisting of red pine and jack pine (*P.*

banksiana). In the 3-ha stand, thirteen white pine had crowns with yellow or bright red needles, probably dying within the previous year. The basal area of these trees was 0.15 m²/ha, 0.7% of the basal area of living white pine. The diameters at breast height (DBH) of the living and dead white pine were 26.3 and 20.6 cm, respectively. The average age at DBH of the live pine was 40.4 yr, and the average height was 21.5 m. The site index for the stand is 18 m for 50 yr (2), a good site for growing eastern white pine (9).

Five of the recently killed white pine, randomly selected, were cut and the boles examined for white pine blister rust (*Cronartium ribicola* J. C. Fischer ex Rabh.) and insects. The root collar and the proximal 1 m of the primary roots were exposed and examined for diseases and insects. Chips of wood from roots with discolored wood were placed in petri dishes with 2% malt agar and incubated at room temperature.

Isolations were also made from discolored roots of two dying eastern white pine and three red pine (*P. resinosa*) in Washington County and two Austrian pine (*P. nigra* Arnold) in Sherburne County. The red pine were on a poorly drained site, and the Austrian pine and eastern white pine were on hillsides. The crowns and boles of these trees were examined for other diseases and insects.

RESULTS

Verticicladiella procera was associated with diffuse black streaking in roots on four of five trees sampled in the Cloquet stand. Successful isolations only resulted from taking wood chips at least 1 cm below the root surface. *Armillariella mellea* (Vahl) Karst. mycelial fans and rhizomorphs were found on all five trees. White pine blister rust cankers girdled the stems at the base of the crown on all five trees. Weevils (*Pissodes* spp.; Coleoptera: Curculionidae) had colonized the roots on four trees from which *V. procera* was isolated. Adult *Pissodes* were emerging from three trees. In the fourth tree, *Pissodes* adults were laying eggs. In the stems of all five trees were larvae of roundheaded borers (Coleoptera: Cerambycidae). Galleries and emerging adults of *Ips* species (Coleoptera: Scolytidae) were found on two trees.

Verticicladiella procera was isolated from roots of the two eastern white pine in Washington County, one of the red pine, and one of the Austrian pine. *Pissodes* spp. and a brown cubical decay were also found in the eastern white pine roots. The needles of the Austrian pine were heavily infected with *Dothistroma pini* Hulb., and *Ips* spp. were found in the boles of the Austrian pine and red pine.

DISCUSSION

In the Cloquet stand, *V. procera* was associated with different symptoms and host characteristics than previously described (1,8,10). The white pine were older (61 vs. 3-20 yr) and did not have basal cankers with the dark stained, resinous wood characteristically found with the fungus in other areas. Eastern white pine with *V. procera* and basal cankers are usually associated with

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poorly drained sites, whereas our isolations of *V. procera* were from white pine growing on a good site. In the situation reported here, however, the trees were suffering from other problems. White pine blister rust probably predisposed the trees to attack by *A. mellea*, *V. procera*, and the insects. This relationship of blister rust, *A. mellea*, *Verticicladiella* sp., and insects was similar to one described for western white pine (*Pinus monticola*) (4).

Despite the presence of the various pathogens in the Cloquet stand, eastern white pine was growing well. The stand has good stocking (7) and has lost less than 1% of the total eastern white pine basal area in the past year.

Verticicladiella procera was found on eastern white pine in two distant locations in Minnesota, and it is probably

widely distributed. This pathogen appears to pose no threat to trees growing on good sites. On poor sites, *V. procera* may become a problem as it has in other states. The presence of this pathogen on red pine and Austrian pine appears to be of little significance in Minnesota. As far as we are aware, this is the first record of *V. procera* on Austrian pine. This host was infected with *D. pini* and attacked by *Ips*, which probably contributed to the death of the tree.

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