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Problem: Pine Wilt - *Bursaphelenchus xylophilus* (pinewood nematode)

Host: Most serious on Scots pine in Kansas. Pine Wilt also been reported on Austrian and white pines.

Description:

The pine wilt disease was identified for the first time in the United States in Columbia, Missouri in 1979. This initial report was followed by confirmation of pine wilt in southeast Kansas also during 1979. Since the first report, nematode assays have located the pinewood nematode in much of the eastern third of Kansas indicating a westward movement is occurring. In Kansas, the pinewood nematode has been found in Scots pine, Austrian, and occasionally white pine. It is considered to be a potentially serious problem Scots pine trees in landscape settings, windbreaks, Christmas tree farms, and recreational plantings.

In Kansas, the symptoms for pine wilt usually appear from August through December. In general, the trees wilt and die rapidly within a short period of time. Occasionally, trees may survive for more than one year. The needles turn yellow/brown and remain attached to the tree. The early stages of the disease are subtle and may vary. The pinewood nematode is transmitted from pine to pine by a bark beetle, the pine sawyer (*Monochamus carolinensis*).

Three to four weeks following infestation by the pinewood nematode, transpiration of the foliage decreases and resin production is reduced. Needles initially show a light grayish-green discoloration, then turn yellow and brown. The disease may progress

uniformly through a tree or branch by branch, depending upon the size of the tree and the environmental conditions during the growing season. The needles remain attached for up to six to twelve months after the tree has died. The rapid death of a tree contrasts with other pine problems such as fungal diseases, insects, or environmental stresses.

In addition to rapid wilting and yellowing of the foliage, another important symptom is reduced resin production. When branches of a healthy tree are cut, a thick, sticky resin will be produced at the site of the wound; on a diseased tree, resin may be absent. Branches and twigs become brittle and dry and will break easily. Trees yellow from winter burn may appear similar but will have flexible branches and good resin production.

Life Cycle:
The life cycle of the insect vector and the pinewood nematode are closely associated. The pine sawyers are wood borers. In May or June, adult pine sawyers emerge from pine trees and fly to new trees and feed under the bark of young pine shoots. If the beetle is carrying the pinewood nematode, the tree may become infested with nematodes. As the adults feed on the new hosts, nematodes move from under the beetles' wing covers to the pine and enter the tree through feeding wounds. Once in the tree, nematode populations build up rapidly and block the resin canals. Within 4 to 5 weeks, the nematode has spread throughout the tree and there is a marked reduction in resin flow and transpiration. Trees start showing initial signs of a wilt condition, including needle discoloration. Trees infested with the pinewood nematode usually die within 3 months.

Eggs are laid on trees that are already stressed; either by the nematodes or some other cause. Larvae develop beneath the bark and within woody tissue of dying trees and recently cut logs. The larvae produce somewhat oval shaped galleries filled with shredded wood. Newly formed adults emerge late in the spring and fly to new trees.

After the tree dies, nematodes continue to reproduce for several months while they feed on fungi that invade the dead trees, principally blue stain fungi. As the wood dries, the nematode switches from a reproductive phase to a dispersal phase. As spring approaches, as many as 100,000 nematode larvae enter the trachea of each newly formed adult beetle just prior to their emergence. The nematode larvae are transported to new trees by the pine sawyer adults, where the disease cycle starts over.

Recommendations:
It is important to confirm the presence of the pinewood nematode *(Bursaphelenchus xylophilus*) if pine wilt is suspected to be the cause of a tree death. Early confirmation will allow the owner to act quickly to prevent the spread of the pinewood nematode to nearby pine trees. An adequate sample for nematode assay is either a branch sample, at least two inches in diameter, collected near the trunk of the tree, or a wedge of wood from the lower portion of the trunk. The best time to sample is late summer/early fall due to high nematode populations. Pinewood samples should be

placed in a plastic bag as soon as collected and mailed early in the week, preferably by Wednesday. Pine samples can be sent through the County Extension office or mailed directly to the Plant Disease Diagnostic Lab. There is a $12.50 fee for the test. Additional county fees will be an additional charge.

Plant Disease Diagnostic Lab
Throckmorton Hall Rm 4032
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In established pine plantings such as landscape settings, windbreaks, and Christmas tree farms, the only control measure is to remove affected trees and burn, bury or chip the wood before May 1. Trees should be removed to ground level. No stumps should be left. This prevents further spread of the nematode and its vector before they emerge from the trees in the spring.

The pine sawyer bark beetles are attracted to stressed trees so, plantings should be kept from stress situations by controlling diseases and insects as well as providing water during extended dry periods. Consider planting less susceptible Austrian or Ponderosa pines or deciduous trees in areas where pine wilt has been a serious problem.

References:

Pine Diseases In Kansas: Tip Blight, Dothistroma Needle Blight, and Pine, K-State Research and Extension, publication L-722.

Last Update: 8/5/2009

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