Evidence of Pine Wilt Disease in Connecticut

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INTRODUCTION

The pinewood nematode, *Bursaphelenchus xylophilus* (STEINER and BUHRER, 1934) NICKLE, 1970, is the causal agent of pine wilt disease in Japan and in the United States7). The pinewood nematode is known to occur in more than 34 states, including Connecticut9). On September 23 and 26, 1991, I observed and diagnosed the disease in four species of dead pine trees in New Haven County, Connecticut. In this report, I present evidence relating pine wilt disease symptoms to the presence of pinewood nematode and feeding and oviposition wounds of the vector beetle of Cerambycidae.

MATERIALS AND METHODS

*Japanese black pine in Madison.*

On September 23, 1991, I examined a recently dead Japanese black pines (*Pinus thunbergii* PARL.) which was planted for the coastal dune fixation (Fig. 1). There were several stumps around the dead pine. These stumps were remains of the pine trees which had died and had been cut in 1991.

*Scotch pine and eastern white pine in Hamden.*

On September 26, 1991, I observed two recently killed Scotch pine trees (*P. sylvestris* L.) (Fig. 2) and a dying eastern white pine (*P. strobus* L.). There were other dead Scotch pine trees at the site which had died within the past two years.
Austrian pine in New Haven.

I observed a recently dead Austrian pine (P. nigra Arnold) in a residential property in New Haven on September 26, 1991 (Fig. 3).

Methods.

To detect the pinewood nematode, I sampled the four recently dead and one dying pine tree of four species at three sites (Table 1). Several branches from each pine tree were cut into small pieces. Additionally, xylem chips from an auger hole were collected from four trees at the height of 1.2 m. Nematodes were extracted from the small pieces of branches and the xylem chips of stem by the Baermann funnel method, that is, both were wrapped in a thin paper and submerged in water in a funnel. After 24 hours under the ambient conditions in the laboratory of the Connecticut Agricultural Experiment Station, the water in the stem of the funnel was drawn and examined with a microscope. Nematodes extracted into the water were photographed for identification. In addition, the stem of each pine was examined after 24 hours for oleoresin exudation from an auger hole.

On cut branches, the twigs were examined for maturation feeding wounds by the adult Cerambycid beetles. At the same time, the stem of each tree was examined for oviposition scars.

RESULTS AND DISCUSSION

The presence of pinewood nematode and evidence of beetle activity are given in Table 2. Pinewood nematodes were detected from four dead pine trees of three species, that is, Japanese black pine, Scotch pine and Austrian pine.

It is well known that these three species are susceptible to the pinewood nematode

<table>
<thead>
<tr>
<th>No.</th>
<th>Common name</th>
<th>Scientific name</th>
<th>Locality</th>
<th>DBH (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Japanese black pine</td>
<td>Pinus thunbergii PARL.</td>
<td>Madison</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>Scotch pine</td>
<td>Pinus sylvestris L.</td>
<td>Hamden</td>
<td>37.1</td>
</tr>
<tr>
<td>3</td>
<td>Scotch pine</td>
<td>Pinus sylvestris L.</td>
<td>Hamden</td>
<td>40.4</td>
</tr>
<tr>
<td>4</td>
<td>Eastern white pine</td>
<td>Pinus strobus L.</td>
<td>Hamden</td>
<td>20.7</td>
</tr>
<tr>
<td>5</td>
<td>Austrian pine</td>
<td>Pinus nigra Arnold</td>
<td>New Haven</td>
<td>57.6</td>
</tr>
</tbody>
</table>

Scotch pine and Austrian pine were the pine species on which the pinewood nematode was first reported from Missouri in the United States in 1979. In Japan the pinewood nematode has caused high mortality of Japanese black pine.

Nematode was not detected from eastern white pine (Table 2). The cause of the mortality was not clear. Although this species was regarded as resistant or low resistant to the pinewood nematode, it is sometimes killed by the nematode.

In Japan the pinewood nematode is transmitted to the pine trees by the Japanese pine sawyer, Monochamus alternatus Hope. The pinewood nematode enters the vascular tissue from the wounds of the healthy pine twigs which are made by the beetle. In the United States, the pinewood nematode has been recovered from adult beetles of M. carolinensis Oliver, M. scutellatus Say, M. titillator Fabricius etc. I observed wounds on the twigs of four pine species caused by maturation feeding by adult Cerambycid beetles.

Table 1. Investigated pine trees.

Table 2. Detection of the pinewood nematode, feeding wounds on pine twigs and oviposition scars on the stem by adult Cerambycid beetles in four pine species.

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Extraction of nematode</th>
<th>Oleoresin flow</th>
<th>Wounds on twigs</th>
<th>Oviposition scars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Branch</td>
<td>Stem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Japanese Black pine</td>
<td>+</td>
<td>x</td>
<td>+</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>Scotch pine</td>
<td>+</td>
<td>--</td>
<td>--</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Scotch pine</td>
<td>--</td>
<td>+</td>
<td>--</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Eastern White pine</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Austrian pine</td>
<td>+</td>
<td>+</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

+: Present, -: Absent, x: No observation
The principal vector was not determined in Connecticut.

Adults of the Monochamus beetles lay eggs successfully on the stem of the pines recently killed by the nematodes (Table 2, Fig. 4). I also observed oviposition scars on the stem of three species (Table 2, Fig. 5), suggesting that the Monochamus beetles were developing under the bark.

ACKNOWLEDGMENT

I thank Dr. K. FUTAI, Kyoto University, for his valuable suggestions and his identification of the pine-wood nematode. I also thank Drs. M. S. MCCLURE and G. R. STEPHENS, the Connecticut Agricultural Experiment Station, for their kind help during the field work and their valuable suggestions.

LITERATURE CITED

7) MAMIYA, Y. and N. ENDA (1972) Nematologica 18, 159-162.

Accepted for publication: August 5, 1992.
和文摘要
アメリカ・コネチカット州のマツの材線虫病

柴田 叡文

1991年秋にコネチカット州の公園や海岸の砂防林で見られた枯れマツから、マツノザイセンチュウ（*Bursaphelenchus xylophilus*）を検出した。検出したのは日本のクロマツ（*Pinus thunbergii*）、スコッチパイン（*Pinus sylvestris*）およびオーストリアンパイン（*Pinus nigra*）の3種類であった。これらの枯れマツの枝には*Monochamus*属のカミキリムシの食痕観が、また幹には産卵痕がみられた。