Cylindrocladium scoparium Morgan — A New Pathogen of some Forest Tree Species in Peninsular Malaysia

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Key words: Cylindrocladium scoparium Morgan; pathogen; forest tree species.

Introduction

In May 1980, a species of Cylindrocladium was one of several fungi isolated from freshly collected seeds of Shorea talura Roxb. obtained from the arboretum of the Forest Research Institute, Kepong, Selangor. Subsequently the same fungus was isolated from seeds of Maesopsis eminii Engl. Musizi and Horsfeldia sp. obtained from the arboretum of the Forest Research Institute and Sungei Buluh, Selangor, respectively. Isolates were identified by the Commonwealth Mycological Institute, Kew, England, as Cylindrocladium scoparium Morgan (Herb. IMI No. 251124).

C. scoparium is a new record in West Malaysia (Lee, 1981) although C. quinqucseptatum Boedijn and Rietema (Anon., 1970), C. pteridis Wolf. (Ivory, 1973) and an unconfirmed species (Hong, 1976) have been recorded from this area.

C. scoparium is a widely distributed pathogen of many species of plants including trees in all major continents (Browne, 1968; Thies, 1969; Bakshi, 1972; Hodges and May, 1972; Peerally, 1973). It incites diseases, such as, leaf spots, root rots, stem lesions, damping-off of seedlings and dieback of older trees (Browne, 1968). This paper reports the potential pathogenicity of this organism to some forest tree species in Peninsular Malaysia.

Materials and Methods

Unfortunately seedlings of the tree species from which C. scoparium had been isolated were not available hence pathogenicity was assessed on the following:

1. Pinus caribaea Mor. – 10 months old.
2. Shorea acuminata Dyer – 5 months old.
3. Dipterocarpus grandiflorus Blanco – 5 months old.
4. Scaphium sp. – 5 months old.

Inoculum for leaf pathogenicity tests was prepared by adding 10 ml of sterile distilled water to a 14-day-old culture of the fungus growing on potato dextrose agar and agitating the surface with a sterile needle. The resulting spore suspension was serially diluted with sterile distilled water.

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Key to authors' names: S.S. Lee and A.A. Manap.
The test plants were watered from overhead three hours before inoculation. The spore suspension was sprayed on the seedling leaves in the evening when the temperature was lower in the greenhouse and the plants enclosed in polythene bags to maintain high humidity. The control seedlings were sprayed with sterile distilled water and kept under identical conditions. Following inoculation the plants were kept in the greenhouse where the temperature over 24 hrs. varied from 22 to 34°C. During the hottest parts of the day (noon to 2 p.m.), the polythene bags were sprayed with water to reduce the temperature. The bags were removed after 3 days and the plants were examined daily thereafter for the development of symptoms.

The pathogenicity of Cylindrocladium scoparium was tested also by wound inoculation of the stems of the seedlings. A 14-day-old culture growing on potato dextrose agar was cut into small pieces (about 1 mm²) to produce inoculum. The stem of the seedling was first wiped with alcohol and a vertical cut (about 1 cm) made in the bark at about 4 cm above the collar. A small piece of inoculum was then placed beneath a flap of bark, the point of inoculation covered with sterile damp cotton wool and wrapped with cello tape. Ten seedlings each of S. acuminata, D. grandiflorus and Scaphium sp. were inoculated. The controls were inoculated with small pieces of sterile potato dextrose agar. The seedlings were kept under cover in the nursery and after one week of incubation, observed daily for the development of symptoms.

RESULTS

Regardless of the method of inoculation disease symptoms did not develop on seedlings of Scaphium sp. or S. acuminata even after two months (Table 1). However with the two higher levels of spray inoculum, lesions developed on the leaves and petioles (in one case) of D. grandiflorus after two weeks. The lesions were 0.5-2 mm in diameter, irregularly circular and reddish-brown in colour. The infected leaves progressively wilted from the tip towards the base and abscised. C. scoparium was isolated from the lesions. Pinus caribaea seedlings also developed symptoms of needle blight one week after spray inoculation. The needles initially became chlorotic, wilted and finally turned a reddish-brown colour. Affected needles abscissed. C. scoparium sporulated on some of the affected needles and the fungus was reisolated from such needles when incubated on malt extract agar after surface sterilization.

Following wound inoculation, three of the ten seedlings of D. grandiflorus exhibited wilting of the lower leaves after one month. Later the wilting progressed basipetally in the individual leaves and acropetally in the shoots. While the fungus was not observed sporulating on the aerial parts of the seedlings, C. scoparium was isolated from excised pieces of stem (about one cm above the original wound) of the wilted seedlings. The controls remained healthy and pieces of stem did not yield any microorganisms.

DISCUSSION

Under the conditions of the experiment D. grandiflorus and P. caribaea were susceptible but Scaphium sp. and S. acuminata were resistant to disease induction by C. scoparium. In Eucalyptus sp. in West Malaysia Cylindrocladium species not recorded) has been associated with symptoms similar to those recorded in this experiment (Hong, pers. comm.)

These results are a new record for C. scoparium as a pathogen of some forest tree species in West Malaysia and they suggest that it may have a wide host range. In the United States, C. scoparium has long been associated with disease in forest tree nurseries (Graves, 1915; Cox, 1954 cited in Thies, 1969; Bugbee and Anderson, 1963), and has caused serious losses of conifer seedlings in the Wisconsin State Forestry nurseries (Thies, 1969). Anderson et al., (1962) reported that C. scoparium caused root rot in seedlings of twelve of thirteen conifer species tested in Minnesota, while Browne (1968) indicated that C. scoparium is parasitic on both angiosperms and gymnosperms. In Brazil, this fungus is a common agent of root rot and damping-off on seedlings of Eucalyptus spp. in many areas (Hodges & May, 1972). C. scoparium is also known to cause large scale mortality in eucalypt seedlings in Argentina, Java and Japan (Spaulding, 1961) and to a smaller extent in India (Bakshi et al., 1972).

Little is known about the susceptibility of forest tree species in Peninsular Malaysia to C. scoparium. The present results which demonstrate the susceptibility of some forest tree species in this country, justify further surveys and investigations into the host range and impact of C. scoparium in Malaysian natural forests and forest tree nurseries.

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## TABLE 1
Pathogenicity of *Cylindrocladium scoparium* to seedlings of four tree species following spray inoculation of leaves and wound inoculation of stems

<table>
<thead>
<tr>
<th>Tree species</th>
<th>Inoculum</th>
<th>No. of seedlings</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Scaphium</em> sp.</td>
<td>Spray inoculum (x 10^4 spores/ml)</td>
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<tr>
<td></td>
<td>5.2</td>
<td>5</td>
<td>No effects after 2 months</td>
</tr>
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<td></td>
<td>8.8</td>
<td>5</td>
<td></td>
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<tr>
<td></td>
<td>10.3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wound inoculum</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><em>Dipterocarpus grandiflorus</em></td>
<td>Spray inoculum (x 10^4 spores/ml)</td>
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<td></td>
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<tr>
<td></td>
<td>5.2</td>
<td>5</td>
<td>No effects after 2 months</td>
</tr>
<tr>
<td></td>
<td>8.8</td>
<td>5</td>
<td>Lesions on petiole and leaves of 1 plant after 2 weeks</td>
</tr>
<tr>
<td></td>
<td>10.3</td>
<td>5</td>
<td>Lesions on leaves on 2 plants after 2 weeks</td>
</tr>
<tr>
<td></td>
<td>Wound inoculum</td>
<td>10</td>
<td>Wilting of lower leaves in 3 plants after 1 month, 1 plant subsequently died</td>
</tr>
<tr>
<td><em>Shorea acuminata</em></td>
<td>Spray inoculum (x 10^4 spores/ml)</td>
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<td></td>
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<tr>
<td></td>
<td>5.2</td>
<td>5</td>
<td>No effects after 2 months</td>
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<td></td>
<td>8.8</td>
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<tr>
<td></td>
<td>10.3</td>
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<tr>
<td></td>
<td>Wound inoculum</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><em>Pinus caribaea</em></td>
<td>Spray inoculum (x 10^4 spores/ml)</td>
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<tr>
<td></td>
<td>5.2</td>
<td>5</td>
<td>Browning foliage on 2 plants after 1 week</td>
</tr>
<tr>
<td></td>
<td>10.3</td>
<td>5</td>
<td>Browning foliage on 4 plants after 1 week</td>
</tr>
<tr>
<td></td>
<td>Wound inoculum</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><em>Scaphium</em> sp.</td>
<td>Control spray inoculum (distilled water)</td>
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<tr>
<td><em>S. acuminata</em></td>
<td></td>
<td>5</td>
<td>No effects after 2 months</td>
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<tr>
<td><em>D. grandiflorus</em></td>
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<td></td>
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<tr>
<td><em>P. caribaea</em></td>
<td>Wound inoculum (sterile piece of agar)</td>
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**REFERENCES**


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