

CYLINDROCLADIUM LEAF ROT OF CLOVE

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## ABSTRACT

Cylindrocladium quinquiseptatum causes a leaf rot and leaf spot disease of clove. The disease was observed for the first time in India on leaves of seedlings as well as mature trees, and was very severe on the seedlings. The fungal isolate was pathogenic to other myrtaceaceous hosts, namely, Eugenia jambolana, Pimenta dioica, Eucalyptus grandis, E. maculata, and E. globulus.

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Clove (Eugenia caryophyllus) is cultivated in the States of Kerala and Tamil Nadu in India, for the unopened and dried flower buds which comprise the clove of commerce. During a survey of clove plantations in different parts of Kerala and Tamil Nadu, the authors observed a severe leaf spot-leaf rot disease in seedlings and bearing trees of clove. The disease was severe during July-September, the period coinciding with the south-west monsoon, but occurred in a mild form throughout the year. The preliminary investigations are reported here.

Symptoms: During the early stage of infection, minute water-soaked spots appeared all over the leaf. The spots later became necrotic with a chlorotic halo. Mature lesions were about 1-3 mm in diameter, and occasionally had a clear whitish center. In most cases, after coalescence the marginal lesions progressed inward, exhibiting typical leaf-rot symptoms. Rotting also appeared from the leaf tip downward, exhibiting a "tip burn" symptom, which occasionally involved half of the lamina (Fig. 1). Under conditions of high humidity, the necrotic areas often showed faint whitish, powdery sporulating masses, mostly on the lower side of the leaf. Leaf rot caused rapid defoliation. Spread of disease in nurseries was rapid during damp weather with intermittent rain. In severe cases, complete defoliation and subsequent death of seedlings occurred. In mature trees severely affected branches remained bare because of heavy defoliation.

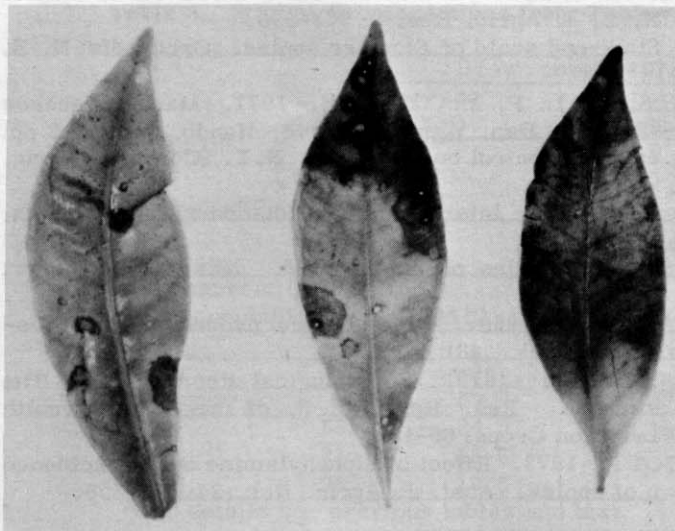


FIGURE 1. Cylindrocladium-infected clove leaves showing leaf rot and leaf spot symptoms.

## MATERIALS AND METHODS

Minute leaf spots and advancing margins of the necrotic areas were cut out, surface sterilized with 1 : 1000 mercuric chloride solution for 2 minutes, and washed six times in sterile water. The tissues were plated on potato-sucrose agar (PSA). Infected leaves were washed in sterile water and incubated in humid petri plates, to induce sporulation. The sporulating mass of conidiophores picked up from these leaves was used for measurement of spores. A dilute spore suspension prepared from a 1-week-old culture grown on PSA was applied on the lower surface of leaves of 6-month-old clove seedlings in clay pots. Immediately after inoculation, the plants were individually covered with moist polythene bags and incubated in shade at 26° C-30° C. Host range of the pathogen was tested on Eugenia jambolana, Pimenta dioica, Eucalyptus grandis, E. maculata, and E. globulus.

## RESULTS AND DISCUSSION

A fungus was isolated consistently on PSA. A fresh sub-culture on PSA showed light brown and fast-growing upright hyphae. Eight-day-old mature colonies of the fungus showed dark brownish zones alternating with light brown to yellowish zones radiating from the center. The outer border was always dull white, subtended by a narrow yellowish zone. Light brown to cream-colored aerial mycelium which later turned brown appeared uniformly over the entire colony in the beginning, but later zonate patterns appeared. The reverse side of a petri plate with a mature colony showed the zonate pattern clearly. Secretion of brown pigment was noted in the solid and liquid media. Sporulation was abundant on PSA as compared with oats agar medium. Formation of sclerotia-like bodies was seen in the older cultures. The conidiophores were upright, septate, occurring in masses, often on the lower surface of the leaves, arising laterally from a stipe. They ranged from 110-484  $\mu\text{m}$  in height and 4.7-9.5  $\mu\text{m}$  in width at the base. The primary branches measured 11.9-28.5 x 2.3-4.7  $\mu\text{m}$  and secondary branches 11.9-14.2 x 2.3-4.7  $\mu\text{m}$ . Tertiary branches were rarely seen. Each branch had 2-4 phialides measuring 9.5-23.8 x 2.3-4.7  $\mu\text{m}$  ultimately giving off conidia. The main axis of conidiophores became sterile threads 187-473  $\mu\text{m}$  in height, which terminated in a club-shaped structure 2.3-4.6  $\mu\text{m}$  in width. The conidia often appeared glued together in masses and were cylindrical, measuring 59.5-107.1 x 4.7-7.14  $\mu\text{m}$  with 3-5 septa. Conidia with 4-5 septa were seen more frequently, and mature spores were strictly five-septate (Fig. 2). Some abnormal spores had inflated tips and also intercalary and terminal dead cells. Spores germinated within 4-5 hours in free water on glass slides incubated in humid petri plates at 28-30° C. Germination was seen both from polar and intercalary cells. Based on the above morphological features, the fungus was identified as Cylindrocladium quinqueseptatum Boedijn & Reitsma. Gloeosporium sp. was also isolated from the affected areas, but it was found to be nonpathogenic.

Inoculated plants exhibited the first symptom of water-soaked leaf spots in about 48 hours. Leaf rot symptoms were noticed after 4-6 days, and sporulation occurred on the affected patches 6-8 days after inoculation, depending upon climatic conditions. In Eugenia jambolana and Pimenta dioica, the initial symptoms started as minute water-soaked spots which later coalesced to form tan-colored necrotic patches exhibiting typical leaf rot symptoms. In the three species of Eucalyptus tested, however, the spots were circular, tan to brown, and depressed, with a clear chlorotic halo and light-colored center.

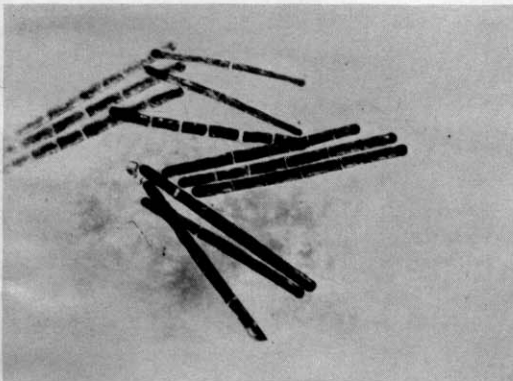


FIGURE 2. Conidia of Cylindrocladium quinqueseptatum with five septa.

Cylindrocladium quinquiseptatum was reported on leaves of clove seedlings at Tjiomas, near Bogor in 1941 in Indonesia (1). In India, this fungus was reported on E. grandis and 10 other species of Eucalyptus, causing severe foliar damage in forest plantations in Kerala (3, 4). Calonectria quinqueseptata Figueiredo & Namekata has been reported as the perfect state of C. quinquiseptatum, on Eucalyptus in Brazil (2). Cylindrocladium heptaseptatum sp. nov., which differs from C. pteridis and C. quinquiseptatum in having seven-septate conidia (5), was recently reported on fronds of Polystichum adiantiforme from Honduras. This is the first record in India of leaf-rot disease of clove caused by C. quinquiseptatum. A comparative study of the isolates of this fungus from clove and Eucalyptus and the nature of survival of the fungus are warranted.

#### Literature Cited

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#### CORRECTIONS

REPORTER, March 1978 issue (Volume 62, Number 3). Page 230.

In Table 1, change the boxhead of the last column from "% Disease excluding to read: "% Disease excluding < 1-inch-high plants" < 12-inch-high plants. "

REPORTER, Index 1977 (Volume 61, Number 13). Page 1111.

In the left column under "Rice (Oryza sativa): "change the first entry from: "bacterial leaf blight: reported in the U.S., 644" to read: "bacterial leaf blight: reported in America, 644." Although bacterial leaf blight has been reported from Mexico, Central America, and South America, it has not been reported from the United States. The Reporter regrets the error.