A FORM OF CERCOSPORA APII PATHOGENIC TO LEAVES OF CLERODENDRUM SPP

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INTRODUCTION

A serious leaf spotting disease of Clerodendrum thomsoniae Balf. (glory bower) was observed in a Sanford, Florida, nursery in December 1962. All of approximately 500 plants in the same enclosure under plastic exhibited from 2-30 lesions per leaf, and some plants were severely defoliated as an apparent result of infection. Examination revealed a species of Cercospora with hyaline acicular conidia fruiting abundantly on both surfaces of the lesions. Since the initial collection, more than 60 additional specimens of Clerodendrum spp., C. fragrans R. Br., C. indicum Kuntz., C. speciosum D'Ombrain, and C. thomsoniae have been examined from nurseries and landscape plantings throughout the state. In each case, a Cercospora with hyaline acicular conidia was associated with the leaf lesions.

According to Chupp (1), four species of Cercospora are known to occur on leaves of species of Clerodendrum. These include Cercospora bakeri H. & P. Syd., C. clerodendri Miyake, C. kashotoensis Yamamota, and C. volkameriae Speg. Three of the species have pale to medium olivaceous, obclavate or cylindric conidia and the other has hyaline to subhyaline, cylindric conidia. None of these species fit the description of the Florida Cercospora, none are known to occur on species of Clerodendrum in the United States, and none have been reported on C. thomsoniae.

The objectives of this study were to determine if the Cercospora associated with leaves of Clerodendrum has been made (2).

SYMPTOMATOLOGY

Lesions on the leaves of Clerodendrum fragrans, C. speciosum, and C. thomsoniae were circular to subcircular, or occasionally irregular, 0.5-4 mm in diam, with depressed tan to light brown centers and reddish brown margins surrounded by a diffuse yellow halo (Fig. 1). Irregular, brown to dark brown lesions up to 10 mm in diam were frequently observed, but these were limited almost entirely to immature leaves.

Lesions on the leaves of C. indicum varied from red to reddish brown, circular to subcircular spots 0.5 mm in diam to subcircular to irregular lesions 5-10 mm in diam with depressed tan to gray centers and wide reddish brown margins.

MATERIALS AND METHODS

Three methods were used to inoculate test plants: i) conidia were transferred from leaves of diseased plants to the upper leaf surface of test plants that had been wetted with a solution containing one drop of Triton B-1956 (77% modified phthalic glyceryl alkyd resin) in 30 ml of water; ii) leaves of test plants were wetted with the solution previously described, and discs 2 mm in diam, of the appropriate fungus cut from the periphery of 14-day-old cultures on potato-dextrose agar (PDA) were placed on the upper leaf surface; and iii) test plants were positioned under 25 diseased plants suspended 24 inches above the greenhouse bench so that conidia of the pathogen could fall onto the leaves. Plants inoculated by the first and second methods were maintained in a mist chamber for 24 hr before and 48 hr after inoculation. The following plants were used in pathogenicity tests: Apium graveolens L. var. dulce DC. (celery), Brassica oleracea L. var. capitata L. (cabbage), Citrullus vulgaris Schrad. (watermelon), Clerodendrum indicum, C. speciosum, C. thomsoniae, Nicotiana tabacum L. (tobacco), Raphanus sativus L. (radish), Senecio confusus Britten (Mexican flame vine), S. cruentus DC.
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Fig. 1.—A leaf of Clerodendron thomsoniae with lesions caused by Cercospora apii f. sp. clerodendri.

plains were maintained with each type of inoculation.

Morphological characteristics of the Cercospora from Clerodendrum thomsoniae were compared with those of Cercospora apii from celery under two different environmental conditions. Cultural characteristics of the two species of Cercospora were compared on PDA.

RESULTS

Spore inoculations.—Leaves of Clerodendrum indicum, C. speciosum, and C. thomsoniae developed lesions 7-9 days after inoculation with the Cercospora from Clerodendrum. By the 20th day the fungus was fruiting on most of the lesions. Occasional lesions were also apparent on leaves of cabbage and radish plants. The fungus that developed from these lesions could not be distinguished from the Cercospora found originally on leaves of species of Clerodendrum. Leaves of the other test plants were unaffected by the fungus. Cercospora apii infected only leaves of celery.

Agar disc inoculation.—This method of inoculation was the least effective of the three used. Only occasional lesions developed on leaves of species of Clerodendrum and celery when inoculated with the Cercospora from Clerodendrum and C. apii, respectively. The leaves of all other plants were unaffected.

Natural infection.—This method was the most effective, although lesions appeared more slowly due to infection occurring at different times. Leaves of Clerodendrum indicum, C. speciosum, and C. thomsoniae and, to a lesser extent, those of cabbage and radish plants became infected with the Cercospora from Clerodendrum thomsoniae. Lesions caused by conidia of C. apii developed readily on celery. All other test plants were unaffected by the pathogens. Both forms were reisolated readily from their respective hosts.

THE PATHOGEN

Conidiophores arose in loose fascicles of 5-30 from stromata varying in size from a few dark brown cells to structures that measured up to 60 μ in diam. The number of conidiophores in each fascicle appeared to be approximately proportional to the size and number of cells in the stroma. Individual conidiophores were pale to
Conidiophores of *Cercospora apii* f. sp. *clerodendri*: A) from leaves of plants grown in partial sunlight outside the greenhouse, B) from leaves of plants grown in the greenhouse.

Medium olivaceous, 0-7 geniculate, with prominent conidal scars at irregular intervals, uniform in width to slightly tapered at the tips, multisepitate, rarely branched, uniform in color or slightly paler at the tips, and 40-180 x 3-6 μ (Fig. 2-A, B). Conidia were hyaline, acicular, straight to mostly curved, with 6-20 moderately distinct transverse septa, acute to subacute tips, subtruncate bases with a prominent spore scar, and 25-350 x 3-5.5 μ. Immature conidia were cylindric, with three to seven septa, and 39-72 x 3-5.5 μ. (Fig. 2-A). Secondary conidia were observed on obovate swellings at the tips of primary conidia, and on short secondary conidiophores that developed from the basal cell of primary conidia.

The *Cercospora* from *Clerodendrum* exhibited considerable variation depending on the environment in which it developed. Conidiophores on leaves exposed to sunlight and natural variations in temperature and relative humidity occurred in fascicles of 5-12. They were pale olivaceous and uniform in color, three to seven geniculate, frequently tapered at the tips, and 40-105 x 2.5-6 μ (Fig. 2-A). In the greenhouse where the relative humidity was consistently higher, with less sunlight and variation in temperature, conidiophores developed in fascicles of 10-30. They were darker but paler at the tips, uniform in width, 0-2 geniculate, and 75-180 x 3-6 μ (Fig. 2-B). Conidia from lesions on leaves of plants grown outside the greenhouse were 6-13 septate, 25-110 μ long, and were never observed to produce secondary conidia. Those from lesions that developed in the greenhouse exhibited up to 20 septations, were 65-350 μ long, and produced numerous secondary conidia.

Growth of the fungus in culture was typical of that exhibited by species of *Cercospora* with hyaline acicular conidia (3). Colonies were flat to slightly raised, light to medium gray, with orange to brown or black submerged growth, and with a light pink to orange pigment associated with the medium around the colony. Maximum growth occurred between 24 and 28 C, and colony diameters of 57-65 mm were obtained in 14 days on PDA.

When *C. apii* was compared morphologically with the *Cercospora* from *Clerodendrum* under the two environmental situations previously described, both were found to exhibit similar variations in the size and physical appearance of their conidia and conidiophores. After 14 days in culture on PDA, colonies of *C. apii* were es-
sentially of the same size, texture, and appearance and could not be distinguished from those of the pathogen.

**DISCUSSION**

The results of this study suggest that environment has an important effect on the morphology of two forms of *Cercospora apii*. This is particularly apparent when figures 2A and 2B are compared. Characteristics such as the presence or absence of a stroma, number and length of conidiophores, the shape of the conidiophore tip, the number of geniculations, and uniformity of width and color of conidiophores were found to be quite different in the two environments. Similar differences were apparent in the length of conidia, the number of septations, the configuration of the base and tip of conidia, and in the production of secondary conidia. Only two characteristics among those used consistently to describe hyaline acicular species of *Cercospora* appeared to be unchanged by environment. These were the acicular shape of mature conidia and the fact that the conidia were hyaline. The variability of these characteristics should not preclude their use in distinguishing between species of *Cercospora*. However, it is suggested that before such characteristics can be taxonomically useful, they must deviate significantly from the type species in varying environments, or they must exhibit stability under variations in environment.

In view of morphology indistinguishable from that of *C. apii*, but differences in pathogenicity, it is proposed that the name *Cercospora apii* Fres. f. sp. *clerodendri* be used to identify the pathogen of *Clerodendrum* spp.

**LITERATURE CITED**


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**LEAF SPOT OF ARACEAE CAUSED BY PSEUDOMONAS CICHORII (SWINGLE) STAPP**

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**ABSTRACT**

*Pseudomonas cichorii* has been known as a pathogen of escarole, cabbage, celery, and chrysanthemum for some time. Isolations from leaf spots on *Scindapsus* sp. yielded a pseudomonad which was identified as *P. cichorii*, further substantiating the wide host range of this pathogen. A number of plants belonging to the Araceae proved highly susceptible when inoculated with *P. cichorii*, whereas other members of this family showed varying degrees of susceptibility.

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**INTRODUCTION**

Among the most important plants grown as foliar ornamentals are those belonging to the family of the Araceae. They are usually grown in greenhouses under conditions of high humidity and high temperature, and are often crowded together on the benches. Such conditions are almost ideal for the development and the spread of pathogenic organisms.

Such plants are grown exclusively for their foliage; therefore, any spotting of the leaf surface mars the appearance of the plants and lowers their market value.

The following study reports on the isolation of a bacterium pathogenic to several genera of the Araceae.