



Figure 3.—Close-up of foliage on upright frames.

CERCOSPORA DISEASES OF LIGUSTRUM

E. K. SOBERS

Plant Pathologist

Division of Plant Industry

Florida Department of Agriculture

Gainesville

INTRODUCTION

Reports from the Division of Plant Industry files since 1954 show that approximately 60 percent of the leafspotting associated with *Ligustrum* spp. submitted for diagnosis was attributed to

three species of *Cercospora*. Although these diseases are considered to be of minor consequence, serious outbreaks occur with sufficient regularity to warrant a closer look at available information concerning the organisms involved.

Two of these species, *C. adusta* Heald & Wolf and *C. ligustri* Roum., have been reported on the leaves of several species of *Ligustrum*, but their pathogenicity, like the majority of the *Cercosporae*, has been assumed and never actually proven. The third species (identified as *C. lilacis*), and by far the most common on *L. japonicum* Thunb. and *L. lucidum* Ait. in Florida, is unreported and has apparently been mistaken frequently for one of the other species.

This paper is concerned with information relative to the comparative morphology of the three *Cercospora* species, the symptoms associated with their presence on *Ligustrum* leaves, and their status as pathogens.

MATERIALS AND METHODS

Two methods were used to inoculate leaves in pathogenicity studies: 1) Conidia were transferred directly from diseased lesions to the upper surface of leaves on test plants which had been wetted with a solution containing 1 drop of Triton-B in 30 ml of water. 2) Discs of each organism, approximately 2 mm diam, were cut from the periphery of 14-day-old cultures and placed on the upper leaf surfaces of the appropriate test plants. Leaves were wetted with the solution previously described before the discs were applied.

Twenty *L. japonicum* and 20 *L. lucidum* leaves, on individual plants, were inoculated on at least two occasions by each of the methods with *C. adusta*, *C. ligustri*, and *C. lilacis*. Large plastic bags were placed over the inoculated leaves, tied securely to prevent loss of moisture, and then removed after 48 hr. All plants were maintained in the greenhouse during the experiment.

The three *Cercospora* species were compared culturally on phytone-dextrose agar (PhDA) through 14 days of growth at 24°C. The same medium was used to prepare inoculum used in pathogenicity tests. Phytone-dextrose agar consisted of phytone (Baltimore Biological Laboratories), 15 g; dextrose, 15 g; yeast extract, 1 g; agar-agar, 17 g; and water to make 1 liter.

Morphological descriptions were made from fresh leaf materials collected in various parts of the state over a 30-month period. All morphological features and conidia and conidiophore sizes are based on a minimum of 500 observations or measurements.

CERCOSPORA ADUSTA Heald & Wolf

Occurrence.—This fungus was first described on leaves of *L. californicum* Hort. (*L. ovalifolium* Hassak.) in Texas (2), and is said by Chupp (1) to be distributed throughout the southern tier of states from Texas to Florida. *L. amurense* Carr., *L. japonicum*, *L. lucidum*, and *L. vulgare* L. are also listed as hosts (4). The occurrence of this fungus in Florida is far less frequent than the other two species. Laboratory files show only 23 collections of *C. adusta* since 1954, and five of

these collections were made during this investigation.

Symptomatology.—Heald and Wolf (2) describe the lesions as large brown to dark brown areas, gradually shading into the chlorotic tissue. The spots frequently extend from the tips downward, and from the margins inward, and are rarely found removed from the margins. Chupp (1) describes them as being circular to subcircular, 10-20 mm diam, with brown centers, and wide pale margins.

Lesions associated with *L. lucidum* leaves are circular to subcircular or irregular, 5-30 mm diam, with depressed brown centers, wide reddish purple to reddish brown margins, and are surrounded by a diffuse area of chlorotic tissue (Fig. 1-A). There are usually no more than 2-3 lesions per leaf, and these are found most frequently at the leaf tips or along their margins. Affected leaves are generally found toward the center or in well shaded portions of the plant. It is not unusual to find as few as 4-6 leaves with lesions on an entire plant.

Insects in various stages of development are frequently associated with leaf lesions. The significance of these occurrences are unknown and have not been investigated.

Pathogenicity studies.—*C. adusta* was found to be non-pathogenic to leaves of *L. japonicum* and *L. lucidum* on two occasions using two methods of inoculation. Typical lesions resulted, however, after inoculum was applied to leaves which were first wounded by needle punctures.

In view of these results and the frequent association of various insects with lesions of *Ligustrum* leaves, it is suggested that possible insect feeding might provide a means of entry for the fungus.

Morphology.—Conidiophores arise in spreading fascicles of 6-20 from small stromata consisting of a few dark brown cells. Conidiophores are pale to medium olivaceous brown, 0-4 geniculate, multiseptate, unbranched, uniform in width to slightly narrowed at subtruncate tips, spore scars prominent, and measure 35-250 X 4-6 μ .

Conidia hyaline, acicular, variously curved or undulate, multiseptate, bases truncate to subtruncate, tips subacute, and measure 40-375 X 2.5-5.5 μ . Secondary conidia were frequently observed on obovate swellings at the tips of some of the conidia. A prominent spore scar was apparent at the tip of each swelling when the secondary conidium was dislodged.

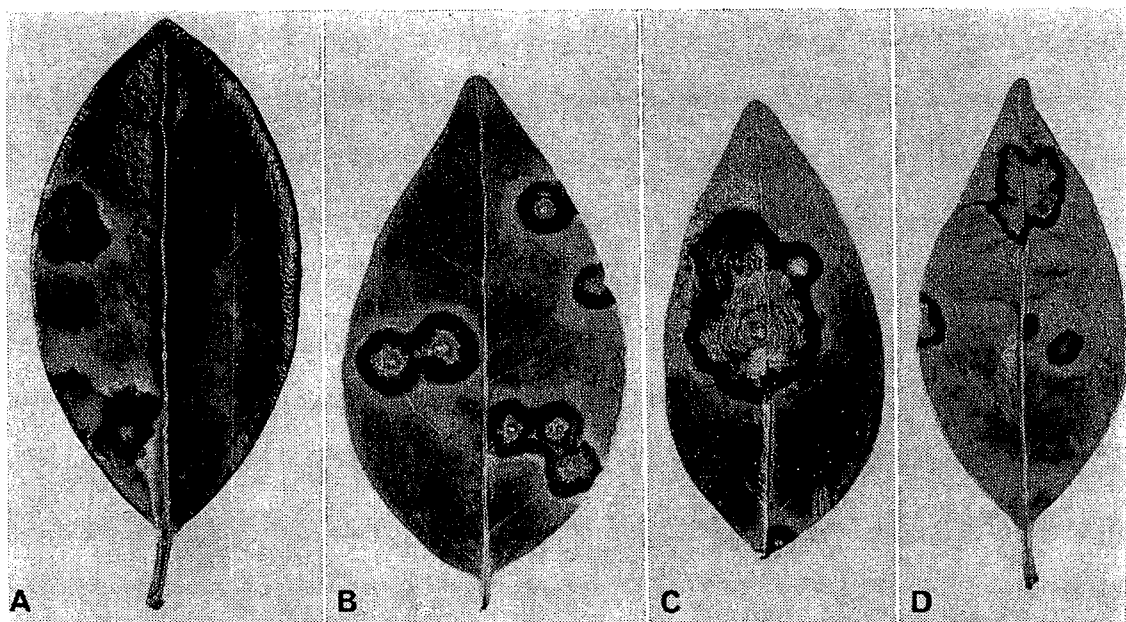


Figure 1.—Lesions on *L. lucidum* leaves caused by A) *Cercospora adusta* Heald & Wolf, B-C) *Cercospora ligustri* Roum., D) *Cercospora lilacis* (Desmaz.) Sacc.

Aerial growth on PhDA was flat, light to medium gray, and very light gray to white at the colony margins. Submerged growth was orange to brown or almost black in color. A faint red pigment was associated with the medium immediately surrounding the colony. The color disappeared, however, after 3-4 weeks.

CERCOSPORA LIGUSTRI Roumequere

Occurrence.—According to Saccardo (3), this species was first described on leaves of *L. lodense* Glogau in France. *L. amurense*, *L. japonicum*, *L. lucidum*, *L. ovalifolium*, and *L. vulgare* have been listed as hosts (4), and the fungus is said to be distributed along the gulf coast and in Japan (1, 4). Laboratory records indicate that *C. ligustri* occurs mostly along the east coast of Florida and in the Tampa area, and that it has been found on leaves of *Ligustrum* sp., *L. japonicum*, and *L. lucidum*.

Symptomatology.—Lesions on the leaves of *L. japonicum* and *L. lucidum* are circular, 5-15 mm diam, faintly zonate, depressed, centers tan to brown with darker brown flecks on the surface, and wide reddish purple margins (Fig. 1-B). When infection is severe several lesions may coalesce to form extensive necrotic areas (Fig.

1-C). A very slight, diffuse area of chlorosis surrounds most lesions.

Lesions found on the leaves of other species of *Ligustrum* are reported to be smaller (2-5 mm diam), and their centers are tan to gray in color (1).

Pathogenicity studies.—Small chlorotic spots appeared on the leaves of *L. japonicum* and *L. lucidum* plants 10-12 days after inoculation with spores or agar discs of *C. ligustri*, and fruiting structures of the fungus were evident after 2-3 weeks. Isolations from disease lesions yielded typical colonies of *C. ligustri*.

Morphology.—Stomata when present, may consist of several brown cells, or dark brown globular structures measuring 20-50 μ diam. Conidiophores single or in dense fascicles, pale olivaceous brown, 0-3 septate, uniform in width and color, unbranched, rarely once geniculate, tips bluntly rounded, and measure 25-70 X 4-6 μ . Conidia are subhyaline to pale olivaceous brown, cylindric, straight to slightly curved, 1-3 septate, base truncate to slightly rounded, tips bluntly rounded, and measure 35-110 X 3-6 μ .

Aerial growth is raised, margins smooth, and the color of the colonies is uniformly tan. Submerged growth is tan to light brown.

CERCOSPORA LILACIS (Desmaz.) Sacc.

Occurrence.—*Cercospora lilacis* (= *Exosporium lilacis* Desmaz.) was redescribed by Saccardo (3) in 1886. Chupp (1) lists *Syringa* sp., *S. vulgaris* L., and *S. persica* L. as hosts, and states that the fungus has been found in Belgium, Germany, central Russia, northern South America, Bermuda, and many of the southern states. The fungus is widely distributed in Florida and is the most common *Cercospora* associated with leafspotting of *Ligustrum* spp. grown in the state.

Symptomatology.—First symptoms appear as small light yellow areas. These enlarge slowly, becoming lemon-yellow to orange in color, and finally brown. Fully matured lesions are mostly irregular to circular, 5-30 mm diam, centers tan to dark-brown, with reddish brown to reddish purple margins of varying width (Fig. 1-D).

Pathogenicity studies.—*C. lilacis* is apparently less pathogenic to *L. japonicum* and *L. lucidum* leaves than *C. ligustri*. Infection on all occasions was approximately 20 percent of that obtained with *C. ligustri* under the same experimental conditions. Chlorotic spots developed in 10-14 days and fruiting structures of the fungus were apparent by the twentieth day. Typical colonies of *C. lilacis* were recovered by isolations from disease lesions.

Morphology.—Stromata dark brown, globular, and measure up to 60 μ diam. Conidiophores may arise from procumbent mycelia or in dense fascicles depending on the age of the lesions. Conidiophores are pale to medium olivaceous brown, uniform in color and width, multiseptate, unbranched, 0-3 geniculate, small spore scar at rounded tip, and measure 35-175 X 3-6 μ .

Conidia are subhyaline to very pale olivaceous brown, linear to narrowly obclavate, straight to curved, septate, bases subtruncate, tips subacute, and measure 30-160 X 2.5-4.5 μ .

Aerial growth is raised, medium olive gray, and the margins are smooth and regular. Submerged growth is very dark green to black.

Final identification of the *Cercospora* from *Ligustrum* was made after comparing the fungus with the type specimen and fresh material of *C. forestierae* West (5) from *Forestiera acuminata* (Michx.) Poir., and with fresh preparations of *C. lilacis* from *S. vulgaris*. Except for minor morphological differences involving characteristics which are subject to a great deal of variation, the *Cercospora* from *Ligustrum* spp. was identified as *C. lilacis*. It must be added, however, that there was an unmistakable morphological similarity between *C. forestierae* and *C. lilacis*.

DISTINGUISHING CHARACTERISTICS

The hyaline acicular conidia of *C. adusta* are easily distinguished from the pale olivaceous brown cylindric conidia exhibited by *C. ligustri*, and the pale olivaceous brown linear to obclavate conidia of *C. lilacis*. Cultural characteristics and comparative rates of growth may also be used to distinguish between the three species. Colonies of *C. adusta* are flat, grow approximately twice as large (56 mm diam) as those of *C. lilacis* (25 mm diam), and about three times the size of those produced by *C. ligustri* (16 mm diam) after 14 days growth at 24°C. Both *C. lilacis* and *C. ligustri* have raised colonies, but the aerial mycelia of *C. lilacis* is medium olive gray as compared to the tan aerial mycelia of *C. ligustri*.

LITERATURE CITED

1. Chupp, C. A monograph of the fungus genus *Cercospora*. Ithaca, New York, 667 p.
2. Heald, F. D., and F. A. Wolf. 1911. New species of Texas fungi. *Mycologia* 3:14.
3. Saccardo, P. A. 1886. *Sylloge Fungorum* 4:471.
4. U. S. Department of Agriculture. 1960. Index of plant diseases in the United States. Agr. Handbook No. 165. p. 319.
5. West, E. 1945. Notes on Florida fungi. III. *Mycologia* 37:76.