

Bougainvillea Blight, a New Disease Caused by *Phytophthora parasitica*

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ABSTRACT

A foliar blight of *Bougainvillea* was observed for the first time in 1968 in Fort Myers, Florida. Isolations from infected leaves and blossoms yielded *Phytophthora parasitica*, which was shown to be the causal agent of the foliar blight. Lesions occur as small, irregular, ashy-green hydrotic spots, usually starting at the tips and margins of the younger leaves. As the lesions enlarge and darken, the leaves become limp, blackened, and curled. Symptoms on floral bracts are tan lesions of collapsed tissue having a reticulate appearance. The fungus often invades the petiole and stems, resulting in blackened, drooping

Additional key words: varietal resistance, phycomycetes.

Phytophthora parasitica Dast. is a destructive pathogen known to have a host range which includes members of 72 genera in 42 families of flowering plants (5). Some of the more important hosts are tomato, *Lycopersicon esculentum* (3, 10, 12); citrus, *Citrus* spp. (2, 7); petunia, *Petunia hybrida* (8, 12); parsley, *Petroselinum crispum* (6, 10); papaya, *Carica papaya* (11); snapdragon, *Antirrhinum majus* (4); watermelon, *Citrullus vulgaris* (9); corn, *Zea mays* (13); carnation, *Dianthus caryophyllus*; pineapple, *Ananas comosus*; hibiscus, *Hibiscus rosa-sinensis*; and eggplant, *Solanum melongena* (10).

In the late summer of 1968, following a period of rainy weather in Fort Myers, Fla., *Bougainvillea* plants of the cultivar Barbara Karst in gallon cans located outdoors in a nursery were observed showing symptoms of foliage blight (1). Lesions occurred as small, irregular, dark green, hydrotic spots usually first seen at the tips and margins of the youngest leaves. Leaves which were wholly necrotic were flaccid, blackened, and curled. Older, mature leaves were not observed showing symptoms of blight. Some *Bougainvillea* plants of an unknown cultivar appeared free from infection, indicating some resistance among cultivars of *Bougainvillea*.

Repeated isolations from blighted leaves and stems of *Bougainvillea* consistently yielded *Phytophthora parasitica*. The culture was maintained on both potato-dextrose agar (PDA, extract of 200 g cooked potatoes, 20 g dextrose, 20 g Difco agar/liter) and hemp agar (HA, 40 ml hemp seed extract, 20 g Difco agar/liter), as most phycomycetous fungi grow well on either or both of these media. HA medium was found to be superior to PDA for sporangial production.

In view of the potential destructiveness of this disease, the purpose of this work was 4-fold: (i) to establish proof of pathogenicity of *P. parasitica* as a foliar-blighting fungus; (ii) to ascertain the relative level of

branch tips. Older, mature leaves were never infected, and appear to be immune. Two cultivars of tomato were susceptible and produced symptoms similar to those on *Bougainvillea*. Of the four *Bougainvillea* cultivars tested, Sanderiana (purple) was highly resistant; After Glow, moderately resistant; and Barbara Karst and Gold, highly susceptible. Daconil 2787 was most effective, captan moderately effective, and fixed basic copper sulfate (53% metallic) least effective in disease control. *Phytopathology* 60:1806-1808.

susceptibility among cultivars of *Bougainvillea*; (iii) to establish other possible hosts; and (iv) to determine the efficacy of three fungicides for disease control.

MATERIALS AND METHODS.—The test for pathogenicity of *P. parasitica* was conducted with the use of four cultivars of *Bougainvillea*: *Bougainvillea* × *butiana* Holtum & Standley 'After Glow', 'Barbara Karst', and 'Gold', and *B. glabra* Choisey & DC. 'Sanderiana' (purple). Potted seedling plants of tomato, *Lycopersicon esculentum* Mill. 'Manalucie' and 'Walter'; petunia, *Petunia hybrida* Vilm. 'Bingo Imperial' and 'Pink Satin'; and papaya, *Carica papaya* L. were also included to determine susceptibility of additional hosts. The selected test plants of *Bougainvillea* were well established in gallon containers, approx 2 ft tall, and in a vigorous state of growth. All test plants were placed in a humidity chamber 24 hr prior to inoculation.

The fungus inoculum was prepared from 16-day-old cultures grown on HA slants and blended for 30 sec in sterile tap water containing a pinch of Bentonite, a colloidal clay which aids in reducing metallic ion toxicity. The inoculum was filtered through four layers of cheesecloth in order to facilitate atomization onto the test plants.

Following 24 hr of predisposition in a humidity chamber, a group of each of the four cultivars of *Bougainvillea* plus the seedlings of tomato, petunia, and papaya were removed from the chamber and inoculated with a sporangial-mycelial preparation. A similar group of plants of each cultivar not receiving any inoculum served as controls. All plants were immediately returned to the humidity chamber. The temp within the humidity chamber ranged from 23-32 C, and relative humidity at 92% ± 5.

In a like manner, plants of each cultivar of *Bougainvillea* predisposed for 24 hr in a humidity chamber were sprayed until just before runoff with the following

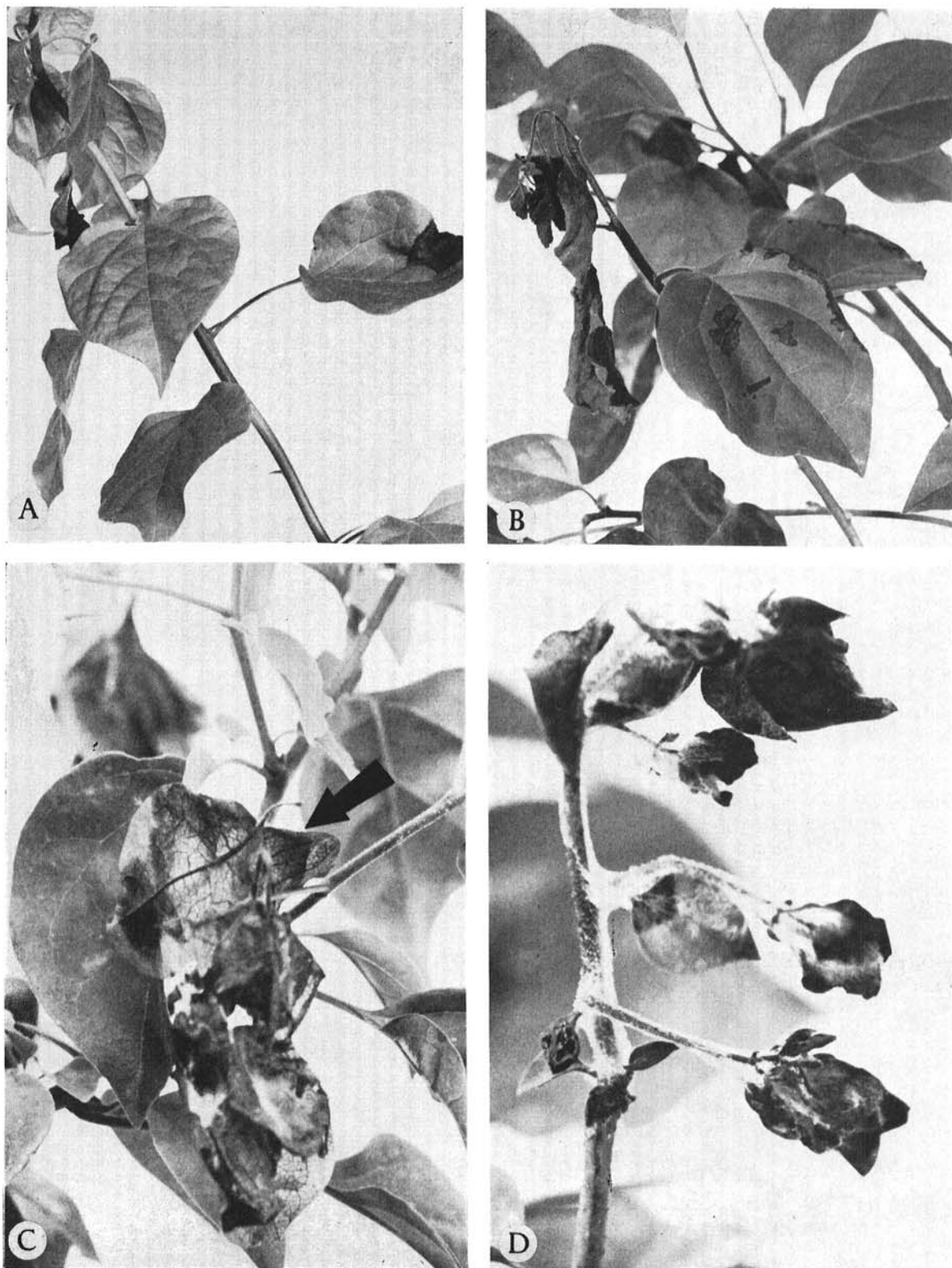


Fig. 1. Symptoms of *Bougainvillea* blight caused by *Phytophthora parasitica*: **A)** blackened leaf spot; **B)** leaf spots and completely blighted leaves and stem; **C)** infected floral bracts with a reticulate appearance; **D)** mycelial weft of *P. parasitica* on leaves, blossoms, and stem.

fungicides: captan [*N*-(trichloromethylthio)-4-cyclohexene-1,2-dicarboximide] 50% WP at the rate of 2 lb./100 gal (14); fixed basic copper sulfate (53% metallic) at the rate of 2 lb./100 gal; and Daconil 2787 (75% tetrachloroisophthalonitrile) at the rate of 1.5 lb./100 gal. The plants were allowed to dry, and were then inoculated with the fungus preparation as noted above. Plants of each cultivar not receiving any fungicide, but inoculated, served as controls. Following inoculation, the plants were returned immediately to the humidity chamber. The range of temp within the humidity chamber was 24-32 C. Relative humidity was 93% \pm 5.

RESULTS AND DISCUSSION.—In the test for pathogenicity, initial infection occurred on the younger leaves as early as 2 days, as small, ashy-green, irregular, hydrotic spots which usually started at the tip or margins of the leaves and later turned dark green or black (Fig. 1-A). Once infection was established, disease development was rapid. In 12 to 24 hr following initial infection, leaves became entirely necrotic, flaccid, blackened, and curled (Fig. 1-B). Floral bracts showed infection even sooner than young leaves. Symptoms occurred as tan necrotic lesions of collapsed tissue having a reticulate appearance (Fig. 1-C). Infection progressed along the petioles into young green stems, where the lesions appeared as slightly sunken brown linear spots progressing in both directions from the point of leaf attachment, and soon encompassing the entire stem which blackens, collapses, and droops (Fig. 1-B). Completely necrotic floral bracts, leaves, and petioles often displayed a delicate white web of mycelium of the fungus when such plants were kept under humid conditions (Fig. 1-D). Older, mature leaves never became infected.

Differences in amount of infection were manifest among the four cultivars of *Bougainvillea*. The quantity of infection determined by visual observation indicates that Sanderiana (purple) is highly resistant; After Glow, moderately resistant; and Barbara Karst and Gold, highly susceptible. A limited amount of infection (less than 1%) occurred on the Sanderiana (purple) cultivar as indicated by the appearance of a single infected young unfolding leaf. After Glow had a limited number of leaf lesions (approx 5% foliage blight), and progressive disease development was not very rapid, whereas Barbara Karst and Gold had the greatest number of lesions (approx 30% foliage blight) which enlarged rapidly.

Seedling tomato plants developed lesions on the leaves and petioles in 4 days. Symptoms were very similar to those produced on *Bougainvillea*, and not unlike those of late blight. The lesions on the leaves were irregular and ashy-gray initially, enlarged rapidly,

and became dark green to black. Infected leaves drooped and became curled and distorted. The plants succumbed in 7 days. The inoculated papaya and petunia plants developed no symptoms, and did not appear to be susceptible to the *Bougainvillea* isolate.

Of the three fungicides tested for control of the foliar blight of *Bougainvillea*, Daconil 2787 was most effective, providing almost complete protection except for three small lesions on the most susceptible cultivars Barbara Karst and Gold; captan, moderately effective, providing 95% protection; and fixed copper sulfate, least effective, providing no protection, when compared to the amount of disease on inoculated control plants.

The pathogenicity of *Phytophthora parasitica* is clearly established in causing foliar blight of *Bougainvillea* and tomato. Differences in cultivar susceptibility of *Bougainvillea* have been determined. Daconil appears to offer an effective degree of disease control.

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