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, ash-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 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 2877 was the most effective, captan moderately effective, and fixed basic copper sulfate (53% metallic) least effective in disease control. Phytopathology 60:1806-1808.

Additional key words: varietal resistance, phymycetes.

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 most 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 phycomycetes 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-bleighting fungus; (ii) to ascertain the relative level of 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. 'Manaluce' 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 run off 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 welf of P. parasitica on leaves, blossoms, and stem.
fungicides; caption [N-(trichloromethylthio)-4-cyclo-
heptene-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% 
tetracloroisopthalonitrile) 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 inocula-
tion, 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% ± 5.

RESULTS AND DISCUSSION.—In the test for pathoge-
nicity, initial infection occurred on the younger leaves 
as early as 2 days, as small, ash-gray, irregular, hy-
drotic 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 develop-
ment was rapid. In 12 to 24 hr following initial infec-
tion, leaves became entirely necrotic, fissured, blackened, 
and curled (Fig. 1-B). Floral bracts showed infection 
even sooner than young leaves. Symptoms occurred as 
necrotic lesions of collapsed tissue having a reticu-
late appearance (Fig. 1-C). Infection progressed along 
the petioles into young green stems, where the lesions 
appeared as slightly sunken brown linear spots progress-
ing 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 deli-
cate 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 quanti-
ty of infection determined by visual observation indi-
cates 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 
infection 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 num-
ber of lesions (approx 30% foliage blight) which en-
larged 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 ash-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 petu-
nia 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; caption, 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 Bougain-
villea 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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