Phytophthora Leaf Blight of Hibiscus, a New Disease Caused by *Phytophthora parasitica*

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ABSTRACT

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Phytophthora parasitica caused a severe leaf blight on cuttings and stock plants of several commercial hibiscus cultivars. Leaves of Crown of Bohemia and Pink Versicolor had water-soaked lesions surrounded by a chlorotic halo 3–5 days after inoculation. Lesions turned black, and white mycelium extended over the leaf surface. Isolations from leaves consistently yielded *P. parasitica*, and this organism caused typical leaf blight on inoculated leaves of six cultivars. The hibiscus isolate also was pathogenic to azalea (*Rhododendron indicum* 'Prize'), chrysanthemum (*Chrysanthemum* × *morifolium* 'Capri' and 'Vermilion'), *Ficus benjamina*, and *Brassaia actinophylla*. Several *Phytophthora* species were tested on hibiscus and found to cause leaf blight. Conditions favorable for symptom expression were temperatures of 20–22 C and 90–100% R H for 3–5 days.

Hibiscus rosa-sinensis L. is produced commercially in Florida. Sales to homeowners and landscape contractors average $10–15 million annually (D. Bruch, *personal communication*). Phytophthora root rot of hibiscus caused by *P. parasitica* has been reported in Florida (1), and leaf blight of *H. moscheutos* L. caused by *P. parasitica* has been reported in India (6). This fungus attacks plants in at least 72 genera in 42 families (3).

Leaf blight was observed in Florida, in propagation flats of unrooted cuttings of *H. rosa-sinensis* 'Pink Versicolor' during the spring of 1983. The leaves were covered with fluffy mycelium in the early part of the day. As temperature increased during the day, the mycelium became less evident and a water-soaked lesion surrounded by a chlorotic halo became apparent (Fig. 1). The water-soaked lesion blackened after 3–5 days and the leaf abscised.

In this, the first report of Phytophthora leaf blight of *H. rosa-sinensis*, we describe the syndrome and report studies of pathogenicity and host range.

MATERIALS AND METHODS

Naturally infected leaf tissue was collected from cuttings of the cultivars American Beauty, Crown of Bohemia, Pink Versicolor, and Senorita. The tissue was surface-sterilized in 0.5% sodium hypochlorite for 1 min, rinsed in sterile water, and pieces were placed on potato-dextrose agar (PDA, Difco) and *Phytophthora*-selective medium (7). Cultures were incubated at 28 C in the dark for 72 hr. Subcultures from hyphal tips were made on plates of PDA for identification. Identification was confirmed by T. Schubert at the Division of Plant Industry, Gainesville, FL. All pathogenicity, cultivar susceptibility, and host range studies consisted of a completely randomized design of three replicates with four plants of each cultivar.

Pathogenicity. Mycelial plugs 4 mm in diameter were incubated for 72 hr in dilute V-8 juice broth (5), and zoospores were harvested by previously described procedures (2). The resulting zoospore suspension was adjusted to 10^5 spores per milliliter and sprayed to runoff on pinprick-injured leaves of healthy Pink Versicolor. Plants 10 wk old, grown in 15-cm-diameter pots and fertilized twice a week with about 100 ml per pot of ammonium nitrate (200 μg N/ml) fertilizer, were incubated for 3 days in a polyethylene bag at 20–22 C (90–100% RH) or without a bag at 20–22 or 25–28 C (60% RH). Control plants were sprayed with sterile water. Isolations from symptomatic tissue were made as described previously.

Cultivar susceptibility. Healthy plants of American Beauty, Brilliant Red, Crown of Bohemia, Painted Lady, Pink Versicolor, and Senorita were inoculated as described previously and ranked for number and size of lesions as an index of susceptibility.

Susceptibility of hibiscus to *Phytophthora* spp. Pink Versicolor plants were inoculated with *P. cinnamomi* Rands, *P. palmivora* Butl., or *P. parasitica* Dast. Inoculum was prepared and plants were inoculated as described. All plants were incubated at room temperature in polyethylene bags. Control plants received sterile water sprays. Severity of lesion development was determined by the Horsfall-Barratt rating scale (4).

Host range of *P. parasitica* on selected ornamental plants. Healthy plants of *H. rosa-sinensis* L. 'Crown of Bohemia,' *Chrysanthemum* × *morifolium* Ramat. 'Capri' and 'Vermilion,' *Ficus benjamina* L., *Rhododendron indicum* (L.) Sweet 'White Gish,' and *Brassaia actinophylla* Endl. were inoculated with a zoospore suspension of *P. parasitica* from *H. rosa-sinensis* and incubated as described previously. Disease ratings were made by the Horsfall-Barratt rating scale (4).

RESULTS

P. parasitica was isolated consistently from naturally infected leaf tissue and was identified using the keys of Waterhouse (8). In pathogenicity tests, injury, high humidity (90–100% R H), and temperatures of 20–22 C greatly enhanced symptom expression; however, infection

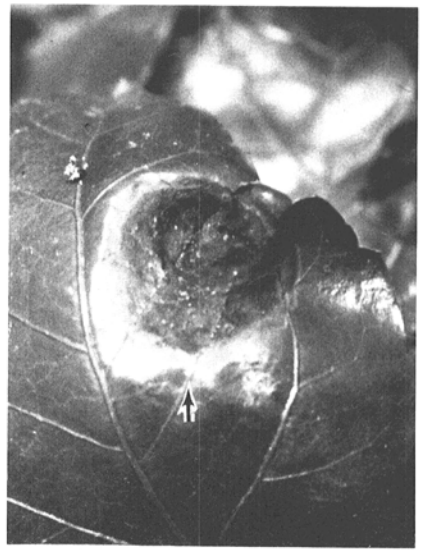

Fig. 1. Water-soaked lesion with chlorotic halo (arrow) caused by *Phytophthora parasitica* on *Hibiscus rosa-sinensis* 'Pink Versicolor.'

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Table 1. Susceptibility of six commercial cultivars of *Hibiscus rosa-sinensis* to leaf blight caused by *Phytophthora parasitica* (isolate HRS 1)

Cultivar	Lesions per plant[x] (no.)	Lesion diameter[y] (cm)
American Beauty	1.18 d[z]	1.4 c
Brilliant Red	4.13 bc	3.5 b
Crown of Bohemia	6.33 a	4.5 a
Painted Lady	4.94 b	4.5 a
Pink Versicolor	4.34 b	5.0 a
Senorita	3.27 c	3.0 a

[x] Lesion number determined from three replicates of four plants (12 wk old) per treatment.
[y] Average lesion diameter from 12 plants.
[z] Values in a column followed by the same letter do not differ significantly ($P = 0.05$) according to Duncan's multiple range test.

occurred frequently when no injury was visible. Without high humidity and at temperatures other than 20–22 C, symptoms were mild or absent. *P. parasitica* was reisolated from inoculated leaf tissue in pathogenicity and cultivar susceptibility tests. Of the six commercial cultivars, Crown of Bohemia, Pink Versicolor, and Painted Lady were most susceptible and American Beauty was least susceptible on the basis of lesion size ratings (Table 1). Lesions in hibiscus leaves inoculated with *P. cinnamomi, P. palmivora*, and two isolates of *P. parasitica* (FTCC 511 and FTCC 866) were smaller than those caused by isolates of *P. parasitica* from *H. rosa-sinensis* (Table 2). Azalea, chrysanthemum, *F. benjamina*, and *B. actinophylla* inoculated with an isolate of *P. parasitica* from *H. rosa-sinensis* developed leaf blight.

Table 2. Susceptibility of *Hibiscus rosa-sinensis* 'Pink Versicolor' to three species of *Phytophthora*[a]

Phytophthora sp.	Isolate	Original host	Lesion rating[b]
P. cinnamomi	FTCC 736	*Taxus brevifola* Nutt.	1
	FTCC 864	*Tristania conferta* R.Br.	1
P. palmivora	FTCC 966	*Fatsia japonica* (Thunb.) Decne & Planch.	1
P. parasitica	FTCC 511	*Hibiscus* sp.	1
	FTCC 866	*Euphorbia pulcherrima* Willd. ex Klotzsch	1
	HRS 1	*H. rosa-sinensis*	7

[a] FTCC isolates were provided by Division of Plant Industry, Gainesville, FL.
[b] Rating scale of Horsfall-Barratt, where 0 = 0% and 11 = 100%.

Reisolations from infected leaves of symptomatic plants yielded *P. parasitica*. No stem colonization was observed.

DISCUSSION

This is the first report of *P. parasitica* causing leaf blight on *H. rosa-sinensis*. Commercially produced cultivars varied in sensitivity to *P. parasitica*. Isolates of *P. parasitica* from commercial hibiscus caused more severe symptoms in hibiscus than did the other *Phytophthora* species tested. In several previous reports (1,3), *P. parasitica* was observed to have a wide host range. Our studies have demonstrated that isolates of *Phytophthora* from hibiscus can infect various ornamental plants. This is important to commercial plant producers in Florida, where several of these plant species are grown side by side. Our pathogenicity studies indicate that disease incidence can be reduced by lowering the relative humidity in the greenhouse and avoiding injuries to plants.

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