

## Increase of Alternaria Blight in Two Ornamental Foliage Plant Species Treated with Benomyl

R. A. ATILANO, Assistant Professor, University of Florida Agricultural Research and Education Center, Fort Lauderdale 33314

### ABSTRACT

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Benomyl (0.6 g/L) applied as a soil drench (5.2 L/m<sup>2</sup>) and again 1 wk later as a foliar spray significantly increased the number of leaf spots in *Brassaia actinophylla* after inoculation with *Alternaria panax*. Two foliar sprays 1 wk apart and a benomyl drench alone resulted in similar responses in both *B. actinophylla* and *Schefflera arboricola*.

Additional key words: fungicides, nontarget effects

Leaf spots and blights caused by *Alternaria panax* Whetzel (7) are endemic in several species of ornamental foliage plants grown in south Florida nurseries (1; R. A. Atilano, *unpublished*).

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Serious outbreaks of Alternaria blights following applications of benomyl have been observed occasionally by J. F. Knauss (*personal communication*) and by nurserymen, but a relationship between benomyl and Alternaria diseases of ornamental foliage plants has not been substantiated. In studies by Engelhard (3,4) and by Manning and Papia (5), benomyl did increase the occurrence of Alternaria blight of carnation.

Benomyl is not recommended for control of *Alternaria*, but it is frequently used in foliage plant nurseries as a soil drench or foliar spray for control of *Rhizoctonia* spp. that cause root rots and "thread blights" of the foliage during the frequent periods of high humidity in

southern Florida. Widespread use of benomyl to protect young plants gave reason to suspect a potentially important impact of benomyl on *Alternaria*-susceptible foliage plants. In this paper, I show that benomyl promotes severity of Alternaria blight of shefflera (*Brassaia actinophylla* Endl.) and dwarf shefflera (*Schefflera arboricola* (Hayata) Merrill).

### MATERIALS AND METHODS

Plants of *B. actinophylla* (two per pot) and *S. arboricola* (one per pot) were grown to heights of 30–40 cm in a steam-sterilized potting mix (peat moss, cypress wood shavings, sand, and perlite [7:5:2:5, v/v] amended with 5.8 kg of dolomite, 3.6 kg of Osmocote [14-14-14 resin-coated fertilizer], and 0.9 kg of Micromax per cubic meter) in pots of 12 cm diameter and about 1-L capacity. Subsequent fertilizer applications were top dressings of Osmocote at 8-wk intervals at the rate of 3.6 kg/m<sup>3</sup>.

Benomyl (0.6 g a.i./L) was applied as a soil drench (5.2 L/m<sup>2</sup>) or foliar spray to runoff in treatments as follows: a drench followed 1 wk later with a foliar spray, drench alone, two spray applications 1 wk apart, and a single spray application.

**Table 1.** Response of *Brassia actinophylla* to inoculation with *Alternaria panax* after applications of benomyl, acephate, and metalaxyl as soil drenches (D) or foliar sprays (S)

Chemical	Treatment <sup>a</sup>		Lesions per leaf	
	Time before inoculation		Experiment 1	Experiment 2
	2 Wk	1 Wk		
Benomyl	D	S	20.2* <sup>b</sup>	93.0*
Benomyl	S	S	18.2*	48.4
Benomyl	D	... <sup>c</sup>	12.1	79.9*
Benomyl	...	S	13.2	16.5
Acephate	S	S	9.6	...
Metalaxyl	D	...	6.7	...
Inoculated control	...	...	8.9	27.0
Uninoculated control	...	...	0.4*	0.1*

<sup>a</sup>Concentrations of benomyl, acephate, and metalaxyl were 0.6, 0.6, and 0.06 g/L, respectively.

<sup>b</sup>Means followed by an asterisk are significantly different from inoculated control ( $P \leq 0.05$ ) by Dunnett's procedure (2).

<sup>c</sup>No treatment.

**Table 2.** Response of *Schefflera arboricola* to inoculation with *Alternaria panax* following benomyl (0.6 g/L) sprays or drenches

Treatment <sup>a</sup>	Lesions per leaf
Foliar sprays	35.4* <sup>b</sup>
Soil drench	15.9*
Inoculated control	5.3
Uninoculated control	0.3*

<sup>a</sup>Two sprays 1 wk apart or one drench at 5.2 L/m<sup>2</sup> 2 wk before inoculations.

<sup>b</sup>Means followed by an asterisk are significantly different from inoculated control ( $P \leq 0.05$ ) by Dunnett's procedure (2).

Controls received water sprays. The systemic fungicide metalaxyl, which is highly specific for pythiaceous fungi, and acephate, a systemic insecticide, were each applied as separate treatments in one experiment. Metalaxyl (0.06 g/L) was applied as a soil drench at 5.2 L/m<sup>2</sup>. Acephate (0.6 g/L) was sprayed on the foliage to runoff in two applications 1 wk apart. All treatments within an experiment were initiated on the same date, and plants were inoculated 1 wk after the last chemical treatment.

One pathogenic, monoconidial isolate of *A. panax* (EX 81-2) obtained from *S. arboricola* as previously reported (1) was grown for inoculum in 9-cm-diameter petri dishes containing V-8 juice agar (6). Cultures were incubated at 27 C and 20 cm below an ultraviolet lamp (model

F20T12/BL, Westinghouse Corporation, Horseheads, NY). Inoculum suspensions of  $5 \times 10^3$  conidia per milliliter of sterile deionized water were prepared from 10- to 14-day old cultures.

Conidial suspensions were applied to the plants in a mist with a hand-operated, trigger-action sprayer. Each pump of the sprayer applied approximately 1 ml of suspension. Each pot was turned 360° during inoculations such that four bursts of mist were equidistantly spaced around each plant. Plants were then enclosed in plastic bags that were removed 72 hr later. Control plants were treated similarly except that they received only sterile deionized water. The plants were maintained on a greenhouse bench where mean daily temperatures ranged from 16 to 29 C. Four single-pot replicates per treatment were arranged in a randomized complete block design in each experiment. Lesions on the youngest fully expanded leaf of each plant were counted 6 days after inoculation. A square root transformation was made before analysis of data, and means were compared by Dunnett's procedure (2).

## RESULTS AND DISCUSSION

Lesions caused by *A. panax* in *B. actinophylla* and *S. arboricola* with certain benomyl treatments were significantly more numerous than in controls (Tables 1 and 2). A benomyl drench followed by a foliar spray resulted in the

most disease in *B. actinophylla*. Two foliar sprays of benomyl 1 wk apart or one drench application inconsistently promoted disease in *B. actinophylla*, and a single foliar spray did not promote disease (Table 1). Lesion numbers in acephate and metalaxyl treatments were similar to those in inoculated controls. Two benomyl foliar sprays 1 wk apart or a benomyl soil drench each promoted disease in *S. arboricola* (Table 2).

My results indicate a hazard in treating *Alternaria*-susceptible foliage plants with benomyl. The threat to such plants is serious because nurserymen have been largely unaware of the hazard and because benomyl is frequently the fungicide chosen to protect young seedlings and cuttings from *Rhizoctonia*.

The time required from benomyl application to stimulation of *Alternaria* and the duration of this phenomenon are not known. Growers should give special consideration to preventive practices that reduce the chance of a severe outbreak of *Alternaria* blight following benomyl applications. Preventive practices include inspecting susceptible plants frequently, reducing duration of leaf wetness, and applying selected fungicides. Alternative fungicides may be substituted for benomyl to control *Rhizoctonia* diseases.

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