Effects of Fertilizer Rate on Severity of Alternaria Leaf Spot of Three Plants in the Araliaceae

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ABSTRACT

Chase, A. R., and Poole, R. T. 1986. Effects of fertilizer rate on severity of Alternaria leaf spot of three plants in the Araliaceae. Plant Disease 70:1144-1145.

Alternaria leaf spot of *Brassaia actinophylla* (schefflera), *Dizygotheca elegantissima* (false aralia), and *Schefflera arboricola* (dwarf schefflera) is caused by *Alternaria panax*. Mean numbers of lesions per plant of schefflera and dwarf schefflera decreased linearly as preinoculation fertilizer was increased to about six times the recommended rate. Growth of schefflera or dwarf schefflera was not affected over this fertilizer range, but height and quality of false aralia decreased significantly. The mean percentage of false aralia foliage infected with *A. panax* was unaffected by fertilizer treatment.

One of the most serious foliar diseases of *Brassaia actinophylla* Endl. (schefflera) and its relatives is caused by *Alternaria panax* Whetzel. (11). Alternaria leaf spot causes serious losses in production of schefflera, *Schefflera arboricola* H. Ayata (dwarf schefflera) (1), *Dizygotheca elegantissima* Vig. & Guill. (false aralia) (11), *Fatsia japonica* (Thunb.) Decne. & Planch. (Japanese fatsia) (4), *Polyscias fruticosa* (L.) Harms (ming aralia) (2), and *Tupidanthus calyptratus* Hook. f. & Thoms. (11). Although fungicides can control this disease on some hosts, they are not always effective and nonphytotoxic under the conditions in which foliage plants are produced. Moreover, pesticides leave an unsightly residue that detracts from foliage plant quality and subsequent salability. Host nutrition has been shown to significantly affect severity of a wide variety of ornamental plant diseases including Phytophthora leaf spot (7) and Xanthomonas leaf spot (6) of heartleaf philodendron, Pseudomonas leaf spot of chrysanthemum (9) and dwarf schefflera (Florida Agricultural Experiment Station, *unpublished*), and Erwinia blight of *Philodendron selloum* (8). The following research evaluates the effect of host nutrition on severity of Alternaria leaf spot of schefflera, dwarf schefflera, and false aralia.

Florida Experiment Stations Journal Series No. 7131.

Accepted for publication 2 May 1986.

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MATERIALS AND METHODS

Plants were obtained from commercial growers as rooted cuttings or small seedlings (less than 6 cm tall) and potted (one to three per pot) in pasteurized potting medium (1.5 hr at 90 C) consisting of Canadian peat and pine bark (50:50, v/v). The medium was amended with 4.2 kg of dolomite and 0.9 kg of Micromax (micronutrient source from Sierra Chemical Co., Inc., Milpitas, CA) per cubic meter. Ten plants each were fertilized with Osmocote (19:6:12, slow-release fertilizer, Sierra) as a top-dressing at 2, 4, 6, 8, 10, or 12 g/10-cm pot. The recommended rate for schefflera is about 2 g/10-cm pot every 3 mo (5). Some tests were done in 15-cm pots with proportionally the same rates of fertilizer (based on surface area of the pot). Plants were grown in a glasshouse with temperatures ranging from 18 to 33 C and a maximum light level of 200 μE m^{-2} s^{-1} for 2 mo. Plant height and soluble salts were recorded before fertilization and again after 4 and 8 wk. Soluble salts were measured only on irrigation days and replaced normal irrigation on those days. Soluble salts were measured by adding about 50–100 ml of deionized water to the potting medium surface. Leachate collected in a beaker beneath the plants was tested for pC using a Hach conductivity meter no. 2511 (Hach Chemical Company, Ames, IA).

Inocula were prepared from a culture of *A. panax* originally isolated from schefflera. Conidia were produced using the method of Shahin and Shepard (10) with malt agar as the initial growth medium. Plates of S agar (20 g each of sucrose and agar and 30 g of $CaCO_3$ per liter) were inoculated with mycelial disks of *A. panax* and incubated at 18 C in the dark for 3 days. A conidial suspension

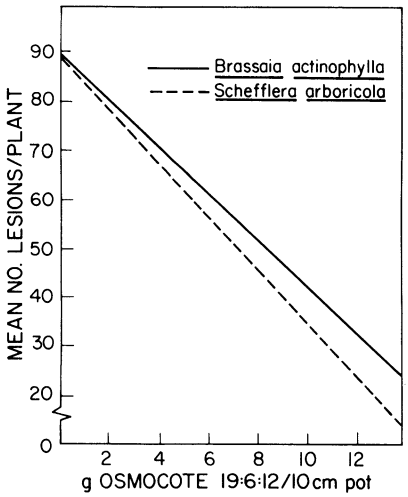

Fig. 1. Effect of host nutrition on severity of Alternaria leaf spot of *Brassaia actinophylla* and *Schefflera arboricola*. Equations for the lines are (——) $y = 89.1 - 4.7x$, $R^2 = 0.94$, and (---) $y = 89.1 - 5.4x$, $R^2 = 0.93$.

was obtained by flooding plates with sterilized deionized water and gently rubbing the surface with a sterilized rubber policeman. This suspension was counted with a hemacytometer and adjusted to 1×10^4 conidia per milliliter. All plants were inoculated with 5 ml of the suspension by spraying with a pump-action hand sprayer 24 hr after misting was initiated. Misting was accomplished with an overhead automated system (5 sec/30 min from 0800 to 2000 hours each day). Plants were enclosed in a polyethylene bag for 48–72 hr after inoculation, then arranged in a randomized complete block design on the greenhouse bench. Misting continued until test completion. The mean number of lesions per plant or a visual rating of the mean percentage of plant foliage infected was recorded from 4 to 21 days after inoculation depending on the host and time of year. Three tests were run on each host species between 2 April and 2 December 1985.

For analysis, the percentage of plant foliage infected was transformed by the arc sine transformation, and sets of data with a significant F test were subjected to regression analysis.

RESULTS

Results of plant growth were the same for each test on each host. Growth of scheffleras and dwarf scheffleras was unaffected by fertilizer rate. Plant height, quality grades of tops (1 = dead; 3 = salable, moderate; and 5 = salable, excellent), and foliage color were similar for all schefflera and dwarf schefflera treatments. In contrast, false aralias had a 50% reduction in height when fertilizer was increased from 2 to 12 g/pot. Also, false aralias were consistently lower in quality grades as fertilizer level increased. In test 1, mean quality grades were 4.9, 4.6, 3.8, 3.4, 2.9, and 2.6 for fertilizer levels of 2, 4, 6, 8, 10, and 12 g/10-cm pot, respectively. Soluble salts readings ranged from 1,500 to 10,000 μmhos/cm at test initiation for most tests and were 500 to 4,000 μmhos/cm at the end of the tests about 8 wk after application.

Increases in fertilizer level resulted in linear decreases in number of lesions caused by *A. panax* on scheffleras in each test (Fig. 1). Because growth of false aralias responded significantly to fertilizer treatment, a visual rating of the percentage of the foliage infected was recorded instead of number of lesions per plant, which would be influenced by plant size. Increased fertilizer levels had no significant effect on the percentage of false aralia foliage affected by *A. panax* in any test. Mean percentages of foliage affected were 26.9, 27.0, 26.3, 22.2, 23.6, and 21.3 as fertilizer increased. Because size of dwarf scheffleras was unaffected by fertilizer treatment, the number of lesions per plant was recorded. A linear decrease in number of lesions per plant was established for dwarf scheffleras as fertilizer level increased in all three tests (Fig. 1).

DISCUSSION

Alternaria leaf spot severity decreased significantly on schefflera and dwarf schefflera when increasing amounts of fertilizer were applied to plants before inoculation. Because these plants did not react adversely to this treatment, as indicated by growth parameters, use of higher than currently recommended rates of fertilizer may be a means to reduce susceptibility of these hosts to *A. panax*. Although false aralia reacted to excessive amounts of fertilizer with reductions in both height and plant quality, disease susceptibility was not influenced by the level of fertilizer. Walker (12) reported that high soil fertility reduced severity of early blight of tomato caused by *Alternaria solani*. Other research has shown that susceptibility of dwarf scheffleras to Pseudomonas (5) and Xanthomonas (3) leaf spots was reduced when plants were overfertilized. In contrast, chrysanthemums were more susceptible to the same Pseudomonas leaf spot when overfertilized (9). Thus, although false aralias are in the same family as scheffleras and dwarf scheffleras (Araliaceae), the effect of fertilizer level on susceptibility to Alternaria leaf spot is not the same. These results emphasize the importance of the host-fertilizer interaction in expression of Alternaria leaf spot disease of ornamental plants in the Araliaceae.

ACKNOWLEDGMENTS

We thank Bill McLees and Jeanne Yuen for excellent technical assistance and central Florida foliage producers for their generous donations of plant materials.

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