number of lesions from about 40 to 50% in two of three tests when compared to the plants fertilized at the recommended rate. Since good quality plants were produced with twice the recommended rate, it may be possible to reduce severity of Fusarium leaf spot at that rate without decreasing quality of red-edge dracaena, unduly increasing fertilizer costs, or increasing potential for ground water contamination due to excess fertilizer use.

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FOLIAR APPLICATIONS OF BENOMYL AND MANCOZEB DO NOT AFFECT LEATHERLEAF FERN CARBON ASSIMILATION, TRANSPIRATION, LIGHT COMPENSATION POINT OR VASE LIFE

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Abstract. **Carbon assimilation (A) and transpiration (E) at 400 $\mu mol \cdot s^{-1} \cdot m^{-2}$ light intensity, as well as light compensation points (LCP), were determined for selected, mature leatherleaf fern (*Rumohra adiantiformis* [Forst.] Ching) fronds on plants growing in controlled-environment chambers. Two foliar applications spaced one week apart with either benomyl (300 ppm) or mancozeb (1438 ppm) solutions had no effect on A, E, or LCP compared to deionized water treatments. Subsequent vase life of treated fronds averaged 13.2 days and was not affected by fungicide treatments.**

Fungal leaf spot diseases are a serious problem encountered in leatherleaf fern production in Florida (5). Benomyl and mancozeb are commonly used to control leatherleaf fern diseases and are often applied at 7 day intervals during humid, rainy weather (13). While this procedure can control disease development, the effects of these sprays on leatherleaf fern are unknown. In fact, neither fungicide has commercial labeling specifically for leatherleaf fern; benomyl products have general ornamental labeling and mancozeb products are applied under a generic fern special local need label.

In work on pecan seedlings, three of eight fungicides tested reduced carbon assimilation (A) by about 35% one day after application (16). Six of the fungicides (benomyl included) decreased A when it was measured 9 days after one application. In later studies, eight of nine insecticides tested suppressed A of mature pecan leaves within 1 day after a single treatment (17). On apples, single applications of benomyl, alone or in combination with oil, had no effect on A (3). Multiple applications of the fungicide dodine to 'Delicious' and 'Golden Delicious' apple trees had no effect on A in another study (10). Reductions in A could result in decreased yields if the effects were of great enough duration and/or magnitude.

The effects of production practices on postharvest longevity are of great concern with a cut foliage crop like leatherleaf fern. The ability of a plant or plant part to maintain homeostatic carbon exchange under low intensity light (light compensation point, LCP) may be a factor in its durability under home/office conditions (1). Additionally, the inability to maintain water balance after harvest can cause vase life termination of floral crops (2, 4) and has been shown to be a serious problem for leatherleaf fern (8, 14, 15). Interestingly, research has shown that the problem of reduced vase life of leatherleaf fern is associated with fronds produced during those months when the fungicides benomyl and mancozeb are most heavily used (7, 9).

The following experiment was conducted to determine the effects of spray applications of benomyl and mancozeb on carbon assimilation, transpiration (E), light compensation point, and vase life of leatherleaf fern.

Materials and Methods

Tissue culture derived leatherleaf fern plants in 6-inch clay pots were placed, three pots per chamber, in each of four controlled-environment chambers (Model E30B, Percival, Boone, IA) in this randomized complete block design

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experiment with four replications. The day/night (12 hrs each) temperatures in the chambers were 24°C and lighting during the day period consisted of 335 μmol · s^{-1} · m^{-2} from fluorescent and 40 μmol · s^{-1} · m^{-2} from incandescent lamps. Plants were watered daily and after a week acclimatization period each of the three plants in each chamber received one of the following treatments: deionized water (DIW), benomyl (300 ppm, equivalent to 0.5 lb. of Benlate 50WP/100 gal), or mancozeb (1438 ppm, equivalent to 1.5 lb. of Manzate 200 80WP/100 gal) sprays to the point of runoff. Treatments were applied at 25 psi using a flat fan spray nozzle (Teejet 8006, Spraying Systems, Bellwood, IL). The two spray treatments were applied 7 days apart.

Carbon assimilation and E of individual recently matured, non-sporulating leatherleaf fern fronds was measured at 400 μmol · s^{-1} · m^{-2} using an open flow infrared gas analyzing (IRGA) system described previously (11). In addition, LCPs were determined for each leaf. Leaf temperatures were maintained at 24° ± 1.5° during the measurements which were made 1 and 6 days after the initial spray application and 1 day after the second spray application.

After the final readings were made using the IRGA, the test fronds were harvested and held in deionized water for vase life determinations under simulated home/office conditions as previously described (15). Fronds were terminated when they started to show symptoms of desiccation or yellowing (7).

Results and Discussion

The fungicide sprays had no effect on A of attached leatherleaf fern fronds when measured 1 and 6 days after the first application and 1 day after the second application (Fig. 1A). Carbon assimilation averaged 4.5, 4.0, and 3.8 μmol · m^{-2} · s^{-1} for the deionized water (DIW), benomyl, and mancozeb sprayed fronds, respectively. Similarly, there were no treatment differences for E at the three measurement dates (Fig. 1B); E averaged 0.98, 0.97, and 0.86 mmol · m^{-2} · s^{-1} for the deionized water (DIW), benomyl, and mancozeb sprayed fronds, respectively. These A and E values are similar to those published for leatherleaf fern in other studies (6, 11). Treatments had no effect on LCPs on days 1, 6 or 8 after the first spray was applied (Fig. 1C). Average LCPs were 2.7, 3.5, and 4.0 μmol · s^{-1} · m^{-2} for the DIW, benomyl, and mancozeb treatments, respectively.

Vase life of harvested fronds were not affected by treatments and averaged 11.25, 15.75, and 12.5 days, respectively, for DIW control, benomyl, and mancozeb. These vase life values are similar to those reported in a study that showed that postharvest benomyl dips are not detrimental and are sometimes beneficial to leatherleaf fern frond vase life (12). There were no treatment differences in the symptoms that caused frond termination in the postharvest evaluation reported here; three-quarters of the fronds in each treatment were discarded due to yellowing and the rest were terminated due to desiccation of the foliage.

Under the conditions of this test, two spray applications of benomyl or mancozeb appeared to have no effect on A, E, LCP, or vase life of leatherleaf fern fronds. However, benomyl and mancozeb are only two of the many chemicals applied repeatedly during the summer to leatherleaf fern. There may be other commonly used chemicals or combinations of chemicals that do have effects on A, E, LCP, or vase life of leatherleaf fern.

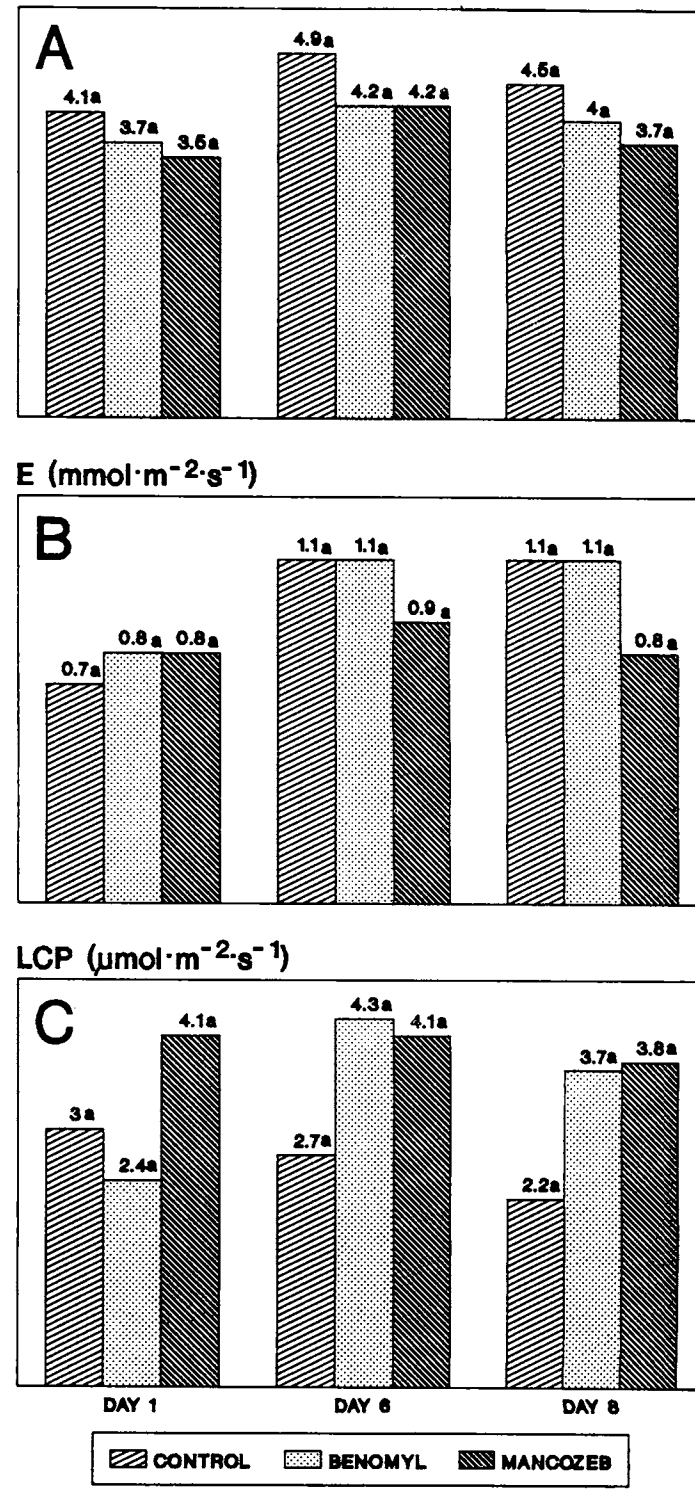

Fig. 1. Carbon assimilation, A, (A), transpiration, E, (B) and light compensation points, LCP, (C) of leatherleaf fern fronds as affected by spray treatments with deionized water (DIW), DIW + benomyl at 400 ppm, or DIW + mancozeb at 1438 ppm applied on day 0 and day 7. Means were not significantly different at the 5% level as determined using Duncan's multiple range test.

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FOLIAGE DISEASE MANAGEMENT ON POINSETTIA PLANTS

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Abstract. **Foliage diseases of poinsettia plants are an important factor associated with plant production in Florida. Diseases that may be serious include alternaria blight (*Alternaria euphorbiicola* Simmonds and Engelhard), botrytis blight (*Botrytis cinerea* Pers. ex Fr.), scab (*Sphaceloma poinsettiae* Jenkins and Ruehle), and choanephora wet rot [*Choanephora cucurbitarum* (Berk. and Rav) Thaxter]. Other diseases of lesser importance include phytophthora blight (*Phytophthora parasitica* Dast.) and leaf spots caused by *Helminthosporium* sp., *Curvularia* sp. *Corynespora* sp., and others. The production and biology of spores and sclerotia on diseased and dead plant tissue are described. Components in a disease control program are discussed. Included are resistant cultivars, crop scouting, a fungicide program, and epidemiological parameters unfavorable to disease development.**

Foliage diseases of poinsettia plants affecting all above ground parts of the plant are a major production problem in Florida. Important diseases include alternaria blight (5, 7, 9, 11) (*Alternaria euphorbiicola*), botrytis blight (4, 14) (*Botrytis cinerea*), scab (*Sphaceloma poinsettiae*) (3, 4), and choanephora wet rot [*Choanephora cucurbitarum* (Berk. and Rav.) Thaxter] (6). The presence of bract necrosis (15) coupled with the large volume of Gutbier V-14 cultivars, which are susceptible to all the above diseases and conditions, has made foliage diseases the principle production problem in Florida.

The objectives of this paper are to describe briefly the important diseases and causal organisms, discuss the biology of the pathogens as it relates to potential disease occurrences, and detail a comprehensive disease management program.

The Diseases

The fungous diseases on the foliage of poinsettia plants in Florida in addition to those mentioned above are rhizopus wet rot [*Rhizopus stolonifera* (Ehr ex Fr.) Vuill.], phytophthora crown and stem rot (*Phytophthora parasitica* Dast) (10) and leaf spots incited by *Helminthosporum* sp., *Curvularia* sp., *Corynespora* sp., and others (4). Diseases of the foliage occur on cuttings in propagation, stock plants, pots grown for sale, and landscape plants.

Biology of Pathogens Disease, Cycle, and Symptoms

Alternaria blight. The initial symptom is a spot on any above-ground parts of the plant. On very susceptible cultivars, the spots enlarge and disease increases until the plants die. The pathogen grows on diseased plant parts and produces countless conidiophores on which conidia

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