Osmocote and those from the research in water do not consider plant and soil effects.

In these experiments plants increased in size with time and utilized nutrients as they were released; therefore they could skew the data in a way that would indicate low availability of nutrients based on conductivity even though plants were growing rapidly. However, plants in this research were poorer in most growth measurements when grown at 35° than at 30°C even though conductivity was generally lower at 35°C. Thus additional research is needed to examine the possibility of changes in release curves at high temperatures in a soil:plant environment. These data also indicate that rapid release of nutrients and possible plant damage may not be as temperature dependent as suspected (5), and can be strongly influenced by plant size at time of application. Further research should also determine the influence of higher soil temperatures on release rate of slow-release fertilizer sources or possible nitrification before the plants can make use of the fertilizer.

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EFFECT OF FERTILIZER LEVEL ON SEVERITY OF FUSARIUM LEAF SPOT OF *DRACAENA MARGINATA*

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Abstract. **The effect of fertilizer level on both growth of red-edge dracaena (*Dracaena marginata* Lam.) and its susceptibility to Fusarium leaf spot, caused by *Fusarium moniliforme* Sheld. was evaluated. Plants were established in 15-cm diam pots and top-dressed with rates of Osmocote 19:6:12 between the recommended rate (x = 6 g/pot) and six times that rate. Number of lesions was highest for plants fertilized with the x rate of Osmocote and decreased linearly as fertilizer rate increased in two of three tests and was unaffected by fertilizer rate in the third test. Plant quality (top grade and height) was optimal for plants fertilized with the recommended or twice that rate of fertilizer and also decreased as higher rates were used. Soluble salts of potting medium leachate from highest quality plants ranged from 300 to 4000 µmhos/cm depending upon time of year.**

One of the most common and important diseases of *Dracaena marginata* Lam. (red-edge dracaena) is a leaf spot caused by *Fusarium moniliforme* Sheld. (8). Chemical controls for this disease have been widely researched and recommendations have been published (1, 3, 4). Many producers, however, want to use alternative methods for disease control since pesticides can be costly and have the potential for causing damage to plants, humans and the environment.

In the past several years, disease control strategies for many crops have been expanded to include cultural controls such as temperature, water and fertilizer management. Although optimal temperatures for development of Fusarium leaf spot of red-edge dracaena have been identified (5), altering the greenhouse to avoid these temperatures (16 to 27°C) does not seem reasonable during the majority of the year. Similarly, elimination of overhead watering as a means for controlling this disease (2) has not met with widespread acceptance. The following research was performed to evaluate the potential for fertilizer management of Fusarium leaf spot of red-edge dracaena.

Materials and Methods

Rooted cuttings of red-edge dracaena were obtained from commercial producers and planted in 15-cm plastic pots containing the following potting medium: 50% Canadian peat and 50% pine bark, amended with 4 kg dolomite and 0.9 kg Micromax per cubic meter. The amendments were added to the basal medium after steam treatment at 90°C for 1.5 hr. Ten plants each were top-dressed with

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one of the following rates of Osmocote 19:6:12: 6, 12, 18, 24, 30, and 36 g/pot/3months. The recommended rate for *D. marginata* under these conditions is approximately 6 g (6). Plants were arranged in a randomized complete block design on a greenhouse bench where they were watered three times a week. Light levels ranged from 1000 to 2000 ft-c under a natural photoperiod with temperatures maintained between 18 and 35°C depending upon time of year. Plant height was measured at test initiation and monthly thereafter for 2 months by measuring the distance from the potting medium surface to the tip of the longest leaf. In addition, soluble salts of the potting medium leachate were measured monthly using the pour through method (9). Prior to inoculation, top quality was rated on the following scale: 1 (dead plant), 2 (poor quality, unsalable), 3 (good quality, salable), 4 (very good quality, salable), and 5 (excellent quality, salable).

Plants were inoculated with a conidial suspension of *F. moniliforme*. The pathogen was grown for 1 week on Difco potato-dextrose agar medium under intermittent light (100 ft-c from fluorescent light for 12 hr/day) at 25°C. Conidia were collected from the surface of the culture and diluted in sterile water. Their concentration was adjusted to 1 x 10^6/ml following counting with a haemocytometer. Ten ml of this suspension was added to the whorl of each plant and plants were enclosed in plastic bags for 3 days. One day prior to inoculation, a misting treatment was initiated (5 sec every 30 min from 0800 to 2000 hr daily). This treatment continued until approximately 3 weeks after inoculation when lesion numbers were recorded. This test was performed three times: 8 Dec. 1986 to 2 Mar. 1987; 4 Mar. to 21 May 1987; and 4 Aug. to 13 Oct. 1987.

Results and Discussion

Results from the three tests were similar. Soluble salts ranged from about 1000 to 8000 µmhos/cm at the end of the 2 month test period (Table 1). Plant height and top quality were consistently highest for plants fertilized with the recommended rate of Osmocote and both decreased significantly as the fertilizer rate increased (Tables 2 and 3). Soluble salts for high quality plants were between 1000 and 4000 µmhos/cm which were achieved with Osmocote rates from 6 to 18 g during the winter and spring. In the final test, soluble salts for high quality plants were between 300 and 1200 µmhos/cm which were achieved with Osmocote rates from 6 to 24 g per 15-cm pot.

Table 1. Effect of fertilizer level on leachate soluble salts for *Dracaena marginata*.

Osmocote 19:6:12 g/15-cm pot/3 mo	Mean soluble salts readings for four replicates[z]		
	Test 1 3 February	Test 2 1 May	Test 3 1 October
6	778**[y]	2050**	312**
12	2167	4000	300
18	3835	5750	1150
24	5122	7062	2000
30	5695	7938	2625
36	7705	7708	3500

[z]Soluble salts were evaluated by collecting the leachate and are given as µmhos/cm.
[y]Significant F value for treatment effects at the 1% (**) or 5% (*) level, or not significant (ns).

Table 2. Effect of fertilizer level on pulled up height for *Dracaena marginata*.

Osmocote 19:6:12 g/15-cm pot/3 mo	Mean plant height for 10 *replicates (cm)*[z]		
	Test 1 3 February	Test 2 1 May	Test 3 29 September
6	40.1**[y]	44.2*	40.6 ns
12	39.6	43.8	40.0
18	38.6	39.8	42.2
24	36.8	39.8	42.0
30	35.6	38.8	37.1
36	33.2	37.1	37.5

[z]Plant height was measured by pulling the leaves into an upright position and recording the distance from the potting medium surface to the tip of the longest leaf.
[y]Significant F value for treatment effects at the 1% (**) or 5% (*) level, or not significant (ns).

Table 3. Effect of fertilizer level on top quality for *Dracaena marginata*.

Osmocote 19:6:12 g/15-cm pot/3 mo	Mean plant height for 10 replicates[z]		
	Test 1 1 February	Test 2 30 April	Test 3 29 September
6	4.7**[y]	4.4*	4.0**
12	4.5	4.4	4.1
18	4.4	3.8	4.4
24	3.9	3.6	4.0
30	3.7	3.6	3.0
36	3.1	3.2	3.0

[z]Top quality was rated on the following scale: 1 (dead plant), 2 (poor quality, unsalable), 3 (good quality, salable), 4 (very good quality, salable), and 5 (excellent quality, salable).
[y]Significant F value for treatment effects at the 1% (**) or 5% (*) level, or not significant (ns).

In the final test, chlorotic and necrotic leaves when associated with typical excess soluble salts were significantly affected by fertilizer rate. Mean number of symptomatic leaves were 1.3, 2.8, 1.8, 3.4, 7.6, and 6.4 per plant for fertilizer treatments from low to high. This response was not explained, however, by soluble salts readings which were the lowest for plants in this trial. The higher rate of irrigation which occurred during the final test could account for leaching of excess soluble salts resulting in low readings.

Severity of Fusarium leaf spot, as measured by mean number of lesions per plant, decreased linearly as fertilizer rate increased in each test (Table 4). Use of twice the recommended rate of fertilizer resulted in a decrease in

Table 4. Effect of fertilizer level on number of lesions caused by *Fusarium moniliforme* on *Dracaena marginata*.

Osmocote 19:6:12 g/15-cm pot/3 mo	Mean number of lesions per 10 replicates		
	Test 1 2 March	Test 2 21 May	Test 3 20 October
6	29*[z]	50*	6 ns
12	18	26	13
18	17	32	9
24	22	15	9
30	17	13	7
36	9	10	11

[z]Significant F value for treatment effects at the 1% (**) or 5% (*) level, or not significant (ns).

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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