necrosis, but the small variation in salts (Tables 1 & 2) indicates this could not be the only factor. Other research (1, 2, 3) has also shown that soluble salts were not significantly related to F induced foliar necrosis.

Dolomite. Tipburn was closely related to dolomite levels ($r = -0.947$ and -0.828 respectively, $P > 0.05$, Tables 1 & 2). As dolomite levels in soil increased, tip necrosis and tissue F decreased. Other research (2) has shown this relationship between dolomite and tip necrosis caused by F.

Experiment 2

Dolomite greatly reduced leached F (Table 3) and more F was leached from pots containing 20% SP than NaF. Sheldrake *et al.* (5) also reported reduced soluble F in a

Table 3. Soluble fluoride (ppm) reduction by dolomite, Experiment 2.

Dolomite (kg/m³)	Fluoride source[z]	Leachate collection dates			
		7/24	7/28	8/4	8/11
4	20% SP	1.2 a[y]	1.1 a	0.8 a	0.8 a
4	NaF	0.5 a	0.8 a	0.6 a	0.4 a
0	20% SP	11.5 c	11.5 b	11.5 b	11.5 c
0	NaF	2.7 b	8.6 b	8.6 b	6.5 b

[z]20% SP = 20% superphosphate; NaF = sodium fluoride. Fluoride was equivalent to 1.5 kg 20% SP/m³ (1.5% F).
[y]Mean separation within columns by Duncan's multiple range test, 5% level.

medium of 1 peat and 1 perlite (v/v) containing dolomite. A medium with 6 kg dolomite/m³ had approximately 1/6 the soluble F of media with no dolomite.

These data and previous research (2) indicate palms are F sensitive. Fluoride containing substances should not be used during palm production and pH should be maintained near 6.0. Palms are sensitive to high soluble salts (4), but lower leaves are usually light green to necrotic in contrast to upper leaves with necrotic streaks and tipburn caused by excess F in the tissue.

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LIGHT AND FERTILIZER LEVELS AND SLOW-RELEASE FERTILIZER SOURCES INFLUENCE GROWTH OF BRASSAIA ACTINOPHYLLA ENDL.[1]

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Abstract. **Urea formaldehyde fertilizer sources were not as efficient as a resin coated source (Osmocote) in producing high quality** Brassaia actinophylla. **Although increasing fertilizer level and amount of shade generally increased plant quality, there was an interaction between fertilizer sources and shade levels which indicated the greater efficiency of Osmocote at every shade level. Availability of nitrogen is discussed in relation to levels found in tissue of plants grown with equivalent N rates, but from different sources. Nitrogen from resin coated fertilizer was higher in tissue than from equivalent rates of urea formaldehyde.**

Slow-release fertilizers have gained in popularity with tropical foliage plant producers. Although slow-release fertilizers cost more than liquid or granulated forms, they offer application advantages for producers of container-grown crops. When proper amounts are applied, slow-release fertilizers have been reported (6) to supply adequate nutrition for 3 to 12 months. Slow-release fertilizers can be incorporated into the potting medium prior to planting, eliminating further fertilizer applications for short-term crops, or surface applied, so no expensive application equipment is needed. Thus, reductions in labor and equipment help offset higher fertilizer cost.

Research conducted at the Agricultural Research Center, Apopka (1, 3, 4, 5, 10) has shown good quality tropical foliage plants can be grown using Osmocote, a resin coated fertilizer. In a preliminary experiment (unpublished), *Brassaia actinophylla* (schefflera) were grown for 6 months under liquid and Osmocote slow-release fertilizer and good quality plants were produced on both programs. Rosenbaum *et al.* (11) reported potted *Chrysanthemum morifolium* Ramat. 'Puritan' were of good quality when grown with either a liquid or slow-release resin coated fertilizer for one season and were superior to chrysanthemums grown with methylene urea (same as urea formaldehyde). Tjia *et al.* (12) found urea formaldehyde fertilizers released nutrients too slowly for optimum growth of potted chrysanthemums.

Previous work (1, 2, 7) with tropical foliage plants has shown light levels in the production range influence growth characteristics and, probably, the amount of fertilizer necessary to produce quality foliage plants (1, 5). Suggested light and nutritional levels for production of schefflera are 50 to 60 klx (about 63% shade from polypropylene shade cloth) with about 2000 kg N/ha per year (equivalent to 5 kg N/100 m²/3 months), based on a 3-1-2 ratio fertilizer source (5).

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The objectives of this experiment were to compare the effects of 2 lower cost slow-release urea formaldehyde fertilizers with a slow-release resin coated fertilizer (Osmocote) at different light intensities and nutritional levels.

Materials and Methods

A 3x3x3 factorial experiment in randomized block design was established January 9, 1979, with 12 to 15 cm seedling scheffleras, 6/20 cm diameter pot containing 4 parts Florida sedge peat and 1 part builder's sand (v/v) amended with 5.3 kg dolomite and 0.9 kg Perk/m^3. There were 4 replications with 1 pot as an experimental unit. Slow-release fertilizer sources were resin coated (RC) 18-6-12 (Osmocote), urea formaldehyde with fritted K (UF + FK) 18-6-12 (Perk was omitted from the medium for this treatment, as this fertilizer contained fritted trace elements at equivalent rates) and urea formaldehyde with sulfur coated K (UF + SCK) 23-4-14; with each fertilizer source surface applied at rates of 1350, 2000, or 2700 kg N/ha per year. Release duration recommended by manufacturers for each fertilizer source were: RC-4 months; UF + FK – 6 months; and UF + SCK – 3 months. Fertilizer treatments were applied initially and again at either 3, 4, or 6 months, depending on manufacturers' recommendations. Production light levels were 0 (full sun), 30, or 63% shade (approximately 130, 90, or 50 klx maximum natural illumination) under polypropylene shade cloth.

Data recorded at experiment termination, July 21, 1979, included height, width, foliar color (where 1 = light green, 3 = moderate green, and 5 = dark green color), and plant grade (where 1 = poor, not salable, 3 = good, salable, and 5 = excellent quality). Most recently matured leaves were collected for elemental tissue analyses at experiment termination to determine efficiency of nutrient uptake from the various fertilizer sources.

Results and Discussion

Fertilizer source had no effect on schefflera height, but width was slightly greater with the RC fertilizer (Table 1). However, overall plant quality was higher when plants were grown with RC fertilizer, followed by UF + SCK and then UF + FK. Plants from UF + FK treatments were not considered salable. Plants receiving fertilizer from the RC and UF + SCK sources were of commercial quality, with RC being superior to UF + SCK. When comparing UF with liquid or RC fertilizer, Rosenbaum *et al.* (11) found growth of chrysanthemums to be unacceptable from UF because it appeared to be unavailable for a short-term crop.

Table 1. Influence of slow release fertilizer source and rate on growth of schefflera grown for 7 months under 3 shade levels.

Treatments	Ht (cm)	Width (cm)	Foliar color[y]	Plant grade[x]
Fertilizer source[z]				
RC 18-6-12	46 a[w]	42 b	4.0 c	3.7 c
UF + FK 18-6-12	48 a	38 a	2.0 a	2.4 a
UF + SCK 23-4-14	45 a	39 a	3.1 b	3.0 b
Fertilizer rate (kg N/ha/yr)				
1350	42 a	37 a	2.6 a	2.6 a
2000	45 a	38 a	2.9 a	2.9 a
2700	51 b	45 b	3.5 b	3.6 b
Shade level (%)				
0	36 a	33 a	2.2 a	2.5 a
30	48 b	41 b	3.0 b	3.2 b
63	53 c	46 c	3.8 c	3.5 b

[z]RC = resin coated (Osmocote); UF + FK = urea formaldehyde with fritted potassium; UF + SCK = urea formaldehyde with sulfur coated potassium.
[y]1 = light green, 3 = moderate green and 5 = dark green color.
[x]1 = poor, not salable, 3 = good, salable and 5 = excellent quality.
[w]Mean separation within columns within treatment groups by Duncan's multiple range test, 5% level.

An interaction of fertilizer source with shade level on foliar color indicated the RC fertilizer produced better color at every shade level than any one other source (Table 2). Only at the 63% shade level did UF + FK produce plants with an acceptable color grade, while UF + SCK produced plants with acceptable color at both 30 and 63% shade. Full sun grown schefflera were of acceptable color only when RC fertilizer was used.

Table 2. Interaction of slow release fertilizer source and shade level on foliar color[z] of schefflera grown for 7 months.

Fertilizer source[y]	Shade level (%) 0	30	63
RC 18-6-12	3.1 cd[x]	4.2 ef	4.5 f
UF + FK 18-6-12	1.6 a	1.6 a	3.0 c
UF + SCK 23-4-14	2.3 b	3.3 cd	3.7 de

[z]1 = light green, 3 = moderate green and 5 = dark green color.
[y]RC = resin coated (Osmocote); UF + FK = urea formaldehyde with fritted potassium; UF + SCK = urea formaldehyde with sulfur coated potassium.
[x]Mean separation by Duncan's multiple range test, 5% level.

Tallest and widest schefflera were grown under 63% shade, while plant quality was equal under 30 or 63% shade (Table 1). Shade level had a strong effect on all parameters measured and reinforces previous research on specific shade requirements for production of foliage plants (1, 2, 6).

Best quality schefflera, as well as tallest, widest, and best colored plants, were grown with the equivalent of 2700 kg N/ha per year (6.25 kg N/100 m^2/3 months). Overall, increasing fertilizer was beneficial in decreasing effect of higher light levels, but the interaction was not significant.

Examination of the results of tissue analyses indicates several reasons why both UF + FK and UF + SCK-grown schefflera were of poorer quality than RC grown plants. Nitrogen (N) level of RC grown plants were much higher than those of plants grown with UF, (indicating a lower rate of absorption during the 7 month growing cycle). Although N has been shown to be the most important element needed by foliage plants (9), reduced levels of phosphorus (P) and potassium (K) in tissue of plants grown on UF + FK and UF + SCK fertilizer sources probably had a strong effect on quality also. Plants grown on UF + FK were of the poorest quality, and the extremely low K level is indicative of the lack of adequate release of K from the fritted source. Lower leaves of UF + FK plants had some marginal chlorosis and, in a few cases, necrosis which could have been K deficiency.

Calcium (Ca) and magnesium (Mg) levels in tissue were within the acceptable range for good growth established previously (8). Micronutrient tissue levels, although variable, were within acceptable ranges for all fertilizer sources.

Increasing fertilizer rate increased N in tissue and decreased Ca, but had no effect on other elements (Table 3). Lack of rate response appeared due to the major differences between fertilizer source and seedlings' variability.

Nitrogen level in tissue was variable, even though it trended higher at the heaviest shade level. Apparent lack of tissue nutrient response to shade level may have been

Table 3. Influence of slow release fertilizer source and rate on elemental tissue analysis of schefflera grown for 7 months under 3 shade levels.

Treatments	Elemental tissue analysis, dry wt basis N (%)	P (%)	K (%)	Ca (%)	Mg (%)	Cu (ppm)	Fe (ppm)	Mn (ppm)	Zn (ppm)
Fertilizer source[z]									
RC 18-6-12	2.11 c[y]	0.11 c	1.27 c	0.94 a	0.64 a	7 a	196 a	359 b	173 b
UF + FK 18-6-12	1.32 a	0.08 b	0.41 a	1.23 b	0.80 b	8 a	231 a	487 c	255 c
UF + SCK 23-4-14	1.56 b	0.05 a	0.71 b	0.95 a	0.60 a	6 a	230 a	273 a	145 a
Fertilizer rate (kg N/ha/yr)									
1350	1.53 a	0.07 a	0.75 a	1.16 b	0.71 a	8 a	196 a	371 a	187 a
2000	1.57 a	0.07 a	0.77 b	1.07 b	0.68 a	6 a	234 a	355 a	188 a
2700	1.90 b	0.09 a	0.87 a	0.89 a	0.63 a	7 a	226 a	394 a	198 a
Shade level (%)									
0	1.67 b	0.07 a	0.78 a	1.09 a	0.71 a	8 a	187 a	393 a	201 b
30	1.54 a	0.08 a	0.79 a	1.07 a	0.68 a	7 a	220 a	363 a	204 b
63	1.78 b	0.09 a	0.82 a	0.94 a	0.65 a	6 a	251 a	363 a	168 a

[z]RC = resin coated (Osmocote); UF + FK = urea formaldehyde with fritted potassium; UF + SCK = urea formaldehyde with sulfur coated potassium.
[y]Mean separation within columns by treatment group by Duncan's multiple range test, 5% level.

due to the low levels found in most treatments. Plant variation may account for the lack of interactions.

Results of this experiment indicate high quality schefflera cannot be grown on UF + FK or UF + SCK at N and, possibly, K rates equivalent to RC fertilizer rates. Based on these data, it is possible UF rates would have to be 50% greater than RC source rates to obtain similar plant quality.

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INDUCING FLOWERING OF SPATHIPHYLLUM FLORIBUNDUM (LINDEN & ANDRE) N.E. BR. WITH GIBBERELLIC ACID (GA_3)[1]

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Additional index words. foliage plants.

Abstract. **One-year-old** Spathiphyllum floribundum **growing in 10 cm pots were sprayed once with GA_3 at 0, 100, 200, or 400 ppm in January 1981 in an attempt to stimulate flowering. All treated plants had at least one open bloom within a mean of 13 weeks from treatment. Mean number of open blooms per plant after 14 weeks from treatment was 0.2, 1.2, 2.0, and 2.2 at 0, 100, 200, and 400 ppm GA_3 respectively. Plants treated with 200 and 400 ppm GA_3 showed a significant increase in the leaf length/width ratio.**

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Spathiphyllum floribundum (Linden & André) N.E. Br., a member of the family *Araceae*, produces a showy inflorescence consisting of a white spathe and spadix. It is not grown commercially as often as other varieties of spathiphyllum because it is relatively slow growing. Two other varieties of *Spathiphyllum* (x Mauna Loa and x