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INFLUENCE OF FERTILIZER SOURCE AND LEVEL ON GROWTH AND FOLIAR CONTENT OF PHILODENDRON OXYCARDIUM AND CHRYSALIDOCARPUS LUTESCENS[1]

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Abstract. **Osmocote and liquid fertilizer produced better** P. oxycardium **than a fertilizer mixture of $(NH_4)_2$ HPO_4, Urea-form and potassium frit and a like mixture plus KNO_3; however, grade and height of** C. lutescens **was equal.** C. lutescens **fertilized with Osmocote and liquid had slightly more tip necrosis and were lighter green in color than plants fertilized with the 2 mixtures.** P. oxycardium **grew equally well when fertilized with a ratio of 14-6-12 (N-P-K) or 14-3-12. An increase from 1.1 to 4.4 g N/8 inch (20 cm) pot slightly increased vine length and grade of** P. oxycardium **but levels did not influence growth of** C. lutescens. **Elemental composition of the 2 plants are discussed.**

Controlled release fertilizers provide a simple means of fertilizing foliage plants and are widely used today. However, "constant feed" or frequent application of liquid fertilizers are also common practices. Two experiments were established to compare controlled release fertilizers with liquid fertilizers applied at various levels.

Materials and Methods

Eight well-rooted 3-5 leaf cuttings of *P. oxycardium* were planted in an 8 inch (20 cm) pot and tied to a 36 inch (90 cm) cypress slab totem pole and placed under 60% shade, 3500-4500 ft-c, where they received overhead irrigation. The experiment was initiated April 25, 1974 and terminated July 30, 1974 and temperatures ranged between 60-100°F (15-37°C). Soil mixture was 3 Florida peat:1 pine bark:1 builder's sand (v/v/v) to which 7 lb (4 kg) dolomite and 3 lb (2 kg) Perk[2] were incorporated per yd^3 (m^3). The experiment was a 7x4 factorial of fertilizer source x level. Fertilizer (N:P:K) sources were (a) Osmocote (OSM) 14-6-12, (b) a solution of NH_4NO_3, KCl and H_3PO_4 (LIQ) 14-6-12, (c) same components as (b) but 14-3-12, (d) Mixture 1, composed of Urea-form, diammonium phosphate and potassium frit (MIX 1) 14-6-12, (e) same components as (d) but 14-3-12, (f) Mixture 1 ingredients plus potassium nitrate (MIX 2) 14-6-12 and (g) same components as (f) but 14-3-12. Potassium nitrate supplied 8% of the N and 27% of the K. Fertilizer levels based on the N component were 1.1, 2.2, 3.3, 4.4 g N/8 inch (20 cm) pot for the duration of the experiment or approx 1200, 2400, 3600 and 4800 lb/A/yr N. Fertilizers in treatments 1, 4, 5, 6 and 7 were incorporated into the soil mixture at time of planting and liquid fertilizer treatments b and c surface applied weekly. Treatments were replicated 5 times.

A similar experiment was initiated April 25, 1974 with *Chrysalidocarpus lutescens* and terminated February 21, 1975. Fertilizer sources were the same, but only 1 ratio, 18-3-10, was utilized resulting in a 4x4 factorial experiment. Controlled release fertilizer was applied twice, April 25 and October 25, 1974, in equal amounts for a total of 2.2, 4.4, 6.6 and 8.8 g N/8 inch (20 cm) pot or approx 500, 1000, 1500 and 2000 lb N/A/yr. Five seedlings were planted/pot and there were 5 replications. Other environmental conditions were the same as those of *P. oxycardium*.

Data collected at termination of the experiments for both species included leaf tissue, ht and grade (based on a scale of 1-5 where 1 = very poor quality, 3 = minimum salable quality and 5 = excellent quality). Palms were also given a color grade (1 = light green, 5 = dark green) and a necrosis grade (1 = no necrosis, 3 = heavy necrosis).

Results and Discussion

Best growth of *P. oxycardium* was obtained from plants fertilized with Osmocote and liquid, with liquid producing the highest grade and most growth (Table 1). Dickey and Poole (2) reported best growth of azaleas fertilized with a liquid solution applied monthly compared to azaleas fertilized with a comparable amount of N supplied as urea-formaldehyde or coated urea. Conover and Poole (1) reported better growth of *P. oxycardium* fertilized with Osmocote compared to a liquid fertilizer and MagAmp. The Osmocote treated plants had N levels higher than plants fertilized with liquid or MagAmp. Plants which grew best in this experiment had a larger percent dry wt of N, P and K (Table 2). All plants fertilized with the Urea-form mixtures had less N, P and K than suggested by Joiner and Waters (3) and less N and K than suggested by Poole et al. (7). Vine length and grade increased with increases in fertilizer level with a large difference between the 1.1 and 2.2 g/pot level and smaller differences between the 2.2, 3.3 and 4.4 g/pot level. Waters and Llewellyn (8) reported excellent quality of *P. oxycardium* when plants were fertilized with 16 lbs 14-3-12 Osmocote incorporated, suggesting that slightly better plants may be obtained by levels higher than 4.4 g/pot which is approx 10 lbs/yd^3.

Table 1. Influence of fertilizer source and level on growth of *Philodendron oxycardium*.

Fertilizer Source	Vine length (cm)	Grade[x]
OSM 14-6-12	53b[w]	3.2d
LIQ 14-6-12	59c	3.8e
LIQ 14-3-12	61c	4.2f
MIX 1[z] 14-6-12	44a	2.2a
MIX 1 14-3-12	45a	2.5b
MIX 2[y] 14-6-12	47a	2.4b
MIX 2 14-3-12	48a	2.7c
g N/20 cm pot		
1.1	44a	2.3a
2.2	51b	3.1b
3.3	53bc	3.2b
4.4	56c	3.5b

[z]$(NH_4)_2HPO_4$, Urea-form, potassium frit.
[y]$(NH_4)_2HPO_4$, Urea-form, potassium frit, KNO_3.
[x]1 = poor quality, 3 = salable, 5 = excellent quality.
[w]Mean separation, within a group, in a column, by Duncan's multiple range test, 5% level.

[1]Florida Agricultural Experiment Stations Journal Series No. 706.
[2]Perk is a micro nutrient blend. Ed.

Table 2. Influence of fertilizer source and level on elemental composition of *Philodendron oxycardium*.

Fertilizer Source	% dry weight					ppm			
	N	P	K	Ca	Mg	Cu	Fe	Mn	Zn
OSM 14-6-12	1.2bc[x]	.24c	2.6b	1.6bc	.93b	22d	250c	158b	182b
LIQ 14-6-12	1.4d	.25c	3.3c	1.4ab	.53a	18c	201b	188c	168b
LIQ 14-3-12	1.4d	.23c	3.2c	1.2a	.48a	15b	132a	162b	166b
MIX 1[z] 14-6-12	1.0a	.18b	2.0a	1.5bc	.99b	15b	164ab	75a	122a
MIX 1 14-3-12	1.1ab	.18b	1.9a	1.5bc	.98b	12a	158a	74a	97a
MIX 2[y] 14-6-12	1.0a	.15b	2.0a	1.7c	1.10c	11a	127a	72a	110a
MIX 2 14-3-12	1.1ab	.11a	2.0a	1.5bc	1.11c	11a	123c	81a	106a
g N/20 cm pot									
1.1	1.8a	.18a	2.3a	1.4a	1.00c	15a	176a	76a	138a
2.2	2.1b	.20a	2.3a	1.5a	.91b	14a	163a	105b	134a
3.3	2.2b	.20a	2.5ab	1.5a	.83a	16a	175a	131c	135a
4.4	2.1b	.18a	2.6b	1.5a	.76a	14a	158a	152d	136a

[z]$(NH_4)_2HPO_4$, Urea-form, potassium frit.
[y]$(NH_4)_2HPO_4$, Urea-form, potassium frit, KNO_3.
[x]Mean separation, within a group, in a column, by Duncan's multiple range test, 5% level.

There was no difference in vine length between plants fertilized with 14-6-12 or 14-3-12 when fertilizer was obtained from the same source, and grade of plants fertilized with 14-3-12 was slightly better than those fertilized with 14-6-12 indicating that P levels may be decreased and plants of equal or higher quality produced. Poole and Conover (4) reported no difference in growth after 2 months between *P. oxycardium* grown without supplemental P or K and plants grown with a complete fertilizer. Poole and Conover (6) also reported no difference in growth of *Aechmea fasciata* fertilized with varying levels of P, again indicating that P is required in smaller amounts than given by a 1-1-1 ratio fertilizer such as 8-8-8 or 20-20-20 ($N\text{-}P_2O_5\text{-}K_2O$).

Fertilizer source had no influence on ht or grade of *C. lutescens*, but mixtures of Urea-form produced slightly better color and less necrosis than Osmocote or liquid applications (Table 3). Osmocote and liquid fertilized palms had more P, K and Mg indicating soluble salts may have caused the necrosis (Table 4). Waters and Llewellyn (8) reported max response of *Collinia elegans* occurred with 8 lbs/yd³ of 14-6-12, half the rate required for max response of *P. oxycardium*. In this experiment there was no response of *C. lutescens* to levels of fertilizer as they increased from 1.1 to

Table 3. Influence of fertilizer source and level on growth of *Chrysalidocarpus lutescens*.

Fertilizer Source	Height (cm)	Grade[x]	Color[w]	Necrosis[v]
OSM 18-3-10	114a[u]	3.8a	3.0a	1.6b
LIQ 18-3-10	111a	3.6a	3.2ab	1.7b
MIX 1[z] 18-3-10	110a	3.3a	3.7b	1.0a
MIX 2[y] 18-3-10	117a	3.4a	3.6ab	1.0a
g N/20 cm pot				
2.2	110a	3.2a	3.2a	1.2a
4.4	111a	3.5a	3.6a	1.3a
6.6	116a	3.7a	3.4a	1.3a
8.8	115a	3.8a	3.4a	1.6a

[z]$(NH_4)_2HPO_4$, Urea-form, potassium frit.
[y]$(NH_4)_2HPO_4$, Urea-form, potassium frit, KNO_3.
[x]1 = poor quality, 3 = salable, 5 = excellent quality.
[w]1 = light green, 5 = dark green.
[v]1 = no necrosis, 3 = heavy necrosis.
[u]Mean separation, within a group, in a column, by Duncan's multiple range test, 5% level.

Table 4. Influence of fertilizer source and level on elemental composition of *Chrysalidocarpus lutescens*.

Fertilizer Source	% dry weight					ppm			
	N	P	K	Ca	Mg	Cu	Fe	Mn	Zn
OSM 18-3-10	2.0a[x]	.17b	1.15b	1.1a	.68b	13a	93a	42a	86a
LIQ 18-3-10	2.0a	.17b	1.11b	1.2a	.62b	10a	89a	40a	85a
MIX 1[z] 18-3-10	1.9a	.09a	.76a	1.0a	.49a	12a	100a	39a	91a
MIX 2[y] 18-3-10	1.9a	.08a	.69a	1.1a	.46a	14a	84a	35a	90a
g N/20 cm pot									
2.2	1.8a	.10a	.76a	1.0a	.55a	14a	88a	39a	90a
4.4	2.0a	.13a	.83ab	1.2a	.58a	12a	86a	33a	88a
6.6	2.0a	.14a	1.00bc	1.2a	.56a	13a	103a	42a	87a
8.8	2.0a	.14a	1.12c	1.1a	.55a	11a	89a	42a	88a

[z]$(NH_4)_2HPO_4$, Urea-form, potassium frit.
[y]$(NH_4)_2HPO_4$, Urea-form, potassium frit, KNO_3.
[x]Mean separation, within a group, in a column, by Duncan's multiple range test, 5% level.

4.4 g N/pot, which is in contrast with previous work (5). Palms in this experiment did not exhibit an increase in elemental composition with increases in fertilizer levels except K, as did palms in the previous work indicating less nutrient availability in the present experiment. Results from this experiment indicate 1.1 g N/8 inch (20 cm) pot/5 months is sufficient for growth of *C. lutescens*, while earlier work (5) reports best growth at 2.5 g/pot. The earlier experiment was conducted for a longer time and 1.1 g may prove insufficient for long term growth as plants become larger and require more nutrients.

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INFLUENCE OF POTTING MEDIA AND FERTILIZER SOURCE AND LEVEL ON GROWTH OF FOUR FOLIAGE PLANTS ON CAPILLARY MATS[1]

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Abstract. Aphelandra squarrosa **Nees cv. Dania (Zebra plant),** Dieffenbachia maculata **(Lodd) G. Don cv. Exotica (Dieffenbachia),** Philodendron scandens oxycardium **(Schott) Bunt (Philodendron) and** Nephrolepis exaltata **Schott cv. Bostoniensis (Boston fern) were grown on capillary mats in potting media of native peat:pine bark:cypress shavings (2:1:1), native peat:mason sand (3:1), native peat (1) and native peat: pine bark (1:1) (v:v) and supplied with 500, 1000, 1500 or 2000 lb N/A/year from Osmocote 14-14-14 or liquid 20-20-20. Osmocote was incorporated into the potting medium, while liquid fertilizer was supplied weekly in the irrigation water. Generally, best overall growth as determined by several measurements was obtained by plants growing in native peat. Fertilizer source had very little effect on growth, while increasing fertilizer level was beneficial to Aphelandra and Boston fern.**

Foliage plants are grown in Florida in potting media with widely different physical and chemical characteristics (8). For the most part, these vastly different potting media allow production of good quality foliage plants, as long as the producer adjusts irrigation and fertilizer programs to the medium and environment. When capillary mats are substituted for hand watering, physical and chemical properties of the potting medium may have to be changed to achieve best crop response.

Campbell (2) grew the *Geranium* cv. Myles Standish on 4 types of capillary mats with 10 potting media and found that a potting medium composed of soil:peat:vermiculite gave greatest fresh and dry wt, and Pro-mix B the poorest. Campbell and Pirani (3) in another experiment used 5 types of capillary mats as well as sand and 10 potting media and again found that combinations of soil:peat:vermiculite gave best overall growth response. In the second experiment, Vattex P was better than other mats tested but not as good as sand. The fertilizer source in both experiments was 3.5 oz each of superphosphate, ground limestone and 14-14-14 Osmocote/bu. Generally, when plants are grown on capillary mats, a slow release fertilizer is incorporated into the potting medium. Freeman (6) grew poinsettias on various levels and ratios of Osmocote and found that 12 lb.[2] of 14-14-14/yd[3] produced highest quality plants. Other researchers (3, 7) have also used Osmocote with good results but European growers (1) usually use liquid fertilizer. Although increased soil-borne disease problems have been of concern with the use of capillary mats, Koths and Judd (7) found no increase in soil-borne diseases when poinsettias, pot mums, Rieger begonias and Easter lilies were grown.

These experiments were initiated to determine effects of 4 commonly used potting media on foliage plant growth on capillary mats when different fertilizer sources and rates were used.

Materials and Methods

Four 4x2x4 factorial experiments in randomized block design were initiated with Zebra plant, Dieffenbachia, Philodendron and Boston fern on November 29, 1974. Potting media (v:v) were native peat:cypress shavings:pine bark—2:1:1—(NP:CS:PB), native peat:mason sand—3:1—(NP:MS), native peat (NP) and native peat:pine bark—1:1—(NP:PB) which were amended with 7 lb. dolomite and 1 1/2 lb. Perk[3]/yd[3]. Fertilizer sources were Osmocote 14-14-14 incorporated into the potting media and liquid 20-20-20 from ammonium nitrate, potassium nitrate and phosphoric acid applied weekly in the irrigation water. Fertilizer levels were

[1]Florida Agricultural Experiment Stations Journal Series No. 746.

[2]For metric equivents see Table near the front of this Volume. Ed.

[3]A micronutrient blend manufactured by Kerr-McGee Chemical Company, Jacksonville, FL.