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

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[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.

500, 1000, 1500 or 2000 lb. N/A/year. There were 4 replications and the experimental unit consisted of 1 Zebra plant, 1 Dieffenbachia rooted cutting, one 3-leaf Boston fern offset or 3 rooted Philodendron cuttings/4 inch sq pot. Plants were grown in a glass greenhouse on U.S. Vattex P capillary mats which were kept saturated at all times, shaded to provide a light intensity of 1500 to 1800 ft-c and maintained at 65°F night min and 90°F day max temp. Benches were divided into compartments so that plants receiving Osmocote could not receive liquid fertilizer which was applied in solution directly on the mats once/week, and fertilizer levels were based on the combined surface area of pots on the mat. This system required a reduction in amount of fertilizer applied/compartment, whenever 1 of the 4 genera were selected for harvest. Experiment termination date varied for the different genera because of their growth rates, with Philodendron harvested January 3, Dieffenbachia on January 9, Boston fern on February 26 and Zebra plant on April 2, 1975. Data collected included plant grade: 1 = poor, 2 = fair, 3 = good, 4 = very good and 5 = excellent; leaf color: 1 = light green, 3 = medium green and 5 = dark green; leaf size, $\frac{\text{length + width}}{2}$ in cm for all 4 plants; ht for Boston fern, Dieffenbachia and Philodendron and no. of runners for Boston fern. Soluble salts were determined at termination date for each species by the 2:1 water to dry potting medium (v:v) method. Root systems of Zebra plant, Dieffenbachia and Philodendron were graded on a scale of 0 to 100 (%) of area of the root ball covered by roots. Root grade was omitted for Boston fern because the color and growth habit of roots prevented use of this grading system. Percent water holding capacity by volume and non-capillary pore space were determined on the 4 potting media prior to experiment initiation.

Results and Discussion

Response of the 4 foliage plants to potting media was variable (Table 1). Leaf size of Philodendron (5 weeks crop) did not vary and vine length varied only slightly in the various potting media. Best ht and leaf size of Dieffenbachia (6 weeks crop) generally occurred in NP or NP:PB. However, the magnitude of the differences (less than 2 cm in ht and 1 cm of leaf size) in these short term crops, although statistically significant, would have been difficult to discern without measurements. Height and leaf size of Boston fern (13 weeks crop) was generally lowest in NP:MS and about equal in the other media. Number of runners produced, however, was greater in NP. Height, plant grade, color grade and leaf size of Zebra plant (18 weeks crop) was generally best in NP:MS or NP. Growth of all 4 foliage plants was generally as good or better in NP than other potting media tested. Soluble salts levels of NP were highest, although similar to NP:MS in the short term Dieffenbachia and to NP:MS and NP:PB in the Philodendron crops (Table 2). A potting medium of 100% peat moss is known to have increases of excessive soluble salts when hand watered (9) and showed the same tendency on capillary mats. Percent of the root ball covered with roots was generally lowest for the NP:MS medium (Table 3) which was the medium with the lowest level of noncapillary pore space (Table 4). Lack of soil oxygen could have been responsible for poor root development in this medium. Height and leaf size of Dieffenbachia and leaf size of Philodendron, the short term crops, were greater when the fertilizer source was Osmocote (Table 1). This was associated with the highest soluble salts level (Table 2), and is probably related to the rapid nutrient release characteristic of 14-14-14 Osmocote. Zebra plant, an 18 weeks crop, had best ht and color grade when liquid fertilizer was applied (Table 1). Soluble salts levels for all plants were acceptable for acclimatized plants (5) and were slightly lower than desired for the long term crops of Zebra plant and Boston fern (Table 2).

Increasing fertilizer level had no effect on Dieffenbachia or Philodendron, the short term crops, but did on Zebra plant and Boston fern (Table 1). On Zebra plant 1500 lb. N/A/year was as good as any other rate except the color grade where the 2000 lb. rate was best. On Boston fern,

Table 1. Influence of media and fertilizer source and level on growth of 4 foliage plants on Vattex P capillary mats.

	Zebra plant 18 wk crop				Boston fern 13 wk crop				Dieffenbachia 6 wk crop		Philodendron 5 wk crop	
Treatment	Height (cm)	Plant grade[z]	Leaf size (cm)[y]	Color grade[x]	Height (cm)	Leaf size (cm)	No. runners	No. fronds	Height (cm)	Leaf size (cm)	Vine length (cm)	Leaf size (cm)
Potting media[w]												
NP:CS:PB (2:1:1)	16.8ab[v]	3.2a	9.0a	3.3a	31.6b	21.2ab	3.1a	7.5a	26.3ab	11.0a	23.7b	8.6a
NP:MS (3:1)	18.1c	3.6bc	10.0b	3.5ab	29.0a	19.9a	3.8a	8.0a	26.1a	11.0a	21.9ab	8.5a
NP (1)	18.0bc	3.9c	9.6ab	3.7b	31.6b	22.7b	5.5b	7.7a	28.1c	11.7b	21.2ab	8.8a
NP:PB (1:1)	16.5a	3.5ab	9.5ab	3.6b	31.5b	21.9b	3.5a	7.8a	27.4bc	11.6b	19.2a	8.8a
Fertilizer source												
Osmocote	16.1a	3.5a	9.6a	3.2a	31.3a	21.7a	4.0a	8.0a	27.7b	11.6b	21.9a	8.8b
Liquid	18.6b	3.6a	9.2a	3.8b	30.5a	21.2a	3.8a	7.4a	26.3a	11.0a	21.2a	8.6a
Fertilizer level lb. N/A/yr												
500	15.3a	2.6a	8.5a	2.1a	30.7a	20.8a	4.3a	6.6a	26.3a	11.0a	22.7a	8.8a
1000	16.9b	3.4b	9.9b	3.3b	33.4b	22.9b	4.0a	7.2ab	27.0a	11.2a	20.6a	8.6a
1500	19.0c	4.0c	9.6b	4.1c	29.7a	21.4ab	4.0a	7.9c	27.1a	11.4a	21.0a	8.7a
2000	18.2c	4.2c	10.0b	4.5d	29.8a	20.6a	3.4a	9.2d	27.5a	11.6a	21.6a	8.6a

[z]Graded as: 1 = poor—unsalable, 2 = fair—unsalable, 3 = good—salable, 4 = very good—salable and 5 = excellent—salable.

[y] $\frac{\text{Length + width}}{2}$

[x]Graded as: 1 = light green, 3 = medium green and 5 = dark green.

[w]NP = native peat, CS = cypress shavings, PB = pine bark and MS = mason sand.

[v]Means within a column followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

Table 2. Influence of media and fertilizer source and level on soluble salts levels (ppm) at termination of the experiments as determined by the 2:1 water to dry potting medium (v/v) method.

Treatment	Zebra plant 18 wk crop	Boston fern 13 wk crop	Dieffen-bachia 6 wk crop	Philo-dendron 5 wk crop
Potting media[z]				
NP:CS:PB (2:1:1)	486 a[y]	468 a	749 a	831 a
NP:MS (3:1)	570 a	569 a	855 ab	1007 b
NP (1)	826 b	879 b	917 b	1046 b
NP:PB (1:1)	538 a	573 a	751 a	920 ab
Fertilizer source				
Osmocote	546 a	552 a	1023 b	1180 b
Liquid	664 a	701 a	613 a	722 a
Fertilizer level lb. N/A/yr				
500	375 a	162 a	664 a	690 a
1000	366 a	289 a	671 a	897 b
1500	634 ab	924 b	815 a	982 b
2000	1045 b	1131 b	1121 b	1236 c

[z]NP = native peat, CS = cypress shavings, PB = pine bark and MS = mason sand.
[y]Means within a column followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

Table 3. Influence of media and fertilizer source and level on percent root ball covered with roots.

Treatment	Zebra plant	Dieffenbachia	Philodendron
Potting media[z]			
NP:CS:PB (2:1:1)	65.5 b[y]	39.8 ab	51.1 c
NP:MS (3:1)	55.8 a	33.7 a	28.6 a
NP (1)	67.7 b	45.2 b	41.0 bc
NP:PB (1:1)	56.7 a	39.8 ab	35.4 ab
Fertilizer source			
Osmocote	59.7 a	47.9 b	41.6 a
Liquid	62.7 a	31.4 a	36.4 a
Fertilizer level lb. N/A/yr			
500	54.1 a	39.3 a	48.2 b
1000	65.0 b	43.3 a	37.8 a
1500	61.1 b	38.6 a	33.7 a
2000	64.5 b	37.3 a	36.4 a

[z]NP = native peat, CS = cypress shavings, PB = pine bark and MS = mason sand.
[y]Means within a column followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

Table 4. Percent water holding capacity (WHC) by volume and non-capillary pore space (NCPS) of 4 potting media.

Potting media[z]	WHC	NCPS
NP:CS:PB (2:1:1)	72.4	19.6
NP:MS (3:1)	73.4	5.6
NP (1)	84.6	12.5
NP:PB (1:1)	74.2	19.7

[z]NP = native peat, CS = cypress shavings, PB = pine bark and MS = mason sand.

however, the 1000 lb. N/A/year rate was as good or better than any other for ht, leaf size and no. runners, but largest no. fronds occurred at the 2000 lb. rate. These results indicate that even the lowest fertilizer rate is adequate for short term crops, but suggested ranges of fertilizer (4) are necessary even for plants produced on capillary mats. Soluble salts levels increased with fertilizer levels (Table 2) and the highest level produced salts levels that were approaching the max desired for acclimatized plants when moved indoors (5).

Overall, good plant growth was achieved on capillary mats by all 4 foliage plants grown and all media were satisfactory. No disease problems were noted on plants grown on the mats which is consistent with previous reports by others (7). Both Osmocote and liquid fertilizer produced good plants and an average rate near 1500 lb. N/A/year was adequate.

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