Influence of Slow-release Fertilizer Source on Growth and Quality of Areca Palm, *Chrysalidocarpus lutescens* Wendl[1]

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Abstract

There was little difference noted in plant growth and quality of Areca palm, *Chrysalidocarpus lutescens* Wendl., when treated with three levels of several slow-release fertilizers at the manufacturer's recommended rates. The two resin-coated (RC) materials 18N-2.6P-10K and 17N-3.1P-10K (18-6-12 and 17-7-12) and urea formaldehyde (UF) fertilizer 10N-4.4P-8.3K (10-10-10) resulted in significantly better growth than either the isobutyledene diurea (IBDU) 20N-2.2P-4.2K (20-5-5) or the sulfur-coated urea (SCU) 14N-6P-12K (14-14-14) fertilizer sources. The RC materials were the least expensive fertilizers used in the production of this slow growing crop.

Index words: areca palm, butterfly palm, yellow-palm

Introduction

Chrysalidocarpus lutescens Wendl., commonly known as Areca palm, is a popular indoor foliage plant because of its longevity and ability to tolerate interior light intensities and low humidity (7). Areca palms are particularly popular with Hawaiian growers because they pack well and tolerate up to 15 days of surface shipping (3).

Many practices common to the production of container grown plants result in low nutrient recovery efficiency. Frequent irrigation applied to small volumes of growing medium contribute to nutrient losses through leaching (1,2). Use of slow-release fertilizers has been suggested as a means of reducing nutrient losses and maintaining adequate fertility levels in container plant production (1). Hauck and Koshino (4) reported that slow-release fertilizers are suitable for container production of many ornamental plants, particularly those with slow, uniform growth over extended periods.

Previous studies have indicated that Areca palm production is enhanced by use of slow-release fertilizers. Poole and Conover (9) reported that use of a resin coated material at a rate of 1794 kg N/hectare/yr (1600 lbs N/acre/year) resulted in plants of high quality. Neel and Donselman (8) reported similar results with a resin coated material and a sulphur coated urea, however the rate of applied N was much greater at 2800 kg N/hectare/yr (2500 lbs N/acre/year). These fertilizer sources had no overall effect on growth of the Areca palm, but better foliage color was produced when plants were fertilized with a ureaform 31N-2.6P-4.2K (31-6-5) combined with a potassium frit product.

Several materials of varying formulations are utilized by growers in Hawaii. These materials vary widely in price and effectiveness. This study was established to evaluate the performance of several locally available slow-release fertilizer sources at different levels in the production of Areca palm, *Chrysalidocarpus lutescens* Wendl., based on manufacturers recommendations.

Materials and Methods

Single Areca palm seedlings at the 1-leaf stage were transplanted singly into 10 cm (4 in) plastic containers. The potting mix was a peat:perlite mix (1:1 by vol) amended with dolomite 4.7 kg/m^3 (8 lbs/yd^3) and 1.1 kg/m^3 (2 lbs/yd^3) treble superphosphate (0-20P-0). In addition, the RC treatments were amended with 1 kg/m^3 (1.7 lbs/yd^3) Micromax, a micronutrient blend manufactured by Sierra Chemical Co, Milpitas, California.

Slow-release fertilizer treatment sources consisted of 2 resin-coated (RC) materials, 18N-2.6P-10K (18-6-12) and 17N-3.1P-10K (17-7-12), urea formaldehyde with fritted potassium (UF + FK) 10N-4.4P-8.3K (10-10-10), isobutylidene diurea (IBDU) 20N-2.2P-4.2K (20-5-5), and sulfur coated urea (SCU), 14N-6P-12K (14-14-14) at 3 rates incorporated into the medium for each treatment (Table 1). At manufacturer's recommendation, levels of any given element were not comparable but the rate of application was within acceptable lbs N/acre/yr based on recommendations from Florida (8,9,10). The UF + FK, IBDU, and SCU materials were reapplied at 3.5 month intervals (105 days) by incorporation into the top layer of the medium. The experiment was arranged as a randomized complete block with 15 single plant replicates.

The palms were grown under 73% saran shade (33778 lux, 3138 ft-c) at the University of Hawaii shade house facility with average day/night temperature range of 27° / 15°C (81° / 59°F). Daily irrigation was provided by overhead spray stakes. Pest control measures were taken as needed.

Growth response was determined by plant height (measured from soil surface to tip of most recently matured leaf), new leaf production as described by Ingram and McConnell (6), and dry weight of tops. Five tissue samples composed of the first mature leaf from 3 plants from each fertilizer rate combination were analyzed for nutrient content at the conclusion of the experiment using an x-ray quantometer.

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Table 1. **Slow-release fertilizer materials and rates.**

Fertilizer	Analysis	Rate (kg/m^3)[x] Low	Medium	High
Resin coated (RC)[z]	18-6-12	3.0	5.0	7.0
Resin coated (RC)	17-7-12	5.0	7.0	9.0
Urea formaldehyde + fritted potassium (UF + FK)[y]	10-10-10	4.2	5.1	5.9
Isobutylidene diurea (IBDU)[y]	20-5-5	1.5	2.2	2.7
Sulfer coated urea (SCU)[y]	14-14-14	1.8	3.6	5.5

[x]Rates based on manufacturer's recommendations.

[y]Reapplied at 3.5 month intervals

[z]Reapplied after 8 months

Cost analysis of the fertilizers was completed using local wholesale prices.

Results and Discussion

Since there was no significant difference in plant height between fertilizer rates, they were averaged for each fertilizer source (Table 2). At 3 months, the greatest height increase was for plants fertilized with the 2 RC and UF + FK materials with the IBDU and SC materials resulting in significantly shorter growth. Height increase was similar for the 2 RC materials after 11 months, followed by UF + FK, SCU, and IBDU.

New leaf production has been suggested by Ingram and McConnell (6) as a useful indicator of growth of palms. While this proved useful during the early growth stages of this study (Table 2), over the long term it was found difficult to monitor as leaf drop on the Areca palm keeps pace with leaf emergence and the number of leaves produced was observed to be nonsignificant.

Plant dry weight appeared to be a better indicator of growth as there were significant differences in both materials and rates (Fig. 1). Similar plant weights were found for the 2 RC fertilizer materials, the UF + FK and SCU fertilizers, while fertilizing with IBDU resulted in poor growth. Most materials showed better growth at the higher rates, especially RC, while the IBDU rates resulted in an inverse relationship.

Use of SCU fertilizer resulted in a sharp depression in medium pH after 3 months (Table 2). Neel *et al* (8) found a similar occurrence with use of a SCU and deduced that pH reduction was due to the oxidation of the sulfur coating. This low pH might have been responsible for poorer growth response of Areca palm since it has been reported that a neutral pH is desirable for best growth (8). Other fertilizer sources had little influence on medium pH and were similar to the initial pH (6.4)

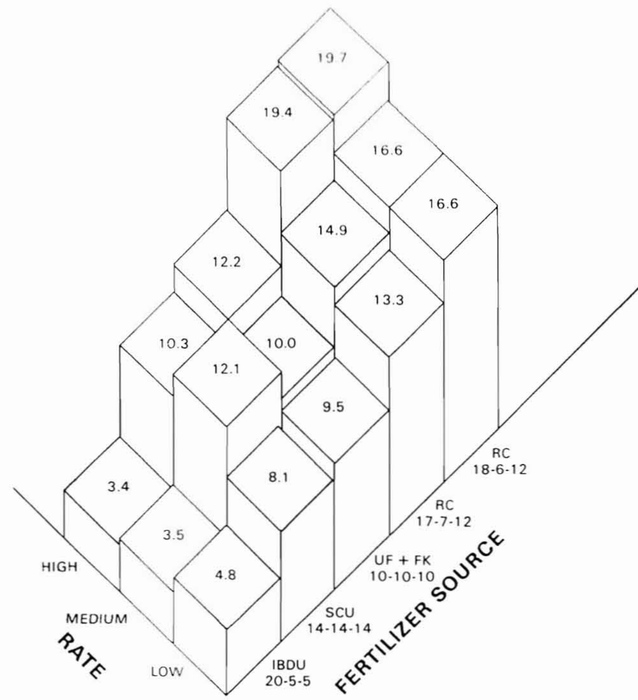

Figure 1. **The influence of slow-release fertilizer source and rate on top dry weight (gm.) of *Chrysalidocarpus lutescens* after 11 months.**

Nutrient levels in the foliage tissue at the conclusion of the experiment were not well correlated (data not shown) with the plant growth differences but were in close agree-

Table 2. **Influence of selected slow-release fertilizers on growth and medium pH of *Chrysalidocarpus lutescens*.**

		3 months			11 months
Fertilizer[z]	Analysis	Height increase (cm)	New leaves	Medium pH	Height increase (cm)
RC	18-6-12	3.5 a[y]	1.1 a	6.13 a	45.7 a
RC	17-7-12	3.5 a	1.4 a	6.42 a	43.3a
UF + FK	10-10-10	3.6 a	0.9 b	6.17 a	35.9b
IBDU	20-5-5	2.6 b	0.8 b	6.38 a	20.0 d
SCU	14-14-14	2.5 b	1.3 a	3.87 b	30.4 c

[y]Means in columns followed by the same letter are not significantly different at the 0.5 level according to the Waller-Duncan K-ratio t-test. Means of 45 plants.

[z]RC = resin-coated; UF + FK = urea formaldehyde with fritted potassium; IBDU = isobutyledene diurea; SCU = sulfur coated urea.

Table 3. Effect of fertilizer source on foliage tissue content of *Chrysalidocarpus lutescens* after 11 months.

		Tissue Analysis									
		Percent						PPM			
Fertilizer[z]	Analysis	N	P	K	Ca	Mg	S	Mn	Fe	Cu	Zn
RC	18-6-12	1.69	0.14	1.47	1.06	0.65	0.27	32	97	10	41
RC	17-7-12	1.89	0.16	1.35	1.08	0.61	0.29	43	87	10	42
UF + FK	10-10-10	1.94	0.28	1.94	1.23	0.86	0.29	70	78	8	47
IBDU	20-5-5	2.11	0.19	1.36	1.13	0.79	0.30	102	82	12	42
SCU	14-14-14	2.77	0.32	1.67	0.87	0.66	0.33	408	89	11	44
Florida standard	(5)	1.5-2.5	.10-.20	1.0-2.0	1.0-1.5	0.3-0.6		50-300	50-300	10-60	25-200

[z]RC = resin-coated; UF + FK = urea formaldehyde with fritted potassium; IBDU = isobutyledene diurea; SCU = sulfur coated urea.

ment with the optimum levels suggested by Henley (5) for Areca palms (Table 3). Higher P levels in tissue of plants fertilized with UF + FK and SCU appear related to fertilizer ratios resulting in more P being applied. Plants supplied with the SCU fertilizer had higher levels of N and Mn in the foliage and a depression in the Ca level. Depressed Ca is probably due to lower medium pH from the sulfur coating. However, there did not appear to be a significantly greater uptake of S by the plants.

Growers often purchase fertilizers based on cost per unit or per pound of fertilizer (Table 4). Using this criteria, IBDU fertilizer appears to be the best buy. However, when the labor and material costs are considered to make repeated applications over the 1 year growing season for Areca palms, RC materials become less expensive than the lower priced IBDU fertilizer.

Significance to the Nursery Industry

When selecting a fertilizer for container plant production of a specific crop, formulated material cost is not always a reliable guide. Using this criterion, the use of IBDU, in this study, would result in the lowest cost per pound of fertilizer. However, when plant performance was considered there was considerable difference in growth (top dry weight) of Areca palms between the various slow-release products tested with the RC materials at the highest rate producing the largest plant. When the other direct fertilizer costs are considered (including labor and material costs for repeated applications), the RC materials were less expensive than the other products tested.

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Table 4. Cost analysis for slow-release fertilizers based on 1987-88 wholesale prices at manufacturer's recommended rates (medium rate).

Fertilizer[y]	Analysis	Cost 50 lb. $	Total Cost[x] yd^3/yr. $	Mo. before fert. reapplication
RC	18-6-12	41.90	13.88	8.0
RC	17-7-12	45.60	12.94	12.0
UF + FK	10-10-10	35.84	29.82	3.5
IBDU	20-5-5	27.35	18.80	3.5
SCU	14-14-14	32.50	23.23	3.5

[x]Includes labor and material cost for reapplication.

[y]RC = resin coated; UF + FK = urea formaldehyde with fritted potassium; IBDU = isobutyledene diurea; SCU = sulfur coated urea.