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Comparison of Three Slow-release Fertilizers in the Production of Seedling Dwarf Date Palm

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Abstract. ***Phoenix roebelenii* O'Brian palm seedlings were potted in Metro Mix 500, and 3 groups of 25 plants each were fertilized with 18–2.6–10 (8- to 9-month release), 19–2.6–10 (3- to 4 month release) Osmocote, and 21–2.6–10 (6-month release) SulfurKote. Control pots with and without plants were either fertilized or not fertilized. Seedling palms were greenhouse grown for 23 weeks at temperatures ranging from 18° to 41°C. Fertilizer type had no significant effect on leaf number or length, total dry weight or root dry weight. Plants which received Osmocote formulations showed higher foliage dry weights than plants which received SulfurKote. Conductivity of leachate (EC = mmhos/cm[2]) from pots fertilized with slow-released materials generally increased with no indication that release rate of nutrients had peaked.**

The dwarf date palm is characterized by slender, soft, pinnately compound leaves and a trunk that rarely exceeds 2.7 m, and is ideal for interior spaces (1, 4, 5). As of yet, little research has been reported for this species. Slow-release fertilizers appear to be useful for dwarf date palm seedlings because of their relatively slow growth and the coarse, well-drained nature of most media recommended for palms (6, 7). The use of soluble materials may involve either excessive leaching of nutrients when water is applied in intermittent fertilizing programs, or accumulations of salts with "constant feed" programs (2, 8). The growth of palm seedlings and analysis of leachates from containers was used to compare the effectiveness of several slow-release materials with a range of effective release times (3).

Palm seedlings with 2 to 3 leaves were washed to remove soil and planted into Metro Mix 500 in 11 cm black plastic pots on 12 Jan. 1982. The palms then were placed in a completely randomized design in the greenhouse where temperatures ranged from 18° to 41°C. Three fertilizer formulations were applied, Osmocote 19N–2.6P–10K, 3–4 month formulation at 3.1 g/pot; Osmocote 18N–2.6P–10K, 8- to 9-month formulation at 3.6 g/pot; and SulfurKote 21N–2.6P–10K, 6 month formulation at 3.1 g/pot. The materials were scattered over the surface of the mix after potting. Twenty-five plants were used per fertilizer treatment. Additionally, 2 pots of mix without plants received each type of fertilizer, 2 pots of Metro Mix 500 were planted with palm seedlings and not fertilized, and 2 pots of Metro Mix 500 without plants were not fertilized. These pots were irrigated with 400 ml tap water each time the others were irrigated, and leachates were collected along with leachates from the fertilizer treatments. After the 1st week of "watering in", plants were irrigated about every other week, and leachates were collected for soluble salt determinations. Leaf number and longest leaf length were measured at the onset of the experiment and again after 160 days (about 23 weeks) at the conclusion on 21 June. A panel of 3 persons judged the plants at the end of the 23-week period for color, selling quality, and tip necrosis. Dry weights of the entire plants and of the top and root portions were determined at the conclusion of the experiment.

After 160 days, there were no significant effects of fertilizer type on leaf number or length, total dry weights nor root dry weights. There were some significant effects of fertilizer type on foliage dry weights, however. Plants that received Osmocote 18–2.6–10, 8– to 9-month formulation had significantly higher foliage dry weights than those receiving SulfurKote 21–2.6–10, 6-month formulation and slightly but not significantly higher foliage dry weights than those which received the Osmocote 19–2.6–10, 3- to 4-month formulation. Plants fertilized with Osmocote (both formulations) had higher foliar dry weights than those receiving SulfurKote (Table 1).

There were no significant differences among treatments in plant color, selling quality, or tip necrosis of leaves. However, some interesting relationships were noted when correlations between ratings and quantitative variables of response were examined. Significant negative correlations existed between color ratings and root and total dry weights, and between selling quality and number of leaves, foliage, root, and total dry weights and between tip leaf necrosis and foliage, root, and total dry weights. It appeared that small, compact plants received higher panel ratings (Table 2). An examination of the results of leachate analyses may be helpful in explaining these relationships.

Table 1. A comparison of the effects of 3 slow-release fertilizers on the foliage weights of *Phoenix roebelenii* O'Brian palm 24 weeks after application.

Treatments	No. months	No. plants	Mean foliage wt (g)
3.6 g Osmocote[z] 18–2.6–10	8–9	25	106.72 a[y]
3.6 g Osmocote 19–2.6–10	3–4	24	102.46 ab
3.1 g SulfurKote[x] 21–2.6–10	6	24	89.63 b

[z]Marketed by Sierra Chemical Co., Milpitas, Calif.
[y]Mean separation within column by Duncan's New Multiple Range Test, 5% level.
[x]Marketed by Sta-Green Plant Food Co., Sylacauga, Ala.

Table 2. The relationship between panel ratings and several measurements of *Phoenix roebelenii* seedling growth over a 24-week period.

	Average judges' ratings		
Measurements	Color rating	Selling quality	Tip necrosis
Mean number of leaves	---	−0.26 (0.03)	---
Foliage dry weights	---	−0.52 (< 0.01)	−0.26 (0.03)
Root dry weights	−0.27[z] (0.02)[y]	−0.48 (< 0.01)	−0.26 (0.03)
Total dry weights	−0.27 (0.02)	−0.51 (< 0.01)	−0.26 (0.02)
Selling quality	0.55 (< 0.01)	---	---
Tip necrosis	0.26 (0.02)	0.48 (< 0.01)	---

[z]Correlation coefficient.
[y]Spearman P values in parentheses. $P < 0.05$ level of significance.

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Table 3. Mean conductivity of leachate samples taken 9 times from 18 Mar. to 21 June 1982, EC = mmhos/cm^2, from containers planted with and without *Phoenix roebelenii* and either fertilized or not fertilized.

Treatments	No. months	Planted or not planted	No. plants	Mean leachate conductivities
1) 3.1 g SulfurKote[z] 21–2.6–10	6	Planted	221	0.96 e[y]
2) 3.6 g Osmocote[x] 18–2.6–10	8–9	Planted	221	1.09 d
3) 3.6 g Osmocote 19–2.6–10	3–4	Planted	219	1.32 bc
4) 3.1 g SulfurKote 21–2.6–10	6	Not planted	22	1.25 c
5) 3.6 g Osmocote 18–2.6–10	8–9	Not planted	16	1.38 b
6) 3.6 g Osmocote 19–2.6–10	3–4	Not planted	16	1.54 a
7) Not fertilized		Planted	18	0.33 g
8) Not fertilized		Not planted	18	0.42 f

[z]Marketed by Sta-Green Plant Food Co., Sylacauga, Ala.
[y]Mean separation within column by Duncan's new multiple range test, 5% level.
[x]Marketed by Sierra Chemical Co., Milpitas, Calif.

Nine leachate samples were taken and compared statistically between 18 Mar and 21 June. Samples from the first 3 dates (11 Feb. to 18 Mar.) varied considerably in conductivity whereas those obtained later were rather uniform. Mean conductivity readings for leachate samples from pots with 3 types of fertilizer, pots with different fertilizers but no plants, pots with plants in Metro Mix 500 alone, and pots with Metro Mix 500 and no plants are presented in Table 3. Leachates from planted pots fertilized with Osmocote 19–2.6–10, 3- to 4-month formulation were significantly higher in soluble salts than those from pots with SulfurKote 21–2.6-10, 6-month formulation or Osmocote 18–2.6–10, 8- to 9-month formulation. Pots with Osmocote 18–2.6–10, 8 to 9-month formulation showed leachates significantly higher in soluble salts than those with SulfurKote 21–2.6–10, 6-month formulation. Leachates from pots that received fertilizer, but contained no plants, were uniformly higher in soluble salts than planted pots with the same fertilizer treatments.

The conductivities of leachates from pots that received the slow-release fertilizers generally increased with time over the period of the experiment, and there was virtually no indication that release of nutrients had peaked before the end of the experiment. The pots that had no fertilizer added to the Metro Mix 500 medium showed some reduction in the concentration of soluble salts in leachates over the 160 day period.

Regression analyses of leachate conductivities and time showed a significant positive relationship for the 8- to 9-month Osmocote formulation (R^2 = 0.59), indicative of a steady increase in successive samples. Positive relationships of leachate concentration and time were found for the other formulations, but they were not significant (R^2 = 0.21) for the 6-month SulfurKote formulation and R^2 = 0.025 for the 3- to 4-month Osmocote.

Plants that were rated high for quality and color by the panel apparently were from media that were at times near harmful levels in soluble salts concentrations. When these media dried between irrigations, some plants were damaged and showed development of leaf tip necrosis. Careful attention to water requirements could allow these plants to be grown without damage.

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