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Removing Potassium-deficient Leaves Accelerates Rate of Decline in Pygmy Date Palms

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Potassium deficiency is a widespread and often serious disorder on many species of palms throughout the world (Chase and Broschat, 1991). Potassium is mobile within plants and deficiency symptoms are most severe on the oldest leaves, becoming less so on younger leaves (Mengel and Kirkby, 1982). As K deficiency becomes more severe on palms, the symptoms will affect progressively younger leaves until no symptom-free leaves remain. At this point, if untreated, new leaves will emerge chlorotic, reduced in size, and with extensive necrosis. Death of the palm's only shoot meristem often follows (Broschat, 1990).

Leaves normally remain on a healthy palm for 2 or more years, depending on the species, and each palm will retain a species-specific number of leaves (Tomlinson, 1990). Mildly K-deficient leaves are typically removed during landscape maintenance because they are visibly discolored, and severely deficient leaves appear dead except for the rachis and adjacent areas of the leaflets. Under conditions of K deficiency, K from the oldest leaves will be mobilized for use by the newly expanding leaves. Premature removal of the oldest K-deficient leaves may remove a source of K needed for plant growth. Potassium required for continued growth should then be mobilized from the oldest remaining leaves, which may previously have been symptom-free. As these leaves become symptomatic and are subsequently removed, still younger leaves will be utilized as a source of K by the meristem. Thus, removal of K-deficient leaves may accelerate the rate of decline from K deficiency in palms. The purpose of this study was to test this hypothesis on pygmy date palms (*Phoenix roebelenii* O'Brien), a species highly prone to K deficiency and which matures at a small enough size to be easily grown in containers.

Mature pygmy date palms having gray trunks at least 30 cm long were transplanted from 24-liter containers into 38-liter polypropylene containers using a 5 pine bark: 4 sedge peat: 1 sand medium amended with 880 g MicromaxR and 4.9 kg of dolomite/m3. Mild K deficiency occurred on palms fertilized with 200 g of Osmocote 17N-3P-10K per container every 6 months and moderate K deficiency was induced by fertilizing with 160 g of Osmocote 17N-3P-10K and 40 g of Osmocote 40N-0P-0K plus 20 g of MgSO4.H2O per container. Within each fertilizer treatment, 10 replicate palms had only dead leaves removed every 3 months, and 10 had dead as well as K-deficient leaves removed on the same time interval. A leaf was considered deficient if more than 3 leaflets had tips with 1 cm or more of orange discoloration.

Palms were grown under full sun (max. PPF=2100 uE.m2.sec-1) and received water as needed from rainfall and overhead irrigation. After 18 months the number of dead, deficient, and green leaves per tree were counted, and leaf samples consisting of the central 10 leaflets from the most recently matured leaf and the second oldest living leaf on each tree were collected for nutrient analysis. Leaf samples were dried, ground, and digested using a modified sulfuric acid and hydrogen peroxide procedure (Allen, 1979), with K concentrations determined by atomic absorption spectrophotometry. Data were analyzed by analysis of variance.

Both mildly and moderately K-deficient palms having deficient and dead leaves trimmed had significantly fewer green non-symptomatic leaves than those having only dead leaves removed (Table 1). These results support the hypothesis that removal of K-deficient leaves results in reduced canopy size and an accelerated rate of decline from K deficiency. In addition, significantly fewer dead and deficient leaves remained on the moderately deficient plants if both dead and deficient leaves were removed when compared to plants with only the dead leaves removed (Table 1).

For mildly deficient palms, only the number of dead leaves was reduced by removing both deficient and dead leaves compared to removal of only dead leaves. For both trimming treatments, the number of green leaves retained by moderately deficient palms was less than for the mildly deficient palms of the same leaf removal treatment ($P<.05$), suggesting that the number of green leaves retained may also be related to the amount of K in the soil available to the palm.

When both old and recently matured leaves were analyzed for leaf K concentrations, no significant differences existed among any treatments (data not shown). It appears that as long as older leaves are available to supplement K taken up from the soil, the K content of recently matured leaves will remain relatively constant until all leaves are deficient. Similar results were reported for K-deficient African oil palms (*Elaeis guineensis* Jacq.) (Hartley, 1988). Assuming that K is mobilized at a constant rate from oldest leaves under conditions of similar K deficiency, the K concentrations in the second oldest leaves should also be equivalent, regardless of the number of green leaves above it in the canopy.

In conclusion, canopy size (green leaves, as well as total living leaves) was reduced after 18 months of K deficiency in pygmy date palms when deficient leaves were periodically removed, compared to palms from which only dead leaves were removed. This supports the hypothesis that removal of deficient leaves removes a significant source of K for the growing meristem and accelerates the rate of decline from K deficiency.

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Table 1. Effects of periodic trimming of K-deficient leaves over an 18-month period on the canopy structure of mildly- and moderately-deficient pygmy date palms.

Treatment		No. of Leaves	
	Green	Deficient	Dead
Mildly-deficient palms			
Dead and deficient leaves removed	23.1	7.0	1.7
Dead leaves only removed	29.2	12.0	10.5
Significance (P)	.02	NS	<.0001
Moderately-deficient palms			
Dead and deficient leaves removed	18.4	9.1	0.2
Dead leaves only removed	24.7	27.7	10.3
Significance (P)	.02	.001	.0002

Nursery Production of Pickerelweed

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Pickerelweed (*Pontederia cordata* L., family Pontederiaceae), is a perennial, emergent, aquatic plant. Three common varieties of pickerelweed have been identified: *Pontederia cordata* L. var. *cordata*, *Pontederia cordata* L. var. *lancifolia* (Muhl.) Torrey, and *Pontederia cordata* L. var. *albiflora* Raf.

Pickerelweed is found in all sections of Florida, but is more abundant in central and south Florida. Variety *cordata* has a glabrous floral tube that is shaggy pubescent in the