POTASSIUM DEFICIENCY OF PALMS

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Potassium (K) deficiency is a common disorder of palms in S. Florida. It may be the most widespread & serious of the non-contagious diseases of palms. Most plants that suffer nutrient deficiencies exhibit various symptoms, some seriously affecting growth; but it is rare that a nutrient deficiency kills a plant. Among palms, however, some species are very sensitive to K deficiency, & they will die if it is not regularly supplied as fertilizer. Manganese (Mn) deficiency ("frizzletop") also will kill palms, & often the symptoms of K deficiency are mistakenly attributed to a lack of Mn.

This fact-sheet was prepared to meet the needs of professional landscape & nursery personnel, & other interested persons, who often request information "in writing" describing how to prevent or correct K deficiency in landscape & nursery palms.

SPECIES AFFECTED

Most species of palms grown in S. Florida can be affected, but K deficiency is most severe on royal (*Roystonea elata* & *R. regia*), queen (*Syagrus romanzoffiana*), coconut (*Cocos nucifera*), areca (*Chrysalidocarpus lutescens*), & spindle (*Hyophorbe verschafeltii*) palms.

Palms reported to be the most tolerant include Alexandra *(Archontophoenix alexandrae)*, spiny fiber (*Trithrinax acanthocoma*), Maya *(Gaussia maya),* & thatch (*Thrinax* & *Cocothrinax*) palms.

CAUSES

This deficiency is very common in Florida where soils are naturally deficient in K. It is also common in highly leached, sandy soils.

K deficiency is relatively uncommon on palms growing in clay. K is retained against leaching in clays & other soils having good cation exchange capacity, but is readily leached from sands or other soils having little cation exchange capacity. It can also be induced by a high Nitrogen (N) to K ratio in the soil.

Palms growing in containers tend to be susceptible to different deficiencies than landscape palms, & their causes are different. K deficiency can occur in containers if fertilizers low in K are used, but N & Iron (Fe) deficiencies are much more common.

The practice of removing older leaves which are partly dead speeds up the progression of symptoms, therefore hastening death. The plant uses these older leaves as a source of K for the new leaves, so this practice removes K & makes the deficiency worse.

SYMPTOMS

Because K is translocated from older to new leaves as new leaves develop, symptoms always appear first on the oldest leaves, & progress upward through the canopy as the deficiency becomes more severe.

Symptoms vary among species, & fall into 3 types: 1. translucent yellow or orange spots, 2. necrotic spots & streaks, plus marginal & tip necrosis of leaflets, & 3. discoloration of leaves, plus a withering or frizzling of leaf tips or entire leaves. **Table I** describes symptom types & lists species which exhibit each. **Table II** lists advanced symptoms present on most species.

DIAGNOSIS

In everyday practice visual symptoms are considered sufficient to identify this disorder. However, since late-stage K deficiency symptoms are quite similar to those of Mn deficiency (frizzle top) leaf nutrient analysis may be required to distinguish between the two (see **Table III**.)

Table I. The 3 types of K deficiency symptoms, & representative species.

type of symptom

1. Yellow spots. translucent yellow or orange spots on the leaflets, which may or may not have small, necrotic spots within them. Often leaflets are also necrotic along margins.
   Species: *Cocos nucifera, Elaeis guineensis, Chamaerops humilis, Chrysalidocarpus, Dictyosperma album, Hyophorbe verschafeltii, Livistona mariae, Neodypsis decaryi.*
2. Necrosis: leaflets are necrotic along margins & tips. Later, entire leaf appears burned & withered.
   Species: *Thrinax*, *Arenga*, *Roystonia*. (In *Livistona chinensis*, & *Bismarckia nobilis,* necrosis is at center & tips of leaflets.)
3. Discoloration: orange-brown or dull yellow discoloration at the tips on leaflets nearest tip of leaf. Rachis remains green, & the green & discolored parts are not sharply delimited. Later, leaflet tips, but not the margins, become necrotic, then the leaflets or entire leaves become withered or frizzled.
   Species: *Phoenix roebelenii.*

Table II. Symptoms of advanced K deficiency.

1. canopy is reduced in size.
2. the palm enters a state of decline.
3. reduced trunk diameter ("pencil-pointing").
4. last few leaves produced are small, frizzled, & chlorotic.
5. very susceptible species usually die.

Table III. Palm disorders/diseases often confused with K deficiency. (Compare with Table I.)

1. Disease: various leafspots. Compare to types 1 & 2.
   species: many.
   distinction: K deficiency spots appear only on older leaves, whereas disease spots are distributed throughout the canopy; nutrient analysis or disease lab report may be required.
2. Disorder: Mg deficiency. Compare to type 3.
   species: phoenix palms *(Phoenix* spp).
   distinction: Mg deficiency is bright yellow, not orange-brown or dull yellow. Green & discolored areas are sharply delimited.
3. Disorder: Mn deficiency. Compare to type 2.
   species: many.
   distinction: in Mn deficiency only new leaves are frizzled &/or off-color. Mn deficient leaves have necrotic streaks within the leaflets.

CONSIDER THE OPTIONS

On soils known through previous experience or soil test to be deficient in K, the regular use of a special palm fertilizer formulation can be effective in preventing or alleviating mild symptoms. If, however, symptoms are more advanced, a soil-applied K supplement, followed by regular use of the palm special, will probably be required.

Another consideration is the time required for a real "cure." Keep in mind that palms grow very slowly, many of them at the rate of about one leaf per month during the warm season, & less than that during Winter. A palm with fifteen leaves, for example, will require 1-2 yrs to replace its foliage at one leaf per month. Leaves which are symptomatic cannot be made green again–they must be replaced with new, healthy leaves. So, expect recovery to be slow.
In some landscape situations, you or your customer may find it preferable to remove the damaged palms

& replace them with healthy palms. Concurrently, you must take action to prevent the problem from recurring, by routinely using a fertilizer containing controlled-release K.

PREVENTION

The following general fertilizer recommendation for palms is based on research conducted in South Florida, updated in 1999. If followed, it will prevent most nutritional deficiencies, including K, in most situations. It is also properly *balanced*, so that too much of one nutrient won't interfere with the uptake of others.

LANDSCAPES & FIELD NURSERIES. Granular fertilizers should be applied to the soil at a rate of 1.5 lbs./100 sq. ft. of canopy area, 4 times per year. Fertilizers should be uniformly broadcast under the canopy rather than concentrating it in bands where some roots may be injured & others may never be in contact with fertilizer.

In landscapes, roots of groundcovers, shrubs, & broadleaf trees are intermingled with those of palms, & share the same soil conditions, so they will also benefit from this fertilization. Do not apply additional fertilizer–this rate is adequate for all the plants in a landscape, including the turf.

Fertility varies greatly among soil types in South Florida, but certain nutrients are consistently lacking in all soil types, & must be supplied by fertilizer. These are nitrogen (N), K, Mg, & Mn. A good balanced fertilizer for South Florida should provide N, P, K, & Mg in a 2:1:3:1 ratio, & contain some sulfur (S), 1-2% iron (Fe) & Mn, & trace amounts of zinc (Zn), copper (Cu), & boron (B). It is important that the N, K, & Mg be present in controlled-release forms like resin- or sulfur-coated products. If these recommendations are followed, deficiencies & antagonistic interactions are less likely to occur.

Foliar fertilization is a common practice in palm production, & is very useful for supplying micronutrients when soil conditions prevent adequate uptake by the roots. But foliar sprays of the macronutrients, like K & Mg, are ineffective in correcting deficiencies because the amount supplied by a foliar spray is insignificant compared to the amount needed to correct the problem.

Liquid fertilization is not the most efficient delivery system for landscape or field-grown palms, especially with overhead irrigation. If drip irrigation is being used, injection of liquid fertilizer through the system might be a feasible alternative.

CONTAINER NURSERIES. For containers, a fertilizer having a ratio of 3:1:2 is recommended. A controlled-release 18-6-12 or something similar can be incorporated into the medium at planting time according to the manufacturer's recommended rate. 1.5 to 3 lbs of a micronutrient amendment (rate depends on product), should also be incorporated into a cubic yard of medium, plus 8-12 lbs of dolomite/cubic yard to increase the pH to 6-6.5 & provide Ca & Mg.

TREATMENT OF K-DEFICIENT PALMS

Palms with mild deficiency symptoms often respond to an application of the fertilizer recommended above for prevention, the symptoms clearing up in 4 to 6 months. You can make applications at any time deficiency symptoms are observed, but especially during periods of active growth (Spring through Fall).

If symptoms are more severe, or if the complete fertilizer doesn't correct the problem, you should make a broadcast application of sulfur-coated potassium sulfate at 3 to 8 lbs. per tree. At the same time also apply 1/3 as much controlled-release magnesium sulfate to prevent K-Mg imbalance (& resulting Mg deficiency), from occurring. Apply both the K & the Mg 4 times per year. Once K deficiency has been corrected, additional soil applications of supplement should be made only if symptoms recur.

Remember that symptomatic leaves on K-deficient palms will never recover & must be replaced by new, healthy leaves. In severely deficient palms, this means replacing the entire canopy, & will take 1 to 2 years or longer.

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Selected References

1. Broschat, T.K., and A.W. Meerow. 1999. *Palm nutrition guide*. Coop. Ext. Ser. pub. SS-ORH-02, Univ. of Florida. 4 pp.
2. Chase, A.R., and T.K. Broschat. (eds.). 1991. *Diseases and disorders of ornamental palms.* American Phytopath. Soc. Press, St. Paul. pp 35 & 42-43.
3. Dickey, R.D.. 1977. *Nutritional deficiencies of woody ornamental plants used in Florida landscapes*. Agric. Exp. Sta. Bul. 791, Univ. of Florida. 59 pp.
4. Meerow, A.W.. 1994. *Betrock's guide to landscape palms*. Betrock Information Systems, Hollywood, Florida. pp 114-116.
5. Meerow, A.W., T.K. Broschat, & J. Miller. 1995. *Field production of palms*. Coop. Ext. Ser. Cir. 877, Univ. of Florida. 12 pp.

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** Special thanks to T.K. Broschat, Univ. of Florida - Fort Lauderdale Research & Education Center, for reviewing this publication.

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The cover art is by Master Gardener Bob Northrup. Thanks.

In Writing
Publications for the horticulture
professionals of Miami-Dade County.
Fact Sheet No. 29
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Extension Agent/Commercial Urban Horticulture
Miami-Dade County Cooperative Extension Service
printed 10/99 jfg K def fs 1099f

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Miami-Dade County/University of Florida
Cooperative Extension Service

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