# Palm Nutrition Guide

by Timothy K. Broschat[2]

Palms suffer quickly and conspicuously from improper mineral nutrition, whether due to insufficient or incorrect fertilization. They also may exhibit certain nutritional disorders in unique ways compared to other ornamental plants. Some nutritional problems in palms are difficult to diagnose accurately because symptoms of several different mineral deficiencies may overlap. In this guide, nutritional disorders common on palms in the landscape are discussed and illustrated. Fertilization recommendations for palms in these situations are also provided.

## Nutritional Disorders in the Landscape or Production Field

### Nitrogen

Nitrogen deficiency is relatively uncommon landscape palms, compared to other elements such as K, Mg, and Mn. Symptoms of N deficiency include an overall light green color and decreased vigor of the palm ( Plate 1 ). It is easily corrected by applying any N fertilizer to the soil. Leaf color quickly darkens in response to either soil or foliar fertilization.

Plate 1.

### Potassium

Potassium deficiency is perhaps the most widespread and serious of all disorders in palms. Symptoms occur first on oldest leaves and affect progressively newer leaves as the deficiency becomes more severe. Symptoms vary among palm species, but typically begin as translucent yellow or orange spots on the leaflets ( Plate 2 ). These may or may not be accompanied by necrotic spots. Leaflets will typically have areas of necrosis along their margins ( Plate 3 ). As the symptoms progress, leaflets or entire leaves will become withered or frizzled in appearance ( Plate 4 ). The midrib usually remains alive on K-deficient leaves, although it may be orange in color instead of green in some species. In date palms ( Phoenix spp.), symptoms are slightly different in that older leaves show an orange-brown discoloration near the tip ( Plate 5 ). It is also the leaflet tips, rather than the margins, that become necrotic as the deficiency progresses. The color of the chlorotic region in Phoenix leaves is a dull orange or even tan ( Plate 5 ), in contrast to the bright yellow of Mg deficiency ( Plate 6 ).

Plate 2.

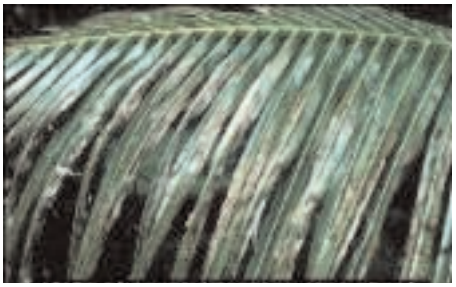

Plate 3.

Plate 4.

Plate 5.

Plate 6.

Potassium is translocated from older to new leaves as required by the palm. In severe deficiencies, the canopy will be greatly reduced in size due to the removal of K from all leaves. Once all K has been removed from older leaves, the palm will go into a state of decline, with reduced trunk diameter (pencil-pointing), and the emergence of small, frizzled or chlorotic new leaves. Without prompt treatment, these palms will usually die. K deficiency affects all species of palms, but is most severe in royal, queen, coconut, areca, and spindle palms. Treatment requires broadcast soil applications of sulfur-coated potassium sulfate at rates of 3 to 8 lbs. per tree 4 times per year plus one-third as much controlled release magnesium fertilizer to prevent a K—Mg imbalance (and resulting Mg deficiency), from occurring. Symptomatic leaves on K-deficient palms will never recover and must be replaced by new, healthy leaves. In severely deficient palms, this means replacing the entire canopy, a process that may take 2 years or longer. Foliar sprays with K fertilizers are ineffective in correcting the problem since the amount of K supplied by a foliar spray is insignificant compared to the amount needed to correct the problem.

**Magnesium**

Magnesium deficiency is also quite common in palms, but especially in Phoenix canariensis . As with K deficiency, symptoms occur first on the oldest leaves and progress up through the canopy. Typical symptoms are a broad light yellow band along the margin of the older leaves with the center of the leaf remaining distinctly green ( Plate 6 ). In severe cases, leaflet tips may become necrotic, but Mg deficiency is rarely, if ever, fatal to palms.

Magnesium deficiency is best treated preventatively since treatment of deficient palms takes considerable time. As with K deficiency, symptomatic leaves will never recover and must be replaced by new healthy leaves. On acid soils, dolomite and magnesium oxide are excellent slow release Mg sources, but on neutral to alkaline soils more soluble forms such as kieserite (a less soluble form of magnesium sulfate) or preferably, coated kieserite are required. They should be applied at rates of 2 to 4 lbs per tree 4 times per year plus coated potassium sulfate at the same rate to correct the problem and prevent a K—Mg imbalance from occurring.

**Manganese**

Manganese deficiency or “frizzletop” is a common problem in palms growing in alkaline soils. Symptoms occur only on new leaves which emerge chlorotic, weak, reduced in size, and with extensive necrotic streaking in the leaves ( Plate 7 ). As the deficiency progresses, succeeding leaves will emerge completely withered, frizzled, or scorched in appearance and greatly reduced in size ( Plate 8 and Plate 9 ). Later, only necrotic petiole stubs will emerge and death of the bud quickly follows.

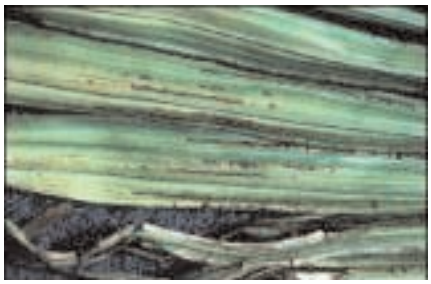

Plate 7.

Plate 8.

Plate 9.

Manganese deficiency is primarily caused by the element's insolubility at high pH's. In palms such as coconut that are not normally affected by the problem, cold soil temperatures during the winter and spring months reduce root activity and thus the uptake of micronutrients (especially Mn). Coconut palms severely deficient in Mn during the winter and spring will usually grow out of the problem without special treatment once soil temperatures warm up in late spring. Other palms such as queen, paurotis, and pygmy date palms, are highly susceptible to Mn deficiency and must be treated with soil or foliar applications of manganese sulfate or they will likely die.

**Iron**

Iron deficiency is relatively uncommon in landscape palms and is not usually caused by a lack of Fe in the soil, or even by high soil pH, as in many other plants. Iron deficiency usually appears on palms growing in poorly-aerated soils or those that have been planted too deeply. Waterlogged soils and deep planting effectively suffocate the roots and reduce their effectiveness in taking up nutrients such as Fe. Deficiency symptoms appear first on the new leaves and in most palms consist of uniformly chlorotic new leaves ( Plate 10 ). As the deficiency progresses, new leaves will show extensive tip necrosis and reduced leaf size. Early symptoms in queen palms include pea-sized green spots on otherwise yellowish new leaves ( Plate 11 ).

Plate 10.

Plate 11.

Iron deficiency symptoms can sometimes be temporarily alleviated by regular foliar applications of iron sulfate, but long term correction will only occur when the poor soil aeration or improper planting depth that caused the deficiency, are corrected.

Diagnosis of nutrient deficiencies by visual symptoms alone can be difficult, since some of the symptoms overlap considerably in some species. For instance, Mn and late-stage K deficiencies are easily confused on queen and royal palms and K and Mg deficiencies are very similar in pygmy date palms. Correct diagnosis can only be assured if leaf nutrient analysis is performed on symptomatic

palms.

**Nutritional Disorders in Container Grown Palms**

Palms growing in containers are susceptible to the same deficiencies that landscape palms experience, but the relative importance of the various deficiencies, as well as the causes, are different. Container media generally are more acid and have greater nutrient holding capacities than many soils. Thus leaching and insolubility of nutrients are much less of a problem. Also, container grown palms are often fertilized with more complete slow release fertilizers or regular liquid fertilization which prevent most deficiencies from occurring.

In containers, N deficiency is the most common deficiency and is caused simply by insufficient N in the medium ( Plate 1 ). It is typically the most limiting element in container production, whereas K, Mg, and Mn are much more limiting in landscape situations. Potassium deficiency can occur in containers if fertilizers having low K analysis are used, and Mg deficiency will occur if insufficient or low grade dolomite are added to the medium. Amendment of container media with dolomite is absolutely essential unless other sources of Ca and Mg are used in the fertilization program.

Sulfur deficiency occasionally occurs in containers if sulfate fertilizers are not used. Symptoms are virtually identical to those of Fe deficiency and can only be correctly diagnosed by leaf nutrient analysis. Manganese deficiency is much less common in containers since the growing medium is usually acid and Mn is much more soluble at lower pH's.

Iron deficiency is quite common in container grown palms ( Plate 10 ). Containers generally provide poor soil aeration at the bottom of the pot where palm roots typically are concentrated and Fe deficiency is usually the result. Planting palms more deeply than they were originally growing, will have the same effect and is a major cause of chronic Fe deficiency in container grown palms. Although foliar sprays with iron sulfate may temporarily correct the problem, permanent correction can only be achieved by replanting the palms at the correct depth and in new, well-drained media. For this reason it is important to use a container medium that will not quickly break down, resulting in finer particles and reduced aeration. Our studies have shown that dibbling of slow release fertilizers (as opposed to surface application) prevents the rapid breakdown of container media and greatly reduces nutritional problems associated with poor soil aeration.

Other essential elements such as P, Ca, Cu, Zn, B, and Cl, are occasionally found to be deficient if one of these elements is omitted from the fertilizer program, but such deficiencies are generally quite rare in container production or in landscapes.

**Palm Fertilization Programs**

**Field Nurseries**

Little or no research exists on fertilization rates for field-grown palms and rates will vary with the soil type and size of the palms. In general, 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 or 1 lb./100 sq. ft. 6 times per year. Rates and/or frequency of application can be reduced in low rainfall areas or on soils that have a moderately high cation exchange capacity. Fertilizers should be uniformly broadcast under the canopy of the palm rather than concentrating it in bands where some roots may be injured and others are never in contact with any fertilizer.

Fertility varies greatly among soil types in south Florida, but certain nutrient elements are consistently lacking in all soil types and must be applied through fertilization. These are nitrogen (N), potassium (K), magnesium (Mg), and manganese (Mn). A good balanced fertilizer for south Florida should provide N, P, K, and Mg in a 2:1:3:1 ratio and contain sulfur (S), about 1 to 2% Fe and Mn, and trace amounts of zinc (Zn), copper (Cu) and boron (B). It is very important that the N, K, and Mg be present in controlled release forms such as resin- or sulfur-coated products. If water soluble N, K, and Mg sources must be used, but they should be applied more frequently (at least monthly) and at lower rates (3/4 lb./100 sq. ft.) to compensate for the rapid leaching of these elements through the soil.

Foliar fertilization is a fairly common practice in palm production. It is a rather inefficient method for providing macronutrient elements such as N, K, and Mg, but is very useful for supplying micronutrients such as Mn and Fe to the plants when soil conditions prevent adequate uptake of these elements by the roots. Foliar fertilization is best used as a supplement for a normal soil fertilization program, particularly for micronutrients.

Liquid fertilization programs are not the most efficient delivery system for field nurseries, especially when overhead irrigation is used. The soluble nature of liquid fertilizer results in leaching or runoff of a great deal of the nutrients before uptake by the roots. To compensate, the grower often increases either rates or frequency of application, which results in waste and the potential for ground or surface water contamination. If drip irrigation is used in the field, injection of liquid fertilizer through the system may be cost-effective, and the problems inherent in overhead delivery may be minimized. A constant fertilization program delivering approximately 150 ppm of both N and K (and 1/3 as much Mg), will probably be adequate. It is a good idea to have your soil and irrigation water tested before formulating the nutrient analysis of your solution fertilizer.

**Container Palms**

For containerized palms, a fertilizer having a N-P 2 O 5 -K 2 O ratio of 3-1-2 is recommended. An 18-6-12 or similar slow release fertilizer can be incorporated into the container medium at planting time according to the manufacturer’s recommended rate. As discussed previously, dibbling of slow release fertilizers (as opposed to surface application) is recommended over surface application and even incorporation. The extra labor costs will be offset by the added longevity of the container soil, reduced weed growth, and consequently, better growth of the crop. One and a half to 3 pounds of a micronutrient amendment (rate depends on product), should also be incorporated into a cubic yard of planting medium. Approximately 8 to 12 lbs of dolomite per cubic yard incorporated into the mix will increase the pH of most media to 6-6.5 and provide calcium and magnesium for the duration of the crop. If constant liquid fertilization programs will be used instead, approximately 150 ppm of both N and K will probably be adequate. When soil temperatures drop below 65°F fertilization rates should be reduced. A monthly foliar fertilization with a soluble micronutrient spray is favored by a number of growers. Many palm species respond favorably to such a program.

**Landscape**

Fertilization of palms in the landscape does not differ appreciably from recommendations for palm field nurseries. Slow release palm special fertilizers like those described in the field nursery section should be applied uniformly to the entire ornamental planting area (or at least the entire palm canopy area) at a rate of 1.5 lbs./100 sq. ft. 4 time per year or 1 lb./100 sq. ft. 6 times per year. Since roots of ornamental groundcovers, shrubs, or broadleaf trees are often intermingled with those of palms in the landscape and share the same soil conditions, these other ornamental plants will also benefit

from this fertilization method.

Most landscapes tend to be a mosaic of turf and ornamental plants. Although the line of demarcation between turf and ornamental plantings may appear to be distinct above ground, the root systems of palms, broadleaf trees, and shrubs usually extend well into the turf area and share the soil with turf roots. Turf fertilizers typically are high in N relative to K and tend to have controlled release N, but water soluble K and often no Mg or micronutrients. When these products are used on turf in the vicinity of palms they often result in K deficiency being induced on palms growing nearby due to their high N to K ratio. Even if these turf fertilizers have a reasonable N to K ratio in their analysis, the controlled release N, but soluble K can result in a severe N to K imbalance over time due to differential leaching of the K. Therefore it is recommended that turfgrass growing within 30 ft of any palm or broadleaf tree or 10 ft of any shrub be fertilized only with the “palm special” landscape fertilizers discussed in the field nursery section above.

## Footnotes

1. This document is SS-ORH-02, a series of the Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Publication date: July 1992. Revised: July 2000. Please visit the EDIS Web site at http://edis.ifas.ufl.edu.

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