

Potassium Deficiency in Palms¹

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Symptoms

Symptoms of potassium (K) deficiency vary among species, but always appear first on the oldest leaves. Older leaflets of some palms such as *Dictyosperma album* (hurricane palm) are mottled with yellowish spots that are translucent when viewed from below (Figure 1). In other palms such as *Dypsis cabadae* (cabada palm), *Howea* spp. (kentia palms) and *Roystonea* spp. (royal palms), symptoms appear on older leaves as marginal or tip necrosis with little or no yellowish spotting present (Figures 2 and 3). The leaflets in *Roystonea*, *Dypsis*, and other pinnate-leaved species showing marginal or tip necrosis often appear withered and frizzled.



Figure 1. Older K-deficient leaf of *Dictyosperma album* showing translucent yellow-orange spotting when held up to the light.
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Figure 2. Potassium-deficient older leaf of *Dypsis cabadae* showing necrosis and curling of leaflet tips.
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Figure 3. Potassium-deficient older leaf of *Roystonea regia* showing leaflet tip necrosis and curling.
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In fan palms such as *Livistona chinensis* (Chinese fan palm), *Corypha* spp. (talipot palm), *Washingtonia* spp. (Washington palms), and *Bismarckia nobilis* (Bismarck palm), necrosis is not marginal, but is confined largely to tips of the leaflets (Figures 4 and 5). In *Phoenix roebelenii* (pygmy date palm), the distal parts of the oldest leaves are typically orange with leaflet tips becoming necrotic (Figure 6). The rachis and petiole of the leaves usually remains green, however, and the orange and green are not sharply delimited as with **magnesium (Mg) deficiency**. This pattern of discoloration holds for most palm species that show discoloration as a symptom.



Figure 4. Potassium-deficient older leaf of *Washingtonia robusta* showing extensive leaflet tip necrosis.
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Figure 5. Potassium-deficient older leaf of *Livistona chinensis* showing leaf discoloration.
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In *Phoenix canariensis* (Canary Island date palm), leaflets show fine (1–2 mm) necrotic and translucent yellow spotting and extensive tip necrosis. These necrotic leaflet tips in most *Phoenix* spp. are brittle and often break off, leaving the margins of affected leaves irregular.

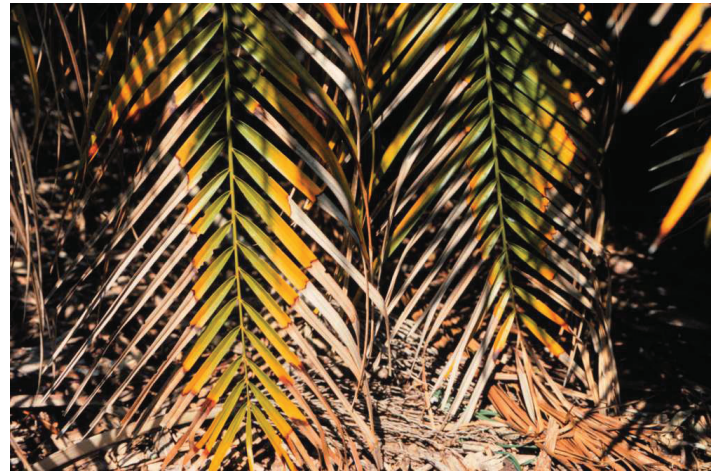


Figure 6. Potassium deficiency of *Phoenix roebelenii*.
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In *Caryota* spp. (fishtail palms) and *Arenga* spp. (sugar palms), chlorotic mottling is minimal or non-existent, but early symptoms appear as irregular necrotic spotting within the leaflets (Figures 7 and 8). In most other palms, including *Cocos nucifera* (coconut palm), *Elaeis guineensis* (African oil palm), *Dypsis lutescens* (areca palm), *Chamaerops humilis* (European fan palm) *Hyophorbe verschaffeltii* (spindle palm), and others, early symptoms appear as translucent yellow or orange spotting on the leaflets and may be accompanied by necrotic spotting as well. As the deficiency progresses, marginal and tip necrosis will also be present. The most severely affected leaves or leaflets will be completely necrotic and frizzled except for the base of the leaflets and the rachis (Figures 9–11).



Figure 7. Potassium-deficient older leaf of *Arenga* sp.
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For all palms, symptoms decrease in severity from tip to base of a single leaf and from old to new leaves within the canopy (Figures 12 and 13). Because K deficiency causes premature senescence of older palm leaves, the severity of this deficiency is best measured not by the number of discolored and symptomatic leaves, but rather by the number of living leaves in the canopy. In severe cases, the

canopy will contain only a few leaves, all of which will be chlorotic, frizzled, and stunted (Figures 14 and 15). The trunk will begin to taper (pencil-pointing) and death of the palm often follows.



Figure 8. Potassium-deficient older leaf of *Caryota mitis*.
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Figure 9. Potassium-deficient older leaf of *Dypsis lutescens* showing leaf discoloration and extensive necrosis of the leaflet margins and tips.
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Figure 10. Potassium-deficient older leaf of *Chamaerops humilis* showing translucent orange and necrotic spotting.
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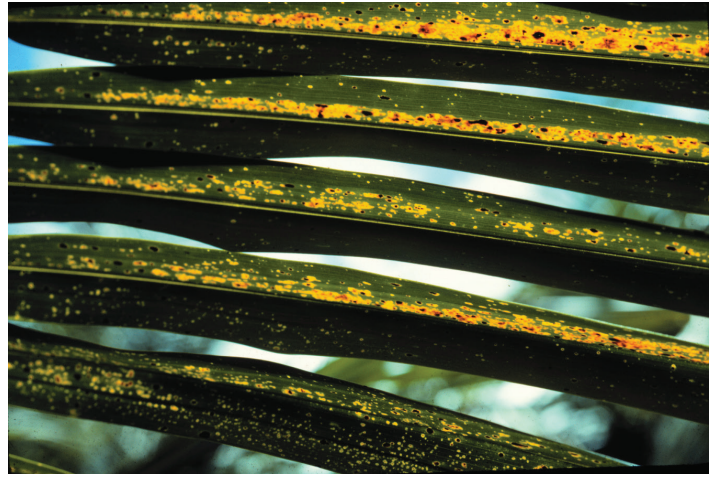


Figure 11. Potassium deficiency symptoms on older leaf of *Cocos nucifera* showing translucent yellow-orange spotting.
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Figure 12. Potassium-deficient older leaf of *Cocos nucifera* showing progression of symptoms from the base to the tip of the leaf.
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Figure 13. Potassium-deficient *Hyophorbe verschafeltii* showing the increase in severity of symptoms from new to old leaves.
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Figure 14. Late-stage K deficiency in *Cocos nucifera* showing small chlorotic and necrotic new leaves and trunk tapering. This palm died shortly after the photo was taken.
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Figure 15. Late stage K deficiency in *Roystonea regia* showing small necrotic leaves and tapering trunk (pencil-pointing)
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Cause

Potassium deficiency is caused by insufficient K in the soil, but can be induced or accentuated by high N:K or Ca:K ratios in the soil. Potassium is readily leached from sand or limestone soils which have very low cation exchange capacities.

Occurrence

Potassium deficiency is very common on palms grown in highly leached sandy soils. It is less common in container substrates. Potassium deficiency is perhaps the most

widespread of all palm nutrient deficiencies, occurring in most palm-growing regions of the world. It is quite severe in southern Florida and much of the Caribbean region. Although most species of palms are susceptible to some degree, genera such as *Veitchia*, *Adonidia*, and *Archontophoenix* are notably resistant to K deficiency. Potassium deficiency is the leading cause of mortality in *Roystonea* growing in southern Florida landscapes.

Diagnostic Techniques

Visual symptoms alone may be sufficient for diagnosis of this disorder although leaf nutrient analysis may be helpful in distinguishing late stage K deficiency from manganese (Mn) deficiency (see ENH-1015 *Manganese Deficiency in Palms* <http://edis.ifas.ufl.edu/ep267>). These two deficiencies can be extremely similar from a distance, but close examination should reveal characteristic spotting and marginal necrosis in K deficiency or necrotic streaking for Mn deficiency (Figures 16 and 17). Potassium deficiency symptoms are also more severe toward the leaf tip and are less so at the leaf base. The reverse is true for Mn deficiency.



Figure 16. Manganese-deficient *Roystonea regia*.
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Figure 17. Magnesium deficiency in *Phoenix roebelenii*.
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When sampling for leaf analysis, select 4 to 6 central leaflets from the youngest fully-expanded leaf. Soil analysis is not particularly useful for diagnosing palm nutrient deficiencies, since palm nutrient symptomology often bears little resemblance to soil nutrient profiles.

Management

Regular applications of K fertilizers will prevent K deficiency and treat palms already deficient. On sandy soils, or those having little cation exchange capacity, controlled-release K sources are much more effective than the easily leached water-soluble K sources. Sulfur-coated potassium sulfate has been shown to be the most effective and economical source for K in the landscape. When applying K fertilizers to correct an existing K deficiency, it is important to also apply about 1/3 as much Mg (also in a slow release form such as prilled kieserite) to prevent a high K:Mg ratio from causing an Mg deficiency problem. For severely K-deficient landscape palms, broadcast this 3:1 blend of sulfur-coated potassium sulfate and prilled kieserite uniformly to the soil under the canopy at a rate of 1.5 lbs per 100 sq ft of canopy area. This should be repeated in three months. Three and six months after that, a 1:1 mixture of the K:Mg blend and a balanced 8-2-12+4Mg palm maintenance fertilizer should be similarly applied at the rate of 1.5 lbs of fertilizer per 100 sq ft of canopy area, bed area, or entire landscape area. After one year, use only the 8-2-12+4Mg with micronutrients maintenance fertilizer at the above rate.

For mild to moderately K-deficient palms, application of the 8-2-12+4Mg palm maintenance fertilizer every 3 months should be sufficient to treat and prevent K deficiencies. Treatment of K deficient palms may require one to two years or longer, since the entire canopy of the palm may need to be replaced with new symptom-free leaves. Removal of discolored older K-deficient leaves on a regular basis has been shown to accelerate the rate of decline from this disorder and can result in premature death of the palm.

See also ENH-1009 *Fertilization of Field-grown and Landscape Palms in Florida* <http://edis.ifas.ufl.edu/ep261> and ENH-1010 *Nutrition and Fertilization of Palms in Containers* <http://edis.ifas.ufl.edu/ep262>.

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