ENH1015

UF UNIVERSITY of FLORIDA
IFAS Extension

Manganese Deficiency in Palms[1]

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Symptoms

The newest leaves of manganese (Mn)-deficient palms emerge chlorotic with longitudinal necrotic streaks (Figures 1 and 2). As the deficiency progresses, newly emerging leaflets appear necrotic and withered on all but basal portions of the leaflets. This withering results in a curling of the leaflets about the rachis giving the leaf a frizzled appearance ("frizzletop") (Figures 3 through 6). Within a single leaf, Mn deficiency symptoms are concentrated at the base of the leaf and are less severe or nonexistent towards the tip (Figure 7). On new leaves of Mn-deficient *Cocos nucifera* (coconut palm), necrotic leaflet tips fall off and the leaf has a singed appearance (Figure 8). In severely Mn-deficient palms, growth stops and newly emerging leaves consist solely of necrotic petiole stubs (Figure 9). Palm death usually follows.

Cause

Manganese deficiency is caused by insufficient Mn in the soil or by high soil pH, which greatly reduces Mn availability (Figure 3). In soils where Mn is marginally sufficient, cold soil temperatures may cause temporary Mn deficiency by reducing root activity levels. This is particularly common on *Cocos nucifera* in Florida. Composted sewage sludge and manure products have also been shown to strongly bind Mn when used as fertilizers or as soil amendments for palms (Figure 8).

Figure 1. Manganese deficient new leaf of *Phoenix roebelenii* showing longitudinal necrotic streaking. Credits: T.K. Broschat

Occurrence

Manganese deficiency is very common on alkaline soils, but can occur in containers if drainage is poor or soil temperatures are cool. Most species of palms can be affected, but *Syagrus romanzoffiana*

1. This document is ENH1015, one of a series of the Environmental Horticulture Department, Florida Agricultural Experiment Station, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date September 14, 2005. Visit the EDIS Web Site at http://edis.ifas.ufl.edu.

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Figure 2. Leaflets on youngest leaf of Mn-deficient *Archontophoenix alexandrae* (Alexandra palm). Note longitudinal necrotic streaking on chlorotic leaflets. Credits: T.K. Broschat

Figure 3. Manganese deficiency or "frizzletop" on *Syagrus romanzoffiana* caused by high soil pH. Note that old leaves are full size, while young leaves are greatly reduced in size. Credits: T.K. Broschat

Figure 4. Manganese deficiency on *Roystonea regia* (Cuban royal palm). Credits: T.K. Broschat

Figure 5. Manganese deficiency on *Phoenix roebelenii*. Credits: T.K. Broschat

Figure 6. Manganese deficiency or "frizzletop" of *Acoelorrhaphe wrightii.* Credits: T.K. Broschat

(queen palm), *Acoelorrhaphe wrightii* (paurotis palm), *Phoenix roebelenii* (pygmy date palm), and *Elaeis guineensis* (African oil palm) are particularly susceptible.

Diagnostic Techniques

Visual symptoms may be sufficient to diagnose this disorder, but leaf nutrient analysis is also suggested, since symptoms of boron (B) deficiency

Figure 7. New leaf of Mn-deficient *Archontophoenix alexandrae* showing more severe symptoms towards the leaf base. Credits: T.K. Broschat

Figure 8. Manganese deficiency on *Cocos nucifera* induced by composted sewage sludge in the backfill. Credits: T.K. Broschat

can be similar. Late stage potassium (K) deficiency symptoms are virtually indistinguishable from those of Mn deficiency at a distance and close examination is required to look for characteristic longitudinal streaking and basal (vs distal) symptom distribution of Mn deficiency.

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.

Figure 9. Severe Mn deficiency in *Syagrus romanzoffiana*. Credits: T.K. Broschat

Management

Fertilizers containing water soluble Mn should be used routinely on soils where Mn deficiency is a problem. Although soil applications of manganese sulfate are effective, spraying the foliage with this product may achieve more rapid, though short-term results, especially on alkaline soils. This should be considered as a supplement to soil applications, not as a replacement. Manganese sulfate solutions to be applied to the foliage can be made by mixing 3 lbs of this product in 100 gals of water. Soil application rates are dependent on palm species, soil type, and severity of Mn deficiency. These rates will range from as low as 8 oz for a small palm or one growing on an acid sand soil to 8 lbs for a large palm growing on a limestone soil. Broadcast this product over the soil under the palm canopy. Applications can be repeated every 2 to 3 months, depending on the severity of the problem and soil type. However, a response may not be seen until 3 to 6 months after applications. Avoid using composted sewage sludge or manure products near palms. Excessive Mn

applications normally result in an induced Fe deficiency, with its characteristic new leaf chlorosis.

Selected References

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