

MANGANESE DEFICIENCY OF PALMS – “FRIZZLETOP”

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Manganese (Mn) deficiency or “frizzle top” is a common disorder of palms growing in the high pH soils found in South Florida.

Most plants can suffer deficiency of one element or another, or even multiple deficiencies, & will exhibit various symptoms, sometimes seriously affecting growth; but it is rare that a nutrient deficiency kills the average plant. Among palms, however, a number of species are so sensitive to Mn deficiency that they will die if it is not regularly supplied as fertilizer.

This fact-sheet was prepared to meet the needs of professional landscape & nursery personnel, & other interested persons, who often request information “in writing” describing steps which can be taken to prevent or correct Mn deficiency in landscape & nursery palms.

SPECIES AFFECTED

Most species of palms grown in South Florida can be affected, but Mn deficiency is probably seen more on queen palm (*Syagrus romanzoffiana*) than on any other ornamental species. It is also frequently seen on coconuts (*Cocos nucifera*) following cold spells.

Palms reported to be particularly susceptible include queen palm, plus the following: paurotis (*Acoelorrhapha wrightii*), pygmy date (*Phoenix roebelenii*), African oil (*Elaeis guineensis*), & Latan (*Latania* spp) palms. These highly susceptible species must be treated with soil or foliar applications on a regular basis, or they may die. In coconut, Mn deficiency is transient, & therefore not fatal. It is worth noting that *Washingtonia* spp and *Sabal* spp appear to be resistant.

CAUSES

Mn deficiency can be caused by insufficient Mn in the soil, & by high soil pH, which makes the Mn that is

present less available. Composted sewage sludges & manures can also cause severe Mn deficiencies since these products can tightly bind any Mn in the soil & render it unavailable. Another cause often operative in South Florida is cold soil. Low temperatures can cause a temporary Mn deficiency by reducing root activity. The roots are less active, so nutrient uptake is reduced, especially micronutrients, & especially Mn.

In South Florida, we see this during the Winter & Spring, even on palms which normally do not suffer Mn deficiency. In coconuts rather severe symptoms may follow a cold spell, then disappear without any treatment as the season progresses & temperatures rise.

Mn deficiency is more often a limiting factor in landscape palms & field-grown nursery stock than it is in container palms. Container growing media are usually acidic & have greater nutrient-holding capacity than our soils. Mn is more soluble & available in acid media at lower pH.

SYMPTOMS

Symptoms show only on the newest leaves, which emerge chlorotic, weak, reduced in size & with extensive interveinal necrotic streaking. As the deficiency progresses, the leaflets on new leaves are necrotic & withered, except at the very base, where they join the rachis. This condition becomes worse on each new leaf.

The withering of the leaflets causes them to curl around the rachis, giving the leaf a frizzled or scorched appearance. This is referred to as “frizzle top,” & is common on queen & royal palms. In coconut the necrotic leaflet tips fall off, giving the leaf a singed appearance.

In very susceptible palms if Mn deficiency is allowed to go uncorrected beyond these first symptoms the plant stops growing, & the last few leaves produced consist of nothing more than dead stubs.

It is at this stage that the bud dies. Bud death means that the palm cannot survive, though it may take several months for the remaining (older) green leaves to die. Once bud death has occurred, the palm can be removed, because it cannot recover. (In multiple-stemmed palms only the affected canes will die.)

DIAGNOSIS

In everyday practice visual symptoms are considered sufficient to identify this disorder. However, if the plants are especially valuable, or if a large number are symptomatic, a leaf nutrient analysis might be a good idea, because the symptoms of Boron (B), Copper (Cu), & Zinc (Zn) deficiencies may be similar. In queen & royal palms, the late stages of Potassium (K) deficiency can also be similar to Mn deficiency.

Occasionally symptoms show up on part of a leaf or leaves, leading to diagnostic errors. It helps if you will view such symptoms back over the time when the leaf was emerging. If, for example, Mn is applied when the leaf is partly developed, the leaflets near the tip may be frizzled, but those near the base normal.

CONSIDER THE OPTIONS

On high pH soils or soils known through previous experience or soil test to be deficient in Mn, fertilizers which contain Mn should be used routinely. The regular use of a special palm fertilizer formulation can be effective in preventing or alleviating mild symptoms. If, however, symptoms are more advanced, the use of a foliar-applied micronutrient formulation may be preferable. The results achieved

through the foliar application are relatively quick, but short-term, & must be accompanied by soil-applied Mn. If not, the palm will become symptomatic again within a few weeks.

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 more than a year to replace its foliage at one leaf per month. Leaves which are green will benefit quickly from an application of Mn, but those which are frizzled cannot be made green again—they must be replaced with new, healthy leaves.

Even as the new leaves begin to emerge green & healthy, there may be an empty place where the dead leaves should be. 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 Mn.

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 Mn, in most situations. It is also properly *balanced*, so that too much of one nutrient won’t interfere with the uptake of others. For details see *Palm nutrition guide*, reference 1.

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. Lower rates may be adequate on marl & muck soils, as indicated by a soil test. Fertilizers should be uniformly broadcast under the canopy rather than concentrating it in bands where some roots may be injured & others are never in contact with fertilizer. Since in landscapes roots of groundcovers, shrubs, & broadleaf trees are intermingled with those of palms, & share the same soil conditions, they will 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, magnesium (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. For more detail, see *Palm nutrition guide*. Foliar fertilization is a common practice in palm production, & is very useful for supplying micronutrients like Mn when soil conditions prevent adequate uptake by the roots; it is best used as a supplement to regular soil fertilization.

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. An 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 Mn-DEFICIENT PALMS

Palms with mild deficiency symptoms will often respond to an application of the fertilizer recommended above for prevention, the symptoms clearing up in 1 to 6 months. Make applications at any time deficiency symptoms are observed, but preferably just before or during a growth flush, in Spring or Summer.

If symptoms are more severe, or if the complete fertilizer doesn't correct the problem, you can also apply a product containing only Mn, like manganese sulfate or TechManGam. The amount to use per tree will depend on the product & the severity of the deficiency, so follow label directions. (Rates of ½ to 2 lbs/plant should be effective.) Once Mn deficiency has been corrected, additional soil applications should be made only if the symptoms recur.

For soil-applied Mn in rock & marl soils, we are not concerned about applying so much that we reach toxicity levels, because the Mn becomes quickly unavailable. The benefit we receive consists of the Mn absorbed before it becomes unavailable.

On such high pH soils, it may be advisable to use a foliar-applied Mn supplement, because it will be absorbed directly & not become unavailable. Spray all foliage, as only what is sprayed responds. The response of chlorotic foliage is seen quickly, often in 4 to 8 weeks. Improvement in the plant as a whole is indicated by emergence of normal leaves, which will take more like 3 to 6 months, pretty much the same as for soil application.

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.

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3. Marlatt, R.B.. 1980. *Noncontagious diseases of tropical foliage plants*. Agric. Exp. Sta. Bul. 812, Univ. of Florida. 49 pp.
4. Meerow, A.W.. 1994. *Betrock's guide to landscape palms*. Betrock Information Systems, Hollywood, Florida. pp 114-118.

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In Writing

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