UF IFAS Extension UNIVERSITY of FLORIDA

ENH1009

Fertilization of Field-Grown and Landscape Palms in Florida[1]

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Palms growing in Florida landscapes or field nurseries are subject to a number of potentially serious nutrient deficiencies. These deficiencies are described and illustrated in document ENH1018. Prevention and treatment of these deficiencies is the subject of this document. Chemical symbols used in this document are as follows: N=nitrogen, P=phosphorus, K=potassium, Mg=magnesium, Ca=calcium, Mn=manganese, Fe=iron, B=boron, Cu=copper, Zn=zinc.

Fertilizer Formulation

Nutrient deficiencies are more easily prevented than corrected once they occur. Correction of nutrient deficiencies can take as long as 2 or 3 years for some elements. Research at the UF/IFAS has shown that regular use of a fertilizer having an analysis (the three numbers on all fertilizer labels which refer to their N-P_2O_5-K_2O content) of 8N-2P_2O_5-12K_2O +4Mg with micronutrients can correct mild to moderate deficiencies and prevent their recurrence in most soil types in south and central Florida (Broschat 2015b; Broschat et al. 2008). However, not all fertilizers that have an analysis of 8N-2P_2O_5-12K_2O+4Mg with micronutrients are effective and, if improperly formulated, may be worse for palm health than no fertilizer at all.

It is essential that 100% of the N, K, and Mg in such a fertilizer be in slow release form. Since Florida's soils have very low capacities to retain these elements in the root zone during periods of heavy rainfall or irrigation, the only effective way to keep these elements readily available to plants during the 2 to 3 month interval between fertilizer applications is to use slow release sources (Broschat 1996; Broschat 1997). A water-soluble source applied one day could be completely leached out of the root zone the next day by a heavy rainfall, and the palm would receive no benefit from the application. Controlled-release fertilizers are not greatly affected by rainfall or irrigation intensity. Since they release more slowly than water-soluble fertilizers, they are also less likely to burn plant roots during periods of drought.

Unlike the macronutrients N, K, and Mg that should be in slow release form, most micronutrients need to be in a water soluble form. However, granular slow release forms of boron are safer and more effective for Florida landscape soils.

Effective sources for N include sulfur-coated urea, urea-formaldehyde, resin-coated urea, and resin-coated ammonium salts. Of all the slow-release K sources tested, sulfur-coated potassium sulfate was found to be the most effective and economical (Broschat 1996). Prilled kieserite (a more slowly soluble form of magnesium sulfate than Epsom salts) is an effective and low-cost slow release form of Mg. Coated Mg products tend to release too slowly to be effective (Broschat 1997; Broschat and Moore 2006). Slow release B sources, such as Granubor, are less affected by leaching than the water soluble B sources often used in landscape fertilizer blends (Broschat 2008). The only

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recommended Mn, Zn, and Cu sources are the sulfate forms of these elements (Broschat 1991). Since iron sulfate is rather ineffective on most Florida soils, granular chelated products such as Trachelene Fe are preferred for blending into palm maintenance fertilizers (Broschat 2005).

Another reason why 100% of the N, K, and Mg must be in controlled release form is that the release rate of a nutrient source can determine the "effective analysis" of the blend. If heavy rainfall or irrigation occurs, any water soluble nutrients will be rapidly leached out of the root zone, while controlled-release sources are still releasing nutrients into the soil. This differential leaching of soluble vs controlled-release nutrient sources can alter the effective ratios among the various elements, often with detrimental effects on palm nutritional health. The soil N:K, N:Mg, and K:Mg ratios are very important for palm health, and it is essential that all three elements have similar release rates in order to keep these ratios constant over time.

Fertilizer Application

How you apply a fertilizer can also determine whether the application will be effective or not. Concentrating fertilizer in holes, as spikes, or in bands around the trunks of palms is less effective than spreading the same amount of fertilizer uniformly throughout the area under the canopy. This is because nutrient movement is almost exclusively downward in direction, and thus only that small proportion of the palm root system directly under concentrated fertilizer will ever be exposed to these nutrients. A concentration of fertilizer is also much more likely to burn palm roots than fertilizer spread out over a larger area. Injecting water-soluble fertilizers into the "root zone" of palms is never recommended because 1) water-soluble fertilizers are readily lost to leaching, 2) lateral movement of injected fertilizer is minimal, and 3) injecting any nutrients deeply enough to avoid turfgrass roots will also miss the majority of the palm's fine feeder roots, which tend to intermingle with turf roots near the soil surface.

Although trunk injection of micronutrients such as Mn has been shown to be effective (Broschat and Doccola 2010), this method is not recommended for palms except in cases where soil applications have been ineffective in alleviating chronic micronutrient deficiency symptoms. Since palms lack a vascular cambium and, thus, the ability to heal over wounds in the trunk, any holes created in the process of injecting palm trunks will remain as permanent scars and may provide entry sites for diseases or insect pests.

The 8N-2P_2O_5-12K_2O+4Mg with micronutrients maintenance fertilizer blend described above should release nutrients for up to three months, and thus a three-month application interval is recommended. The suggested application rate for south Florida landscapes is 1.5 lbs of the 8N-2P_2O_5-12K_2O+4Mg with micronutrients fertilizer (not N) per 100 sq. ft. of palm canopy area, bed area, or landscape area. Field nurseries typically apply twice that amount to maximize growth (Broschat 2015b). For landscapes in central and north Florida, winter applications can be omitted and lower application rates may also be adequate, although field nurseries in those regions will probably benefit from the higher south Florida application rates.

Fertilization in Areas where Summer Applications of N and P Are Prohibited

Some counties or municipalities in Florida prohibit the application of P fertilizers unless soil tests demonstrate that P is deficient. In addition, all N and P-containing fertilizers may be prohibited during the rainy months of June through September. Since this is a period when palm nutrient demands and leaching of existing soil nutrients are the greatest, proper fertilization is essential. However, earlier studies have suggested that N may not be as limiting during this warm wet season due to higher rates of natural organic matter decomposition. A recent study has shown that P fertilization may not be necessary at all under most Florida landscape conditions and an 8N-0P_2O_5-12K_2O+4Mg was as effective as the traditional 8N-2P_2O_5-12K_2O+4Mg formulation (Broschat 2015a). This study also showed that if the 8N-0P_2O_5-12K_2O+4Mg product was applied in February, May, and November, but the August application received a similar controlled release palm fertilizer that contained no N or P, then the resulting palm quality was as good as for those palms that received the 8N-0P_2O_5-12K_2O+4Mg product for all four applications. These no N or P palm fertilizers have an analysis of 0N-0P_2O_5-16K_2O+6Mg plus micronutrients. Contact your county Extension agent for information about the availability of these products in your area.

The 8N-0P_2O_5-12K_2O+4Mg fertilizers described above are suitable for all palm species growing in all soil types found within the state of Florida except for the muck soils of the Everglades Agricultural Area. In those soils, sufficient N is released naturally to provide more than enough N for optimum palm growth. However, if the standard 8N-0P_2O_5-12K_2O+4Mg fertilizer is used on these soils, the additional N from the fertilizer combined with that released from the

soil can result in excessive N relative to K, Mg, and other elements and could make deficiencies of those elements more severe. In those soils, the 0N-0P_2O_5-16K_2O+6Mg formulation described above is recommended.

Use on Entire Landscape

While the 8N-2P_2O_5-12K_2O+4Mg with micronutrients maintenance fertilizer described above was developed primarily for the nutritional requirements of palms, other types of plants, including broadleaf trees, shrubs, herbaceous ornamentals, fruit trees, and even turfgrass growing in the same soil are subject to the same inherent nutritional deficiencies in these soils (Broschat et al. 2008). Since palm nutritional requirements are higher than those for other types of plants, a fertilizer that is suitable for palms will be more than suitable for other types of plants. Comparative trials at the UF/IFAS Ft. Lauderdale Research and Education Center have shown that St. Augustinegrass fertilized with the above palm maintenance fertilizer had quality equal to that produced by a high quality turf fertilizer (Broschat et al. 2008).

Use of the above 8N-2P_2O_5-12K_2O+4Mg with micronutrients fertilizer is recommended for use on the entire landscape. This not only simplifies fertilization by having to use only a single product, but eliminates a serious problem encountered when high N turf fertilizers are applied to turf areas with palms growing nearby. Roots of large palms typically extend out 50 feet or more from the trunk in all directions and will take up whatever fertilizers have been applied to the turfgrass. The high N:K ratio and the lack of any Mg in most turf fertilizers forces rapid growth in palms, but without sufficient K or Mg to support that growth, this growth dilutes the existing K and Mg reserves within the palm and induces or exacerbates K and/or Mg deficiencies in the palms. High N fertilizers applied to turfgrass, even 30 feet away from a palm on one side only, have been known to kill palms from induced K deficiency. Given the high value of most specimen palms, applying high N fertilizers to the palms or to nearby turfgrass is no bargain, no matter how much less it may cost.

Sometimes it may not be possible to control what kinds of fertilizer are applied within the area covered by a palm's root system. For example, you may have a large palm relatively close to your property line. While you may be properly fertilizing your palm and lawn with the recommended 8N-2P_2O_5-12K_2O+4Mg, your neighbor may be fertilizing his lawn with typical turf fertilizers that will negatively affect the health of your palm. A recent study has shown that if the turfgrass near a palm has been fertilized with a typical high N:K ratio turf fertilizer, the negative impacts can be prevented by fertilizing the area under the canopy of the palm with the no N or P 0N-0P_2O_5-16K_2O+6Mg fertilizer discussed above instead of the usual 8N-2P_2O_5-12K_2O+4Mg (Broschat 2015a). This approach may also be more cost effective than fertilizing the entire landscape with 8N-2P_2O_5-12K_2O+4Mg for mixed landscapes containing palms and turfgrass.

Treatment of Severe Deficiencies

Finally, while the palm maintenance fertilizer described above is suitable for prevention of all nutrient deficiencies and correction of mild to moderate deficiencies, what can be done to correct existing severe deficiencies? For severe N deficiency, this palm maintenance fertilizer will be adequate by itself, and re-greening of the foliage should occur within a month or two.

When applying K fertilizers to correct a severe K deficiency, it is important to also apply about 1/3 as much Mg to prevent a high K:Mg ratio from causing a Mg deficiency problem. For severely K-deficient landscape palms, broadcast a 3:1 blend of slow release 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. A slow release palm fertilizer like the 0N-0P_2O_5-16K_2O+6Mg mentioned above works well for this purpose and is more readily available than slow release potassium sulfate and kieserite. This application should be repeated in three months. Three and six months after that, a 1:1 mixture of the 0N-0P_2O_5-16K_2O+6Mg and a 8N-2P_2O_5-12K_2O+4Mg palm maintenance fertilizer should be substituted at the rate of 1.5 lbs of fertilizer per 100 sq ft of canopy area. After one year, use only the 8N-2P_2O_5-12K_2O+4Mg palm maintenance fertilizer at the same rate.

Treatment of K deficient palms typically requires from one to three years or longer, since the entire canopy of the palm will need to be replaced with new, symptom-free leaves. Potassium-deficient palms support fewer leaves in their canopies than K-sufficient palms, and the symptomatic older leaves will not be eliminated until a full, rounded canopy of leaves has been produced (Broschat and Gilman 2013). 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 (Broschat 1994).

Treatment of severely Mg-deficient palms can require a year or more and is accomplished by broadcasting a controlled-release magnesium source (prilled kieserite is an excellent

source) at rates of 2 to 5 pounds per tree 4 to 6 times per year to the area under the canopy. This treatment is to be considered as a supplement to regular applications of a balanced 8N-$2P_2O_5$-$12K_2O$+4Mg palm maintenance fertilizer. To reduce the potential for salt injury, Mg and maintenance fertilizer applications can be offset by six weeks.

For Mn-deficient palms, soil applications of manganese sulfate are effective, but 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 5 lbs for a large species 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, but a response may not be seen until 3 to 6 months after applications. Avoid using composted sewage sludge or manure products near palms (Broschat 1991). Excessive Mn applications normally result in an induced Fe deficiency, with its characteristic new leaf chlorosis.

For treatment of Fe deficiencies, soil applications of iron sulfate are generally less effective than some of the chelated compounds such as FeDTPA, FeEDDHA, or FeHEEDTA, because free Fe^{++} ions are rapidly oxidized under most soil conditions to the less soluble Fe^{+++} form. On alkaline soils, FeEDDHA is the most effective product, followed by FeHEEDTA and FeDTPA (Broschat and Elliott 2005). FeDTPA is the most effective product for foliar application, but it is important to note that all of these chelates can be phytotoxic to palms and other plants when applied at high rates. Follow application guidelines on the label for these products. Keep in mind that most Fe fertilizers can cause brown staining, so take precautions to keep them away from non-target objects.

Fertilization to correct or prevent B deficiency in palms is problematic at this time. The most common B sources used on palms are water soluble sodium borates. In high rainfall climates, such as that of Florida, an application of water-soluble B can be completely leached out of the root zone with a single heavy rain shower. Slow release B fertilizers such as Granubor are an obvious solution to this problem because they release over a 3 to 4 month period (Broschat 2008). However, appropriate application rates for this product on palms have yet to be determined. It is extremely important not to overdose palms with B fertilizers since the difference between deficiency and toxicity levels of B is rather small, and correction of a B toxicity caused by over-application of slow-release B fertilizers could be very difficult.

Current recommendations for correcting B deficiencies in palms are intentionally conservative because of the potential for toxicity. Dissolve about 2–4 oz of Solubor or Borax in 5 gallons of water and drench this into the soil under the palm canopy (Dickey 1977). Do not repeat this for at least 5 months because it will take this long to see the results of the first application.

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