

# Palm Nutritional Deficiency Correction and Antagonistic Nutritional Relationships

*Submitted by Charlie Beck*

Every palm enthusiast wants to grow beautiful palms. Recommended fertilization and irrigation are key to growing attractive palms in Palm Beach County (PBC). Many palms respond to this treatment and grow vigorously, but palm enthusiasts want to grow a wide variety of palms, some of which might not respond favorably to standard maintenance practices. Even within a species of palm there are genetic differences which make them prone to nutritional deficiencies.

The first thing one must decide is whether deficient palms are worth growing. Some palm enthusiasts grow only palms which survive with little or no maintenance. Others follow all of the recommended practices. Some palms can recover from a deficiency with a few applications of supplemental elements but other palms take a real commitment by the enthusiast. In my mind, some palms do deserve special treatment, so their beauty can be appreciated.

This article is my attempt to simplify the correction of palm nutritional deficiencies. Most of the recommendations in the article are based on the research done by Dr. Timothy Broschat at the University of Florida. Other information from research papers, published domestically and overseas, were also included in my perspective. Also, recommendations are based on my decades of experience growing a wide variety of palms in Palm Beach County.

If you want to ID a palm deficiency, use the multitude of Electronic Data Information Source (EDIS) University of Florida publications. Just search the internet for EDIS + palm + suspected deficient element. You will see all of the EDIS research with accompanying photos. This is valuable information. Unfortunately many of the photos look similar, even with differing deficiencies. Symptoms may look different depending on the species, and not many species are shown. EDIS publications make suggestions on how to correct the deficiency. This is great information, except many of the recommended products are not available unless you order a minimum four ton purchase from a fertilizer company.

Tables in this article recommend nutritional elements that are available for purchase in Palm Beach County. Where slow release EDIS recommended products are not available, the tables will list quick release products applied more frequently at reduced amounts. Use these tables as a starting point for nutritional correction. Your experience growing palms in your garden (considering soil type and PH) may lend you to alter the application timing and rates. Most EDIS recommendations are expressed in pounds per 100 sq. ft. I converted weight recommendation into a more convenient measure of volume (cups).

Edis publications recommend a Palm Special formulated with proper nutritional ratios. This fertilizer was developed to supply a balanced amount of nutrients which are tailored to palm requirements. In a previous newsletter we published a practical guide to these recommendations. First line of defense is to apply approved Palm Special fertilizer as recommended by EDIS. Standard application rate is 1.5 pounds (approximate 2 1/2 cups) per 100 sq. ft. All supplemental feeding recommended in this article are meant to be in addition to regular applications of Palm Special fertilizer.

See link: [http://www.palmbeachpalmcycadsociety.com/documents/Fertilizer\\_Guide\\_for\\_Landscape\\_Palms.pdf](http://www.palmbeachpalmcycadsociety.com/documents/Fertilizer_Guide_for_Landscape_Palms.pdf)

## **Synergism- Antagonism**

Application of excessive amounts of one nutrient affects the uptake of others, thereby causing a nutritional deficiency. An example of this is the nutritional deficiency that occurs when high Nitrogen (N) lawn fertilizers are used around palms. Excessive N spurs growth, which triggers deficiency of other elements, which are not available in balanced amounts. To see a good example of this, observe palms growing along the median of A1A between Donald Ross Road and Indiantown Road in Jupiter, FL. Most of the *Roystonea regia* (Royal Palm) planted there are in a death spiral due to application of high N fertilizer. Classic Potassium deficiency is evident. It first occurs in old fronds and eventually moves up to the newest fronds causing "stem pencil pointing" and eventual death. How do I know this is due to high N fertilizer? The lawn underplanting is dark green and lush, and is provided with plenty of irrigation. These palms repeatedly die and are replaced- what a waste of money. I've seen this happen for years. The *Phoenix roebelenii* (Pigmy Date Palm) planted there are dying of Manganese deficiency (Frizzle Top) also caused by poor fertilizer choice. Keep in mind- not all palms show negative effect to High N fertilizer.

Synergism is the positive effect between nutrients applied at the recommended percentages. Antagonism is the negative effect between nutrients, when an excessive amount of one nutrient reduces the uptake of another. Soil type and PH influence antagonistic relationships, example- palms grown in alkaline soil are more prone to Manganese deficiency. This is why fertilizer for potted palms (acid soil) is vastly different from fertilizer formulated for in-ground planting (neutral to alkaline soil). Many of the papers published on nutrient Antagonism refer to agricultural crops, including coconut and oil palms.

Nutrient Antagonism	Based on EDIS publications and/or Internet Sources
EXCESS ELEMENT	NUTRIENTS AFFECTED
Nitrogen	Iron, Manganese, Potassium, Calcium
Potassium	Magnesium, Manganese
Magnesium	Calcium, Potassium
Manganese	Iron, Magnesium
Iron	Manganese
Calcium	Boron

Experience is key when evaluating a nutritional deficiency. Some species are especially sensitive to certain deficiencies. Royal Palms are declining all over PBC due to Potassium deficiency. *Syagrus romanzoffiana* (Queen Palm) often suffers from Manganese deficiency. Boron deficiency is evident in many genera, including *Copernicia*, *Dypsis*, *Livistona* and *Syagrus*. As we plant new species from around the world, we will discover their individual requirements. I divide deficiencies into two categories- “Old Frond” and “New Frond.”

- Potassium (K) and Magnesium (Mg) deficiencies first appear in old fronds.
- Iron (Fe), Manganese (Mn) and Boron (B) deficiencies first appear on new fronds.

Recommendations are based on the canopy size of the palm.

Small Palms = 100 sq. ft. = 5.6’ long fronds such as *Phoenix roebelenii* (Pigmy Date Palm)

Medium Palms = 300 sq. ft. = 9.8’ long fronds such as *Syagrus romanzoffiana* (Queen Palm)

Large Palms = 450 sq. ft. = 12’ long fronds such as *Bismarckia nobilis* (Bismark Palm)

## Nutritional Deficiencies



*Roystonea regia* showing effect of using high Nitrogen fertilizer. Potassium deficiency first shows in old fronds.



*Roystonea regia* Late stage Potassium deficiency is often confused with Manganese deficiency (Frizzle Top)



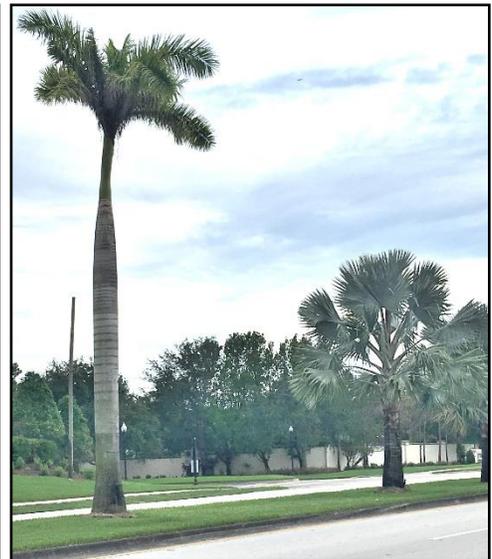
*Phoenix roebelenii* showing effect of using high Nitrogen fertilizer. Manganese deficiency first shows in new fronds.



*Copernicia baileyana* in the Beck Garden displaying symptoms of Potassium deficiency  
Picture taken June 2014



*Copernicia baileyana* same palm (shown on left) 3 years later after supplemental applications of Sulfate Potash Magnesia



*Bismarckia nobilis* seems content growing beside declining *Roystonea regia*

### **Deficiencies in Old Fronds**

Potassium deficiency is the most widespread in PBC. EDIS Pub ENH1009 recommends applying a 3/1 blend of slow release K & Mg every 3 months. Slow release K is currently not available in PBC. Slow release Mg (Kieserite) is available at box stores sold as Rite Green Magnesium Sulphate.

I recommend applying quick release products monthly or a combination of available products as shown in the table. The tables show equivalent amounts of products listed by weight and volume.

I highly recommend the use of Sulfate Potash Magnesia which is reasonably priced and widely available at landscape supply outlets. The K/Mg ratio is 2/1 rather than 3/1 as recommended by EDIS. I've applied this product monthly and have had successful results. You might choose to apply more product less frequently.

I find most Mg deficiencies are cured by this recommended blend of K and Mg. If severe Mg deficiency is present see EDIS pub ENH1014.

## DEFICIENCY in OLD FRONDS

Percentage of elements and weight per cup were considered when determining the values in the tables.

### Option 1 (recommended)

Apply 0-0-22-11Mg, Sulfate Potash Magnesia (Landscape Supply Outlets)  
May take 3 years for full recovery

#### Sulfate Potash Magnesia Apply monthly

Weight	Volume	
9 oz.	¾ cup	Small Palm (100 sq. ft.)
1 ½ pounds	2 1/2 cups	Medium Palm (300 sq. ft.)
2 ½ pounds	3 1/2 cups	Large Palm (450 sq. ft.)

**OR**

### Option 2

Apply 0-0-60 Potash (Internet Source) with either Magnesium source listed below:  
Rite Green Magnesium Sulphate 16% Mg (Box Stores) applied every **3 months**

**or**

Epsom Salt 10% Mg applied **monthly**

May take 3 years for full recovery.

#### 0-0-60 Potash Apply monthly

Weight	Volume	
4 oz.	1/3 cup	Small Palm (100 sq. ft.)
10 oz.	1 cup	Medium Palm (300 sq. ft.)
14 oz.	1 ½ cups	Large Palm (450 sq. ft.)

**AND**

#### Rite Green Magnesium Sulphate

Apply every **3 months**

Weight	Volume
6 oz.	½ cup
18 oz.	2 cups
27 oz.	3 cups

#### Epsom Salt - Apply monthly

**OR**

Weight	Volume	
3 oz.	½ cup	Small Palm (100 sq. ft.)
10 oz.	1 ¼ cups	Medium Palm (300 sq. ft.)
14 oz.	2 cups	Large Palm (450 sq. ft.)

## Deficiencies in New Fronds

Fe, Mn and B deficiencies appear in new fronds. Fe deficiency is indicated by production of abnormally light green fronds. There is an antagonistic relationship between Fe and Mn. Mn deficiency causes frizzled emergent fronds which sometimes can be confused with B deficiency. Mn deficiency also can be confused with late stage K deficiency. Prior to death from K deficiency emergent fronds are frizzled, but remember K deficiency first appears on old fronds.

Dr. Broschat informed me that the only palmate leaf palm that he has ever seen with Mn deficiency was *Acoelorrhaphes wrightii* (Paurotis Palm). That information might help you to distinguish between Mn and B deficiency. We might find exceptions to this observation as we plant more and more species.

EDIS Pub ENH1013 Iron Deficiency in Palms recommends applying Fe per label directions to Fe deficient palms. Chelated Iron EDDHA is the most effective Fe supplement when applied to alkaline soil. This product is expensive but is very effective. It can be found locally at landscape supply outlets.

The products I use are Chelated Iron EDDHA and Techmangam. Both of these products are water soluble. I mix appropriate amounts of both products with 4 gallons of water in a 5 gallon bucket. Once the solution is thoroughly mixed, I transfer a portion of the solution to a watering can and mix with additional water to further dilute. Then I evenly distribute the mixture from the watering can to the root zone. I repeat the process until all of the original solution from the 5 gallon bucket is gone. It might take 3-4 watering cans of solution to cover the entire zone out to the frond tips. I only use this process on a few palms that display Fe deficiency. Some palms (*Dypsis*, *Metroxylon*, etc.) seem to need extra Fe.

EDIS pub ENH1012 Boron Deficiency in Palms states that B is readily leached through most soils, with a single heavy rain event temporarily leaching most B out of the root zone. After a leaching event, B is replaced by decomposition of organic matter. It recommends diluting Borax in 5 gallons of water and evenly applying to root zone. Do not over apply this product because it becomes toxic in higher amounts.

For convenience, I do not mix Borax in water but carefully spread the recommended amount evenly to the root zone. I've never noticed a negative effect on lawn or other underplanting due to applying in the dry form.

The EDIS pub also explains that most forms of B mixed in Palm Special fertilizers are powders which tend to settle to bottom of fertilizer bag. This may cause uneven application of B when spreading the product, causing over and under application. Granubor is a better B source which does not tend to settle in fertilizer bags.

Another interesting antagonistic relationship is B with Calcium (Ca). I've been told by a nurseryman that a combined product with B & Ca (Calcibor) has been effective at his nursery. Unfortunately this product is not available locally.

Edis pub ENH1015 Manganese Deficiency in Palms states "Excessive Mn applications normally result in an induced Fe deficiency, with its characteristic new leaf chlorosis."

To address Fe-Mn antagonism in Fe deficient palms, I recommend a full dose of Fe and a quarter dose of Mn as shown in the table.

To address Fe-Mn antagonism in Mn deficient palms, I recommend a full dose of Mn as recommended by EDIS and a half dose of Fe as shown in table.

## DEFICIENCY in NEW FRONDS

**IRON (Fe) DEFICIENCY-** apply Fe supplement per label directions plus low dose of Manganese (Mn) to counteract nutrient Antagonism. **Apply 4-6 times per year until deficiency is gone.**  
Percentage of element and weight per cup were considered when determining the values in the tables.

Possible Fe supplements:

1. Chelated Iron EDDHA 6% Fe (Sequestrene 138Fe or equivalent) available at landscape supply outlets.  
Chelated Iron is 10 times more effective (by weight) than non-chelated iron sources. (Recommended-most effective Fe source when applied to alkaline soils)
2. Ironite 1-0-1-20%Fe (available at box stores)
3. Chelated Liquid Iron 5%Fe (Southern Ag or equivalent available at landscape supply outlets)

### High Dose Fe

Chelated Iron EDDHA 6%Fe (water soluble)	Ironite 20%Fe (granular)	Chelated Liquid Iron 5%Fe	
1/2 cup	0.3 pound or 1/2 cup	2 fl. oz.	Small Palm (100 sq. ft.)
1 1/2 cups	0.9 pound or 1 1/2 cups	5 fl. oz.	Medium Palm (300 sq. ft.)
2 1/4 cups	1.4 pounds or 2 1/4 cups	7 fl. oz.	Large Palm (450 sq. ft.)

Possible Mn supplements:

1. Techmangam 32% Mn (available at landscape supply outlets)
2. Manganese Sulfate 27% Mn (Rite Green available at box stores)

### Low Dose (25%) Mn

Techmangam 32% Mn (water soluble)	Manganese Sulfate 27% Mn (granular)	
0.3 pound or 1/3 cup	0.3 pound or 1/2 cup	Small Palm (100 sq. ft.)
0.8 pound or 1 cup	1.0 pound or 1 1/2 cups	Medium Palm (300 sq. ft.)
1.2 pounds or 1 1/2 cups	1.5 pounds or 2 1/4 cups	Large Palm (450 sq. ft.)

**Boron (B) DEFICIENCY-** apply Borax (available at supermarket) evenly to soil either dry or dissolved in 5 gallons of water. **Repeat at 5 month intervals until deficiency is gone.**

Borax	
1/8 cup	Small Palm (100 sq. ft.)
1/4 cup	Medium Palm (300 sq. ft.)
1/2 cup	Large Palm (450 sq. ft.)

## DEFICIENCY in NEW FRONDS (continued)

**Manganese (Mn) DEFICIENCY** (frizzle top) - apply high dose of Mn as shown in table below **and** apply low dose Fe to counteract nutrient Antagonism. **Repeat every 2-3 months until deficiency is gone.**

Possible Mn supplements:

1. Techmangam 32% Mn (available at landscape supply outlets)
2. Manganese Sulfate 27% Mn (Rite Green available at box stores)

### High Dose Mn (Frizzle Top)

Techmangam 32% Mn (water soluble)	Manganese Sulfate 27% Mn	
1.1 pounds or 1 ½ cups	1.3 pounds or 2 cups	Small Palm (100 sq. ft.)
3.3 pounds or 4 cups	4 pounds or 6 cups	Medium Palm (300 sq. ft.)
5 pounds or 6 ¼ cups	6 pounds or 9 cups	Large Palm (450 sq. ft.)

Possible Fe supplements:

1. Chelated Iron EDDHA 6% Fe (Sequestrene 138Fe or equivalent) available at landscape supply outlets. Chelated Iron is 10 times as effective (by weight) than non-chelated iron sources. (Recommended- most effective Fe source when applied to alkaline soils)
2. Ironite 1-0-1-20%Fe (available at box stores)
3. Chelated Liquid Iron 5%Fe (Southern Ag or equivalent available at landscape supply outlets)

### Low (50%) Dose Fe

Chelated Iron EDDHA 6% Fe (water soluble)	Ironite 20%Fe (granular)	Chelated Liquid Iron 5%Fe	
1/4 cup	1/4 cup	1 fl. oz.	Small Palm (100 sq. ft.)
3/4 cup	3/4 cup	2 1/2 fl. oz.	Medium Palm (300 sq. ft.)
1 cup	1 cup	4 fl. oz.	Large Palm (450 sq. ft.)

### Product Availability

Landscape Supply Outlets carry products that sell in large quantities. Golf courses and landscape maintenance companies are major customers. Lawn maintenance products and palm nutritional products are very different. Sometimes a lawn care product intersects with a palm nutritional product, such as, Sulfate Potash Magnesia which is commonly applied to golf greens. Otherwise, we are stuck using products that are commonly applied by landscape maintenance companies. Either cost or lack of knowledge drives these companies to use products which are inappropriate for palm maintenance. All you need to do is observe palms, such as *Wodyetia bifurcata* (Foxtail Palm) and *Roystonea regia* (Royal Palm), planted in PBC commercial settings to conclude that palm nutrition is not a priority. Lucky for us, Palm Special fertilizer, approved by UF, is available.

Here are some Landscape Supply Outlets located in PBC:

- Helena Chemical
- Winfield Solutions
- SiteOne Landscape Supply
- Uncle Bim's Garden Center

### General Supplemental Palm Nutritional Mixture

Craig Morrell gave our group a lecture a few years ago pertaining to supplemental palm nutrition. He reported success using a special mixture of products sprayed on the canopy and root zones of palms. I forwarded this supplemental recipe to Dr. Broschat for his opinion. He stated that it is hard to cure palms of a nutritional deficiency without applying the prescribed amount of the element. The amount of K in this General Supplemental Palm Nutritional Mixture would be inadequate to cure a K or Mg deficiency.

I did experiment with this General Supplemental Palm Nutritional Mixture. I applied it monthly to the entire garden. It is expensive and requires special equipment (high output sprayer) to apply in an efficient manner. I did see positive effect in mostly healthy palms, but this mixture wouldn't correct a severe nutritional deficiency. I include this recipe for your reference. This mixture is great on crotons.

### Craig Morrell Formula

Product	Per 100 gallons of water	Per 25 gallons of water	Per gallon of water
Keyplex	3 quarts	3 cups	2 tablespoons
Potassium nitrate	2 pounds	1 cup	2 teaspoons
20-10-20	2 pounds	1/2 pound or 1-1/4 cups	1 tablespoon
Mn liquid	3 quarts	3 cups	2 tablespoons
Epsom salt	2 pounds	1 cup	2 teaspoons
liquid dish soap	1 quart	1 cup	2 teaspoons

**SAFETY- always use appropriate safety gear when applying nutritional products. Breathing dust and skin contact should be avoided. Contact with products may have a cumulative, negative effect on your health. Wear appropriate respirator and gloves. Follow label warnings.**