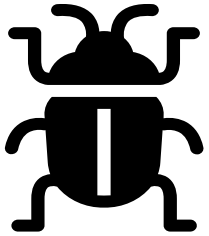
Palm Nutrition Update

Mica McMillan, PhD

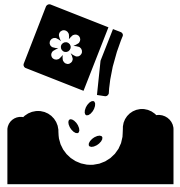
Mica.McMillan@ufl.edu

UF/IFAS – Fort Lauderdale Research and Education Center Palm Team



Entomology- Brian Bahder, PhD

Disease- Braham Dhillon, PhD



Environment - Mica McMillan, PhD

What are the three most common questions?

- Palm Nutrition – Potassium, Magnesium and/or Boron
- Transplant
- Amendments and Water

Nutrients Required for Palm Growth

Macronutrients

- **Potassium**
- **Magnesium**
- **Nitrogen**
- Phosphorus
- Sulfur
- Calcium

Micronutrients

- **Manganese**
- **Boron**
- Chlorine
- Copper
- Iron
- Molybdenum
- Zinc

Potassium Deficiency

- Yellow and orange spots on **oldest leaves - speckled**
- Leaf tip necrosis
- Curly tips
- Brittle tips- Phoenix spp.
- High N fertilizer leads to K deficiency.

K Deficiency

- Where? Lower Fronds
- Leaf tip necrosis? Yes
- Yellow and orange – mottling

- **K Deficient Leaves will never green up! Palms must grow new, health leaves which can take several years depending on the species.**
- **Palms in turfgrass areas that receive high N fertilizer with little K.**
- **Most common fertilizer deficiency on palms**

Magnesium Deficiency

Mellow Yellow

K and Mg – may exhibit both deficiencies on palms

T. Broschat

Magnesium Deficiency

- Light yellow color on the outer margins – center of the leaves remain green.
- Low and mid- canopy
- High nitrogen and potassium fertilization can lead to Mg deficiency
- Phoenix spp. Susceptible
- **Mg Deficient Leaves will never green up! Palms must grow new, health leaves which can take several years depending on the species.**

Photo-M.McMillan

Manganese (Mn) Deficiency

- “Frizzletop” and reduced size and chlorosis of ***new leaves***
- Most severe at the **base of the leaf.**
- Longitudinal streaking on the palm leaves.
- Caused by high soil pH

Photo-T. Broschat

Manganese Deficiency Identification

Necrotic Streaking on *Archontophoenix alexandre* – Alexandra Palm

“Frizzletop” on *Syagrus romanzoffiana*- *Queen Palm*-

Photos: Dr. Timothy Broschat

Boron Deficiency

- Always on New Leaves
- “Accordion Leaves”
- Inverted truncations
- Unopened spear leaves
- Crown bends in one direction and/or new leaves grow downward.
- Necrotic inflorescence
- Boron is either leached by rainfall or high soil pH with a dry soil

Photo M. McMillan

Boron – Dr. Seuss Deficiency

Unopened Spear Leaves

Small Crumpled Accordion New Leaves

Photos: T. Broschat

Unopened spear leaves

Boron Deficiency

- ❑Apply 2-4 oz of Solubor or Borax in 5 gallons of water
- ❑Drench around a single tree
- ❑5 months to see results of this application

Necrotic inflorescence- *Syagrus romanzoffiana-*

Photo: T. Broschat

Nitrogen Deficiency

- Nitrogen Deficient Solitarie Palm (*Ptychosperma elegans)*
- Caused by insufficient N in soils and cool temperatures
- Palms WILL respond to N fertilizer unlike other elements.
- Most common on Queen Palms (*Syagrus romanzoffia*na) in California but not typical in Florida
- Container Palms


232

Fertilization of Palms

For common nutrient deficiencies of palms (K, Mg, Mn, B), application of the appropriate fertilizer will *NOT* correct the leaf symptoms already present.

Fertilization is targeted at new leaves developing in the bud and emerging.

Fertilization of Palms

How can we help the Green Industry?

We must help homeowners and businesses understand that palms – although in the monocot family- are NOT turfgrass.

Response to fertilizer may be very slow- even years.

LETS PREVENT THE OVER APPLICATION OF FERTILIZERS!

For common nutrient deficiencies of palms (K, Mg, Mn, B), application of the appropriate fertilizer will *NOT* correct the leaf symptoms already present.

Fertilization is targeted at new leaves developing in the bud and emerging.

Again, fertilizer will *NOT* correct these symptoms! They will remain until affected leaves die naturally or are pruned.

Granular Fertilizer Rates

- 1.5 lbs of 8N-2P_2O_5-12 K_2O+4Mg per 100 sq.ft
- Apply 3-4 months out of the year.

- Fertilizer Ordinance (ufl.edu)

All businesses and residences are prohibited from using fertilizer containing nitrogen and phosphorus **between June 1 and Sept. 30**. The ban coincides with Florida's wet season, when rain is more likely to wash fertilizer into ditches and creeks leading to the lagoon and river, where algae gorges on it.Jun 1, 2021

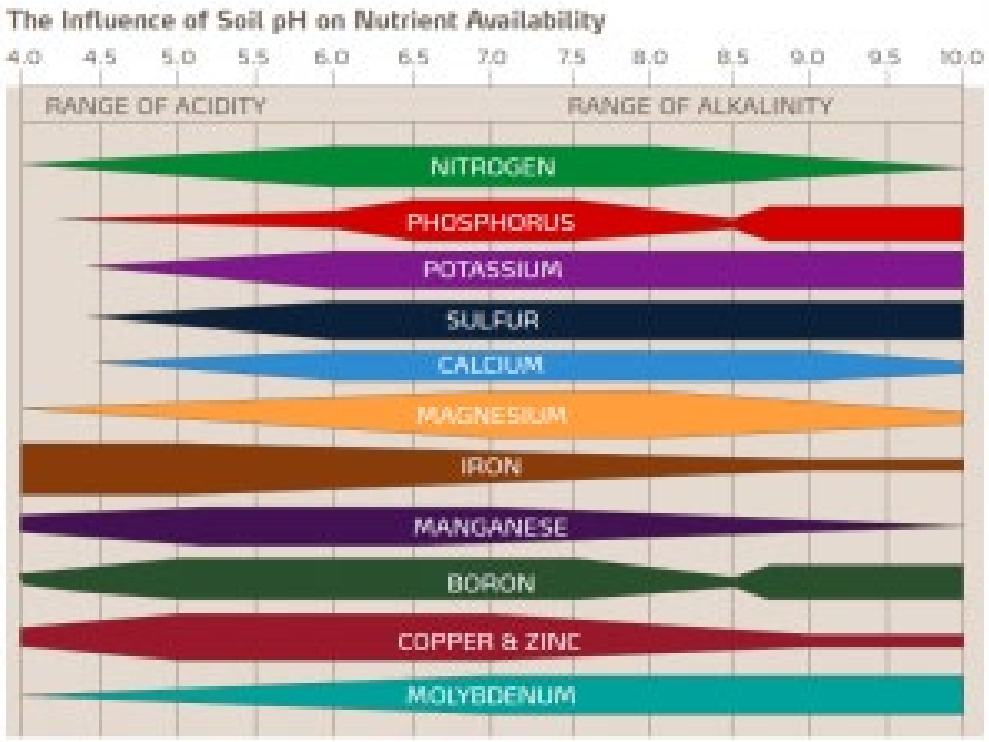
Fertilizing Landscape Palms

Use 8-2(0)-12-4Mg with micronutrients

- Broadcast 15 lbs fertilizer per 1000 sq. ft. of bed or canopy area every 3 months.
- Broadcast 1.5 lb/s per 100 sq.ft.
- When to use a slow release palm fertilizer like the 0N-0P_2O_5-16K_2O+6Mg?
- Fertilize turf within 50 ft. of any palm (that's where palm roots are located).

Causes of Palm Nutrient Deficiencies

What is your soil pH?

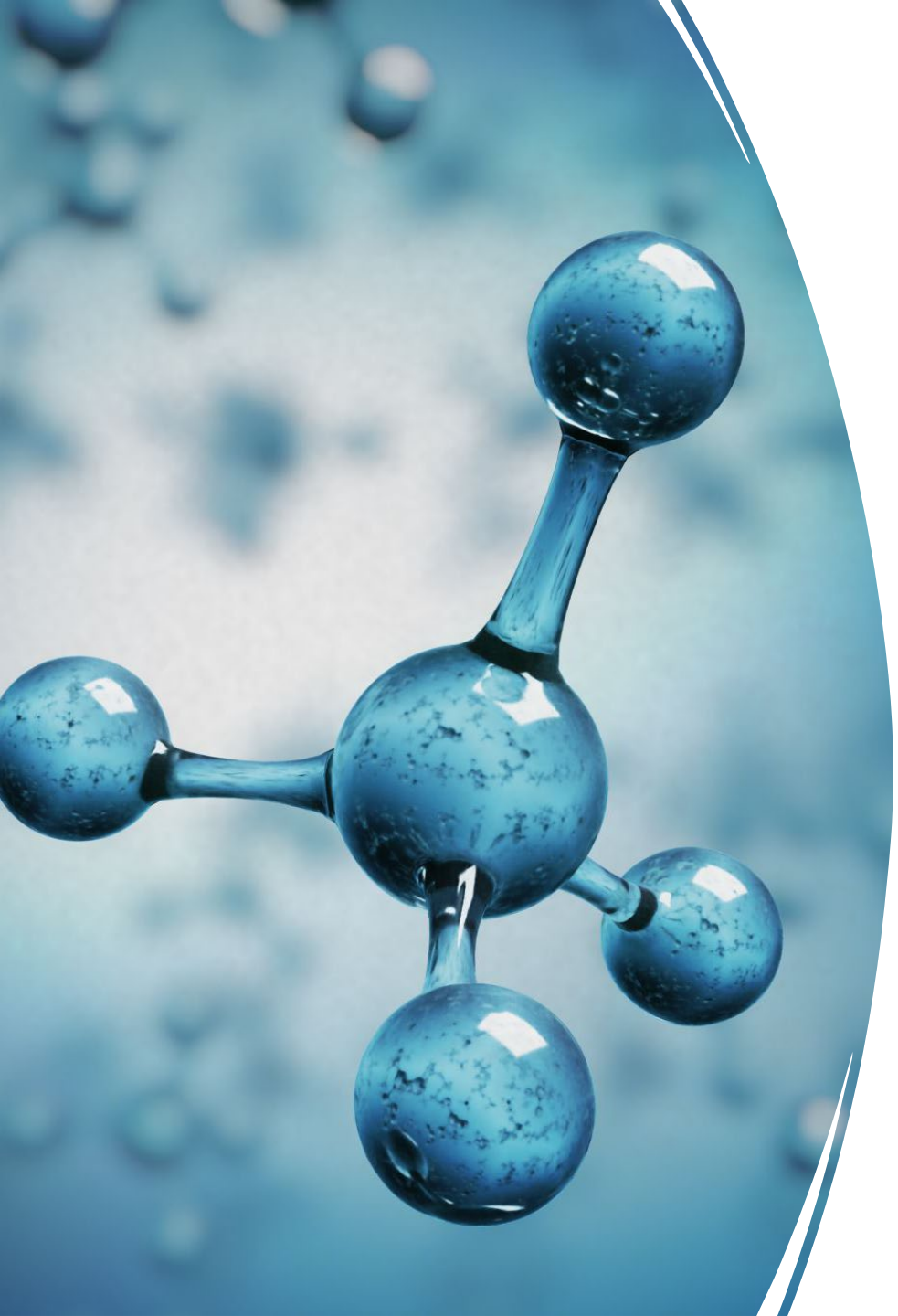


- UF/IFAS Extension Soil Testing Laboratory (http://soilslab.ifas.ufl.edu).
- Some UF/IFAS Extension offices also offer soil pH testing; locate your local UF/IFAS Extension office at http://solutionsforyourlife.ufl.edu/map/.
- *Soil Sampling and Testing for the Home Landscape* at https://edis.ifas.ufl.edu/ss494 for information about how to properly take a soil sample

Pruning of Older Leaves

- Removing older Mg and K deficient leaves- Serve as a source for these nutrients.
- Keep the lower leaves on the palm until deficiencies can be corrected using fertilizers.
- Program Approach

Photo:T. Broschat



Causes of Nutrient Deficiencies

- Leaching – Heavy Irrigation or high rainfall leaches N, K, Mg and B.
  - Slow-Release or Controlled Release Fertilizer
- Cool Temperatures – Reduced respiration causes reduced nutrient absorption. Mn is particularly prone to cool temperatures and most Mn issues are seen in spring in areas with cooler temperatures and therefore reduce root activity.
- Soil amendments- Can tie up nutrients
- Species Vary in Their Ability to Take Up Nutrients
- Nutrient Imbalances- Elements compete for exchange sites
  - Example: High K fertilizer but no Mg can result in Mg deficiency

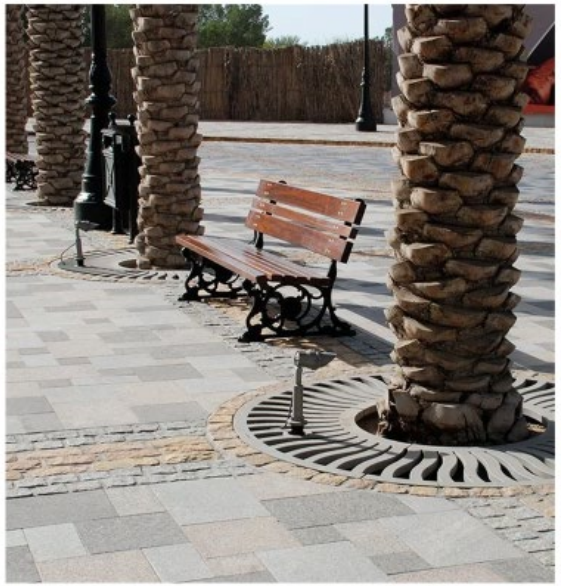
Fertilizing Landscape Palms

- Preventative Program – It may take years to recover a full canopy.
- Regular applications of a palm fertilizer with a N:P(P_2O_5):K(K_2O):Mg ratio of 2:1:3:1
- **Follow label rates**. Broadcast every 3 months.
- Fertilize turf within 50 ft. of any palm
- Sulfur-coated products – help to lower pH on alkaline soils
- Macronutrients (N, P, K, Mg) in slow-release form

Palm Nutrition

How do you fertilize these palms?

NO fertilization within 10-20 feet of a waterway.



Palms in small spaces….how do you fertilize?

The Solution:
Project: Palm Nutrient Injection-does it work and for how long?

- In-Situ Foxtail Palms (*Wodyetia bifurcate*) were chosen as indicator palms for nutrient deficiencies.
- **Treatments:**
- **Injection**
- **8-2-12+4 Mg**
- **0-0-22+4 Mg Apps**
- **Control**
- Frond Nutrient Analysis- Satellite vs Drone
- Plug Evaluation
- TDR- Moisture content
- Economics
- **NUTRIENT RANGES FOR MOST COMMON PALMS**

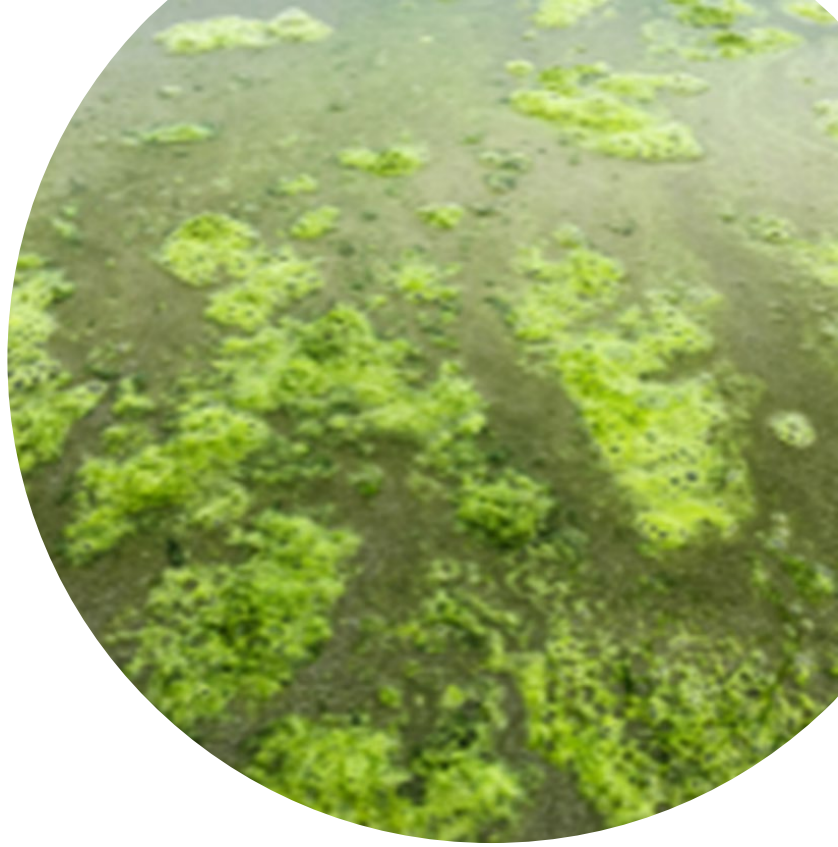
FNGLA
FLORIDA NURSERY, GROWERS AND LANDSCAPE ASSOCIATION
Leading Florida's Green Industry

ARBORJET
Revolutionary Plant Health Solutions

Previous injection in *Phoenix roebellini*

NO fertilization within 10-20 feet of a waterway.

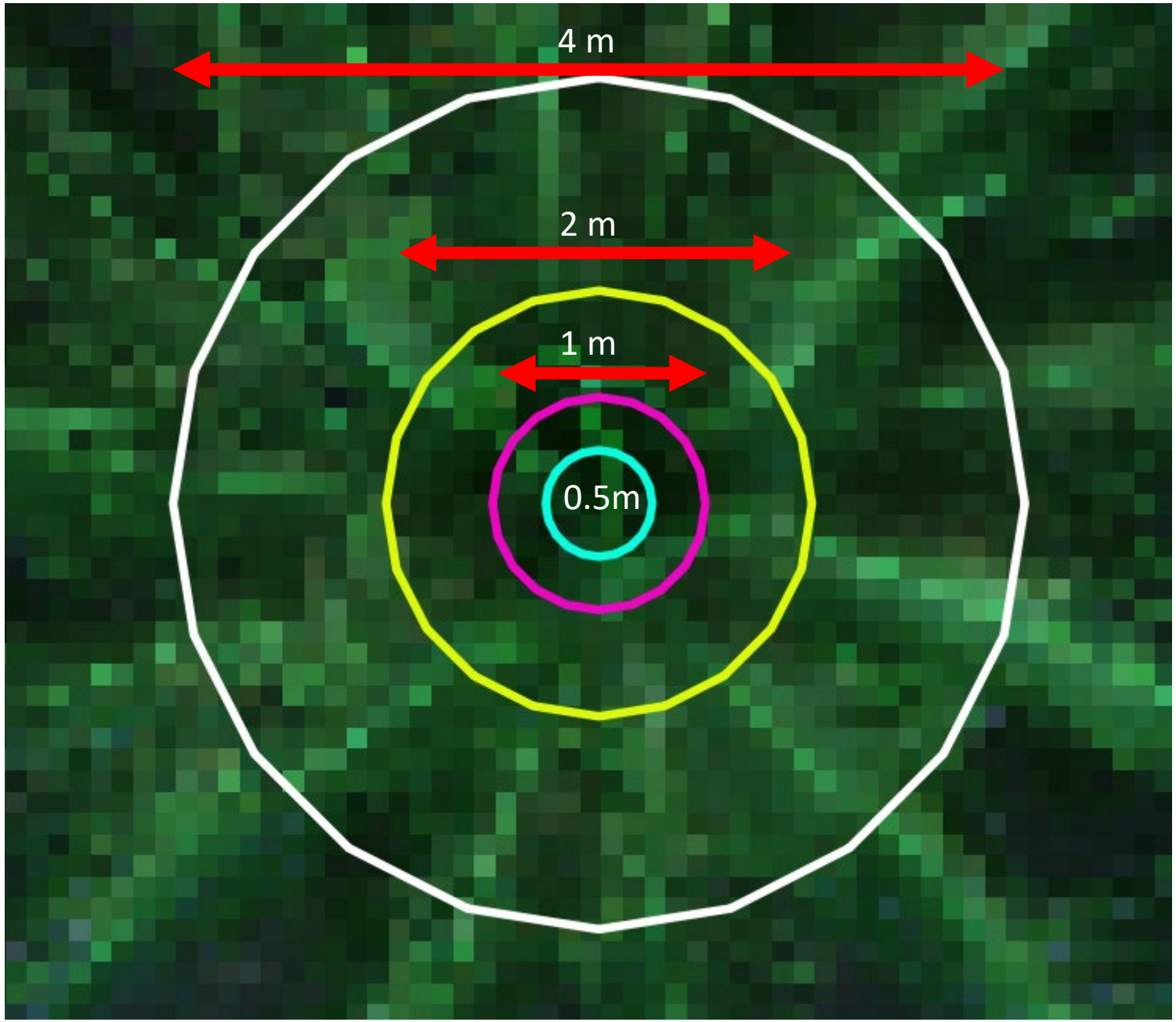
How do you fertilize these palms?



How can we maximize nutrient uptake in palms to minimize nutrient loss to the environment?

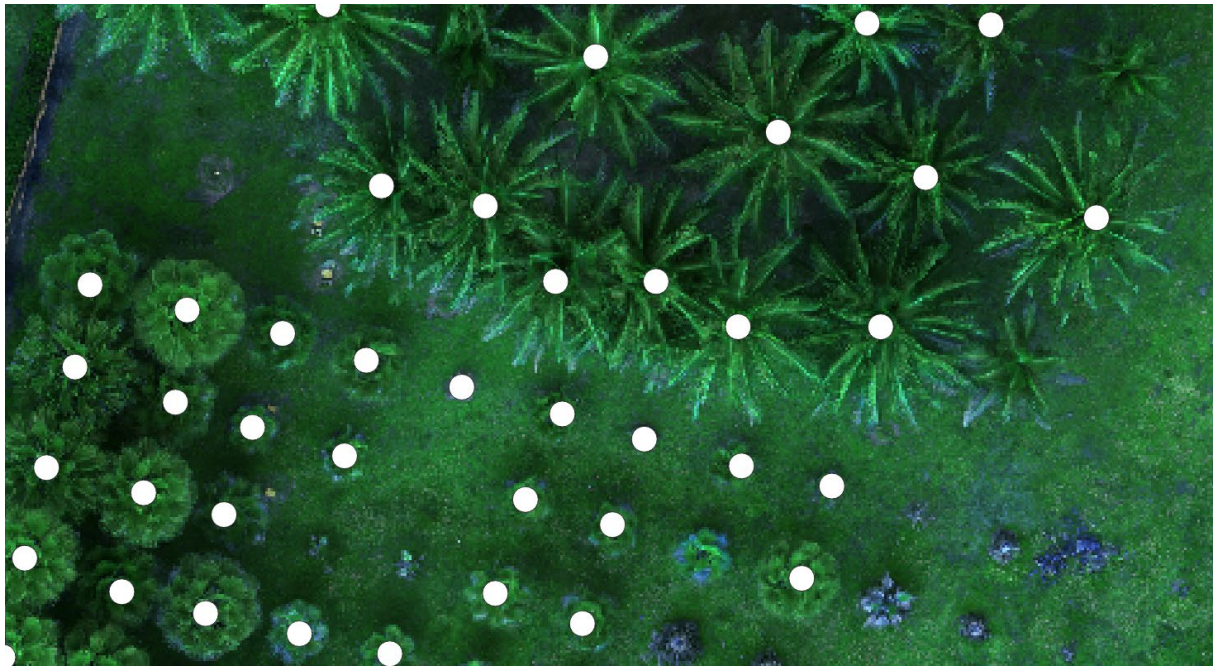
Aerial view of palm species

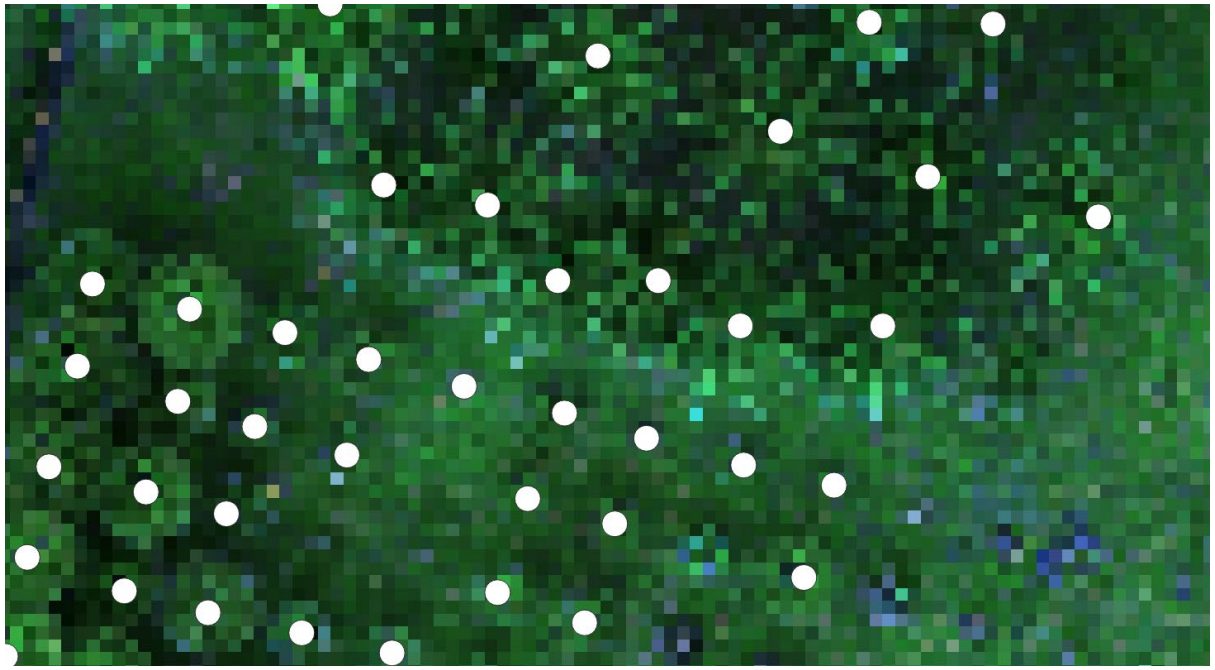




4 m
2 m
1 m
0.5m

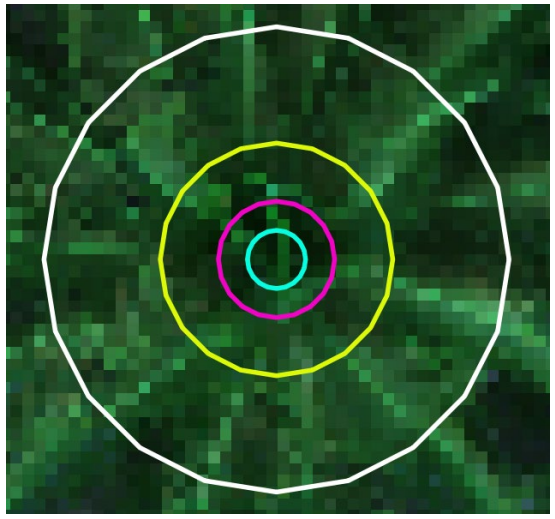
High Resolution Drone 10 cm

Satellite Equivalent 50 cm

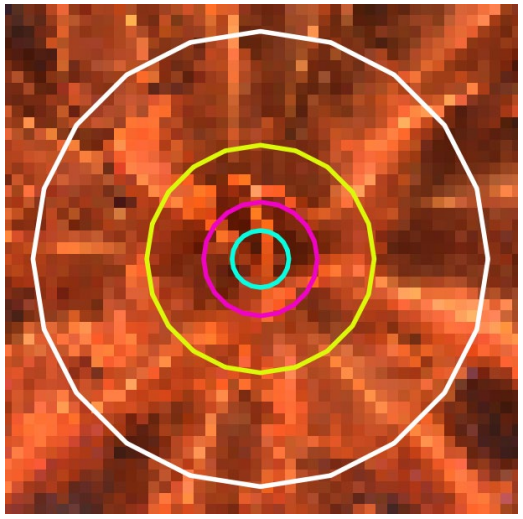




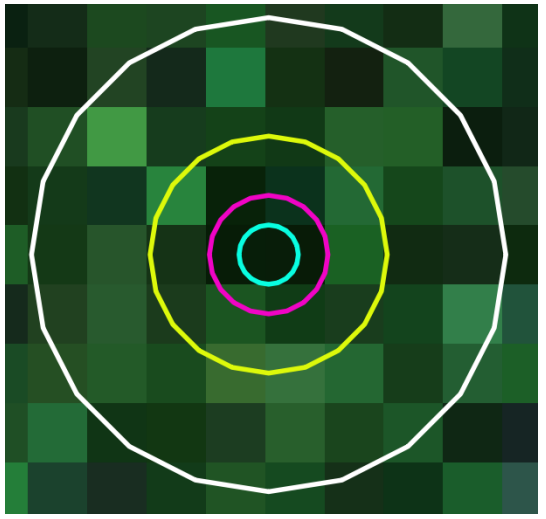
RGB



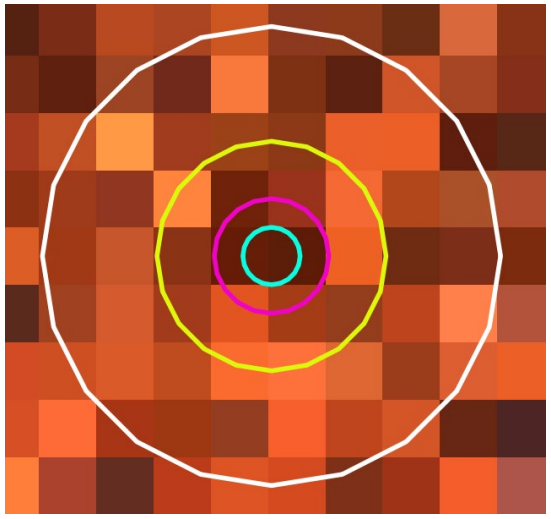
NIR-G-B



RGB



NIR-G-B



Sabal palmetto Cabbage palm

- State Tree of Florida and South Carolina
- One of the most common native palms in the US
- Some are booted
- Trees are harvested from the wild
- Susceptible to LB, Palmetto weevils, Ganoderma

GRIFFIN TREES

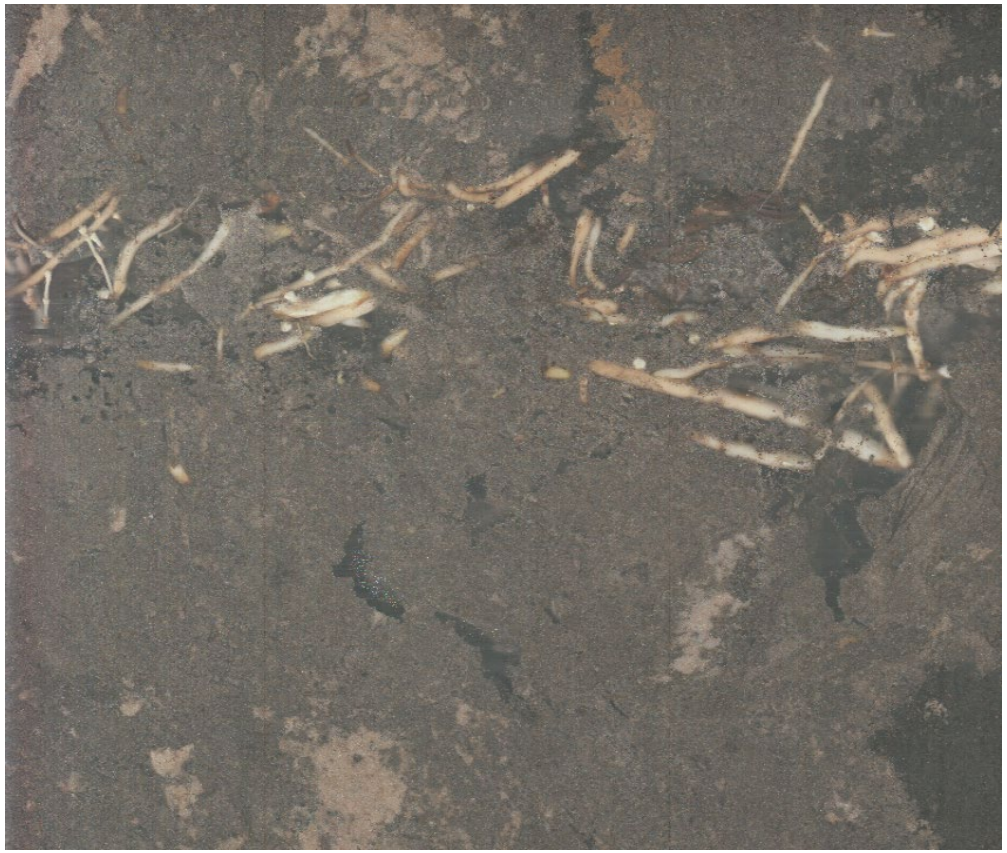
ROOT ENHANCED PALMS

Griffin Trees
Sabal palmetto
Transplant
Success
Lake Placid,
Florida

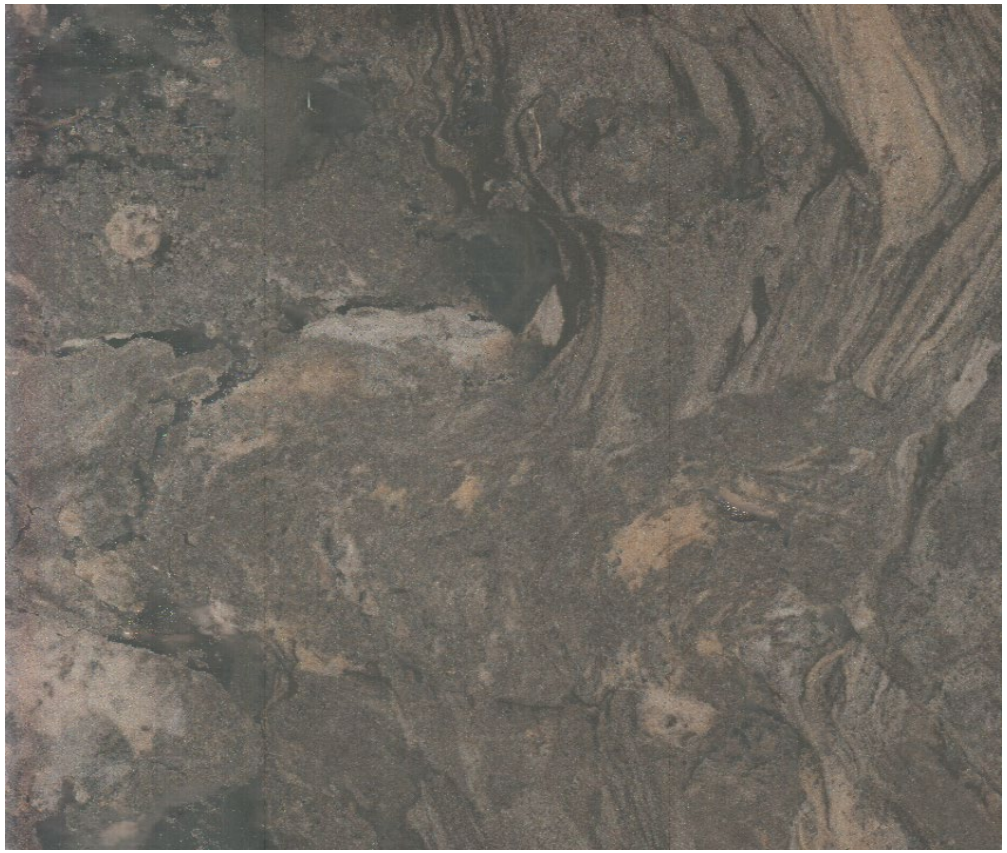
- Compost vs Native Soil
- Twenty “Fresh Cut” Sabal Palms
- Volumetric water content
- Frond Assessments
- Root images

Less than two months after trial initiation (June 23, 2022)…… we have roots.

Compost Amended Native Soil



Native Soil



Compost

Alternative Fertilization Methods for Palm Trees

Mica McMillan

Karen Williams

Palm Nutrition

UF/IFAS recommendations are 8-2-12+4 Mg or 0-0-22+4 Mg blend

Applied at a rate of 1.5 lbs/100 sq.ft.

3-4 applications outside of the rainy season: November, January, March and if necessary, end of April.

Preventative Management vs Treatment Management

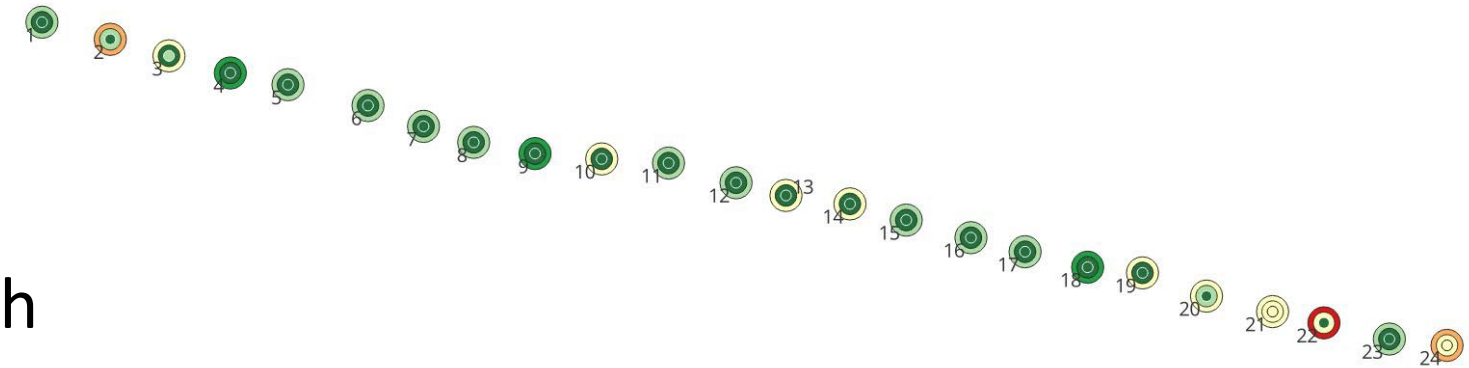
Objective:

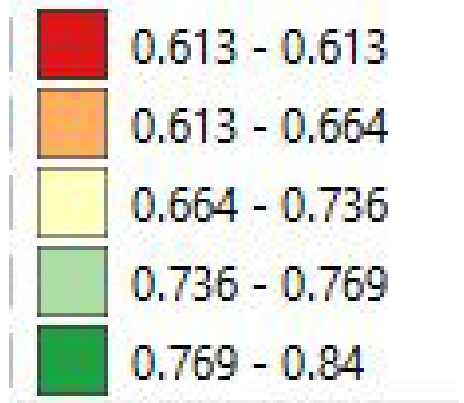
- To determine the best fertilizer method for palms in low organic matter sand soils.
- To determine the best fertilizer method when standard treatments are not an option.

Using Drone Imagery to Evaluate Palm Health

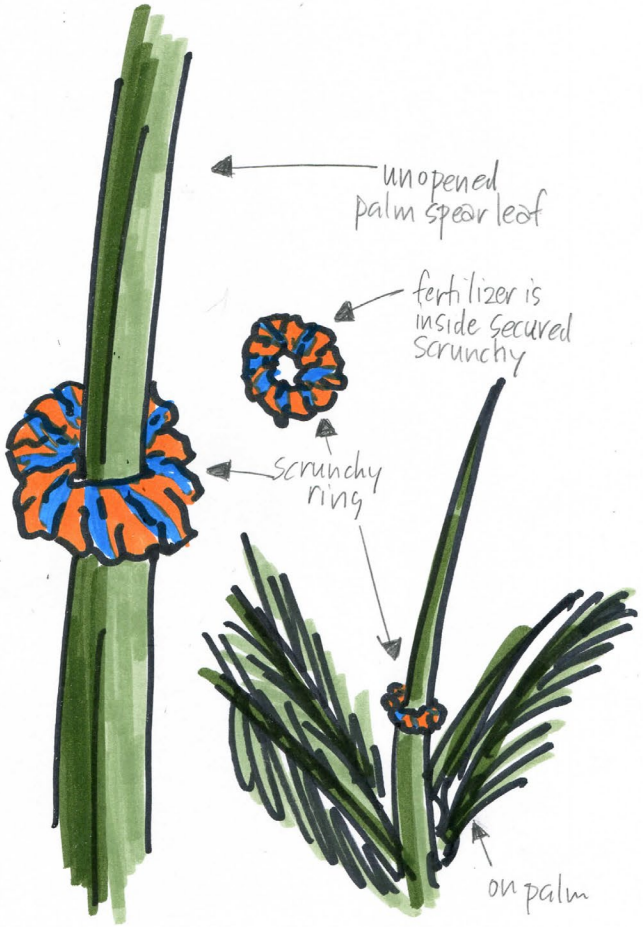
Treatments:

1. 8-2-12+4
2. PalmJet + Phosphojet Apical Meristem Drench
3. PalmJet + Phosphojet Injection
4. Control
5. Sul-Po Mag (0-0-22+4)
6. Gator Grip – Patent Pending





ON
OFF
ARBORJET.
QUIKJET AIR

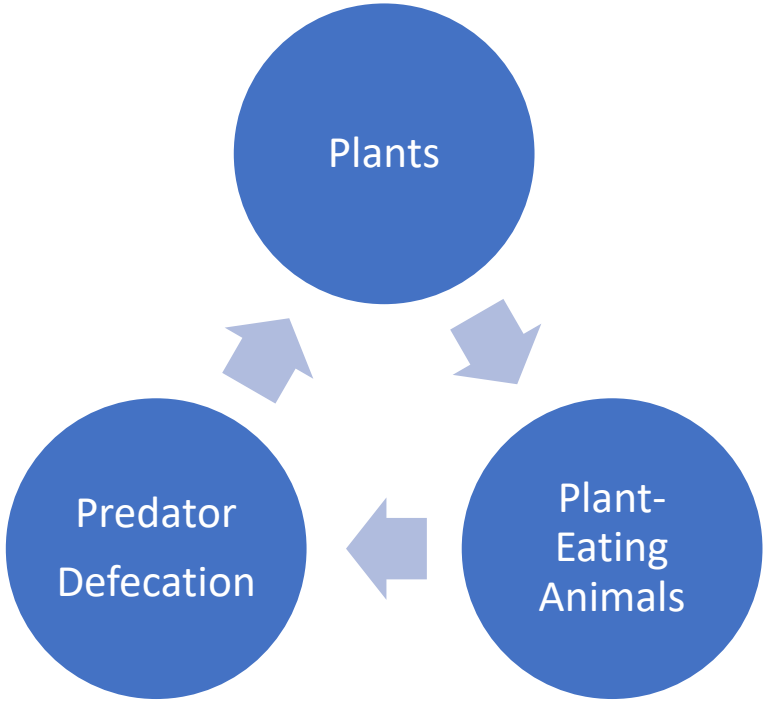


"Gator Grip" – Biodegradable Palm Fertilizer Scrunchie

- Designed for Arborists to apply nutrients at time of pruning
- Takes the guess work out of the "application math"
- Can be applied during the rainy season when palm is most actively growing so there is no leaching in sandy soils
- Set it and forget it

Litter - Trapping Palms

- Poor soil in the Tropics (sound familiar?)
- Capture the litter and take advantage of the nutrients
- Mulch around palms – additional benefit of water holding capacity and nutrient holding capacity



Zona, S. 2019. Litter-trapping palms. IPS. https://palms.org/litter-trapping-palms/

Litter-Trapping Palms
A “compost” pile

Christmas Palms – *Adonidia merrillii*

VWC at 3 different depths (1.5”, 3.0” and 4.5” - can range from

0-10%

Data Collection

- Frond Counts
- SPAD
- VWC captured using TDR at the 1.5”, 3.0” and 4.5”
- Monthly Visual Quality of Palms based on a 1-9 scale where 9= best quality palm.
- Drone Imagery captured seasonally
- Frond Nutrient Analyses
- Monthly Mini-Rhizotron Data Collection

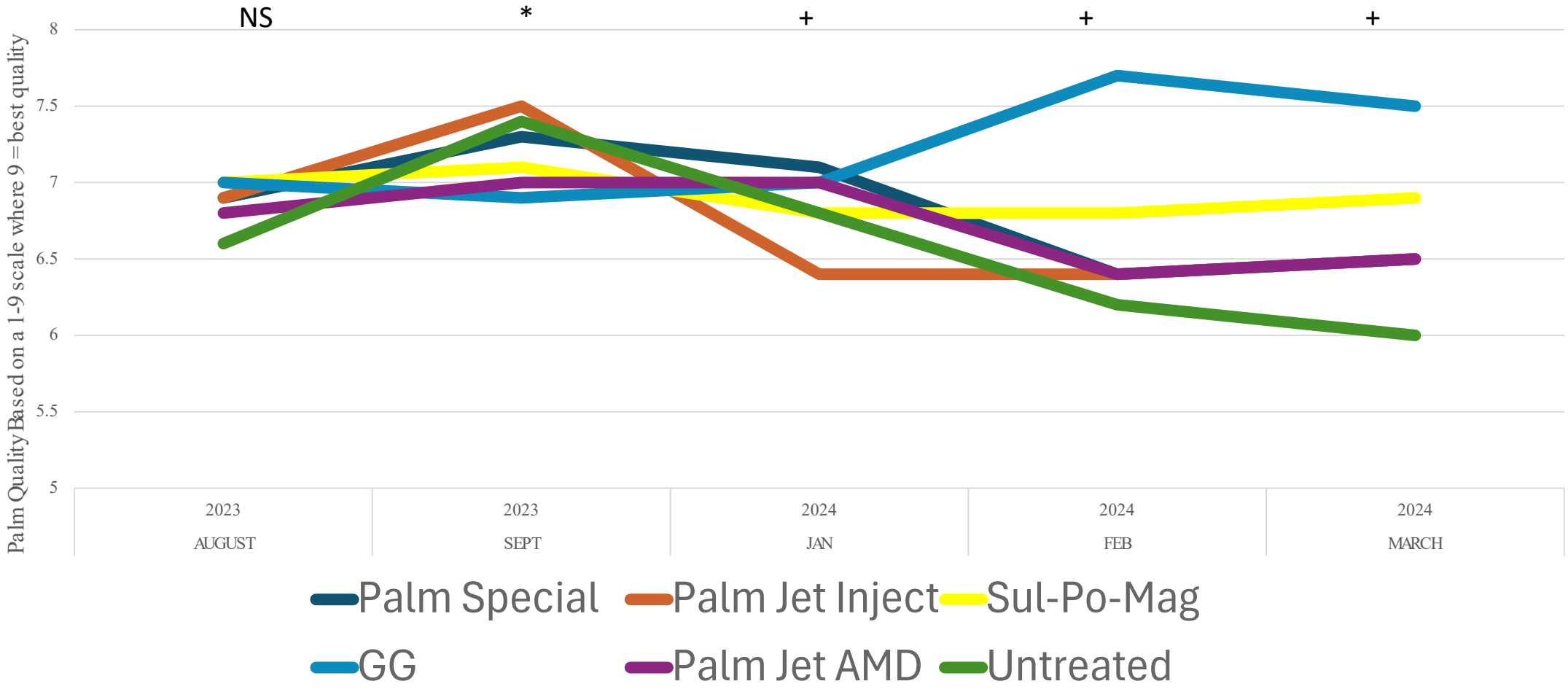
Which Treatment Improves Root Growth to Sustain the Tree During Drought

Mini-Rhizotron Set Up

Right: Using the mini-rhizotron to capture high resolution images of each palm's root structure and volume

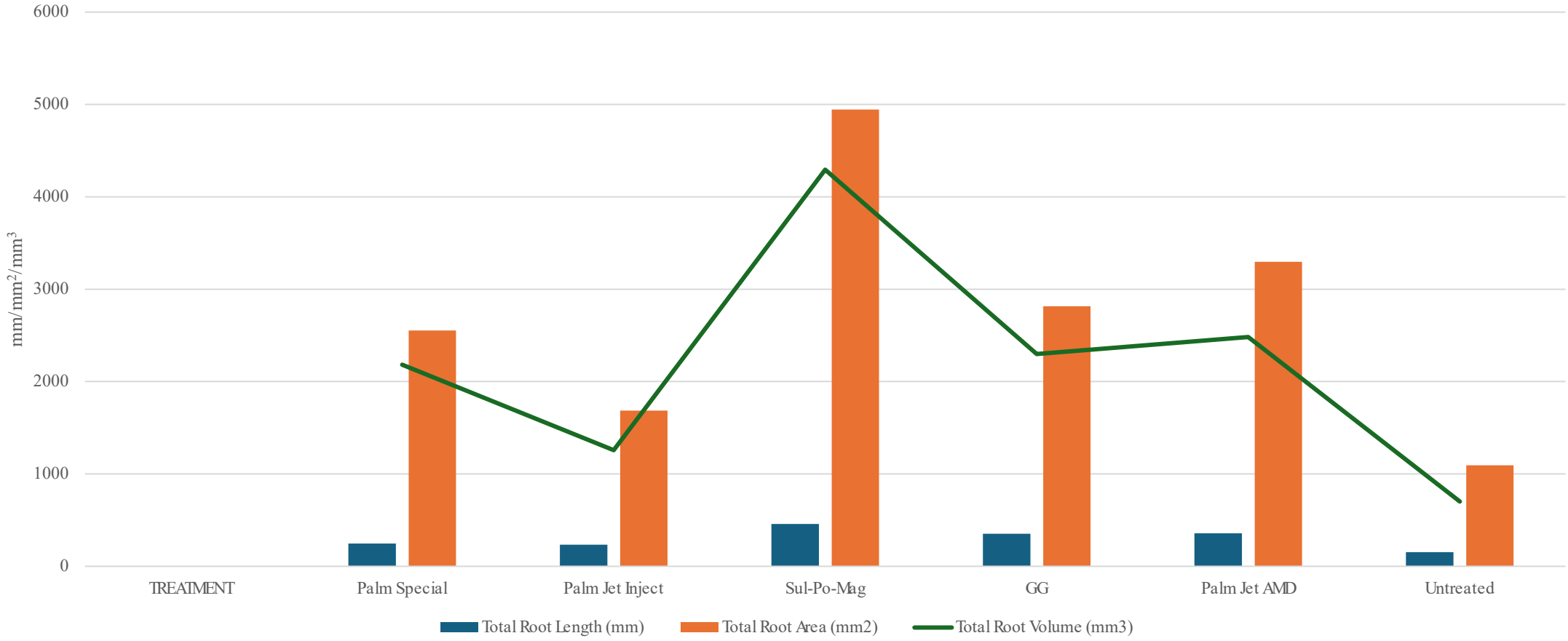
Above: Digital scan of Adonidia roots using the non-destructive mini-rhizotron.

Effect of fertilizer application method and material on Visual Quality of *Adonidia merrillei*

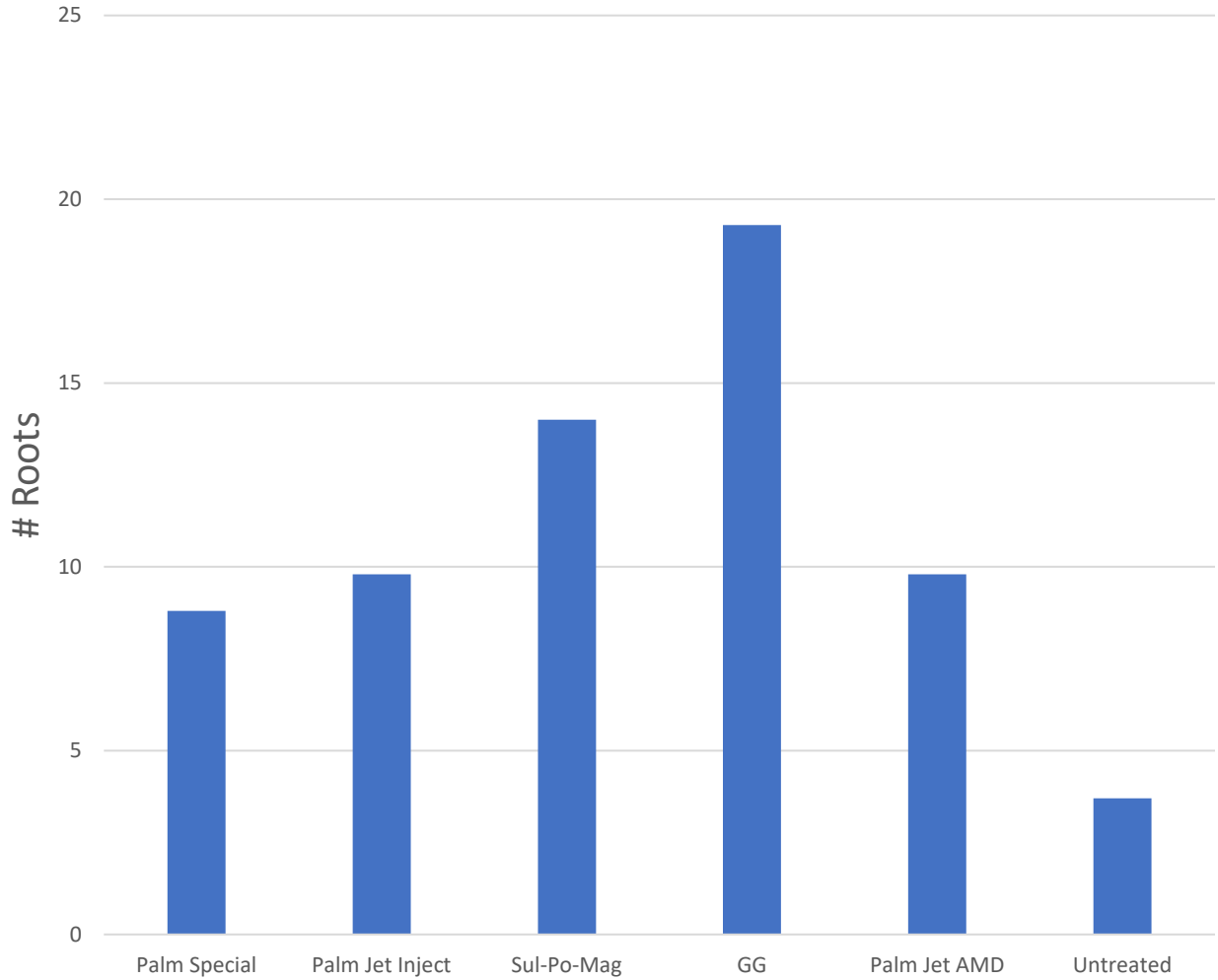


ns, +, * = P>0.10, P<0.10, P<0.05

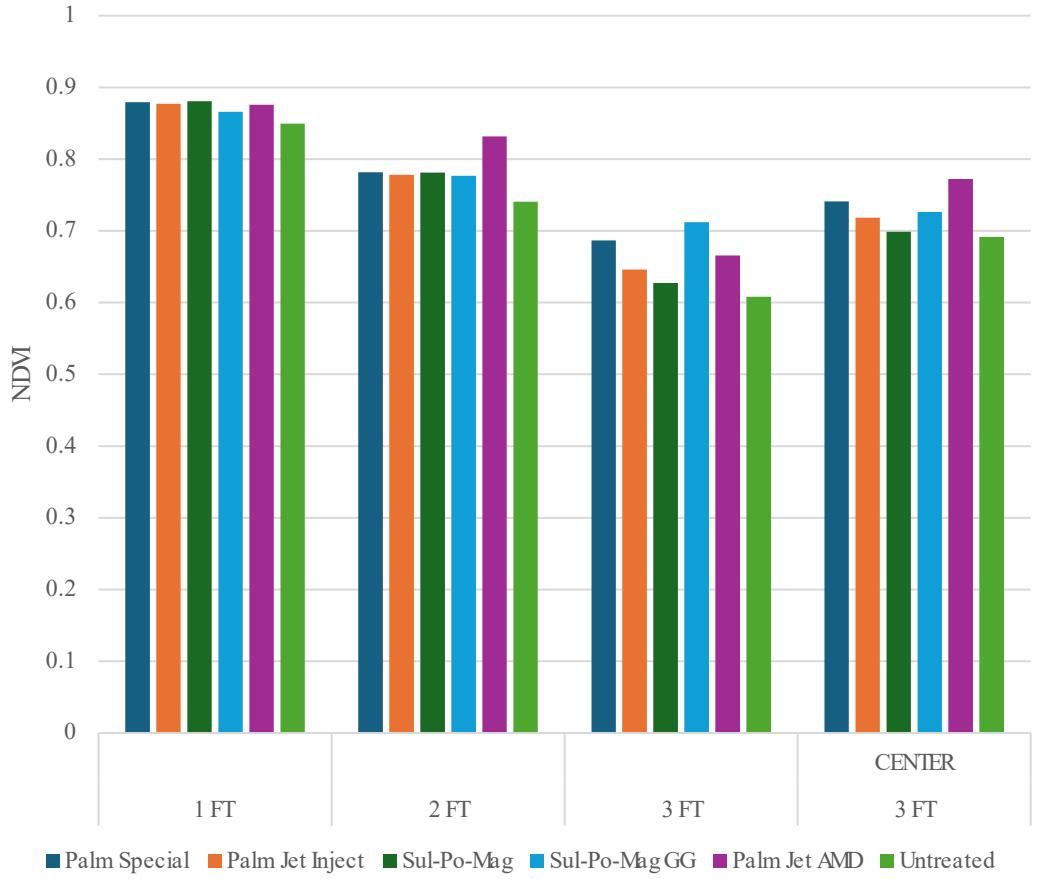
Effect of Fertilizer Application Method and Material on Root Length, Area and Volume

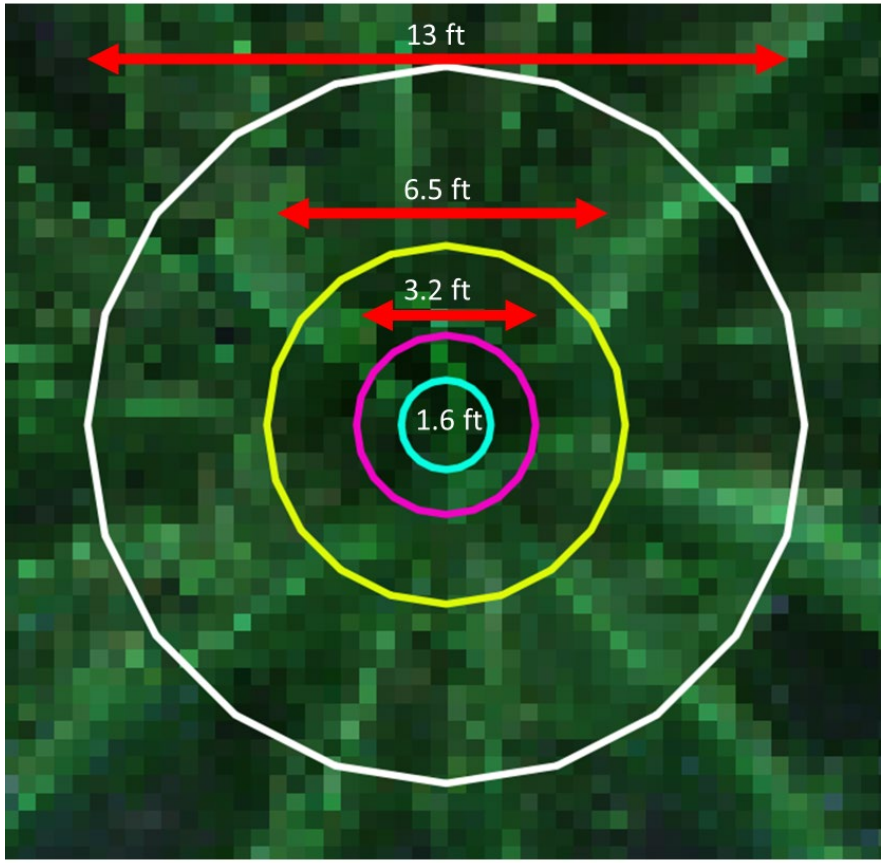


Effect of Fertilizer Application Method and Material on Root Number



Evaluating Practical Applications for Drone Imagery on Palm Health and Nutrient Status





UF | IFAS Research
UNIVERSITY of FLORIDA

Future Research Questions

- Is multispectral imaging an accurate assessment of palm health
- Can novel fertilization application methods provide results similar or more efficacious to standard fertilization practices
- What is the most efficacious fertilizer method based on abiotic and environment conditions
- Can mini-rhizotron digital images of palm root health correlate to the I/O ratio of multispectral imagery

Frond Fertilizer (left) vs. Untreated (right)

Special Thanks To:
Karen Williams, Lucas Altarugio, Andy Zhou and UF/IFAS Extension Agents

THANK YOU

Mica McMillan
Mica.McMillan@ufl.edu
954-577-6330