

Optimizing irrigation and fertilization for HLB-affected trees

Davie Kadyampakeni
UF/IFAS Citrus Research and Education Center
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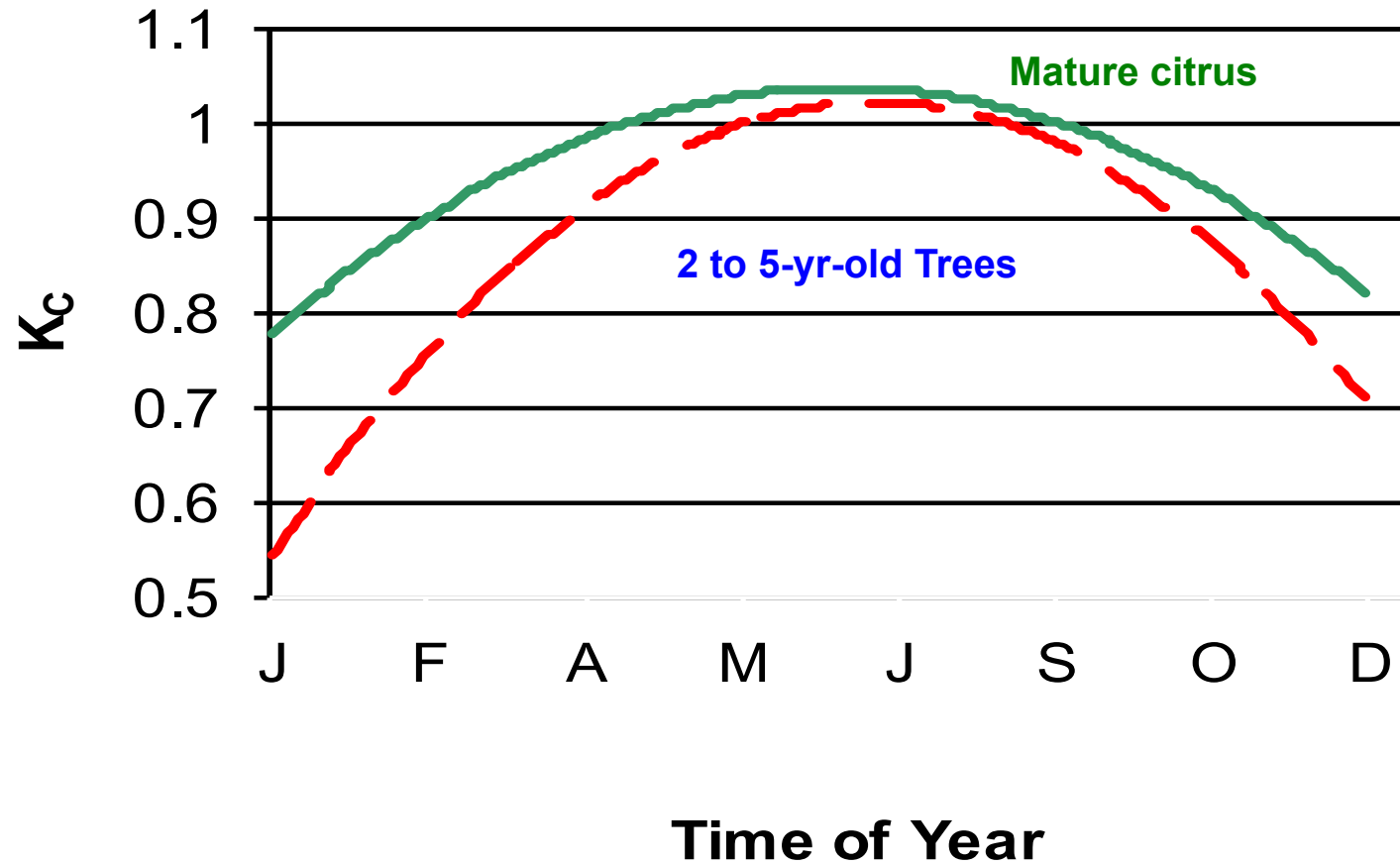
Take home messages

- Tools are available for irrigation management including plant-based and soil-based sensors.
- Optimal irrigation is possible using improved irrigation scheduling and can lead to great water savings.
- Most soils for crop production are sandy and need good management to optimize water use.
- We need more studies on better irrigation management for bearing trees.

Take home messages

- Citrus fruit yields, juice quality, canopy size and development are enhanced with a balanced nutrition approach for HLB-affected citrus.
- Root health and overall plant health and immunity are strengthened with elevated rates of macronutrients and micronutrients compared to current recommendations.
- Use of disease mitigation and optimal nutrition work together and not in isolation.
- With macronutrients and micronutrients we observed reduced root dieback and increased root growth because root density was increased and the tree was more efficient in nutrient uptake.
- Nutrient leaching was significantly reduced with bi-weekly fertigation and retained nitrates in the top 6 inches.

Citrus water requirements



Water needs are highest in summer and lowest in winter.

Tree water needs will depend on soil type



Clayey/Loamy

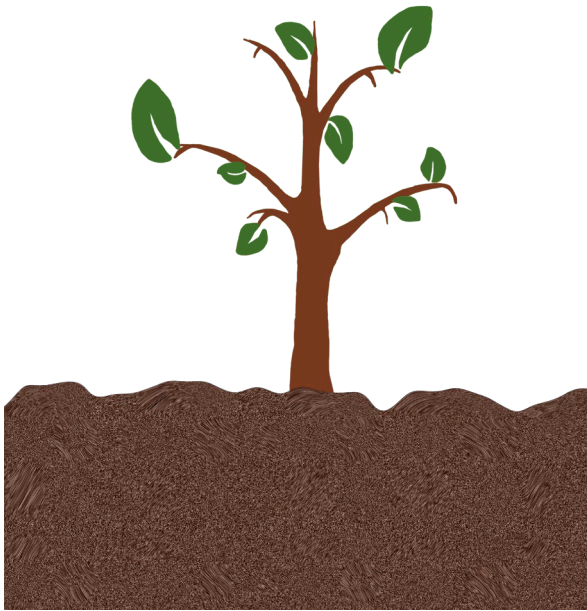
- Poor drainage
- Holds water longer over time



Sandy

- Good drainage
- Water moves through quickly

Tree water needs will depend on tree age and size



Young Tree

- Not bearing fruit
- Less than four years old



Mature Tree

- Bearing fruit
- Four years old and up

But what if it rains?

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
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Rainy season



If you receive ½ inch (or more) of rain, recommended not to irrigate for 2 days because the soil will be moist enough.

Florida receives enough rainfall in a year, but we don't receive the rainfall when we need it.

Improved canopy volumes and fruit yields with foliar applications of essential nutrients on 'Valencia' sweet orange with 3x current recommendation.

Mn, Zn, B applied separately
(1x=5 lbs metallic per ac Mn and Zn
and ¼ lbs metallic per ac B)

3x = 15 lbs Mn and Zn

0 x = control

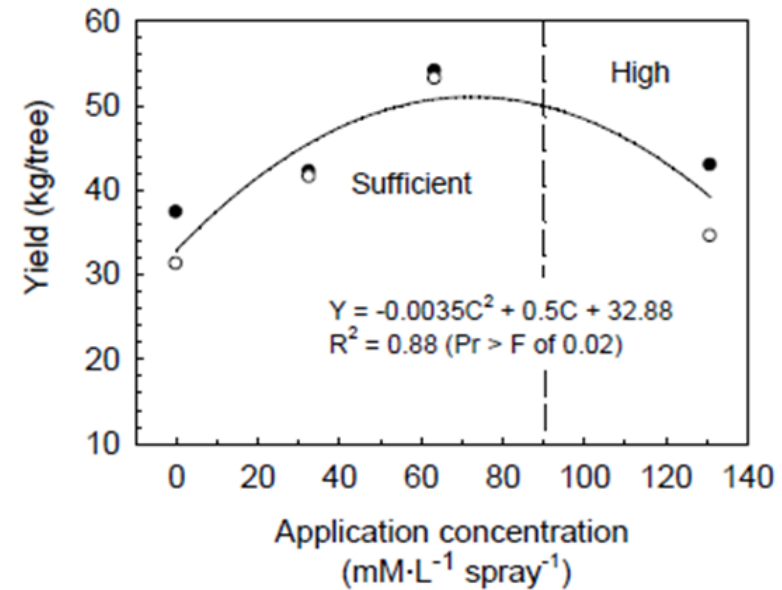
1.5 x = IFAS Annual Recommendation

3 x = IFAS Annual Recommendation

6 x = IFAS Annual Recommendation

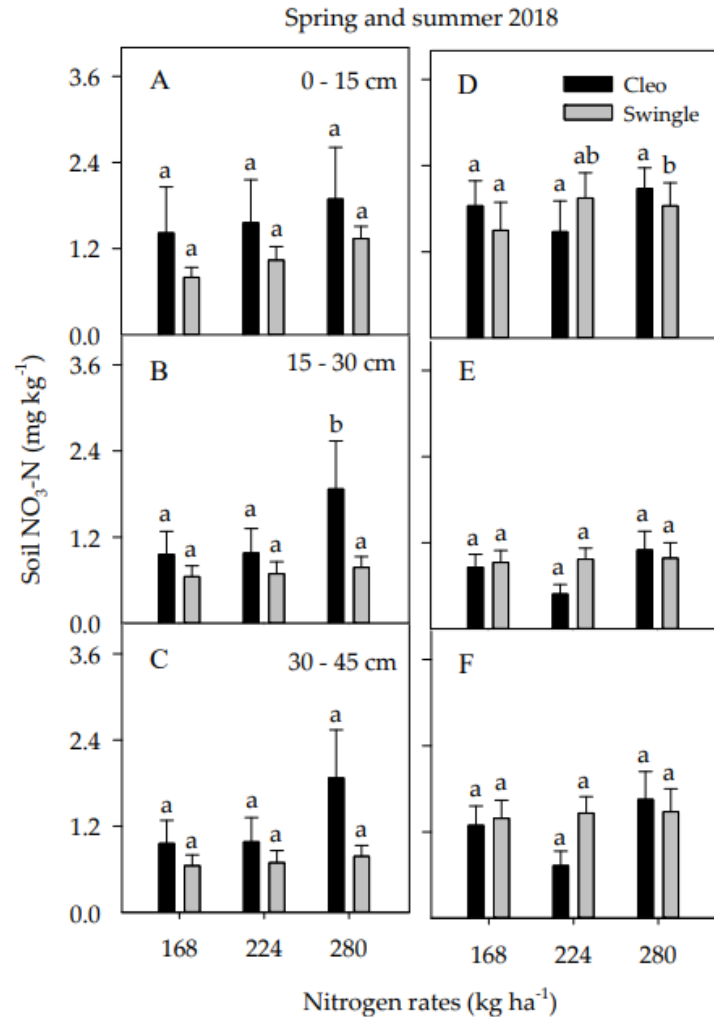
Greatest fruit yield at 3x Mn and high range of foliar Mn.

The key was to keep Mn, and Zn in the optimum or high range of leaf nutrient concentration.



Morgan, Rouse, and Ebel, 2016. Foliar Applications of Essential Nutrients on Growth and Yield of 'Valencia' Sweet Orange with Huanglongbing HortScience.

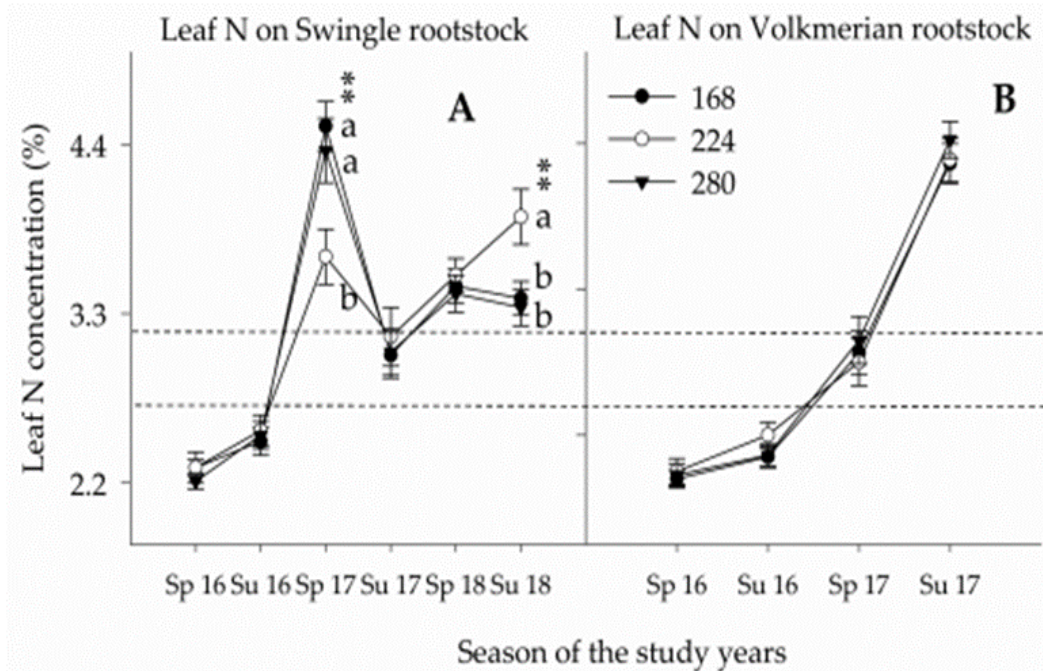
Soil NO₃ does not appear to be leaching below 6 inches because of the FAWN-based irrigation scheduling.



Improved N availability with fertigation at 150, 200 and 250 lbs/ac equivalent to 168, 224, 280 kg/ha, respectively.

A. Atta, K.T. Morgan, S.A. Hamido, D.M. Kadyampakeni (2020) Water and Soil Nutrient Dynamics of Huanglongbing-Affected Citrus Trees as Impacted by Ground-Applied Nutrients. Plants.

Improved leaf N with fertigation of N

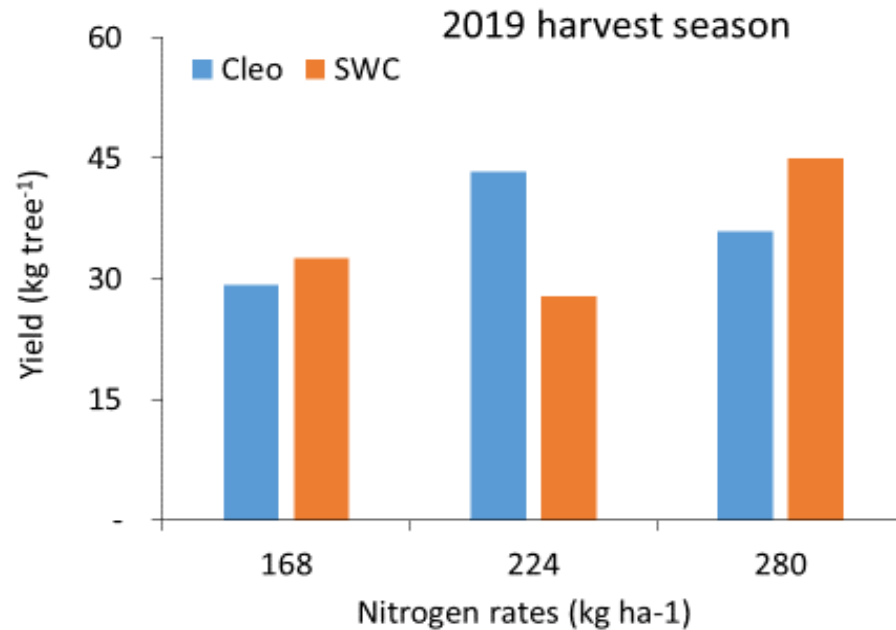


Improved Leaf N with 150, 200 and 250 lbs per acre equivalent to 168, 224, 280 kg/ha, respectively. No significant difference in leaf N among rates because they were in excess of the optimum N concentration 1 year after start of the project.

A. Atta, K.T. Morgan, S.A. Hamido, D.M. Kadyampakeni (2020) Water and Soil Nutrient Dynamics of Huanglongbing-Affected Citrus Trees as Impacted by Ground-Applied Nutrients. Plants.

Data showed significant differences, Cleo rootstock with highest yields at 200 lbs/ac and Swingle highest yields at 250 lbs N/ac.

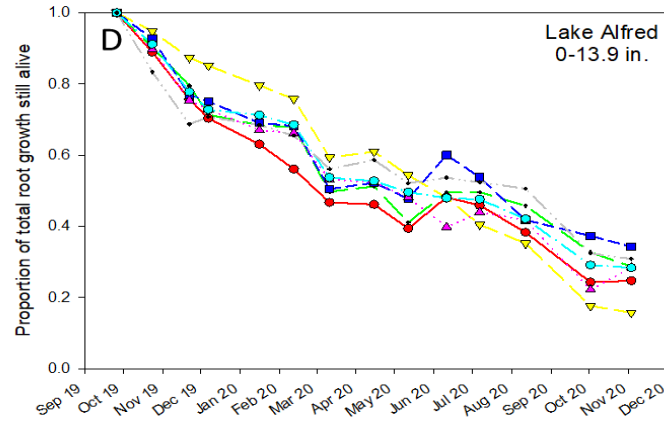
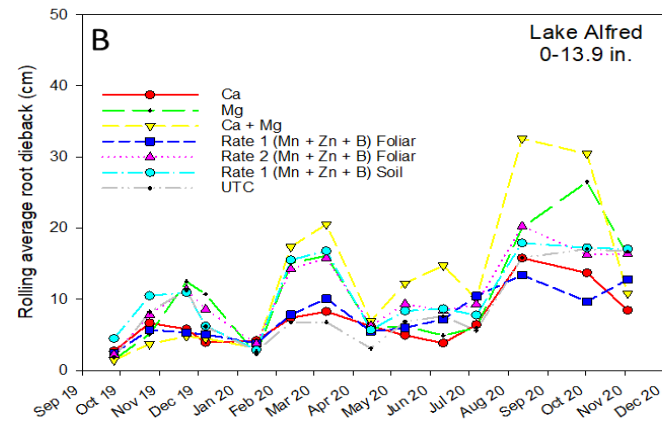
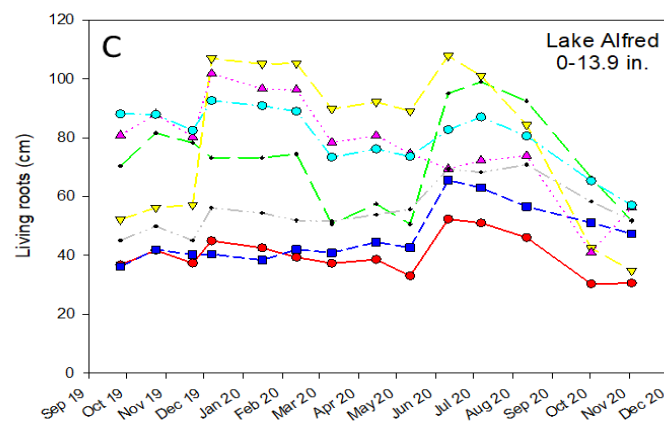
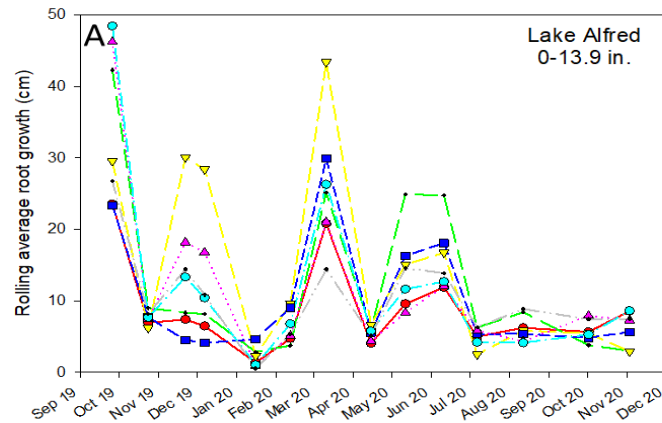
Fruit yield varied by root stock within the same site. No size fits all.



Comparison of fruit yields between 150, 200 and 250 lbs N per acre equivalent to 168, 224, 280 kg/ha, respectively.

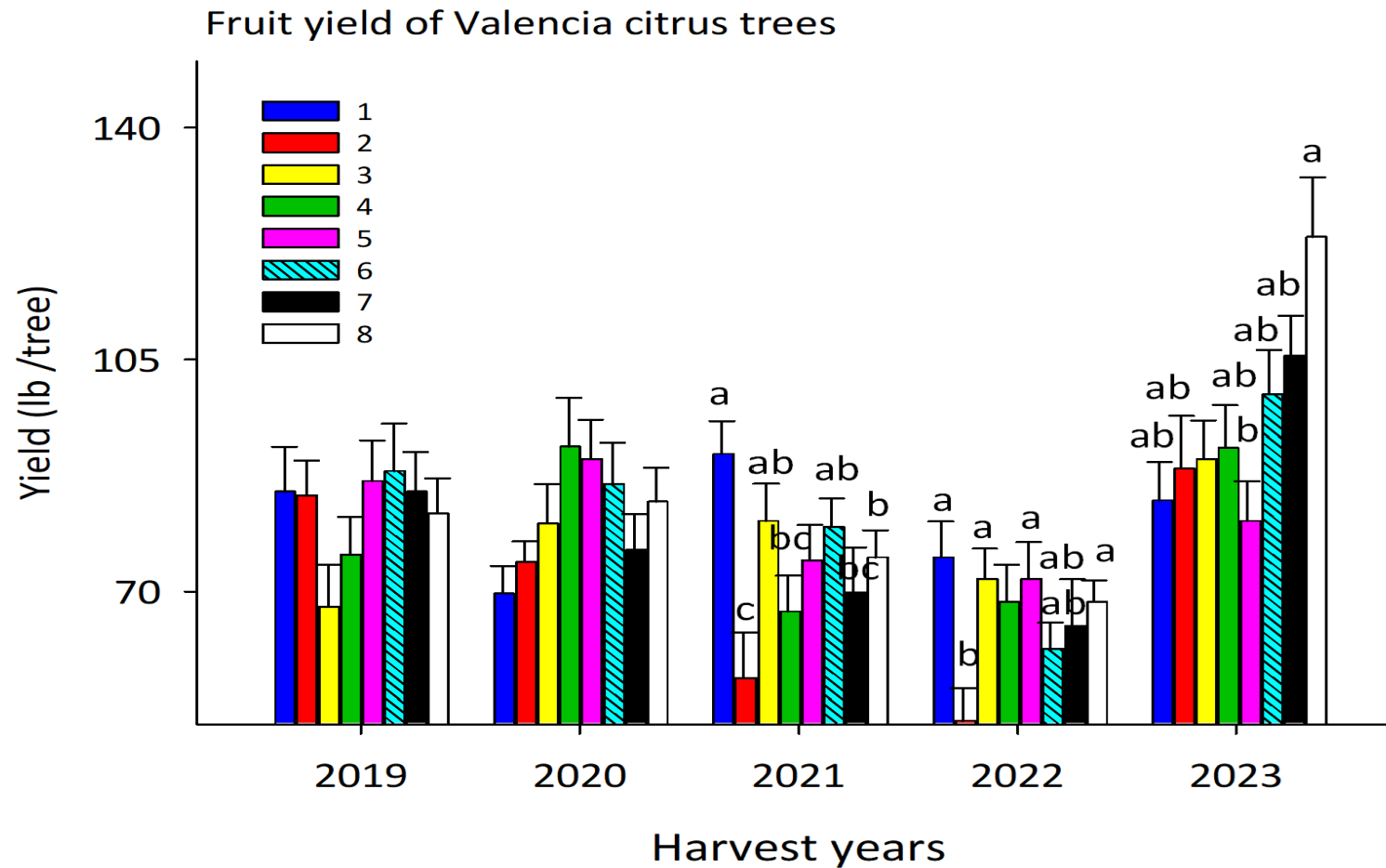
A.A. Atta, K.T. Morgan, D.M. Kadyampakeni and K.A. Mahmoud. 2020. The Effect of Foliar and Ground-Applied Essential Nutrients on Huanglongbing-Affected Mature Citrus Trees. *Plants*.

Root density is increased by foliar nutrient application because the tree is more efficient in soil nutrient applied uptake.



Kadyampakeni, D., E. Johnson, K. Morgan, A. Atta. 2021. Lessons on macronutrients and micronutrients on root health. Citrus Industry

Improvements in yield as a result of the combined use of improved fertilizer blends and crop protection products. Yields between 180 to 350 boxes per acre and yield per tree: 0.63 to 1.55 boxes per tree.



Take home messages

- We have tools to determine if the tree needs fertilizer or more water.
- A lab soil or leaf test is more reliable to determine accurate nutrient needs.
- It is good to understand the fertilizer label to know how much the fertilizer contains.
- Timely, frequent irrigation and optimal fertilization keeps trees healthy and productive.

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- We need more studies on better irrigation management for bearing trees.

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Atta, S. Kwakye, Q.
Uthman, E. Esteves, W.
Bandaranayake, W. Pihilla,
A. Hernandez and T.
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CITRUS INITIATIVE

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Facebook: Water and Nutrient Lab At CREC

Website: <https://crec.ifas.ufl.edu/people/faculty/davie-kadyampakeni/publications/>

E-mail: dkadyampakeni@ufl.edu