An Update on Citrus N and BMP Statewide Trials

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Take home messages

- Soil NH_4-N showed significant values when trees at the nitrogen rate of 150 lb ac^{-1} on the topsoil only accumulated on the topsoil layer.
- About 50% of soil NH_4-N was less than the topsoil (0-6 inch) and only 25% accumulated in the middle (6-12 inch) and bottom (12-18 inch) soil horizon.
- Soil NO_3-N showed on average about 30% between consecutive soil horizons indicating probable soil nutrient leaching from the topsoil horizon.
- Soil NO_3-N showed no treatment effect but more accumulated in the 0-6 inch soil layer than the 6-12 inch and 12-18 inch soil depths.
- High to excess levels of P but optimum to high for N in Cold Hardy Citrus in leaf analyses.
- Our findings indicated that there were no yield differences regardless of treatment effect and nutrient application rates but fruit quality analysis is still under way.

ROLES OF NUTRIENTS IN IMPROVING PLANT HEALTH

The Law of the Minimum describes how plant growth is constrained by resource limitation. Plants need many nutrients to grow well. If only one of these nutrients is deficient, plant growth will be inhibited, even if all the other essential nutrients are available in abundance. This is also true for all other resources such as light, temperature and water for the respective plant species. The scarcest resource always restricts plant growth and is the limiting factor.

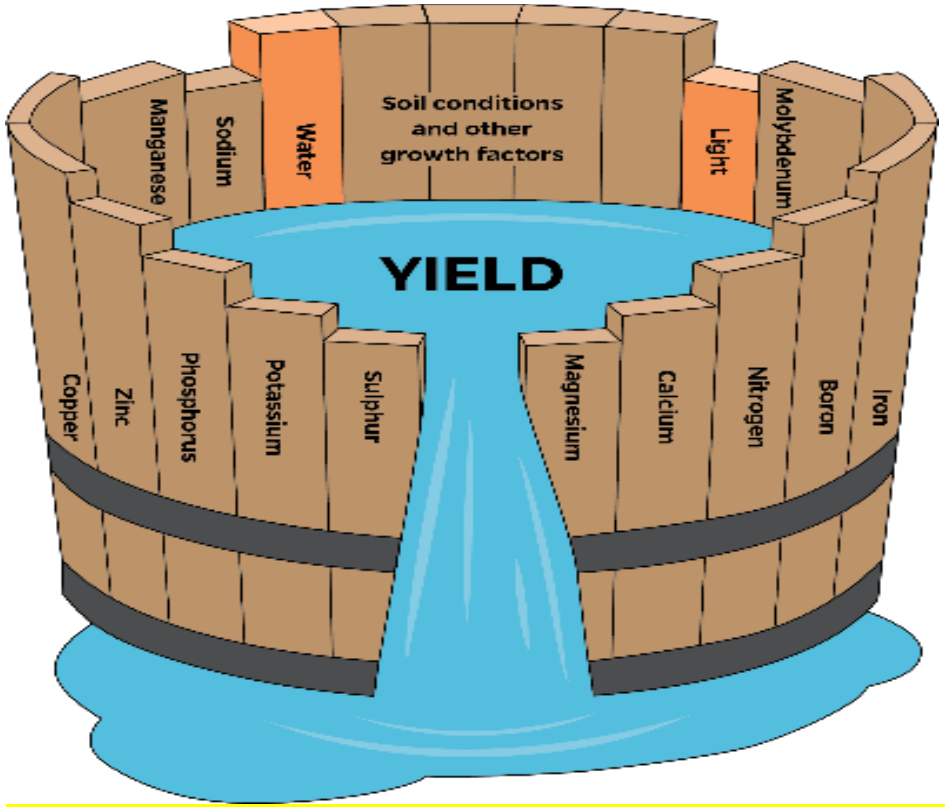

Figure 1. Liebig's Law of Minimum illustrated for plant growth and nutrition with a leaking barrel. Credit UF/IFAS Communications

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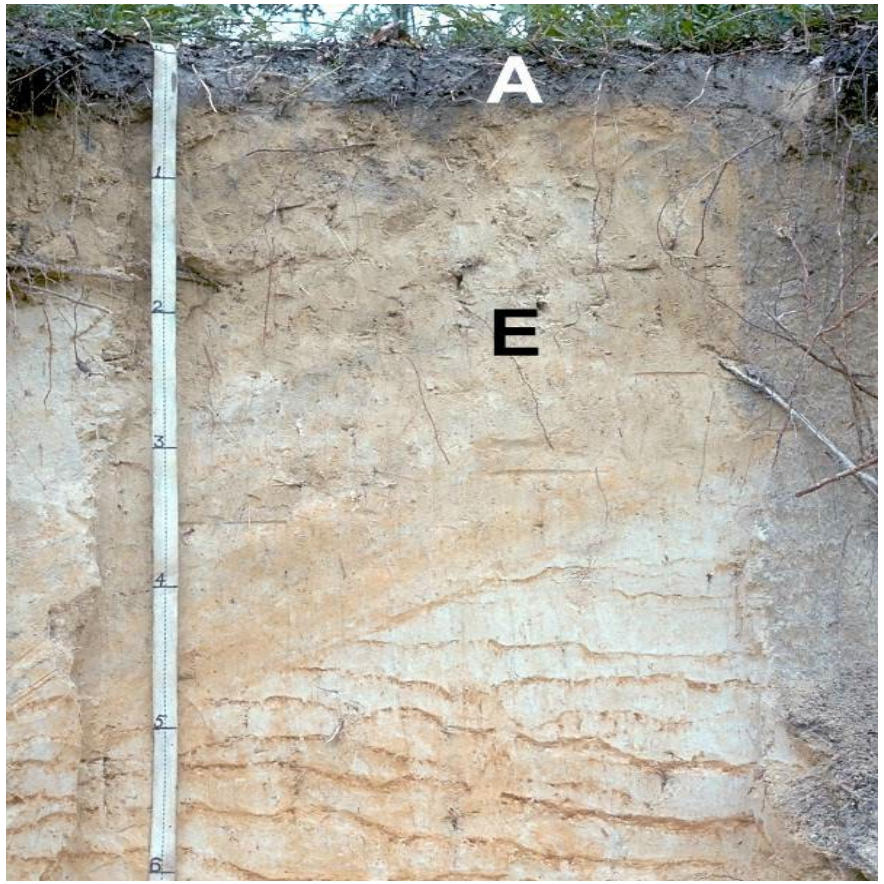
The Case for Citrus Best Management Practices

- 100% endemic HLB situation in contrast to pre-HLB era
- Sandy soils (>95%) with
  - low organic matter
  - low cation exchange capacity
  - low water holding capacity



Profile of Astatula sand, an Entisol, showing surface (A) and subsurface (E) horizons. Sources: SL253, Obreza and Morgan, 2008

The Case for Citrus Best Management Practices (2)

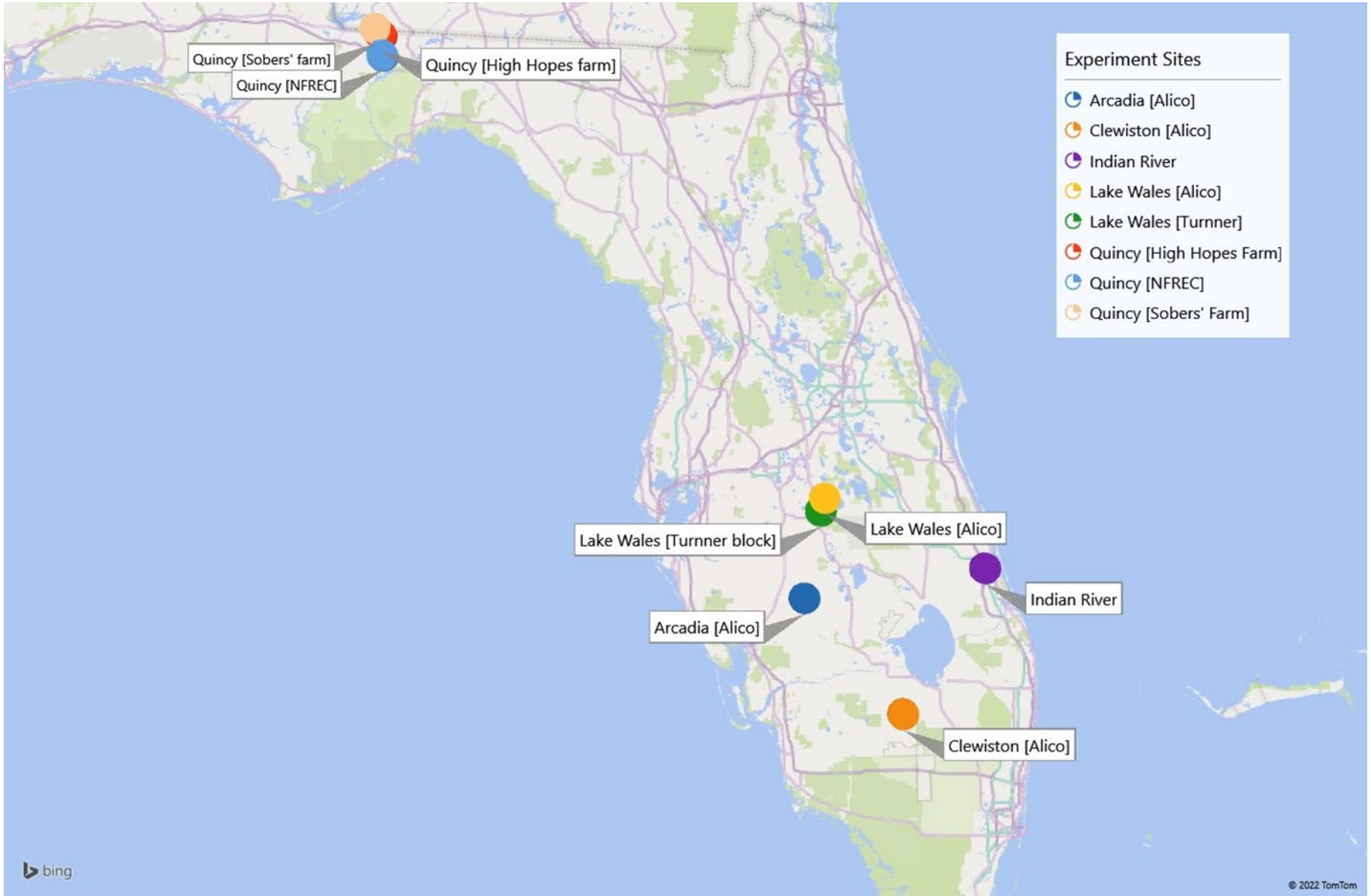
- Severe defoliation
- Root loss in young presymptomatic and symptomatic trees (30-38% root loss) and fully symptomatic trees up to 80% root loss (Graham et al. 2013; Johnson et al. 2014; 2021)

Schematic of root loss. Credit. UF IFAS Communication

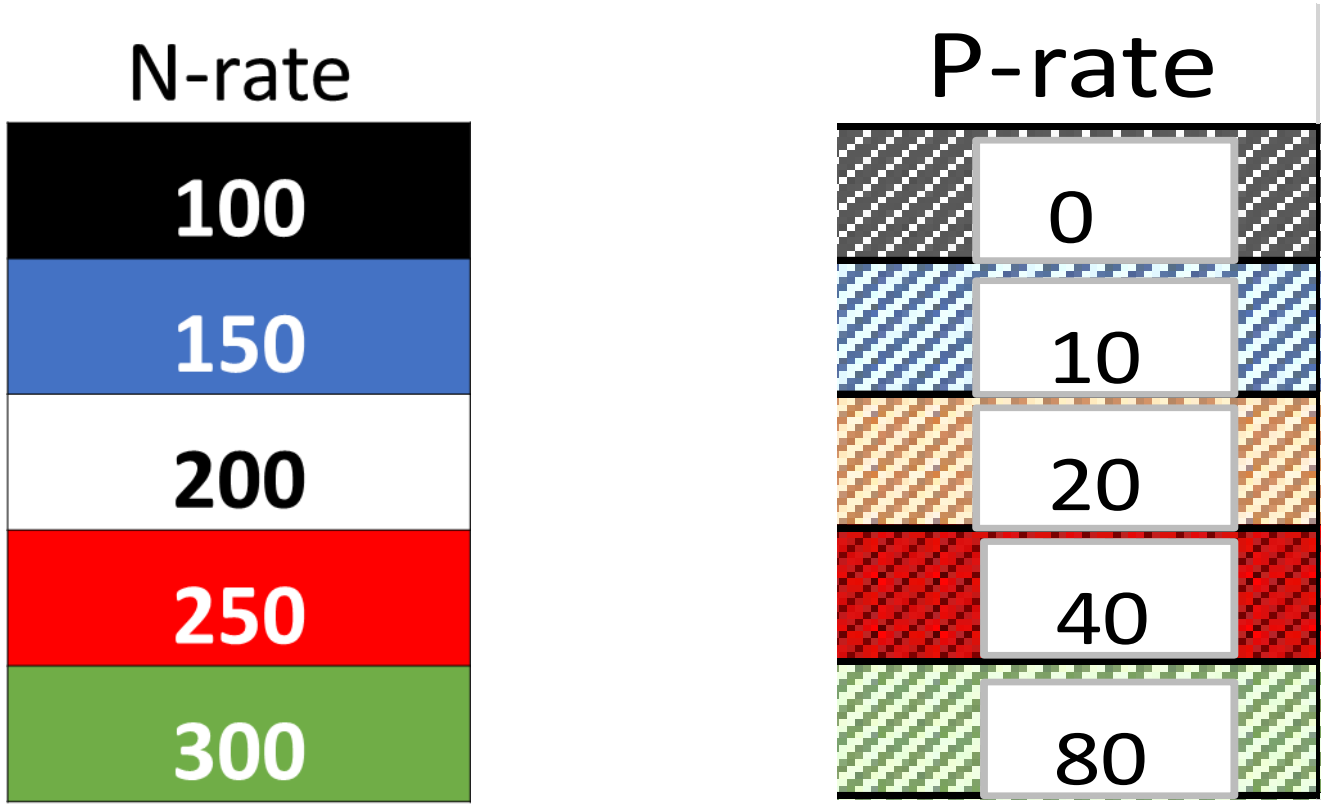
Objectives

1. Evaluate the impact of two forms of N and P fertilizer on yield, juice quality, fruit shelf-life, tree growth, physiology, and environmental quality.
2. Determine the optimal N and P rates for young and mature citrus trees at different citrus growing zones in Florida based on soil characteristics.
3. Assess nitrate and orthophosphate leaching as a function of fertilization rate and fertilizer source/form.
4. Determine optimal horticultural, tree performance, physiological and biochemical variables as a result of fertilization rate and fertilizer form.
5. Conduct an economic analysis of profitability estimates based on underlying cost and revenue estimates specific to varying fertilization rates and sources.

Project Sites



Fertilizer Treatments



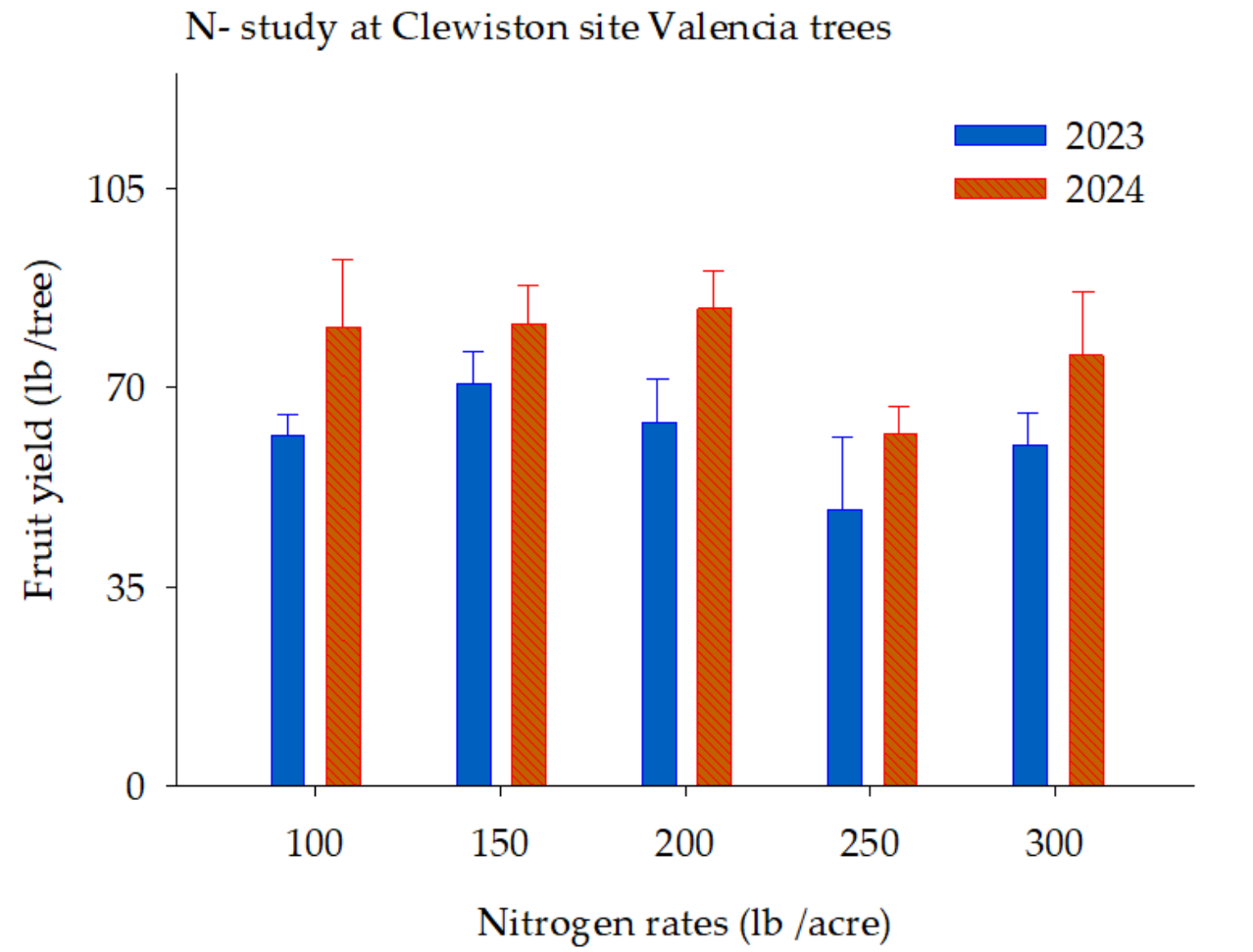
Each treatment is replicated 5 times

Fertilizer sources and quantities used per year

Fertilizer source	#bags/yr/site
10-2-10	32
15-2-15	39
20-2-20	20
10-0-10	26
0-46-0	1

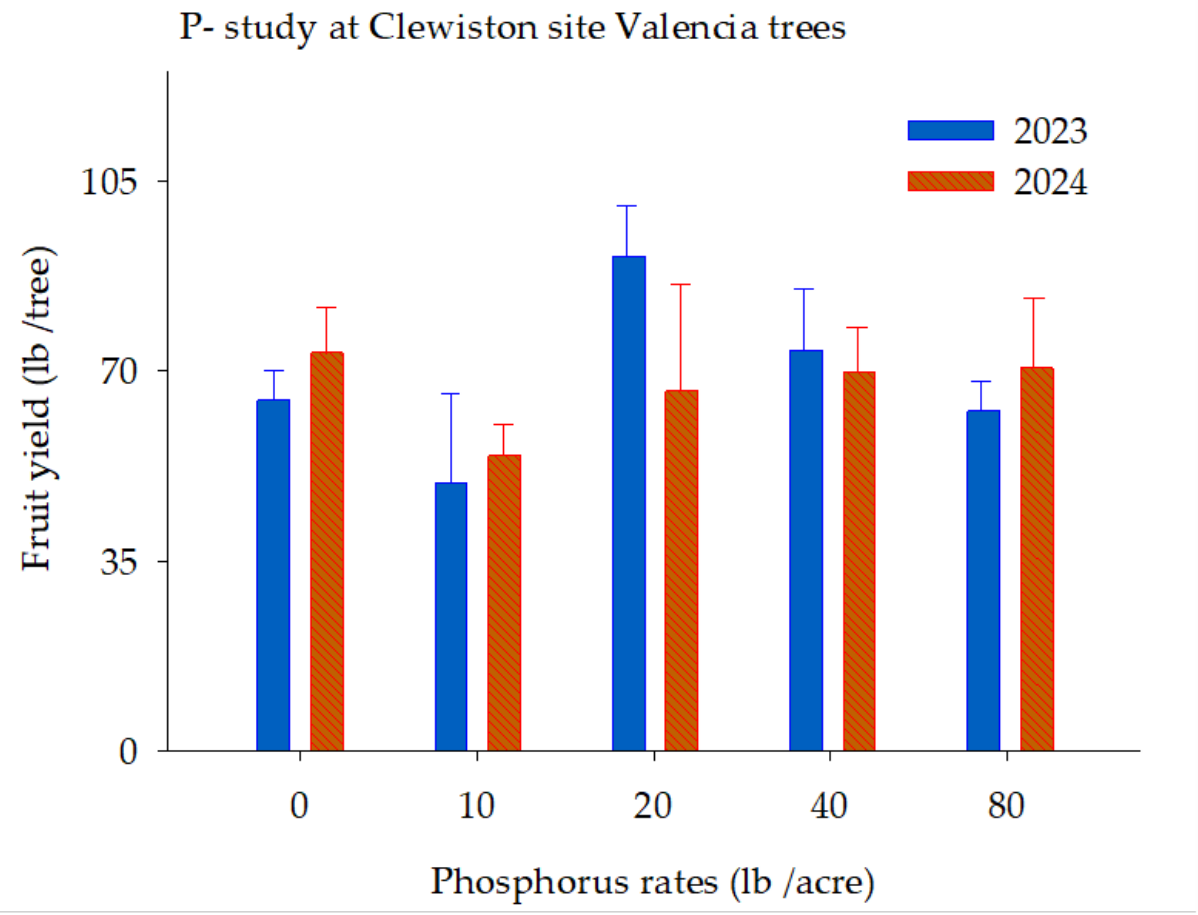
- Applications for Lake Wales, Arcadia, Clewiston, Fort Pierce and Quincy
- Application done 3 times/year
- First application done by Jan/Feb, then May/June and finally (Sept/Oct)
- Application done by broadcasting

Impacts on fruit yield-Valencia orange



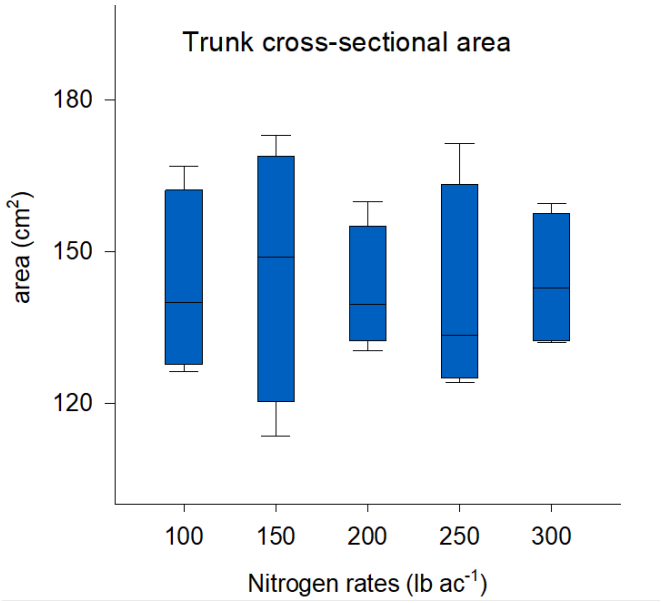
- **Impacts of the N rate on fruit yield of Valencia orange.**
- **Increases in the second year but no differences between treatments.**

Impacts on fruit yield-Valencia orange



- Impacts of the P rate on fruit yield of Valencia orange.
- No change in fruit yields from first to second year and no differences between treatments.

Impact on canopy size



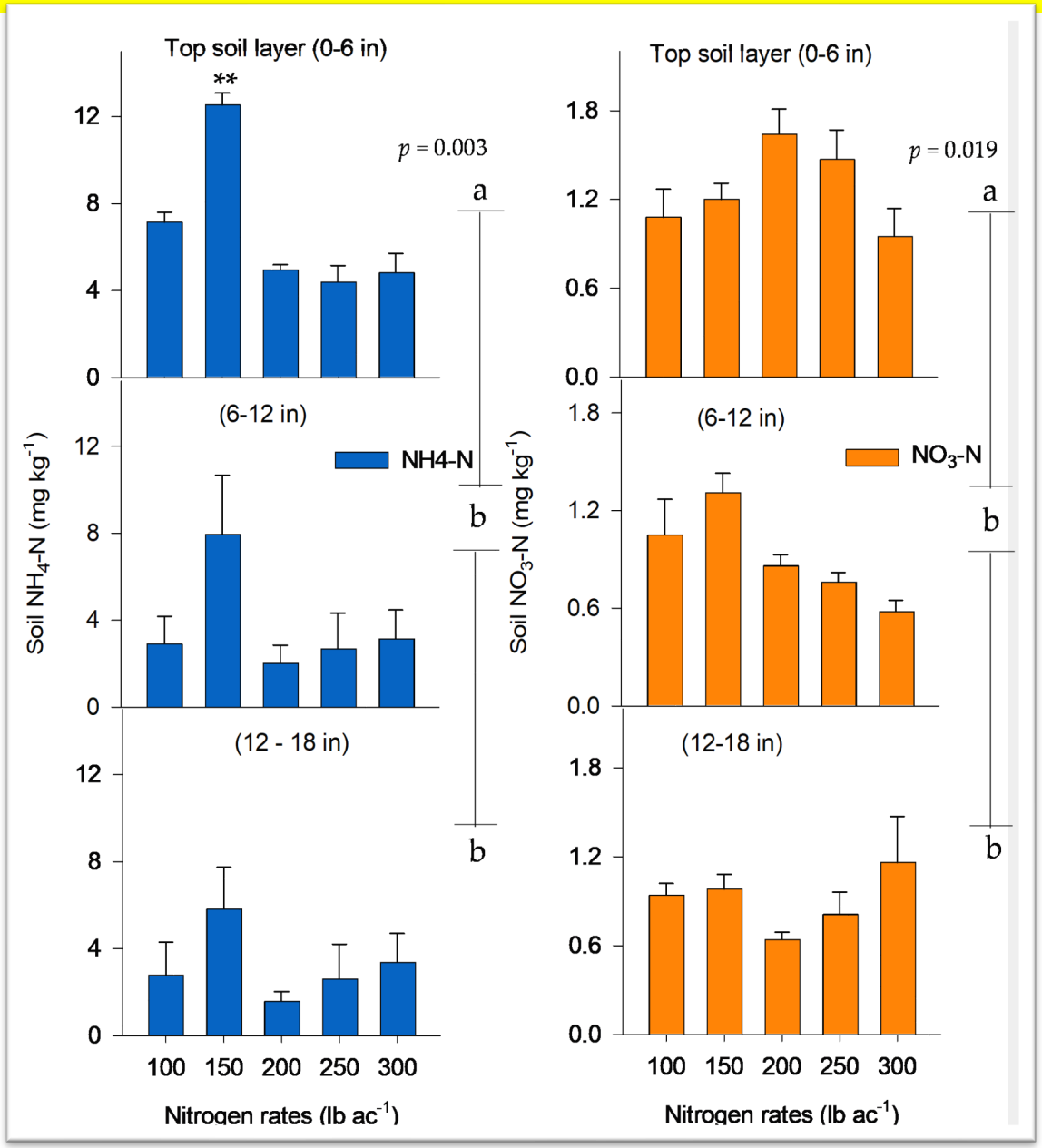
Impact on canopy size

No differences in canopy voume and trunk size

No differences in fruit yield in the first 2 years.

Some of these results may take about 36 months to show effect in HLB-affected trees.

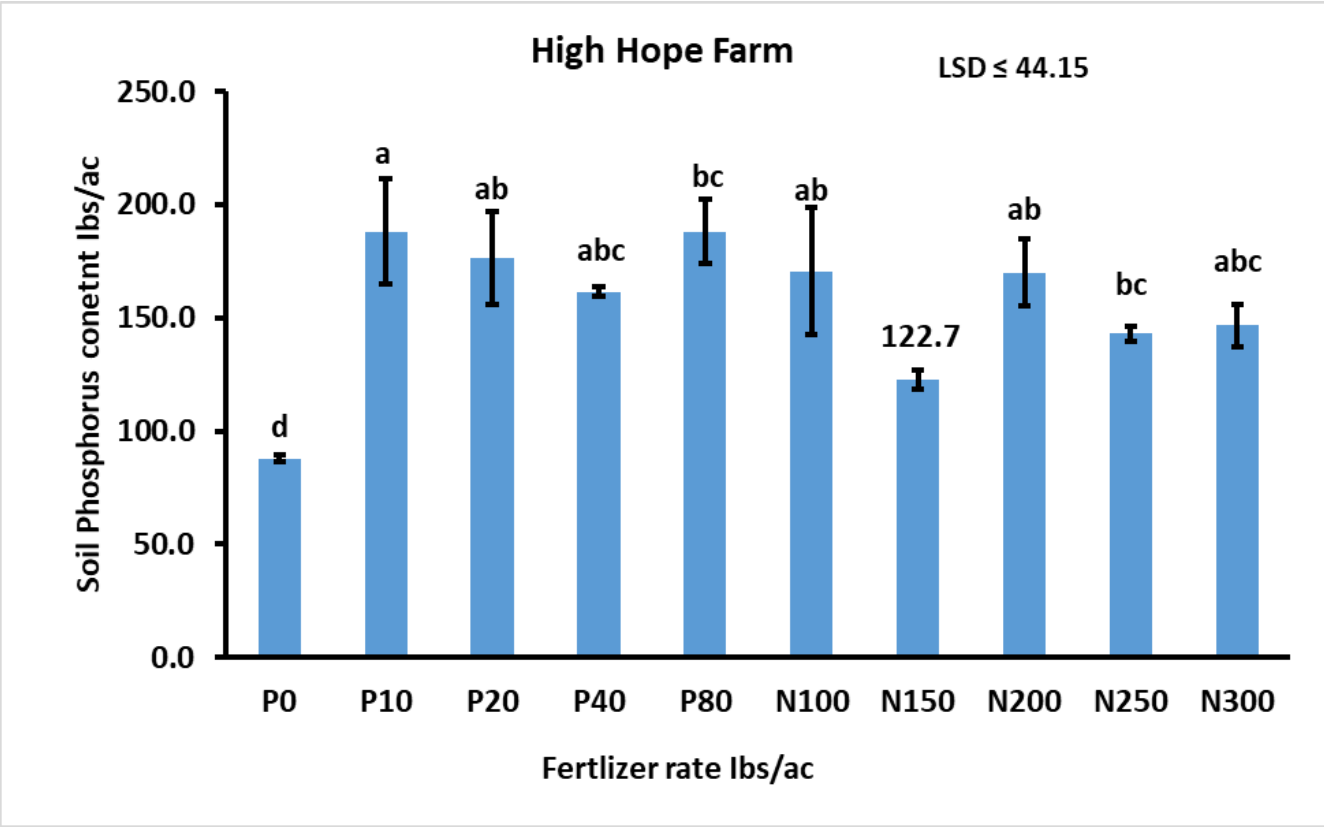
Soil nutrient analyses for Valencia orange in Clewiston, FL



Soil nitrogen (NH_4-N and NO_3-N) nutrient concentration at three soil horizons.

Most ammonium and nitrate N retained in the top 0-12 inches.

Soil phosphorus concentration in Cold Hardy Citrus

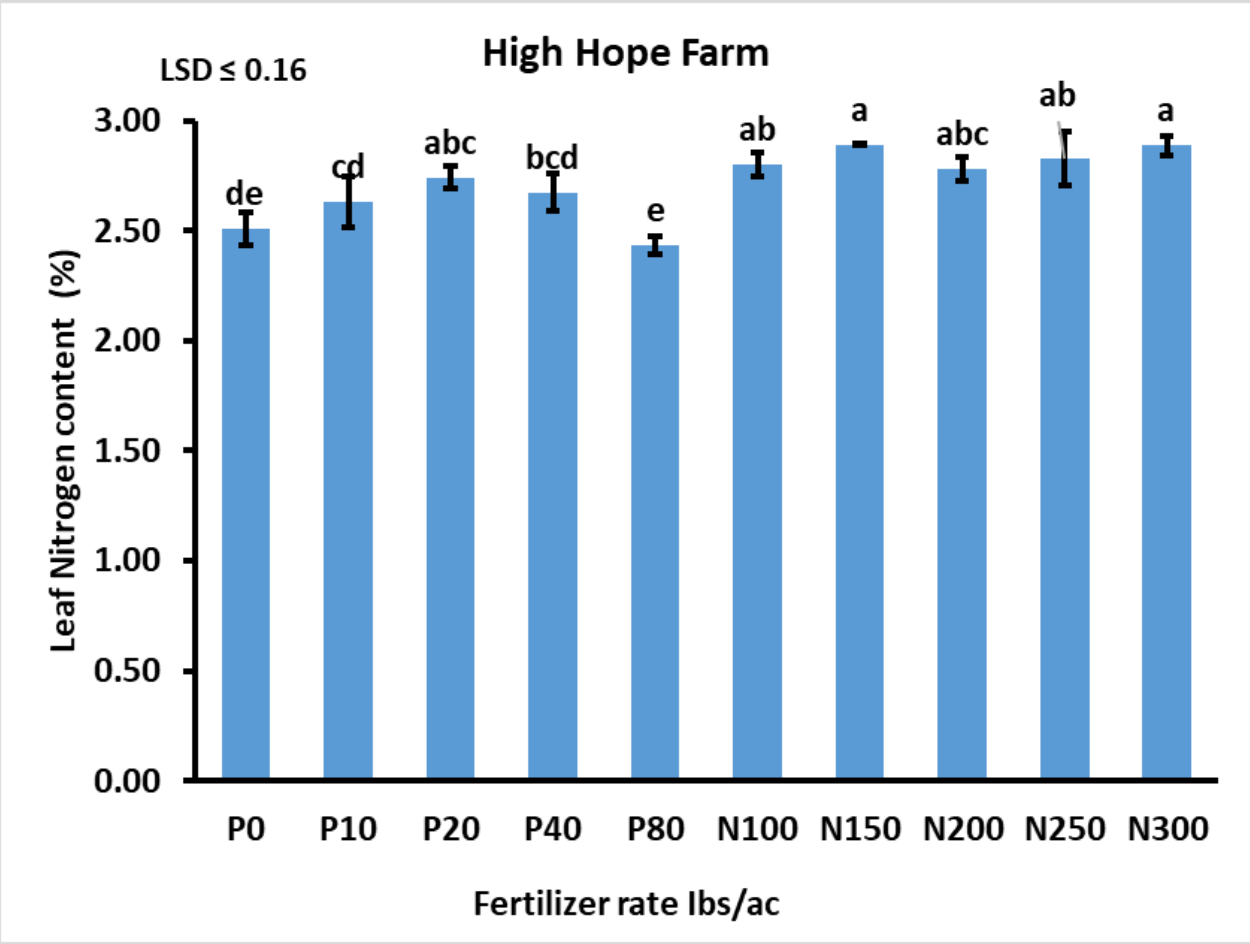


Soil P levels in varying P and N rates.

Soil P levels high even in controls probably due to residual

Credit: Dr. Shahid

Leaf nitrogen concentration in Cold Hardy Citrus

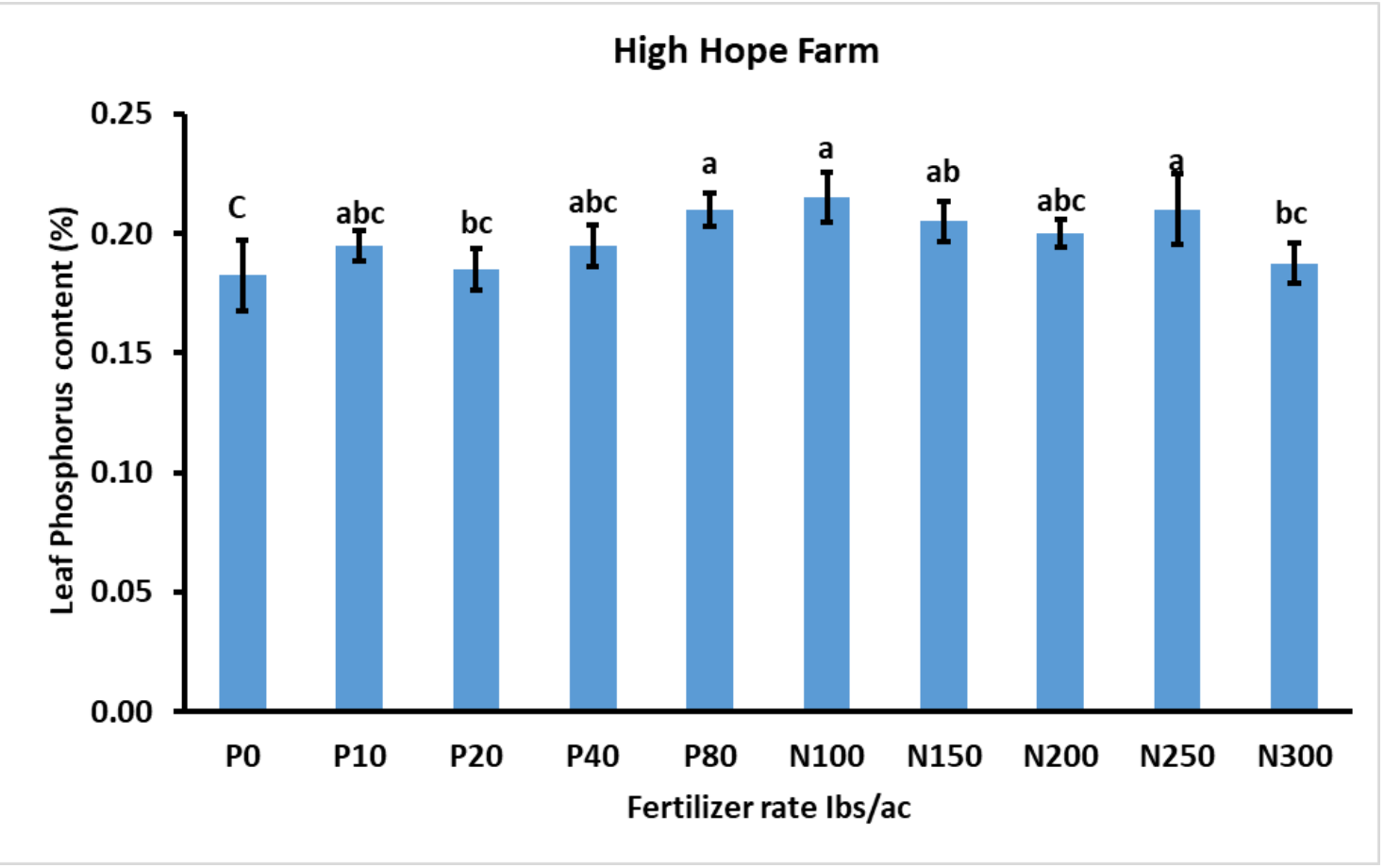


Leaf N levels in varying P and N rates.

Leaf levels mostly in optimum range.

Credit: Dr. Shahid

Leaf phosphorus concentration in Cold Hardy Citrus



Leaf P levels in varying P and N rates.

Leaf P levels mostly in fery high or excessive range including in the controls.

Credit: Dr. Shahid

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Acknowledgments

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Comments/Questions