Fertilizer Options and Alternatives for Improving Nutrient Uptake and Fruit Yield in Citrus Trees

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Key Takeaways

- Use of high efficiency fertilizers especially for HLB trees is recommended to improve canopy, fruit yield and juice quality.
- Addition/application of livestock manure increases N, P, K and other nutrients and can be used to offset absence or scarcity of inorganic fertilizers.
- Regular compost applications in our sandy soils improves nutrient retention and water holding capacity and can increase long-term tree productivity of nutrient depleted groves.
- Base fertilization on soil, leaf and/or manure/agricultural waste lab tests to determine correct citrus tree nutrition needs.

Five R Concept

- Right source of fertilizer
- Right timing of fertilizer application
- Right placement of fertilizer
- Right rate of fertilizer to meet BMP requirements
- Right irrigation rate

Roles of nutrients in improving plant health

Liebig's Law of the minimum: The Law of the Minimum, made by Justus von Liebig, 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 therefore is referred to as the limiting factor!!**

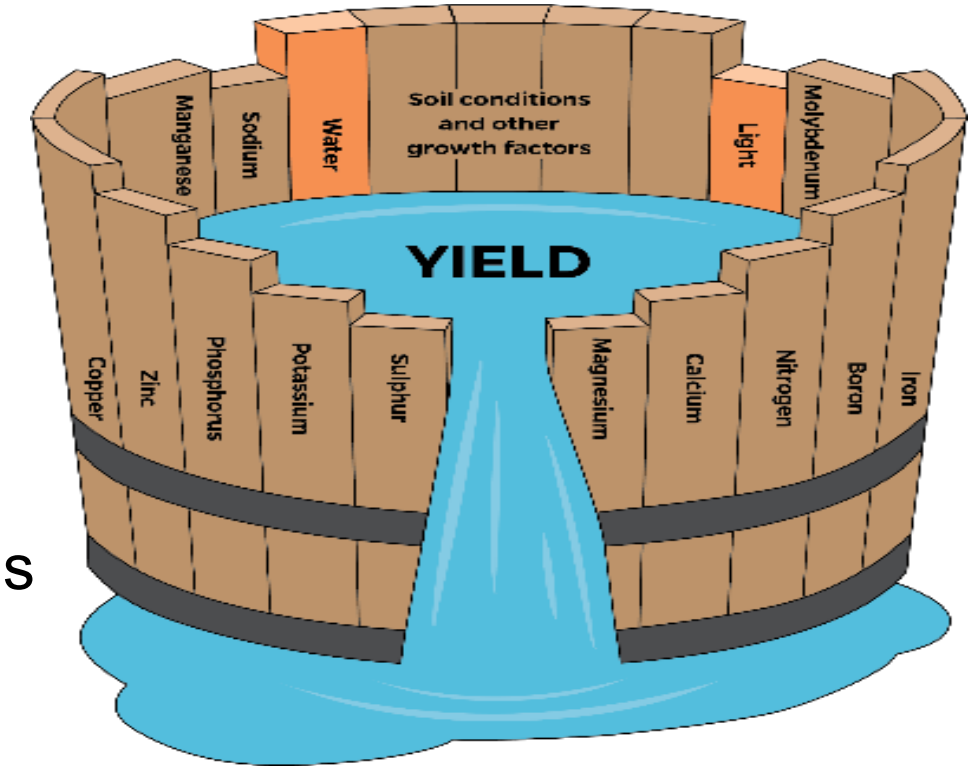

Figure 1. Liebig's Law of Minimum illustrated for plant growth and nutrition with a leaking barrel. Credit UF/IFAS Communications

High efficiency fertilizers that meet citrus needs

- Slow-release fertilizer (SRF) including some macro and micronutrients
- Controlled release fertilizer (CRF) including some macro and micronutrients
- For 6-9-month SRF and CRF, apply 2-3x/year
- For 12-month SRF and CRF, apply 1-2x/year

High efficiency fertilizers that meet citrus needs (2)

- Improved blends for granular application and containing micronutrients
- Apply 4x/year
- Ideal to apply dry soluble as follows: 20% in Feb, 30% in April, 30% in June and 20% in October.

High efficiency fertilizers that meet citrus needs (3)

- Liquid fertilizer applied via fertigation
- Apply about 12x/year if fertigating monthly, 20x/per year if fertigating biweekly
- Recommended to fertigate mainly between Feb to Oct, and avoiding the cold winter months of Nov-Jan.
- Avoid fertigating summer months and consider using CRF/SRF in June-August to prevent leaching

High efficiency fertilizers that meet citrus needs (4)

- Foliar fertilizers (applied 3 to 4x/year)
- Apply micronutrients foliarly as a remedy for correcting deficiency
- Selected macronutrients such as Ca and potassium can also be sprayed in small amounts to improve fruit retention and quality as needed in addition to soil fertilization

Organic fertilizer sources that can substitute for inorganic fertilizer

- Typical composition for nutrients in animal manure and agricultural waste (Kadyampakeni, 2014. Agron. J. 106:100-110)

Nutrient source	N (%)	P (%)	K (%)	Mg (%)	C (%)	App rate tons/acre
Animal manure	1.0-8.0	0.2-2.0	0.5-3.0	0.1-3.0	--	2-5
Agricultural waste	0.5-2.3	0.04-0.3	0.9-1.3	--	--	5-8
Agricultural industrial waste	0.5-1.2	0.06-1. 8	0.3-1.7	--	--	5-9
Plant residue/compost	0.9-2.2	0.1-0.5	---	--	3.7-4.9	5-8

Organic fertilizer sources that can substitute for inorganic fertilizer (2)

- Place the animal manure/waste, agricultural waste, agricultural industrial waste in the tree or plant row to reach the root zone and ensure efficacy of uptake.
- Disk in or apply on the surface if runoff is not a problem.
- Some may be applied at planting stations when new groves are installed.
- Apply the manure or waste 1x or 2x per year.

Benefits for using animal, ag waste or plant residue

- Increased organic matter and soil carbon and soil health parameters
- Improved water and nutrient retention
- Long-term improved soil fertility
- Increased microbial activity in the soil and nutrient cycling and transformation
- Moderation of soil quality e.g. soil pH, salinity are optimized
- Easy to find especially in areas close to ranches and agricultural industrial sites
- Can offset high costs associated with inorganic fertilizers

Challenges for using animal, ag waste or plant residue to meet nutrient needs

- Excessive baggage!
- Slow nutrient release, so not ideal for short term need.
- Very important to know the nutrient ratios to avoid oversupply of nutrients (do a lab test for manure, compost or residue to know what's in it!)

Right irrigation rate

- Irrigation decisions should be based on use of soil moisture sensors recommended for Florida sandy soils to minimize nutrient leaching.
- It is good to also use soil moisture sensors to help determine if enough water is maintained in the root zone.
- Do not irrigate for two days if you received 0.5 inch of rain or more.
- Keep an eye on weather data from Florida Automated Weather Network (FAWN) @https://fawn.ifas.ufl.edu

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CITRUS INITIATIVE

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