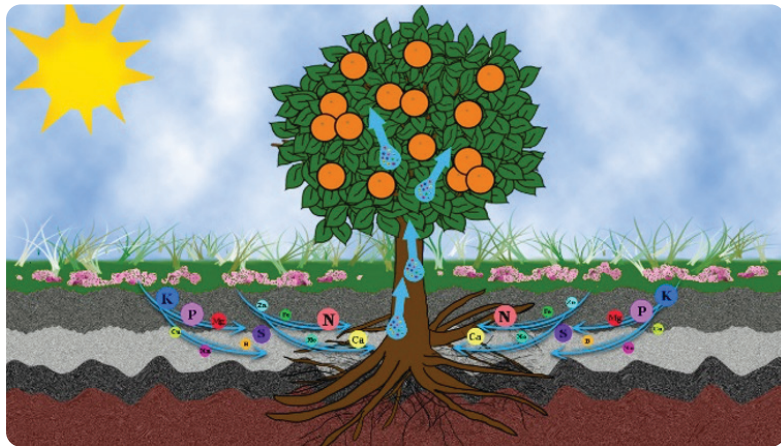


Soil-Applied Nutrition

- Plants uptake nutrients when they are in a water solution.
- Soil-applied nutrients are moved into the root during water uptake and therefore distributed in the tree along with water.
- Mobile and immobile nutrients have an equal and uniform distribution in all parts of the plant.
- Granular fertilizer, controlled-release fertilizer, and fertigation are all soil-applied fertilization methods.

HUANGLONGBING (HLB) CONSIDERATION

- HLB-affected trees have a small root system; therefore, the nutrient uptake capacity of roots is limited.
- The constant availability of nutrients is critical.

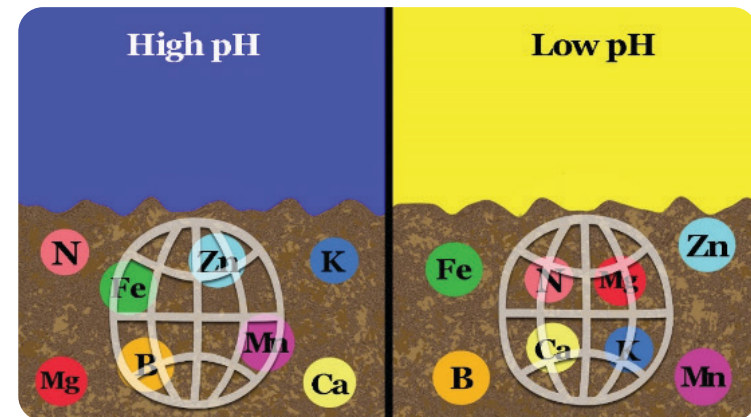


During the water uptake by the plant, the dissolved mineral nutrients get taken up by the plant and distributed throughout the canopy.

Credit: Tonya R. Weeks, UF/IFAS CREC

Foliar-Applied Nutrition

- Nutrient sprays should be timed at two-thirds-expanded to nearly fully expanded young leaves.
- Mature leaves with thick leaf cuticles limit nutrient uptake.
- Even when foliar sprays are applied at the right time, immobile nutrients can get locked in leaves and cannot move into growing leaves, roots, or fruit; as a result, their distribution within the plant is poor.



The availability of soil-applied nutrient is dependent on soil pH.

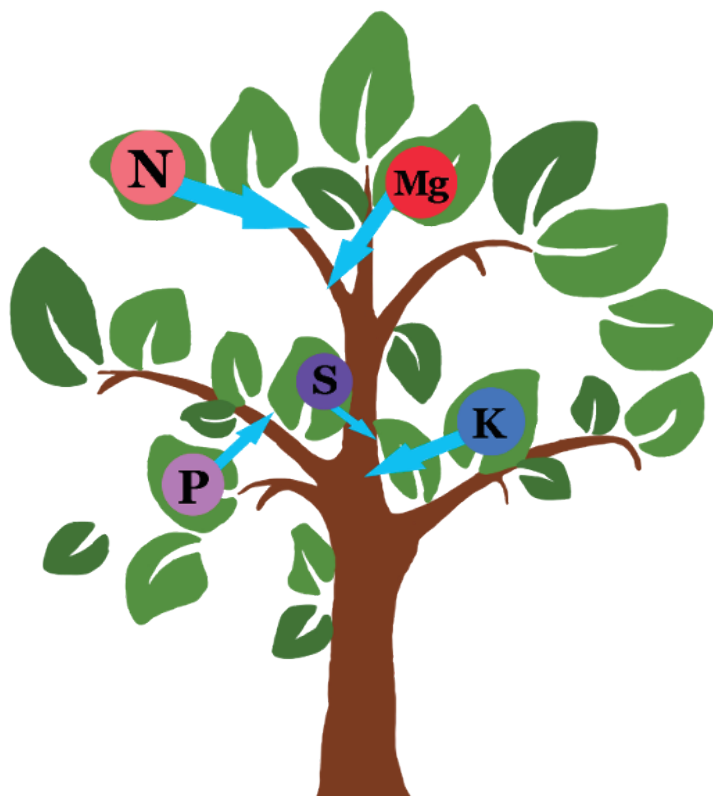
Credit: Tonya R. Weeks, UF/IFAS CREC

Soil pH and Nutrient Interactions

- At high soil pH, most of the micronutrients bind to the soil and become unavailable for plant uptake.
- At extremely low soil pH, most of the macro- and secondary nutrients become unavailable for plant uptake.
- The goal is to have the right soil pH range for nutrient uptake.
- The preferred range for soil pH in Florida citrus production with HLB-affected trees is 5.8–6.5.

Movement of Mobile Nutrients

- Mobile nutrients move to areas of active growth within the plant.
- Nutrients move in all directions.
- These nutrients are transported via xylem and phloem.
- Deficiency symptoms appear first in older leaves, and if the deficiency is not corrected, they show up in new growth.
- Mobile nutrients include Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), and Sulfur (S).
- Soil- and foliar-applied nutrients are both adequate.



Mobile nutrients move in all directions throughout the plant.

Credit: Tonya R. Weeks, UF/IFAS CREC

Movement of Immobile Nutrients

- Immobile nutrients do not redistribute within the plant.
- These nutrients are transported only via xylem.
- Immobile nutrients do not move to areas of active growth.
- Deficiency symptoms show up in the new growth first, and if not corrected, they will show up in older leaves.
- Immobile nutrients include Calcium (Ca), Iron (Fe), Zinc (Zn), Copper (Cu), Manganese (Mn), Boron (B), and Molybdenum (Mo).
- Foliar applications have limited efficacy and distribution in the plant.



Immobile nutrients do not move throughout the plant and are locked in the mature (old) growth.

Credit: Tonya R. Weeks, UF/IFAS CREC