UF | IFAS Extension UNIVERSITY of FLORIDA

HS1292

Citrus Nutrition Management Practices

J. D. Burrow, T. Vashisth, M. Zekri, S. H. Futch, and A. Schumann

MINERAL NUTRIENTS

- Plant mineral nutrients play an essential role in the plant's life cycle; there are 14 mineral nutrients that are recognized as essential for normal plant growth and development.
- Essential nutrients are not simply plant food necessary for optimum plant growth and yield, they also influence plant resistance or susceptibility to pathogens and pests.
- Nutrients aid in the formation of mechanical barriers, primarily through the development of thicker cell walls and the synthesis of natural defense compounds (phytoalexins, antioxidants, and flavonoids) to provide protection against pathogens.

Relative essential mineral element composition of a 6-year-old 'Hamlin' orange tree (excluding Cl and Ni). (Derived from Mattos et al. 2003).

ELEMENT	NO. OF ATOMS RELATIVE TO MO	% OF TOTAL TREE DRY WEIGHT
Mo	1	0.00003
Cu	100	0.002
Mn	200	0.003
Zn	300	0.006
Fe	600	0.010
B	800	0.002
S	11,111	0.096
P	13,000	0.116
Mg	18,000	0.120
K	66,000	0.728
Ca	98,000	1.096
N	237,000	0.932

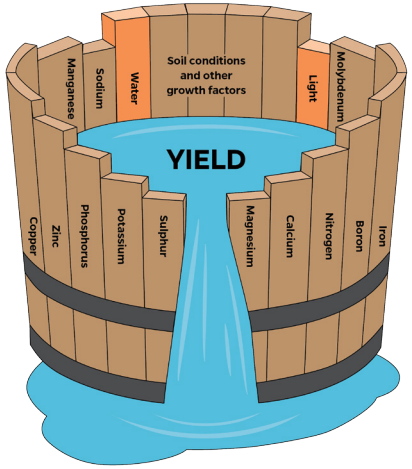
Source: *Nutrition of Florida Citrus Trees, Second Edition*. Edited by Thomas A. Obreza and Kelly T. Morgan

BENEFITS OF PLANT NUTRITION MANAGEMENT

- Balanced and complete nutrition can help trees in performing proper functions.
- Mineral nutrition is a factor that can be controlled in agricultural systems.
- Proactive and timely nutrition management can enhance a plant's efficiency to absorb nutrients. Consistently available macro and micro nutrients improve metabolism and other processes in the plant.

LIEBIG'S LAW OF THE MINIMUM

- The leaky barrel illustrates Liebig's law of the minimum.
- Just as the capacity of a barrel with unequal length staves is limited by the shortest stave, so too is a plant's health, growth, and yield limited by the nutrient in shortest supply.



RESOURCES

Nutrition of Florida Citrus Tree, Second Edition. Edited by Thomas A. Obreza and Kelly T. Morgan

A Guide to Citrus Nutritional Deficiencies and Toxicities. Steve Futch and D.P.H. Tucker

The Critical Importance of Citrus Tree Nutrition. Mongi Zekri

NUTRITION BALANCE AND DISEASE RESISTANCE

- Plants with an optimal nutritional status have the highest tolerance to pests and diseases. Any nutritional deficiency hinders plant metabolism and results in a weakened plant, which may lower disease resistance. Disease susceptibility increases as nutrient concentrations deviate from the optimum.
- The goal is to maximize yield and the potential for disease and pest control through mineral nutrition and fertilizer applications.

THE RIGHT NUTRIENT PROGRAM STEWARDSHIP FOR BEST MANAGEMENT PRACTICES (BMP)

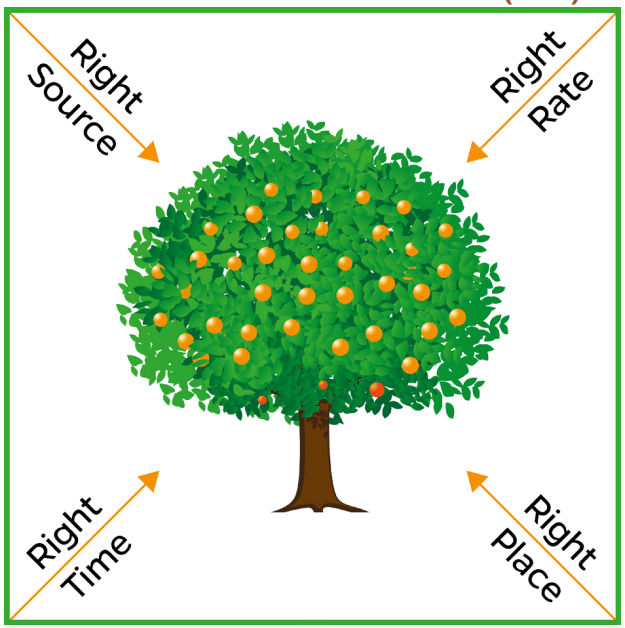


Photo Credits: Mongi Zekri, Tripti Vashisth, UF/IFAS Communications, and R.C.J. Koo

1. This document is HS1292, one of a series of the Horticultural Sciences Department, UF/IFAS Extension. Original publication date May 2017. Visit the EDIS website at http://edis.ifas.ufl.edu.

2. Jamie D. Burrow, Extension program manager, UF/IFAS Citrus Research and Education Center; Tripti Vashisth, assistant professor, Horticultural Sciences Department, UF/IFAS CREC; Mongi Zekri, Extension agent, UF/IFAS Extension Hendry County; Stephen H. Futch, Extension agent emeritus, UF/IFAS CREC; Arnold Schumann, professor, Department of Soil and Water Sciences, UF/IFAS CREC; UF/IFAS Extension, Gainesville, FL 32611.

Reviewed: 06/2025



Nitrogen (N)

DEFICIENCY SYMPTOM: entire leaf yellowing of old leaves

FUNCTION: vegetative growth, flowering, fruit yield

APPLICATION METHOD: foliar and soil



Phosphorus (P)

DEFICIENCY SYMPTOM: fruit has thick rind and hollow core; leaf symptoms are rare in Florida

FUNCTION: photosynthesis and plant energy

APPLICATION METHOD: foliar and soil



Potassium (K)

DEFICIENCY SYMPTOM: yellow blotches merge and spread becoming darker bronze

FUNCTION: yield, fruit size, juice quality

APPLICATION METHOD: foliar and soil



Calcium (Ca)

DEFICIENCY SYMPTOM: yellowing of leaf margins; small, thickened leaves

FUNCTION: important component of cell wall (overall tree growth)

APPLICATION METHOD: foliar and soil



Magnesium (Mg)

DEFICIENCY SYMPTOM: inverted 'V' pattern at base of leaf

FUNCTION: main element in chlorophyll; aids in photosynthesis

APPLICATION METHOD: foliar and soil



Sulfur (S)

DEFICIENCY SYMPTOM: pale green to yellow in color on new growth

FUNCTION: protein synthesis, amino acid, chlorophyll production

APPLICATION METHOD: foliar and soil



Iron (Fe)

DEFICIENCY SYMPTOM: green veins on a light green leaf; symptoms appear first on new foliage

FUNCTION: essential for synthesis of chlorophyll and energy production

APPLICATION METHOD: soil



Copper (Cu)

DEFICIENCY SYMPTOM: 'S' curved branching, inter-nodal stem gumming, twig dieback

FUNCTION: proper enzyme activity and metabolism; plays essential role in chlorophyll formation

APPLICATION METHOD: foliar and soil



Zinc (Zn)

DEFICIENCY SYMPTOM: leaf is yellow with green veins

FUNCTION: plant metabolism, growth-promoting substances in plants (auxins)

APPLICATION METHOD: foliar and soil (soil applications are not recommended on calcareous soils)



Manganese (Mn)

DEFICIENCY SYMPTOM: dark green bands along midrib and main veins surrounded by light green interveinal areas

FUNCTION: energy metabolism

APPLICATION METHOD: foliar and soil (soil applications are not recommended on calcareous soils)



Boron (B)

DEFICIENCY SYMPTOM: corky veins

FUNCTION: movement of sugar in phloem; translocation of sugar

APPLICATION METHOD: foliar and soil



Molybdenum (Mo)

DEFICIENCY SYMPTOM: large interveinal yellow spots

FUNCTION: plant protein formation

APPLICATION METHOD: soil and foliar

The role of chlorine (Cl) and nickel (Ni) in citrus trees is not well defined.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For more information on obtaining other UF/IFAS Extension publications, contact your county's UF/IFAS Extension office.

U.S. Department of Agriculture, UF/IFAS Extension Service, University of Florida, IFAS, Florida A & M University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Andra Johnson, dean for UF/IFAS Extension.