

The Impact of Organic Acids on Soil Health and Acidification for Enhanced Nutrient Uptake and Tree Productivity in Huanglongbing-affected Citrus Trees

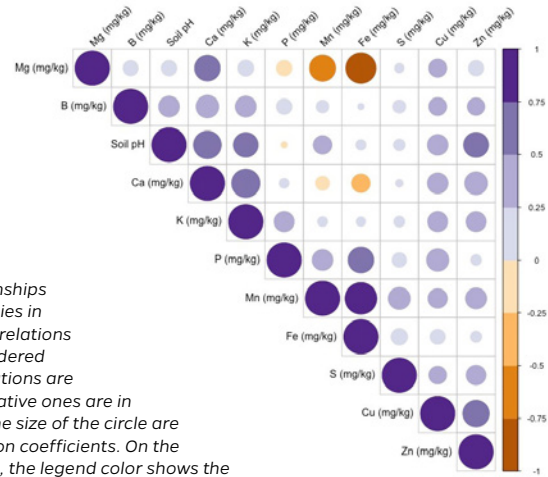
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Summary: We conducted an experiment for 4.5 years to first, determine effects of lowered soil pH on *Candidatus Liberibacter asiaticus* (CLAs) populations and root physiology including internal root apoplast and vascular tissue pH; and secondly, field test multiple acidification materials including organic acids for tree response CLAs suppression, nutrient uptake, and root and vascular pH changes. In the project's first objective, we analyzed root physiological responses and leachate nutrient levels at varying pH levels from 5.5 to 8.5. Soil

Correlation matrix of relationships among soil chemical properties in the central Florida ridge. Correlations with p -value > 0.01 are considered insignificant. Positive correlations are displayed in purple, and negative ones are in brown. Color intensity and the size of the circle are proportional to the correlation coefficients. On the right side of the correlogram, the legend color shows the correlation coefficients and the corresponding colors.



macronutrient and micronutrient were promoted at the moderate acidity (5.5 and 6.5) and not at higher pH (7.5 and 8.5). In the second objective, we compared impacts of fulvic acid, humic acid, and sulfuric acid with and without elemental sulfur. We tracked and analyzed canopy size, fruit yield, fruit quality, soil nutrient availability, leaf nutrient levels, and root density in the field. Fruit yields were negatively compromised by hurricane damage and freezes, but soil macronutrient and micronutrient availability and uptake were improved particularly

where acids were applied with elemental sulfur every six months.

Take Home Message:

- Moderate acidity (pH 5.5-6.5) promoted nutrient availability compared to pH > 7.5.
- Use of organic acids such as humic acid and fulvic acid should be considered for lowering soil pH along with elemental sulfur.
- Combined use of organic acids and elemental sulfur increased nutrient availability on Ridge and Flatwoods soils though fruit yields and fruit quality were comparable between treatments over the four years.

Funding:

