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Citrus Soil pH Management

SL453

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Factors Affecting Soil pH

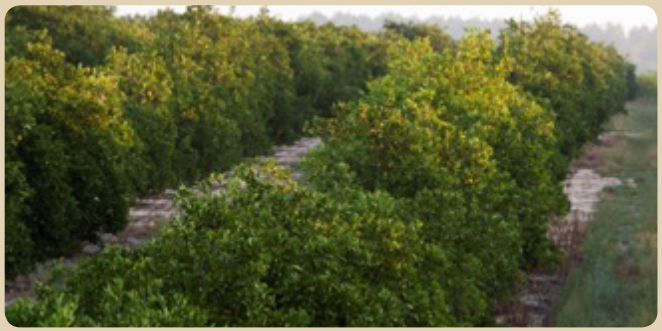
- Irrigation with high-pH or saline water can cause a gradual increase in soil pH.It is strongly recommended that an irrigation water-quality (pH and salinity) test be done yearly.
- Water drawn from the limestone aquifer is high in bicarbonates and has a liming effect on the soil.
- Numerous soil amendments, including composts, contain nutrient value and may also have a liming effect resulting in unintended increase in soil pH.

Concern about Soil pH

- Soil pH determines the solubility and bioavailability of nutrients essential for citrus growth and yield.
- Research has determined that adjusting soil pH from greater than 7 to the range between 6 to 6.5 increases availability of potassium (K), phosphorus (P), calcium (Ca), manganese (Mn), zinc (Zn) and iron (Fe), improving citrus growth and yield.
- Ferrous iron found in slightly acid soils is the form available to most plant species, but ferric iron in high-pH soils is not. Thus, citrus grown on high-pH soils will be iron-deficient.
- When soil pH reaches 5 or lower, aluminum (Al), Fe, Mn, and/or Zn solubility increase in the soil solution and can become toxic to most citrus.

Management Options

- Management of soil pH and nutrients should include annual soil sampling. Water samples should be taken if elevated soil pH is reported.
- Irrigation water acidification, elemental sulfur application, or use of acidifying fertilizers are recommended to reduce soil pH to the acceptable range.
- Injection of acids into irrigation water high in bicarbonates will reduce soil solution pH, removing soil bicarbonates.
- The current recommendation is to lower irrigation water to a pH between 5 and 6. Soil pH will decrease over time depending on soil buffering capacity and bicarbonate concentration.
- The time required to obtain optimum soil pH (6–6.5) can be 6 to 24 months depending on the soil buffer capacity, moisture, temperature, and aeration.
- In certain cases, elemental sulfur (S) may be applied to the soil. Over time, the soil bacteria will convert the elemental S form into the sulfate form. Sulfuric acid is released in the process, neutralizing hydroxides and bicarbonates.
- Acid-forming fertilizers are positively charged nutrients, such as ammoniacal-N, K, Ca, and Mg, that lower root zone pH after being absorbed by plants.
- Long-term use of ammoniacal fertilizers will also result in lowering the pH by nitrification .
- Sulfate, nitrate, or phosphate ions in fertilizers do not cause soil pH decrease.



Management of both soil pH and nutrients is required to maintain soil fertility levels and ensure economic agricultural production. Maintaining soil in the 6.0–6.5 pH range is best for most crops, including citrus.

Credits: Tyler Jones, UF/IFAS

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2. Kelly Morgan, professor and center director, UF/IFAS Southwest Florida Research and Education Center, Immokalee, FL 34142.

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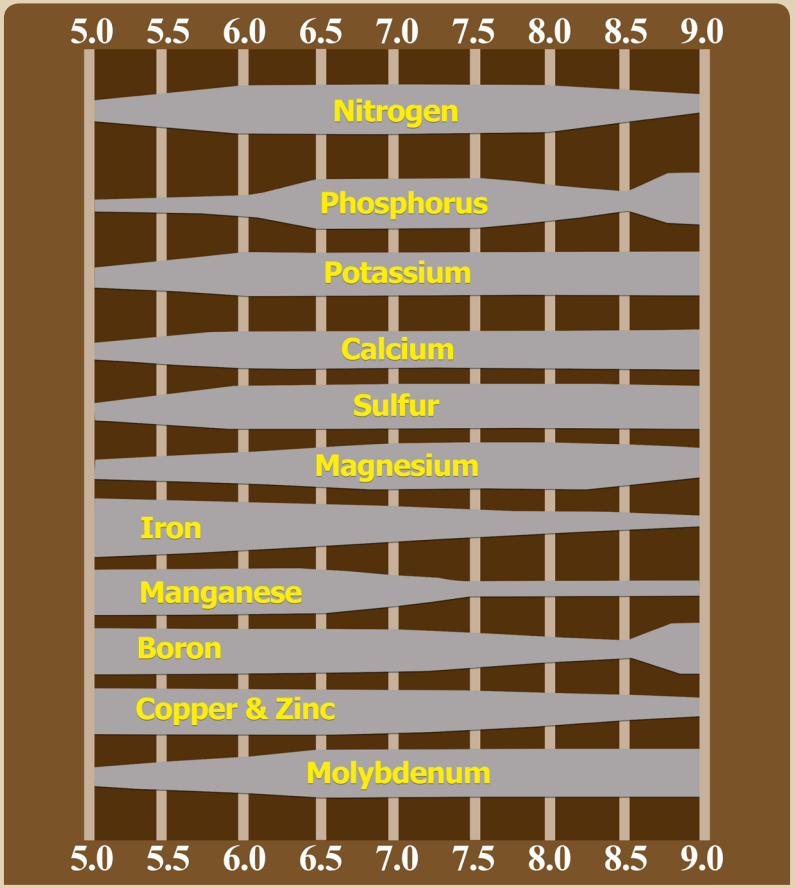
pH Test Equipment

Effect of Soil pH on Nutrient Management

- High soil pH (greater than 7.2) causes NH3 volatilization from fertilized soils with ammoniacal-N sources, such as ammonium sulfate, or ammonium-forming fertilizers, such as urea.
- Low soil pH exacerbates nutrient-leaching problems because positively charged nutrients such as ammonium, calcium, magnesium, and potassium adsorbed by soil particles may be replaced by hydrogen protons.
- Nutrient leaching out of the root zone reduces citrus nutrient uptake.
- Caution is recommended to avoid soil pH lower than 5.0.

Avoid soil pH lower than 5.0.
Credits: Tonya R. Weeks, UF/IFAS

Effect of soil pH on nutrient availability as expressed by relative bar width.



Source: *Nutrition of Florida Citrus Trees*. 2nd Edition.
T. A. Obreza and K. T. Morgan