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[1]Citrus Fertilizer Management on Calcareous Soils[1]

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INTRODUCTION

Soils in the south Florida flatwoods are underlain by calcium carbonate ($CaCO_3$) that has accumulated through marine deposition over thousands of years. In most flatwoods, the $CaCO_3$ lies below the profile and the overlying surface soil is usually acidic. However, $CaCO_3$ also can occur at the surface, either naturally or as a result of earth-moving operations that have mixed the soil. The resultant soil is called calcareous. Soils also can become calcareous through long-term irrigation with water from the Floridan aquifer. This water contains small amounts of dissolved $CaCO_3$ that can accumulate with time.

Florida calcareous soils are alkaline (have pH values greater than 7) because of the presence of calcium carbonate ($CaCO_3$), which dominates their chemistries. These soils can contain from about 3% to more than 25% $CaCO_3$ by weight, with pH values in the range of 7.6 to 8.3. Usually, the pH is not in excess of 8.3 regardless of $CaCO_3$ concentration, unless a significant quantity of sodium (Na) is present.

Many Florida flatwoods soils contain one or more calcareous horizons, or layers (see Table 1). A typical characteristic is an alkaline, loamy horizon less than 40 inches deep, which can be brought to the surface during land preparation for citrus planting. These soils are important for citrus production in the Indian River area (east coast) and, to a lesser extent, in the Gulf region (southwest Florida). Increased nutritional management often is required to grow citrus successfully on calcareous soils. Some sites (e.g., ditchbanks) are composed of soils with extremely high levels of lime rock or shell. Planting these sites may not be economically justifiable, considering the management problems and costs involved.

Citrus fertilizer management on calcareous soils differs from that on noncalcareous soils because of the effect of soil pH on soil nutrient availability and chemical reactions that affect the loss or fixation of some nutrients. The presence of $CaCO_3$ directly or indirectly affects the chemistry and availability of nitrogen (N), phosphorus (P), magnesium (Mg), potassium (K), manganese (Mn), zinc (Zn), and iron (Fe). The availability of soil copper (Cu) also is affected; however, since the citrus Cu requirement is normally satisfied through foliar sprays of Cu fungicides, it is not discussed in this fact sheet.

THE EFFECT OF $CaCO_3$ ON NITROGEN TRANSFORMATIONS

Soil pH affects the rates of several reactions involving N and can influence the efficiency of N use by plants. Nitrification, or the conversion of ammonium (NH_4^+) to nitrate (NO_3^-) by soil bacteria, is most rapid in soils with pH values between 7 and 8.

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