Keeping soil pH at the optimal level

By Brandon White

This time of year is the end of the peak nutrient demand for citrus trees. Regardless of the types of fertilizer or inputs applied in the groves, trees have been taking up nutrients while growing in full tilt during the spring season.

One of the greatest factors determining how well trees take up nutrients is soil pH. Having soil pH dialed in to the recommended range will increase nutrient uptake efficiency, thereby making better use of costly inputs and potentially decreasing the nutrient rates required for optimal tree health.

The preferred soil pH range for most plants is 5.5–6.5, but recent research suggests a slightly narrower range of 5.8–6.5 for citrus in the HLB era. Figure 1 shows 12 of the 14 essential nutrients plants take up from the soil. (The other two are not pH dependent). The wider the bar, the more available a nutrient is at that corresponding pH value; the narrower the bar, the less available it is.

Most micronutrients are more available at lower pH and less available at higher pH, while the opposite is true for macronutrients. Excessively low soil pH values for citrus can be problematic. Micronutrients are needed in smaller amounts yet are more available at these lower pH values. Toxicities can develop if plant uptake is too high. Aluminum, naturally found in high levels in most soils, can also become toxic when pH drops below 5.0.

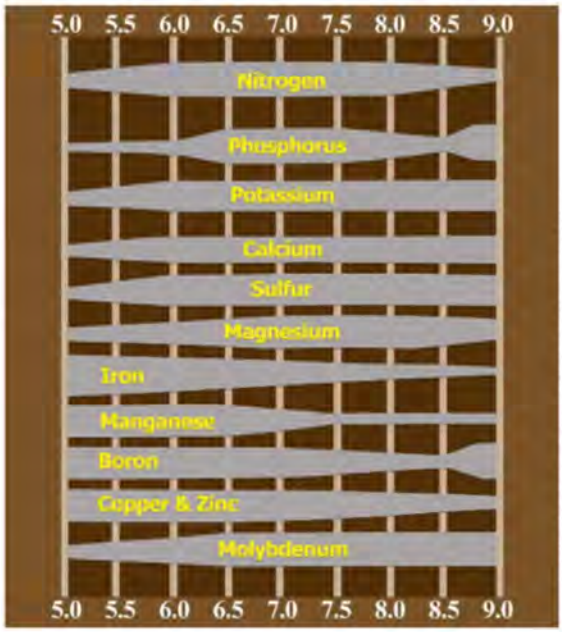

Figure 1. The wider the bar, the more available a nutrient is at the corresponding pH value. The optimal soil pH range for citrus in the HLB era is 5.8–6.5.

DETERMINING FACTORS

Several factors can determine the soil pH. Many soils in South Florida tend to be high pH because of the influence of limestone bedrock, but many other soils in the state naturally have much lower pH values. Even within a grove, the soil pH can vary, so it is best to break up large groves into smaller blocks when sampling soil to check pH.

Irrigation water in Florida often has high bicarbonates and pH values, which can increase the soil pH over time. Fertilizers, particularly high ammonium sources of nitrogen, acidify the soil and their repeated use over time can drive down the soil pH. Composts are great amendments that provide many benefits to overall soil health, but many sources are high in pH (7.0+). So that needs to be considered when applying, particularly where soil pH is already high. Seasonal changes in soil and well water pH can also be observed.

MAINTAINING THE RIGHT RANGE

Maintaining soil pH within the recommended range is an important practice. From a management standpoint, raising the pH is often easier and lasts longer than lowering the pH.

Lime and dolomite are often used to raise pH and are relatively inexpensive. Composts or other additives with high pH can also increase soil pH. Large inputs of organic matter to sandy soils over time can also increase the buffering capacity of the soil and in turn help resist pH changes.

Lowering the soil pH is often achieved through acidifying irrigation water or adding elemental sulfur products to the soil. Care needs

to be taken in acidifying irrigation water, and systems need to be checked regularly. Mistakes or equipment failure can cause over-acidification and quickly have negative impacts to the rootzone of the soil and impact production. When carefully managed, neutralizing bicarbonates in irrigation water by acid injection can be very effective, however.

> *Even within a grove, the soil pH can vary, so it is best to break up large groves into smaller blocks when sampling soil to check pH.*

Granular elemental sulfur products are readily available and can be used by growers to lower soil pH. These products are broken down by soil microbes that acidify the soil in the process. Because this process is dependent on microbial activity, it can take longer for this affect to take place. Growers can also use acid-forming fertilizer blends on a regular or occasional basis depending on pH trends in the grove.

ANNUAL CHECK

Checking soil pH once a year is a recommended practice. Typically, growers will submit a soil sample to a lab for a full nutrient profile that includes pH. The best time to do this is late summer/fall before fertilizer applications need to be made and to allow time for potential adjustments in pH to take effect. Comparing soil pH year after year can be helpful to track trends over time and to aid in management decisions.

See Citrus Soil pH Management at edis.ifas.ufl.edu/publication/SS666 for more information.

Brandon White is a University of Florida Institute of Food and Agricultural Sciences commercial crop production and food systems Extension agent in Tavares.

Quicker, More Targeted Research

By Rick Dantzler, CRDF chief operating officer

The Citrus Research and Development Foundation (CRDF) has taken a different approach with a significant portion of its funding this year. Instead of funding projects through a typical request for proposals around numerous general topics, we are reaching out to researchers with expertise in particular areas, consulting with them about what specifically we wish to have investigated, and then getting a proposal from them for our evaluation. This has two advantages: speed and more targeted research. While it doesn't give everyone a shot at this money, the dire state of the industry outweighs this concern.

It also opens an avenue for CRDF to run down the occasional anecdotal report we hear from growers regarding something they are doing that seems to be working. A meeting I had a while back with growers regarding their use of gibberellic acid and 2,4-D resulted in CRDF funding a project with University of Florida Institute of Food and Agricultural Sciences researchers Tripti Vashisth and Fernando Alferez in which we incorporated some of these growers' suggestions. For their other suggestions, CRDF will advertise the scope of work and solicit bids from public and private sector researchers. We are doing the same thing with brassinosteroids, zinc and injecting oxytetracycline.

So, if you are doing something that you believe is working, please let us know. We have created a place on the CRDF website for you to share your practice with us. You may also call me. A word of caution: We do not view this as a way for, say, a fertilizer manufacturer to get CRDF to do basic research on its product, but if growers are using products in unique ways and can attest to their effectiveness, we will attempt to find a way to do testing.

Related to this is a project CRDF funded years ago, which was to run down "escape" trees — those that seemed to be escaping the ravages of HLB — to evaluate tolerance. CRDF funded Fred Gmitter, UF/IFAS researcher, to perform evaluations in Florida and China on trees that appeared to have natural tolerance. Unfortunately, they never led to much, but with the hope that the Donaldson tree has created and with the encouragement of the Florida Citrus Commission, CRDF intends to reinstate the program. You will find a link on our website which allows you to report trees you believe are exhibiting significant tolerance compared to others in the block.

I mentioned that CRDF, at the encouragement of several growers, is aggressively researching injecting oxytetracycline. With anything of this nature, residues remaining in fruit, juice and peel — if any — are paramount. For that reason, CRDF has contracted with the U.S. Department of Agriculture's National Science Laboratory in North Carolina to test samples from these experiments for residue. This laboratory has the equipment that is sensitive enough to determine residues below the required thresholds, and their work is also done according to Good Laboratory Practices, a protocol required for federal registration. The first batch of samples have already been sent off, so fingers crossed…

CRDF Grower Dollars at work for you

Column sponsored by the Citrus Research and Development Foundation