EXTENSION CONNECTION

By Chris Oswalt

Acidification of irrigation water or sulfur can be used to lower the soil pH in the wetted irrigation zone.

Soil pH: How low can you go?

You may have noticed University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) citrus soil pH recommendations have been revised slightly downward compared to pre-HLB levels. Lower soil pH affects tree health and micronutrient availability, specifically manganese, zinc and boron.

We are not talking about significant wholesale reductions. Previous to HLB, the target pH for Florida citrus was 6 to 7. Today, we are looking at a target pH level of around 6.

A few years back, there was significant interest in the bicarbonates contained in well water used for irrigation, having the effect of raising soil pH in the wetted zone. Acidification of well water became more prevalent as an economical method to quickly lower soil pH and react with bicarbonates in irrigation water to maintain a desired pH level in the soil. Sulfur and sulfur-coated fertilizer materials are also used to lower the soil pH in the wetted irrigation zone. In my experience, both ways work. It is the cost and speed of the reactions that will be different, but the result of lowering the soil pH to these new recommended levels is the same.

COPPER CONCERNS

In lowering the soil pH, one needs to be careful not to reduce it too much. Excessively low soil pH will many times lead to increased availability and toxicity of some mineral elements. Florida citrus groves can commonly have excessive levels of soil copper. Excessive levels of copper can lead to toxicity with a lower soil pH.

The potential for toxicity is

especially a concern on sandy ridge soils, which have a lower ability to tie up some of this excessive copper. Excessive soil copper levels in citrus trees lead to growth-restricted darkened feeder roots and iron deficiency in the foliage. Iron deficiency can lead to defoliation, twig dieback and overall tree decline.

So, when should you be concerned? When soil copper levels approach 100 pounds of copper per acre, toxicity is problematic. Analyzing feeder root samples for copper can provide additional information. Generally, 350 to 800 parts per million copper in feeder roots has been associated with copper toxicity in mature groves.

SOIL pH AND HLB

Elevating the soil pH will make excessive copper unavailable or tied up in the soil, making toxicity less severe. I would even be concerned at high soil copper levels if the soil pH is lower than 6.5.

Lowering the soil pH in HLB-affected trees has benefits. According to numerous citrus soil analysis reports, it is becoming apparent that in some instances soil pH levels are considerably lower than what would be beneficial for HLB-affected trees. This low soil pH coupled with high, but not necessarily toxic, levels of soil copper could be detrimental to citrus tree health.

Knowing there is a relationship to better citrus tree health by lowering soil pH, it is imperative to monitor soil pH routinely during the year. Lowering soil pH is especially of concern with the constant acidification of well water exceeding the soil's buffering capacity. A significant lowering of soil pH after acidification results in pH levels that could be problematic.

Low soil pH can also affect the solubility of calcium and magnesium, resulting in excessive leaching as the soil pH drops. I recommend letting the soil pH in the root zone stay in the range of 5.8 to 6.5. If you are aggressively managing your soil pH, I suggest investing in an affordable, portable pH meter that can be used in the field.

Chris Oswalt is the UF/IFAS citrus Extension agent for Hillsborough and Polk counties.

Five Tactics in the HLB War

By Rick Dantzler, CRDF chief operating officer

On Aug. 14, I will have been the COO of the Citrus Research and Development Foundation for exactly two years. I'm pleased with changes we have made administratively, and we continue to learn more about HLB. But in all honesty, I thought we'd have whipped the disease by now. Perhaps it was my naivety as a non-scientist that I thought this, but it is a big disappointment to me that we have not.

We are going to cure HLB or make it functionally irrelevant, though. I am determined to do this and convinced we can.

How will it happen? Here are five plausible ways.

1. Genetic modification. Scientists are either very close or have already identified the genes that allow Liberibacter to do its damage. Through CRISPR editing, these genes can be turned off to make trees less affected. Views of what constitute a genetically modified organism are changing, thus minimizing potential marketing or regulatory issues.

2. Trunk injection of an agent that either kills Liberibacter or inhibits its growth to the point that it becomes inconsequential. What is injected does not have to be the bactericides which have already been approved for foliar application. There are numerous compounds — some completely natural — that could kill or inhibit Liberibacter. Getting to the bacterium is the challenge, which is why I support aggressively testing the newest and most promising models of injection devices. Not only could naturally occurring pesticide-like products such as antimicrobial peptides be injected directly into the phloem (where Liberibacter lives within the tree), but such devices could also possibly deliver micronutrients. Wouldn't it be great if we were able to give plants grams of micronutrients instead of pounds?

3. Delivery to the tree of antimicrobial peptides or genes from plants such as spinach by using citrus tristeza virus (CTV). CTV is endemic in Florida and lives in the phloem of citrus trees, so it can deliver treatments against Liberibacter. Much of the regulatory hurdle to activate this tool has already been cleared, too.

4. Development of resistant scions. Breeders have already developed orange-like hybrids that look, taste and smell like conventional round oranges (*Citrus sinensis*), and some are virtually HLB resistant. If transport and processing issues can be resolved, if these hybrids prove to be as nutritious as *Citrus sinensis*, and if we don't create foreign competition that cuts our own throats, this could be a segment of the citrus industry that would be mostly unaffected by HLB.

5. A novel way to kill the Asian citrus psyllid or render it unable to transmit HLB. Remarkable progress is being made in altering bacteria in the gut of the psyllid that either kills the psyllid or makes it virtually harmless to citrus.

Are there others? Sure, but these are five that hold real promise.

There are good growers who have given up on the idea of a cure. I understand that sentiment, but we can't quit. There will be a time when HLB is in the rear-view mirror. I've never been so sure of it.

CRDF Grower Dollars at work for you

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