

A Healthy Choice

**Growers are seeing
their trees responding
to enhanced nutrition.**



By Bob Rouse
rrouse@ufl.edu

Citrus grower Maury Boyd has stimulated the interest of citrus growers in Florida with his production practice of using foliar applications of fertilizer nutrients and SAR (Systemic Acquired Resistance) products to maintain the health of his HLB-infected trees in his grove. HLB, also known as citrus greening disease, was positively identified in his grove using PCR (Polymerase Chain Reaction) in the spring of 2006. Since confirmation of HLB, his Orange Hammock grove in Felda has maintained tree health and production having produced five years of normal crops. Boyd uses a foliar spray cocktail of nutrients and SAR products applied three times per year timed with the initiation of new vegetative flush. More about this foliar cocktail was published in the January 2009 issue of *Florida Grower* in an article about Boyd and his methods in handling HLB.

At the UF/IFAS Southwest Florida Research and Education Center (SWFREC) in Immokalee, we started evaluating Boyd's foliar cocktail by establishing trials with all the possible combinations of the ingredients as treatments. Our objective was to determine if we could duplicate at other sites the success Boyd was having and identify the primary ingredients most responsible. Trials were established at SWFREC and in commercial groves. Treatments to HLB infected trees were started with the spring growth in 2008. The treatments included combinations of macro and micro-nutrients, SAR (Systemic Acquired Resistance) compounds, phosphite, and hydrogen peroxide.

After nearly three years it appears that the macro and micro-nutrients and phosphite might be the core ingredients to ameliorating the symptoms of HLB and allowing the tree to maintain health and production. The SARs are still under investigation and may have a role in allowing the tree to promote new vegetative shoots.

As a result of our root studies on

nutrient treated trees, we have found that we are not seeing root sloughing or loss of root density where the treatments are being applied. In fact, the root density is greater in the second year of the study than in the first year. This has led us to consider why the roots are not suffering since the HLB bacteria is supposedly plugging the phloem. A plugged phloem restricts the carbohydrates and sugars, the food for the roots made from photosynthesis, from getting to the roots. Teaming up with Dr. Ron Brlansky, UF/IFAS, we have been looking at the phloem.

**More
Online**



To watch Bob Rouse discuss foliar nutrition's role in citrus, scan the tag with your smartphone or view at



FloridaGrower.net



Bob Rouse discusses foliar nutrition during the 2011 Florida Citrus Show.

Figuring Phloem Function

The preliminary data using a dye to determine phloem function is one of the exciting aspects of our study of the nutrient cocktail. Comparing

our untreated control with one of our treatments receiving both nutrients and phosphite, we see phloem function. The amount of starch accumulation in the phloem is much reduced. Preliminary investigation with a fluorescent chemical shows phloem loading/movement in nutrient treated trees that took up the compound, and the untreated HLB infected trees did not. Apparently, the phloem of the untreated trees are blocked or necrotic and that doesn't allow for the uptake. Possibilities are: The nutrients are stimulating production of new phloem at a rate that it is able to sustain the tree and produce normal size fruit; and the necrosis and plugging of the phloem system is reversed. We propose to study this using light and electron microscopy and will determine phloem uptake using a fluorescent dye. Additional samples are being viewed and assessed as to the condition of the

phloem tissues in trees receiving nutrient treatments compared to untreated HLB affected trees.

What does an open phloem mean for maintaining the citrus tree and keeping it productive? Understanding how the phloem is disrupted by the HLB bacteria and what role the nutrient treatments are playing in keeping the phloem open is critical to maintain the HLB infected tree healthy and productive. Knowing which component(s) in the nutrient cocktail are promoting phloem movement is necessary to facilitate and promote the enhancement in the most economic way.

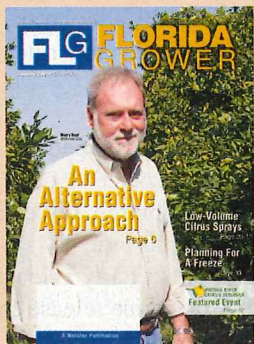
Going Forward

The two findings above are the exciting aspects of our work with nutritionals for maintaining trees with HLB. The first that the nutritionals work by maintaining the trees and production until a more permanent solution through genetic resistance or other means can be developed, and second that the nutritional/SARs may be the key to the phloem function allowing the trees to sustain with HLB.

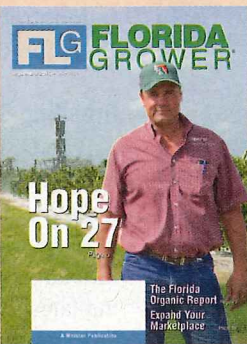
All this is important for the survival of our citrus industry in Florida. The increased use of foliar applied fertilizer nutrients in the citrus industry is evidence that growers are seeing their trees are responding to the enhanced nutrition. Continued psyllid management is important to prevent the re-inoculation of the HLB bacteria into the tree, and to reduce stress on the tree in order to allow all resources to go toward growth and fruit.



Florida Grower has featured several different growing operations that employ a foliar nutrition protocol as part of its production program. Each uses different formulations but similar applications. For more information on nutritionals and the level of success these growers have seen and are seeing, refer to these issues of Florida Grower in print and at FloridaGrower.net.



January 2009



September 2010



April 2011

Bob Rouse is a citrus horticulturist at the UF/IFAS Southwest Florida Research and Education Center in Immokalee.