Rehabilitation of HLB trees after pruning

Figure 1. Left, severe pruned and unpruned trees at the beginning of the trial in February 2010; center, regrowth on pruned trees in September 2010; right, first crop on pruned trees in February 2012.

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By Bob Rouse

Citrus trees infected with HLB bacteria become weak and develop dieback, resulting in lost production. These trees eventually decline to a production level that is not economical to maintain in a citrus operation.

Citrus growers in Florida have been using foliar nutritional sprays as a therapy to maintain tree health in HLB-affected groves. The application of macro- and micro-nutrient foliar sprays has resulted in maintaining tree health and fruit yields. Evidence has been mounting that foliar-applied nutrition is helping existing trees remain productive.

Severe pruning is a recognized practice to rehabilitate citrus damaged by freezing temperatures. If the damage is severe, trees are pruned back to the scaffold limbs. This severe pruning results in the maximum stimulation and the strongest regrowth.

At the University of Florida's Southwest Florida Research and Education Center at Immokalee, a 5-acre site of 100 percent HLB positive trees of Valencia sweet oranges on Swingle citrumelo rootstock in decline and losing production were severely pruned to stimulate regrowth. The objectives were: (1) to salvage and rehabilitate the trees to avoid the cost and time required when replanting, (2) to rebalance the shoot/root ratio of declining trees with pruning and (3) to feed the new foliage stimulated by pruning with foliar-applied nutrients. The rationale was that if existing trees could be rehabilitated, the costs of removing the old tree, purchasing a nursery tree and planting it, and the cost of tree care for four to seven years until production is established could be avoided. The objective of this experiment was to determine if HLB trees could be rehabilitated and resume economic production in less time than replanting a new tree.

The planting was a typical flatwoods citrus grove bedded with two tree rows per raised bed. The trees were severely pruned (buckhorned) using a commercial mechanical hedger and topping machine (Figure 1). One tree row on each bed was hedged to 4 feet wide in the row and topped 4 feet high to stimulate maximum forcing of shoot regrowth. The other row on the bed remained unpruned.

Four foliar nutrient treatments were applied to the regrowth foliage of the pruned trees and at the same time to the unpruned trees. The four foliar treatments were applied with a John Bean Redjet citrus speed sprayer. The foliar-applied nutrient treatments were

(1) The Boyd cocktail of macro- and micro-nutrients, phosphite and salicylic acid; (2) Fortress (a micronutrient product of phosphite + nutrient) plus potassium nitrate (KNO_3), (3) Fortress plus Urea and (4) control (liquid micro-nutrient plus 435 citrus oil). Nutritional treatments 1, 2 and 3 were applied to the foliage four times a year when young vegetative flush was present. Treatment 4 was applied only with the summer oil spray in June. Nutritional applications were made in March when the spring flush emerged — two during summer flush in June and late July, and to the fall flush in September.

The control trees showed HLB symptomatic leaves throughout the year and became visibly yellow and chlorotic during the fall and winter. The Fortress treatments exhibited some chlorotic leaves during the growing season on select shoots and moderate visible symptomatic leaves during fall and winter. The Boyd-treated trees remained mostly free of HLB symptomatic leaves during the growing season with only minor symptomatic leaves during the winter.

In each year, the pruned trees had significantly more and longer shoot growth than unpruned trees at each of the normal growth flush periods (Figure 1, page 6). Leaf size was noticeably larger on shoots from pruned trees. In the first year (2010), the pruned trees had two to three times the shoot length of unpruned trees. It would be expected that pruning would stimulate good regrowth. In the subsequent years (2011 and 2012), the pruned trees continued to have significantly more shoot growth than the unpruned trees. After the first year's regrowth on pruned trees in 2010, the trees' annual increase in volume was reduced, probably as a result of the heavy fruit load.

Table 1. Crop yield in 2010, 2011 and 2012 from pruned and unpruned HLB infected trees receiving foliar nutrient sprays.

Treatment	2010 crop yield (lbs./tree)	2011 crop yield (lbs./tree)	2012 crop yield (lbs./tree)
Nutrient treatment to unpruned trees			
Boyd	77.4 a*	155.8 a	228.5 ab
Fortress + KNO_3	75.7 a	133.1 abc	195.2 b
Fortress + urea	75.7 a	134.5 abc	197.3 b
Control	49.3 b	112.0 c	149.3 c
Nutrient treatment to pruned trees			
Boyd	22.0 c	144 ab	205.7 ab
Fortress + KNO_3	29.5 c	123.8 ac	264.7 a
Fortress + urea	29.5 c	133.0 abc	270.0 a
Control	27.4 c	116.8 bc	156.4 c

**Within a column, means followed by the same letter are not significantly different.*

The crop production of the pruned and unpruned trees is given in Table 1. The Valencia crop on the trees in February 2010 at the start of the experiment was harvested in April 2011. The unpruned trees yielded about 75 pounds of fruit and the control 49 pounds. This difference can be explained by the fact that the unpruned trees received the Boyd and Fortress nutrient applications from bloom in March 2010 to the harvest in April 2011. The pruned trees only had fruit in the row tree line since the

Figure 2. Left, commercial grove topping HLB trees in January 2011; center, topped trees showing "floating" resulting in various topping heights; right, topped tree regrowth and fruit crop in December 2011.

canopy had been removed. The 2011 crop harvested in April 2012 showed increased yield in the unpruned trees that had been receiving the foliar nutritional sprays. The pruned trees had re-established a canopy and set a crop. The crop from the pruned trees equaled that of the unpruned trees. The 2012 crop harvested in spring of 2013 had equaled or exceeded the crop of the unpruned trees. The second production year after pruning the trees had returned to an economic production level. Fruit sizes were not significantly different among size categories for pruned and unpruned trees.

The juice legal maturity factors (percentage juice, acid, Brix, Brix/acid ratio, pound solids/box) generally showed no significant differences in fruit quality. The pound solids per box, which is the basis for how growers are paid, were similar to fruit before HLB.

Many citrus growers in Florida have adopted the practice of severe pruning to rejuvenate HLB trees. Grove managers have eliminated the hedging and refined the topping practice to only remove the top part of the canopy showing thinning of the foliage, dieback or decline (Figure 2). This procedure has been referred to as "floating" the tree tops when the topper is lowered or raised to only remove the thin canopy in the upper half of the tree. This practice has left the lower half of the tree intact and maintains cash flow for the grove. To date, several thousand acres have been pruned in this manner.

SUMMARY

In this trial, pruning of HLB-infected citrus trees appeared to be a method to revitalize the trees and improve tree health and production. The objective is to stimulate new growth and re-establish the balance in the shoot/root ratio, allowing the leaves and roots to support each other. The new growth was supported with a foliar-applied nutritional treatment. Trees showing decline with dieback in the upper canopy were able to re-establish a healthy canopy and improve production. Yield from trees that had become economically non-productive reached economical production with the second crop year after pruning.

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