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Management of Closely Spaced Trees[1]

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A trend towards spacing trees closer together in the row began in the 1960s in Florida and has continued to the present time. Trees planted 10-15 feet apart in the row rapidly grow together to form a continuous hedgerow as they mature. Growers have expressed concern that the continuous hedgerow may be a less efficient production system due to a reduction in light penetration and fruiting surface area. Possible alternatives to a continuous hedgerow include interrupting the hedgerow by cross hedging or removal of some trees to leave spaces in the hedgerow. Spaces created by these methods could be left between every tree, or there could be groups of two, three, or four trees separated by an opening.

A number of 5-year experiments were begun in 1979 to determine if spaces created in a hedgerow by cross hedging or tree removal would affect yield, fruit size, fruit color, or juice quality. Groves used included early, mid-season and late varieties of oranges on conventional rootstocks. All groves were planted 25 ft, between rows and were 7-28 years old at the beginning of the experiments. All experiments included hedgerow plots in addition to cross hedging or tree removal plots. Some experiments included annual topping of hedgerows at various heights. The remainder of this section presents the results of these experiments.

CROSS HEDGING

Yield was reduced most years by cross hedging, and cross hedging to create a one-tree unit reduced yield more than for a two-tree unit. Yield was significantly reduced in over 50 percent of the plots during the 5 years of the experiment. Average yield was greatly reduced by cross hedging for 2-tree units in 4 out of 7 experiments, and for 1-tree units, in 5 out of the 7 experiments. Trees were only 7-years old at the beginning of one experiment and were not yet touching in the row. Yield was not reduced during the first years of cross hedging. However, as the trees started forming a hedgerow, cross hedging reduced yield in this experiment also.

Cross hedging did not affect fruit size, external fruit color or juice quality. In one experiment, it appeared that cross hedging resulted in more severe freeze damage. Also, weed growth was a more serious problem in the spaces opened by cross hedging.

TREE REMOVAL

In-row tree spacings were approximately 10 feet in the tree removal experiments. In one experiment, yield expressed on a per acre basis was reduced the first year but not in subsequent years. In fact,

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considerable yield compensation occurred even in the first year. For example, removal of every fifth tree to form a 4-tree unit eliminated 20% of the trees, but reduced yield by only 10%. In a second tree removal experiment, reductions in yield occurred most years of the experiment. Again, yield reductions the first year were not as great as expected. Removal of every other tree to form 1-tree units caused a 50% reduction in the number of trees, but only a 25% reduction in boxes of fruit per acre the first year. Yield reductions due to tree removal were less in subsequent years.

Tree removal did not affect average fruit size, external fruit color, or juice quality. As with cross hedging, weed growth was a more serious problem in spaces created by tree removal. Trees adjacent to openings left by tree removal grew rapidly into the opening. This extension growth would reform the hedgerow in a few years unless cross hedging was performed periodically. At close in-row spacings, tree removal may be a more desirable method of creating spaces in the hedgerow than biennial cross hedging. Neither cross hedging nor tree removal improved yield.

TOPPING

Three of 4 experiments included topping heights of 15 and 18 ft. In one of these where little foliage was removed by topping, yield was not reduced by topping at the lower height. In the other 2 experiments, topping at the lower height reduced yield some years. The fourth experiment included 12, 15, and 18 ft, topping heights. Yields were substantially reduced by topping to the lower heights. Compared to the 18 ft. height, yield was reduced the first year 65% at the 12 ft. height and 35% at the 15 ft. height. Some compensation occurred in subsequent years as the fruiting zone moved down on trees topped at the lower heights. However, yield reductions at lower heights persisted throughout the experiment.

Average fruit size increased as a result of the substantial yield reductions from some topping treatments. External fruit color was not affected. Juice brix was reduced by topping to lower heights in most of the experiments. In the experiment involving 12, 15, and 18 ft topping height, average juice brix was about 0.5 units lower for the lowest topping height.

Regrowth following topping was rapid. This vegetative regrowth may have competed with fruiting, partially explaining the reduction in yield and juice brix. In hedgerows, a higher percentage of the fruit is found in the top, center portion of the tree. Fruit from this portion of the tree also contains the highest juice brix.

RESULTS

The results of these experiments demonstrates that a continuous hedgerow is a desirable production system for Florida citrus. In no case did interrupting the hedgerow by cross hedging or tree removal improve yield, fruit color, or juice quality. The absence of effects on color or juice quality suggests that hedgerows should be suitable for the fresh fruit market as well as oranges grown for processing.

Attempts to maintain high yields on trees topped annually at lower heights were not successful. Although annual topping is not a common commercial practice, the results of these experiments suggest that maintaining short trees may be difficult without some yield and brix reduction. Minimal topping required to control tree height or hedgerows should be practiced.