

Pruning Systems for Tropical Fruits in Florida*

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Pruning has been practiced on deciduous fruit trees for hundreds of years. Florida citrus growers began pruning citrus in the late 1950s after the development of hedging and topping machines. In southern Florida, mechanical pruning was adopted in the 1960s by growers of limes, avocados, and mangos. In the early years of the southern Florida tropical fruit industry groves were planted at wide spacings with little to no pruning practiced. With the advent of high density plantings in the late 1960s and beyond, non-pruned groves began to lose fruit production and produce poor quality fruit. Picking costs became expensive as the area of fruit production moved to the top of the trees. Soon growers realized that tree size management was necessary. This paper reports on some pruning systems used by growers of tropical fruits in southern Florida.

Information about pruning is uncommon in many of the older tropical fruit publications. Some of these old publications, and more recent ones, say that tropical fruits need no pruning or that pruning is only used to remove dead, diseased, or damaged branches (Aponte et al., 1977; Galan and Menini, 1989; Mosqueda et al., 1996; Ruele, 1958; Ruele and Ledin, 1960; Yee, 1976). Pruning of tropical fruits began to be practiced in southern Florida in the late 1960s and was increasingly used by most growers thereafter. Growers of the three major tropical fruit crops—avocado, mango, and ‘Tahiti’ limes—were the first to use topplers and hedgers developed for the citrus industry (Campbell, 1984; Young and Sauls, 1981). These machines did a good job of pruning trees at a very reasonable cost. Growers of other tropical fruits soon adopted mechanical pruning for their crops, such as guava, carambola, longan, and lychee. Growers of mamey sapote were the last group to adopt mechanical pruning because, as with ‘Valencia’ orange, trees have fruit year round and a small amount of fruit is removed when trees are pruned. This leads growers to delay pruning as long as possible.

Pruning, especially topping and hedging, was adopted by southern Florida tropical fruit growers out of necessity. Historically, trees were planted at wide spacings, reducing the competition for light, water, and nutrients among trees (Ruele, 1958; Ruele and Ledin, 1960). However, when growers adopted high density plantings (i.e., close spacings), light competition among trees began 5 or 6 years after planting. Those growers who did not control tree size saw the loss of the lower canopy and subsequently the loss of fruit production and a decrease in fruit quality (Phillips, 1981; Stassen and Davie, 1996). As a consequence, mechanical pruning was adopted by many growers. At the present time, two common pruning systems are used by tropical fruit growers: 1) structural or formative pruning (also called tree training) and 2) maintenance or production pruning.

NURSERY STRUCTURAL PRUNING. Structural pruning is used in the nursery and during the first 2 years after planting. Pruning at the nursery level is not common and is used mostly to remove damaged, diseased, or dead shoots. Some claim that trying to form the basic tree structure so early is questionable as many chosen shoots die or are slow growers, forcing the nurserymen to choose other shoots or to let the tree develop the structure naturally. However, where air layering is the method of propagation, there is a definite opportunity for the selection of shoots with good structure since these shoots will become well developed and permanent.

FIELD STRUCTURAL PRUNING. Newly planted trees with only a central shoot may be pruned back to about a 3-ft height to force lateral branching. Young trees with good branching and those trees induced to branch should be pruned again 4 to 8 months after planting to induce further branching (Galán and Menini, 1987; Gilman, 1997). This is usually done in the spring and summer when trees are actively growing. Many growers do tip or pinch the terminal shoots in parts of the tree in the spring and then come back in the summer and complete the tipping. This process is repeated during the second year after planting. Where a shoot tip is removed, apical dominance is broken, resulting in the formation of two to four new shoots. Shoot tip removal results in multiple shoots, and a short, compact, well-structured tree without dominant shoots. The potential for production is increased with increased branching as production is generally related to the number of shoots a tree possesses. During the first 2 years after planting it is recommended that growers remove any inflorescence or fruit set because both slow down canopy development.

As the tree matures, branches from the trunk below 2–2.5 feet from the ground up are removed while those above 2–2.5 feet are usually left to maximize bearing surface. These lower branches are easy to spray and pick and increase the bearing surface. The practice of having branching begin above 4 to 6 feet is not recommended since one-third or one-quarter of the productive canopy is lost. Aesthetics is of no importance in commercial fruit production.

*This publication can be seen with graphics and photos at:
<http://miami-dade.ifas.ufl.edu/agriculture/tropical.fruit.Publications.shtml>
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Some tropical fruit species or cultivars have a tendency to produce long, dominant shoots, such as longan and 'Keitt' and 'Palmer' mango cultivars (Crane et al, 2005a; Ruehle and Ledin, 1960). These long shoots should be pruned to the same height as the surrounding canopy. These cuts will reduce shoot vigor and induce multiple shoot formation. In grafted trees, there is a tendency, especially in cleft grafted trees, for trees to produce shoots from the rootstock below the graft union. These shoots should be removed immediately because if they are allowed to develop, they foster a sprouting tendency at the base of the cut shoots. In addition, these shoots compete for water and nutrients, will not produce for a number of years, and may end up choking the scion and occupying most of the canopy.

Finally, if young trees to be planted are leggy, not branched, and top heavy, it is necessary to cut the top of the trees to about 2–3 feet to induce lateral branching to select the main scaffold branches. Subsequently, usually three or four strong, well-spaced, wide-angled branches are selected (Galan and Menini, 1987). Most tropical fruit publications from the 1980s to the present recommend pruning, with emphasis on structural pruning (Campbell et al., 2002; Crane et al., 2005a, 2005b; Gilman, 1997; Toro, 1986).

MAINTENANCE OR PRODUCTION PRUNING. Maintenance pruning is necessary for several reasons, including maintaining the fruit production throughout the tree canopy; improving the efficiency of monitoring the canopy for insects, diseases, and nutrient deficiencies; maintaining the efficiency of foliar applications and harvesting; and reducing damage caused by strong winds. Maintenance pruning commences as trees begin fruit production 3 to 4 years after planting. Maintenance pruning involves maintaining a tree size that maximizes fruit production and quality, and reduces the risk of tree damage due to strong winds (Crane et al., 1994). This pruning involves removing weak, damaged, or dead branches, and pruning the sides and tops for size control. Pruning may become a yearly or biannual operation and is usually done soon after the crop has been removed from the trees. The time of pruning varies because the harvest season for different fruit species and cultivars varies. For example, early avocados (July–August) and mangos (June–August) are usually pruned by the end of July or August, while late avocados may be pruned in the winter as soon as the crop is off. Ideally, tropical fruits that are pruned early June to early September put out one to three leaf flushes before late fall and winter and then stop growing.

The pruning of late varieties or species (with fruit on trees) is a little more complicated. When trees are pruned in winter and the crop has been recently removed, trees respond with mostly vegetative growth (leaves). Usually flowering and fruit production are reduced because the new shoots and leaves have not had sufficient time to accumulate carbohydrate reserves and/or growth regulators necessary for proper flowering and fruit set. To avoid this situation growers have several options: 1) hedge and top the grove knowing that there will be a small or no crop; 2) top all the trees but hedge alternate rows so half of the grove may bloom and have a crop; 3) top all the trees but hedge only one side of each row and hope to get a crop from the side not hedged. Generally, hedging the trees at a 5° to 10° angle from the vertical allows more light to reach the bottom of the trees than a vertical hedging. Trees should end up with a pyramidal shape with their bottom wider than the top (Phillips, 1981; Stassen and Davie, 1996). The recommended height to top trees varies with the fruit crop, but for avocados and mangos is generally 14–16 ft, although currently there is a tendency to top trees closer to 12–14 ft. Generally, the row middles are kept open 6

to 8 ft wide to facilitate grove traffic such as fertilizer spreaders, sprayers, mowers, and trucks. In groves where large trees have been planted (avocado, mango, lychee, longan, mamey sapote) at too close a spacing (e.g., 20 ft between rows or less), keeping the row middles open at 6–8 ft usually results in less production because of the excessive hedging.

REJUVENATION PRUNING. Old groves or groves that have not been under a tree size control maintenance program may need to be drastically pruned to establish a productive and manageable canopy. This type of drastic pruning is sometimes called skeletonizing or hat-racking, and usually consists of removing most of the tree canopy back to either just main scaffold limbs or to the main trunk. This rejuvenating pruning process can be done in all the grove at once or may be done over a 2- to 3-year period, pruning one-half or one-third of the grove at a time. Prior to pruning, the trunk and/or major scaffold limbs should be painted with either a 50/50 mixture of white latex paint and water or with a whitewash solution consisting of slaked-lime and zinc sulfate and water (Phillips, 1981; Ruehle and Ledin, 1960). Generally, trees will re-establish moderate fruit production within 3 to 4 years.

STUMPING/TOPWORKING. Topworking is a method of changing the cultivar of fruit produced from a tree. Prior to topworking, the tree is cut back to stumps 3 to 4 ft high with two to four large, short branches arising from the main trunk. As with rejuvenation pruning, trees should be painted prior to pruning to prevent overheating of the remaining trunk and scaffold limbs. After three to four new shoots that have grown from the pruned tree are 2 to 4 ft long, a new cultivar is veneer grafted on to them.

LARGE BRANCH THINNING. This is a fairly new practice for tropical fruit trees in southern Florida and is being used in old groves that have a dense canopy. The strategy is to remove usually one, sometimes two, main branches to increase light penetration into the lower inside of the tree canopy and re-establish productive canopy on the inside of the tree. Generally, this procedure results in new branches emerging on the first 4 to 10 ft of the interior of the tree. This practice may be used instead of rejuvenation pruning as it can be done as a yearly practice.

SANITATION PRUNING. Sanitation pruning eliminates insect- and or diseased-damaged branches and broken or dead branches. It is used to diminish chances of disease or insects spreading.

FRUIT THINNING. This is a common practice used to improve fruit size in crops that tend to overbear and that respond to the thinning, such as guava, longan, carambola, and loquat. Avocados and mangos rarely respond to this (Anonymous, 1995; Ruehle, 1958). Sometimes total fruit removal is used to induce offseason fruiting such as in carambola (Núñez-Elisea and Crane, 1998, 2000).

TREE THINNING. Tree thinning (removal) has been used by a few southern Florida tropical fruits growers who have old, crowded groves. The thinning can be done all at once or programmed for over a 2- or 3-year period. When the job is completed, the number of trees per acre is usually cut in half. Generally, light penetration in the grove is greatly increased and subsequently fruit production. Though this technique has occasionally been used here and in other areas, it may have important disadvantages in areas prone to hurricanes. Although tree hurricane damage is controlled by several factors such as species, cultivar, presence or absence of wind breaks, and a tree size control program, high wind velocity hurricanes (above category I) cause a large amount of structural damage plus the loss of many trees. This loss of trees affects production in low density groves more than moderate or high density groves. In general, tree removal should not be used

but rather other accepted practices already discussed (rejuvenation, stumping, branch thinning) that preserve the original plant density per acre.

Literature Cited

- Anonymous. 1995. Informações Técnicas Sobre a Cultura da Manga No Semi-rido Brasileiro. Serv. de Prod. Inf. EMBRAPA.
- Aponte, C.E., A. Ayala, V. Cibes, and G. Jackson. 1977. Conjunto Tecnológico para la Producción del Mango. Publ. 114. Estación Experimental Agrícola de Río Piedras, Univ. de Puerto Rico, Recinto Mayagüez.
- Campbell, C.W. 1984. Tahiti lime production in Florida. Bul. 187. Coop. Ext. Serv., IFAS, Univ. of Florida.
- Campbell, C.W., N. Ledesma, and C.W. Campbell. 2002. Tropical mangos. Fairchild Tropical Garden, Coral Gables, FL.
- Crane, J.H., C.F. Balerdi, and I. Maguire. 2005b. Avocado growing in the Florida home landscape. Univ. of Florida Ext., IFAS.
- Crane, J., C. Balerdi, R. Campbell, C. Campbell, and S. Goldweber. 1994. Managing fruit orchards to minimize hurricane damage—Lessons from Hurricane Andrew. HortTechnology 4:21–27.
- Crane, J.H., C.F. Balerdi, S.A. Sargent, and I. Maguire. 2005a. Longan growing in the Florida home landscape. Univ. of Florida Ext., IFAS.
- Galan, V. and D. Fernandez. 1987. El Cultivo del Mango en Canarias. Cuad. Divulg. No. 1/87 CD. Conserjería de Agricultura, Ganadería y Pesca.
- Galan, V. and U.G., Menini. 1989. Litchi cultivation. FAO Plant Production and Protection Paper 83.
- Gilman, E.F. 1997. An illustrative guide to pruning. Delmar Publ., Intl. Thomson Publ. Co.
- Kretchman, D.W. and A.H., Krezdorn. 1961. Recent developments in pruning citrus. Proc. Fla. State Hort. Soc. 74:67–74.
- Mosqueda, R., F. De los Santos De la Rosa, E. Noé Becerra Leor, H. Cabrera Mireles, D.A., Ortega Zaleta, and A.L del Angel Pérez. 1996. Manual para Cultivar Mango en la Planicie Costera del Golfo de México. Foll. Tecn. 15. Inst. Nac. Inv. Forest. Agr. Pec., Campo Experimental Cotaxtla.
- Núñez-Elisea, R. and J.H. Crane. 1998. Phenology, shoot development, and floral initiation of carambola (*Averrhoa carambola* L. cv. Arkin) in a subtropical environment. Proc. Fla. State Hort. Soc. 111:310–312.
- Núñez-Elisea, R. and J.H. Crane. 2000. Selective pruning and crop removal increase early-season fruit production of carambola (*Averrhoa carambola* L.). Scientia Hort. 86:115–126.
- Phillips, R.L. 1981. Pruning principles and practices for Florida citrus. Circ. 477. Fla. Coop. Ext. Serv., IFAS, Univ. of Florida .
- Ruehle, Geo. 1958. The Florida avocado industry. Bul. 602, Subtropical Expt. Sta., Univ. of Florida.
- Ruehle, G.D. and B. Ledin. 1960. Mango growing in Florida. Bul. 174, Agr. Ext. Serv., University of Florida.
- Stassen, P.J.C. and S.J. Davie. 1996. Tree manipulation—Its application in the citrus and subtropical fruit industries. Info. Bul. No. 285. Inst. for Tropical and Subtropical Crops, South Africa.
- Toro, E. 1986. El Cultivo de Aguacates en Puerto Rico. Publ. H-27. Serv. Ext. Agr., Univ. of Puerto Rico, Mayagüez.
- Yee, W. 1976. The mango in Hawaii. Circ. 388. Coop. Ext. Serv., Univ. of Hawaii.
- Young, T.W. and J.W. Sauls. 1981. The mango industry in Florida. Bul. 189. Coop. Ext. Serv., IFAS, Univ. of Florida.