bands could also interfere with the differentiation of meristematic tissues in the formation of graft unions.

An additional factor reported by Ogden (1984), which may cause problems in grafting, was the high content of silica in the cortical tissue of mamey sapote stems. She found this to be a physical problem in the preparation of stem sections for microscopic examination, the tissues tending to tear rather than to cut cleanly because of the hardness of the silica deposits. The silica caused microtome blades to become dull quickly and would have the same effect on the blades of grafting knives.

Nevertheless, although all of these factors contribute to the difficulty of grafting the mamey sapote, with proper techniques and good environmental conditions, this fruit can be grafted successfully. This is evidenced by the success of many nurserymen in Florida and elsewhere.

Summary

1. Mamey sapote cultivars can be propagated true to type only by vegetative methods.
2. Propagation by cuttings, air layers and tissue culture has not been successful.
3. Grafting and budding can be done successfully and are currently the most practical methods for vegetative propagation of the mamey sapote.
4. Successful methods include approach grafting, veneer grafting, cleft grafting and shield budding.
5. Careful attention must be given to grafting technique (sharp knives, accurate cuts), condition of scions and roootstocks, and environmental conditions.
6. Mamey sapote seedlings are used for rootstocks. Seeds should be planted immediately after removal from the fruit because they lose viability rapidly.
7. Timing of grafting is important. In Florida the best times are late October to early December and late March to early May.
8. Grafting success is improved if scions are girdled 2-3 weeks before removal from the tree.
9. Dormant scions can be forced into active growth by defoliation 8-10 days before removal from the tree.

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THE 'RUBY' MANGO

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Abstract. **'Ruby', a Florida mango [*Mangifera indica* (L.)] cultivar with promise for Tropical America, is described and discussed. *'Ruby' originated* as a seedling of unknown parentage from Miami, Florida. 'Ruby' fruit are small, averaging from 200-300 g. The fruit have brilliant color, with a yellow-orange ground color and a red or crimson blush. Eating quality is good with only a moderate occurrence of internal breakdown. 'Ruby' holds promise for Tropical America as a commercial export mango due to its consistent production, brilliant color and good internal quality in Florida. Significant drawbacks of this cultivar in Florida include the small size of the fruit, and the production of seedless fruit or nubbins.**

Florida can be characterized as a secondary center of diversity for mango cultivars (Campbell, 1992; Crane and Campbell, 1991; Young and Sauls, 1989). This is the result of a concentrated effort of mango germplasm introduction, evaluation and selection in Florida over the last century. Many of the cultivars developed in Florida have become commercially successful throughout the world due

to outstanding characteristics such as superior color, consistent production, superior handling characteristics and anthracnose resistance. With the present and expanding interest in mango production throughout Tropical America, changing market demands, and the undesirable complete dependence on only a few cultivars, other Florida cultivars, as yet not widely known, are being tested as commercial cultivars throughout the world.

The objective of this paper is to describe one such cultivar, 'Ruby', which is under trial in many countries of Tropical America as a possible export quality mango for that region.

History

'Ruby' is of unknown parentage growing from a seed planted on the property of Mr. E. P. Davis of Miami, Florida. It was first evaluated by the Variety Committee of the Florida Mango Forum in 1948. 'Ruby' was never widely propagated in Florida, but was included in germplasm collections at the University of Florida Tropical Research and Education Center and the United States Department of Agriculture National Clonal Repository in Miami, Florida. From these two locations, and probably others, graftwood and/or grafted plants have been distributed to many countries of the world.

Description

'Ruby' trees are moderately vigorous, forming a medium to large, upright, and open canopy. As with other mango cultivars, the size, growth habit, and appearance of the tree will depend on climatic conditions such as elevation, average temperature, and soil type. In Florida the trees are regular producers, often producing fruit in clusters. The fruit matures from July to early August.

Fruit are small, averaging from 200 to 300 g (Fig. 1). Fruit shape is oblong with an average length of 10.5-12.5 cm, breadth of 6.5-7.5 cm, and a thickness of 5.5-6.0 cm. The base is rounded with a stout stem inserted squarely in an elevated manner. The apex is rounded with no beak, and the surface of the skin is typically smooth. The fruit have exceptional color, with a yellow-orange ground color and a red or crimson blush with numerous small yet prominent yellow lenticels. The thick, tough skin separates easily. The flesh is firm due to fine, non-objectionable fiber with a rich, aromatic, spicy, and sweet flavor. The fruit have a strong, pleasant aroma. The overall eating quality is good. The stone is thick and woody with a monoembryonic seed filling 70-85% of the stone. The flesh/seed ratio is generally about 9 and the soluble solids concentration typically ranges from 16 to 19.

Discussion

'Ruby' was selected for placement in collections of superior mango germplasm due to its brilliant color, consistent production, considerable anthracnose resistance, and good eating quality. However, two drawbacks have limited this cultivar's appeal in Florida; its small size and the production of seedless fruits, termed nubbins.

The small size of the fruit will certainly limit their acceptance in markets which traditionally prefer larger mangos such as 'Tommy Atkins' (450-700 g) or 'Keitt' (510-2000 g). However, with the acceptance of smaller fruit such as 'Van Dyke' (250-520 g) in some markets, such as Europe, there may be a place for 'Ruby'. The production of nubbins is a serious problem with 'Ruby' in Flurida, as with other Florida cultivars such as 'Haden' and 'Parvin' (Campbell and Campbell, 1991). The production of nubbins is not fully understood but has often been attributed to cold temperatures during flowering and/or fruit set, which is common in Florida. Trials of 'Ruby' in Tropical America are still limited; thus, the severity of nubbin production in these areas can not be fully assessed. As with other cultivars, nubbin fruit develop normal internal and external quality (except size) and may be suitable for local or specialty markets.

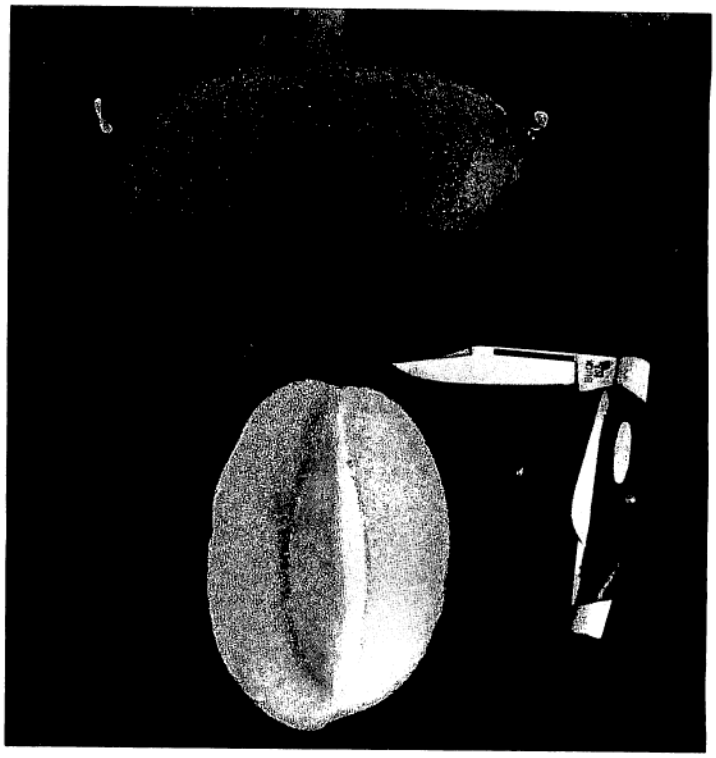

Figure 1. Interior and exterior view of 'Ruby' fruit.

Internal breakdown is sometimes a problem with 'Ruby', but generally this is not severe with this cultivar. It is considered better than 'Tommy Atkins' or 'Van Dyke' in this respect. 'Ruby' has considerable anthracnose resistance, although not as much as 'Tommy Atkins'. Shipping and handling characteristics are, as yet, not well tested. If 'Ruby' is to serve as an export mango to the United States, its tolerance of hot-water quarantine treatments for fruit fly control needs to be assessed. One advantage of its small size would be the possible use of shorter immersion times in hot-water treatments and the resultant superior quality after shipping.

To date much of the exploitation of mango germplasm from Florida has centered on the search for mangos suitable for export to the United States and Europe. This has led to the adoption in many areas of one (e.g., 'Tommy Atkins') or a handful of cultivars. There is a developing consciousness, however, of internal market opportunities in many countries of Tropical America. 'Ruby' is a cultivar which may have a future in export, but because of its color and good internal quality it would also be suitable for local markets. The present interest in 'Ruby' in Tropical

America (C. W. Campbell and R. J. Campbell, personal observations) indicates a desire to explore such possibilities.

In conclusion, 'Ruby' has some outstanding characteristics which make it suitable as a commercial mango cultivar; namely, consistent production, outstanding color, good internal quality, and anthracnose resistance. The small size of its fruit, and production of nubbins have limited its use in Florida, but if environmental conditions are suitable and the fruit can be marketed successfully, it may have a future as a commercial mango for both domestic and export markets in Tropical America.

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CHARACTERS NEEDED FOR COMMERCIALLY SUCCESSFUL PASSION FRUIT

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Abstract. **Efforts to grow passion fruit in southern Florida have uncovered problems that necessitate specific genetic modifications of the clonal material in order to make crop production economically feasible. Field observations show that the carpenter bees that normally pollinate *Passiflora edulis* elsewhere are absent from the fields in Dade County, and that essentially all pollination here is done by the honey bee, not a normal pollinator of *P. edulis*. This bee's small body size necessitates the selection of *P. edulis* genotypes with a high degree of self-compatibility (or pseudo-self-compatibility) and a flower having stigmas and anthers borne close together, making self-pollination relatively easy. The North American market appears to prefer red or purple-colored fruit over yellow, but the yellow-fruited form of the species (*P. edulis* f. *flavicarpa*) survives field conditions in south Florida whereas pure purple (*P. edulis* f. *edulis*) does not, thus red-fruited hybrids of purple × yellow breeding, or seedlings derived from such hybrids, are often grown. Fungus diseases of root, leaf, and fruit are serious problems. Sources of genetic resistance to fungus disease are being sought for use in breeding improved lines with enhanced commercial potential.**

Florida's passion fruit industry is small, but was growing until the recent setback imposed by Hurricane Andrew. The area planted in mid-1992 was 65 acres (26 ha), with an annual production of about 200,000 pounds of packed fruit (C. A. Campbell, pers. comm.). Because much fruit (50% of some lots) is discarded at the packinghouse because of disease or blemishes, this figure does not represent the total state production. The estimated yield of approximately 3,200 pounds of packed fruit per acre does not approach normal yields in Hawaii, for example, where yellow passion fruit is the form normally cultivated. Returns from recent production in Florida, however, have been adequate to encourage expansion of plantings. The objective of this work is to examine current needs and chart a course of action aimed at developing improved cultivars that can be expected to produce reliably here.

Problems and Needs

The passion fruit cultivar commonly grown in south Florida, 'Possum Purple', in spite of its name is not a pure clone of *Passiflora edulis* f. *edulis*, the purple passion fruit, but is of mixed purple and yellow (*P. edulis* f. *flavicarpa*) background. This has been demonstrated by the fact that seedlings of 'Possum Purple', self-pollinated, segregate for yellow and purple fruit color. This cultivar bears an attractive maroon-colored fruit weighing between 50 and 65 grams that is well accepted in the market but has several serious problems. The most serious is its susceptibility to fungal diseases that attack the root, stem, leaf, and fruit. Anthracnose (*Colletotrichum gloeosporioides* Penz.) is probably the most widely distributed fruit disease in southern Florida. On passion fruit it causes severe fruit and leaf spotting and defoliation that weakens the vine, particularly in early summer after the normal rainy season begins, when fruit of the early crop is ripening. This fungus was reported to cause a severe fruit canker on purple and yellow passion fruit in India (10). Some years ago, a *Phytophthora* species was isolated from diseased stems of *P. edulis* growing near Miami (6). More recently Ploetz (9) found *Nectria haematococca* Berk & Broome causing a sudden wilt syndrome from which *Passiflora* plants did not recover. He also found that this fungus can grow from the soil upward along the vine, making a resistant rootstock ineffectual, should such a stock be found. No plants of *P. edulis* examined in the field in Dade County have yet shown immunity to sudden wilt or to anthracnose, but we have observed resistance in a minority of the vines, and are keeping these under observation. We are using those observed to have the greatest field resistance as parents to breed progenies that we hope will have sufficient field resistance to disease to enable them to survive and fruit well here. Another problem shown by 'Possum Purple' is the production of "light" fruit that is incompletely filled with seeds and the surrounding juice sacs that make a marketable passion fruit (C. W. Campbell, pers. comm.). This problem relates to pollination in that each fertile seed in the fruit is the result of the fertilization of one embryo sac by one pollen grain, and the greater number of viable seed a fruit contains, the larger the fruit is and the greater is its juice content. Most vines of *P. edulis* are self-incompatible, and need cross-pollination to set fruit (1, 8, 4), although the purple-fruited form shows some degree of self-compatibility (2, 3). The vine subsequently named 'Possum Purple'