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HORTICULTURAL LESSONS WITHIN THE WILLIAM F. WHITMAN TROPICAL FRUIT PAVILION

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Abstract. Nearly a century has passed since Dr. David Fairchild first wrote about the potential in the Americas of exotic tropical fruit. He and fellow tropical fruit pioneer Wilson Popenoe were enchanted by the allure of exotic tropical fruit; they foretold of their emergence in the mainstream United States marketplace. Many of David Fairchild's early articles in the proceedings of the Florida State Horticultural Society told this story. Yet, the durian (Durio zibethinus), mangosteen (Garcinia mangostana), duku (Lansium domesticum) and tarap (Artocarpus odoratissimus) remain novelties to the United States consumer- a considerable distance from their predicted importance. The Whitman Tropical Fruit Pavilion at FTBG has the potential to help realize the century-old aspirations of David Fairchild, and to forge a new horticultural reality for exotic tropical fruit in the Americas. Three years into the Whitman Pavilion project we can report of early success with the mangosteens and their relatives. Five durian species and several selections of langsat show considerable promise. Rambutan (Nephelium lappaceum) pulasan (Nephelium ramboutan-ake), and tarap have been disappointing. Clonal material of featured species has been the key to early success with precocity and public display. The challenge remains pollination within the enclosed Pavilion structure and successful horticultural management of difficult species.

David Fairchild, founder of the Seed and Plant Introduction Division of the United States Department of Agriculture, had a vision for the development of tropical fruit within the United States. He and a handful of tropical fruit pioneers devoted their lives to the pursuit of superior tropical fruit and their introduction and adaptation to the United States. South Florida would become David Fairchild's home, as well as, the introduction site for the exotic tropical fruit that he predicted would become household names for the United States consumer. For over a century, the identification, collection and introduction of exotic tropical fruit took place in South Florida, as documented within the proceedings of the Florida State Horticultural Society. Many of these fruit did indeed meet with commercial success within Florida and the United States, including the avocado, mango and pineapple. However, there were many failures. Only words and legend are to show for a century of effort.

In 2001 Fairchild Tropical Botanic Garden received an endowment from Mr. William F. Whitman to further its work on the introduction, adaptation and distribution of exotic tropical fruit. Mr. Whitman is a noted plant collector himself, a frequent contributor to the Florida State Horticultural Society, and one of the co-founders of the Rare Fruit Council, International. Mr. Whitman's life was devoted to the search, introduction and production of exotic tropical fruit. His endowment allowed FTBG to properly develop its program with exotic fruit. With the construction of the Whitman Tropical Fruit Pavilion at FTBG there was now an appropriate climate-controlled structure to provide the warmth, relative humidity, soil, water and other horticultural amenities needed to grow and produce the world's most alluring of tropical fruit treasures.

The objective of this paper is to present the results of our first 3 years of work on exotic tropical fruit within the Whitman Tropical Fruit Pavilion at FTBG in Coral Gables, FL.

Horticultural assumptions

As previously stated, Wilson Popenoe and David Fairchild (Fairchild, 1930; Popenoe, 1920), noted pillars of the tropical fruit world had foretold of the ascension of ultra tropical fruit such as mangosteen and durian; yet, over a century later they remain novelties. In order for our project to succeed, we had to make some strategic horticultural decisions in order to avoid a repeat of this scenario.

pH. Many of the finest exotic tropical fruit require an acid growing medium. In order to provide these edaphic conditions it was decided to excavate the entire area under the Pavilion roof and replace it with an acid sand medium. Prior to construction of the Pavilion structure, the ground was excavated to a depth of 9.5 to 12.5 ft (3 to 4 m) and was backfilled with an acid sand medium of about pH 6.

Water. A cistern was constructed for the capture and retention of rain water from the roof of the Pavilion and adjacent structures. This cistern provided the irrigation water to the Pavilion for the majority of the year. pH values of the cistern irrigation water was near neutral to slightly acidic.

Heating and relative humidity. Heaters within the Pavilion maintain temperatures at 10C or above during the winter and exhaust fans vent hot air and provide for a maximum temperature of 30 to 32C during the spring and summer. There was no consideration made for the modification of relative humidity; however, during the winter months, when ambient relative humidity was low, the Pavilion windows were closed to maintain a high relative humidity.

Discussion

A partial list of the fruit species and selected cultivars is provided in Table 1. Success within the Whitman Pavilion will be measured on fruit production within the structure; thus, some fruit species were selected for their precocious fruiting habit [araza (Eugenia stipitata), abiu (Pouteria caimito)], while on other species horticultural techniques were used to achieve precocious fruiting, maintain superior clones, maintain sex of the scion, or to provide for superior growth traits. A challenge for the entire Pavilion project was a general lack of reliable horticultural information for the fruit species used. Innovations were achieved largely through trial and error.

Grafting of known clonal selections of the selected species was the predominant horticultural technique employed throughout the display. Where recognized clones were not available, superior selections were used from over a decade of FTBG collecting expeditions to Tropical America and Asia. Thus, we hoped to shorten the fruiting time for the trees on public display and insure the superiority of the material. Grafting was also used to insure the presence of female trees within the public display. This was particularly important with this project, because many of the exotic fruit used are dioecious.

As previously mentioned, reliable information on rootstocks and grafting techniques was not widely available for most of the crops used within the Whitman Pavilion; therefore, we proceeded on recommendations of collaborators or through trial and error. The need for clonal material presented significant problems as well due to the costs and difficulties involved in the identification, location and importation of improved scion material. Progress made to date with clonal propagation within the Whitman Pavilion has been modest and has come in a large part from experience from numerous collaborators throughout the tropical world. In some instances, such as the mangosteens, we have been successful in identifying a single suitable rootstock for use with a number of scion species.

Interpretation within the Pavilion has been prioritized due to the unknown nature of many of the fruit involved in the project and the need to engage the viewing public. Bilingual interpretive panels were used throughout the public display, and these panels relied heavily on photographs and story-telling. Several fruit were often grouped loosely by family for ease of interpretation and to reduce the amount of signage used. Figure 1 is an example of an interpretive panel developed for the durians in which you can note the reliance on visual images.

Figure 1. Bilingual interpretive panel within the Whitman Tropical Fruit Pavilion.

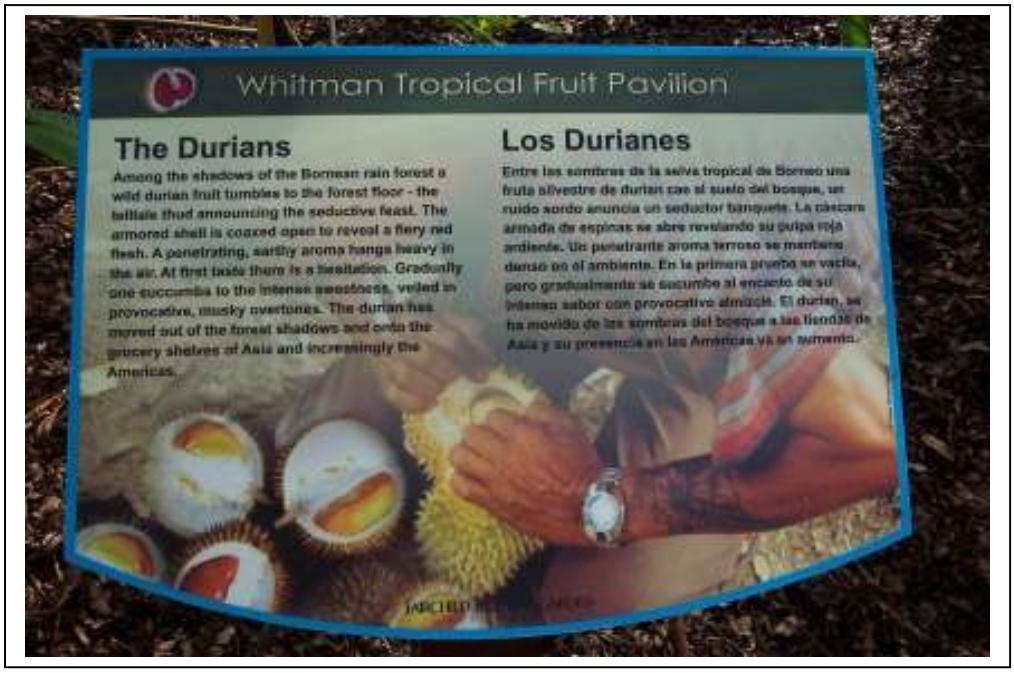

Table 1. Select fruit trees within the William F. Whitman Pavilion, Fairchild Tropical Botanic Garden, Coral Gables, FL. June, 2006.

Accession	Species	Common name	Cultivar
2002-0939*A	Artocarpus altilis	Breadfruit	'Puero'
991715*A	Artocarpus integer	Champedak	'Nong Nooch', 'Seedless'
2001-0865*A	Artocarpus odoratissimus	Tarap	'T-1'
2002-0940*A	Artocarpus sericicarpus	Pedalai	-
2002-0167*A	Borojoa patinoi	Borojo	-
991690*A	Bouea macrophylla	Maprang	'Maprang Mun'
2004-1096*A	Coffea arabica	Coffee	'Caturra'
2001-0863*A	Durio graveolens	Durian Kuning	'Orange', 'Suluk 3'
95243*A	Durio testudinarium	Durian Kura Kura	-
89405*A	Durio zibethinus	Durian	'Dalit'
991790*A	Eugenia stipitata	Araza	-
200060*A	Eugenia sp.	-	-
2000853*A	Garcinia dulcis	Gamboge	-
2001-0866*A	Garcinia hombroniana	Luli	'Montgomery', 'Page'
2001-0380*A	Garcinia mangostana	Mangosteen	'Borneo'
2000694*A	Garcinia parvifolia	Assam Aur Aur	-
2001-0858*A	Garcinia prainiana (♀)	Cherapu	'Whitman'
2001-0858*B	Garcinia prainiana (♂)	Cherapu	
2001-0870*A	Lansium domesticum	Langsat	'Concepcion', 'Duku', Long-kong'
2000688*A	Litsea garciae	Litsea	
2003-1757*A	Myrciaria paraensis	-	-
2004-1112*A	Nephelium lappaceum	Rambutan	'Amarillo', 'Chompoo', 'R-167', 'Teodoro'
2004-0893*A	Nephelium mutabile	Pulasan	'Purple'
2004-0339*A	Pouteria caimito	Abiu	'Gray', 'Z-2'
2002-0941*A	Quararibea cordata	Chupa Chupa	'Whitman'
961590*A	Rheedia brasiliensis	Achacairu	-
2002-0947*A	Rheedia magnifolia	Bacuripari	-
2001-0861*A	Rheedia sp	Charachuela	'Possum 2'
991677*B	Salacca wallichiana	Salak	-
2001-0864*A	Salacca zalacca	Salak	-
2003-1184*A	Theobroma cacao	Cacao	
2003-1189*A	Theobroma grandiflorum	Cupuacu	'Seedless'
2002-0936*A	Theobroma obovatum		

The Mangosteens

The mangosteens have been our most outstanding success within the public display. All of the mangosteen species have grown well, we have made considerable progress in clonal propagation and selection of rootstocks, and most importantly we have fruiting on 8 of the species used; namely, mangosteen (Garcinia mangostana), cherapu (Garcinia prainiana), luli (Garcinia hombroniana), assam aur aur (Garcinia parvifolia), achachairu (Rheedia brasiliensis), charachuela (Rheedia acuminata), gamboge (Garcinia xanthochymus) and other selections. This grouping of "mangosteens" is rather liberal, as previously mentioned and includes both new and old-world species. The mangosteens have proven valuable for education and tours due to the unique beauty of the flowers, the fruit quality and the rich history that the fruit has with the Asian tropics in general and specifically with David Fairchild.

The Durians

The durians offered considerable horticultural and marketing challenges from the outset of the project. In terms of horticulture we have been successful with several species, including the commercial durian (Durio zebethinus), the durian kuning (Durio graveolens), and the durian kura kura (Durio testudinarium). We have used Durio zebethinus and Durio graveolens as rootstocks, with our most healthy trees propagated on Durio graveolens. The tree growth and overall health has been acceptable, although the trees are sensitive to rapid environmental changes, often exhibiting rapid die-back. There has

been no flowering on any of the species to date. When flowering does occur there will be significant challenges with pollination.

The Langsats

The langsats are as a group lacking in horticultural information about clones, grafting and the like. We were successful in grafting improved selections collected from various locations in Tropical Asia. The trees have grown exceptionally within the Pavilion; however, we have had no flowering to date. Langsats are noted for their long juvenility period and we do not know what to expect from the grafted trees as there is no reliable information available from Asia regarding this. However, their adaptation to the Pavilion structure has been exceptional.

The Rambutans and Pulasans

Rambutans have been challenging in all regards within the Pavilion and pulasans have performed even poorer. In general marcotts have performed better than grafted trees, both with rambutans and pulasans; however, both marcotts and grafted trees experience die-back during periods of high temperatures and low relative humidity. The trees have responded well to pruning, but there has been no flowering.

The Artocarpus

The artocarpus include the jackfruit (Artocarpus heterphyllus), champedak (Artocarpus integer), marang or tarap (Artocarpus odoratissimus), kanun Pan (Artocarpus rigidus ssp. rigidus), pedalai (Artocarpus sericicarpus), and breadfruit (Artocarpus altilis). This group has been a disappointment, although the response of each species has been quite distinct. The potential for the champedak and the marang remains outstanding, if challenges of horticulture can be overcome.

Conclusions

We have nearly completed 3 years with the Whitman Tropical Fruit Pavilion. Significant progress has been made with the exotic tropical fruit targeted in the project, particularly with the mangosteens, durians and the langsats. However, only the mangosteens have fruited. Our ultimate success with this project relies on the successful growing and fruiting of all targeted species. Only then can we take advantage of the marketing and promotion opportunities afforded by the public garden at FTBG. We have taken a step forward, but our journey to the successful integration of the mangosteen, durian, langsat and marang within the United States remains an arduous one.

Literature Cited

Fairchild, D. 1930. Exploring for Plants. The MacMillan Co., New York.

Popenoe, W. 1920. Manual of Tropical and Subtropical Fruit. The MacMillan Co., New York.