

Update on New *Mangifera* Species in Florida, USA

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Abstract

Several *Mangifera* species have been collected and are under evaluation at Fairchild Tropical Botanic Garden in South Florida, FL, USA over the past 15 years. *M. odorata*, *M. casturi*, *M. lalijiwa*, *M. quadrifida*, *M. laurina* and a putative *M. odorata*/*M. foetida* hybrid have been grafted successfully on 'Turpentine' rootstock and trees have been grown in the field for 14 years. All of these species have bloomed and fruited with reasonable reliability over this time. In addition, many of the species have withstood temperatures as low as 29F for more than 5 hours with only minimal damage. Temperature does not appear to be a reliable inducer of bloom for these species growing in the field. Additional investigation is necessary, but *Mangifera* species also have shown a high degree of anthracnose tolerance under Florida conditions, but many have shown severe susceptibility to leaf and twig bacteria infection. The fruit of each species is unique in terms of color, appearance and eating quality, and all have potential as fresh fruit given proper selection of clones with superior fruit quality. *M. griffithii*, *M. quadrifida*, *M. merilli* and *M. lalijiwa* have performed better with *M. casturi* as an interstock. *M. caesia*, *M. foetida*, *M. pajang* and some unidentified species have not been successfully grafted on *M. indica* and no successful interstock has been found.

INTRODUCTION

In Southeast Asia there is a wide diversity of *Mangifera* species that bear edible fruit, with 69 taxonomically recognized (Kostermans and Bompard, 1993). Among these species, *Mangifera indica* is the most important commercial fruit crop. Two decades ago Kostermans and Bompard (1993) outlined the potential of *Mangifera* species as edible fruit crops, rootstocks, and as sources of genetic diversity for the future breeding of disease resistance, and desirable horticultural traits in the modern mango. The importance of conserving these species and their genetic potential has been clearly recognized by the scientific community, but there is almost no practical horticultural information available about their suitability for propagation, their care and domestication.

More than 16 *Mangifera* species from Borneo, peninsular Malaysia, and Thailand have been accessioned into the genetic collections of Fairchild Tropical Botanic Garden since 1994 (Campbell and Ledesma, 2002). These species were introduced as clonal material for each species; however, information about potential graft compatibility was not readily available in this hemisphere. The process was undertaken by trial and error and there have been many failures in establishment of these species. The objective of this work is to detail the progress made with the establishment of *Mangifera* species for use in future breeding with *M. indica* and for the development of new ornamental, home garden, estate and commercial crops.

GENERAL METHODOLOGY

All collected material was brought to the United States as budwood. The entry of seed material is not allowed due to seed weevil and since many of these species are monoembryonic there would have been no advantage to the introduction of superior selections without clonal material. All species were grafted with cleft or veneer grafts depending on the size of the scion and the rootstocks available. Most grafts were made when nighttime temperatures were 20C or higher. The rootstocks used were 'Turpentine' imported from Costa Rica and interstocks of *M. casturi* and *M. odorata*. The *M. casturi* and *M. odorata* interstocks were from accessions originating in Australia and Brazil, respectively.

MANGIFERA SPECIES TRIALED

Mangifera species with edible fruit were identified and collected from private residences, commercial orchards, public and private experimental farms in Peninsular Malaysia; Sarawak and Sabah, Malaysia and Brunei Darussalem on the island of Borneo; Australia; Hawaii; Puerto Rico and Thailand. The species collected were *M. caesia*, *M. casturi*, *M. foetida*, *M. griffithii*, *M. lalijiwa*, *M. merillii*, *M. laurina*, *M. odorata*, *M. pajang*, *M. pentandra*, *M. quadrifida* and *M. zeylanica* and several undetermined species. For *M. casturi*, *M. odorata*, *M. pajang* and *M. lalijiwa*, multiple clonal selections were collected on the basis of their superior fruit characteristics. Our objectives were to achieve horticultural improvement; therefore, the species chosen for study were those with economic importance in their native or other regions, quality fruit characteristics and tolerance of constant warmth and humidity.

GENERAL RESULTS

Veneer and cleft grafts of *M. caesia*, *M. foetida*, *M. merilli* and *M. pajang* were ultimately unsuccessful and we have been unable to evaluate the potential of these species in Florida. Several attempts to graft these species have been conducted throughout the years. Grafts have lived for up to 6 months in some cases, but eventually they have died. We are now beginning to evaluate the use of *M. odorata* and other species as potential interstocks. *M. casturi*, *M. lalijiwa*, *M. laurina*, *M. odorata*, *M. pentandra*, *M. zeylanica* and several unidentified species grafted on *M. indica* had success rates similar to *M. indica* grafted upon itself (80 to 100%). Scions of these species began to grow within 2 weeks of grafting and had good vigor. Graft unions healed normally with no visual signs of incompatibility and trees have been growing in the field for more than 10 years with good vigor, flowering and fruiting. All field collections have survived several freeze events, frosts and several named hurricanes.

INDIVIDUAL SPECIES DESCRIPTIONS AND OBSERVATIONS

M. zeylanica, or kaddu-ma, is a slow-growing tree in South Florida, forming a tight canopy with small, light-green leaves. The blooms are cream to off-white in color, compact and rather inconspicuous. The fruit average 150 g; have a thin skin and a watery, sweet and pleasant flavor. Trees of a single accession of kaddu-ma collected in the Seychelle Islands have been grown for decades in South Florida on *M. indica* 'Turpentine' rootstocks. Anthracnose tolerance of the leaves, blooms and fruit is excellent, although powdery mildew has been a problem in some years. The clone present at this writing does not hold great potential as a fresh fruit. Additional accessions should be introduced with improved fruit quality.

M. odorata, called kuini, has also been in South Florida for over 50 years, but there has been only a single accession introduced from an unknown source. The tree is vigorous, forming an open canopy with large, deep green leaves and bright red new growth. The flower panicles are large, bright red and highly ornamental. Fruit average 325 g and are from green to a canary yellow at maturity, with a rich, sweet flavor and slightly fibrous flesh. Leaf, bloom and fruit tolerance to anthracnose and powdery mildew is excellent, but the stems are susceptible to bacteria infection. The fruit have an intense, earthy aroma, and kuini is often referred to as the durian mango. We have two new accessions of kuini under trial with the hope that their fruit quality will be superior to the older clone present in Florida. We have begun to investigate the use of this species as an interstock for *M. caesia* and *M. foetida*.

A putative *M. odorata*/*M. foetida* hybrid, called Rampagni, for the experiment station in Sarawak, Malaysia where it was collected, has performed well in the field for more than 10 years. The tree is similar in appearance to kuini, although the leaves are smaller, more rigid and the growth habit is more spreading. The new growth and the inflorescences are a bright red color and highly ornamental. The fruit are larger than those of kuini and are yellow at full maturity. The leaves, blooms and fruit are highly tolerant of anthracnose and powdery mildew, but the tree branches with green bark are highly susceptible to bacteria infection. The tree has survived many cold events, but blooming and fruit set has been poor following cold winters.

M. laurina, or mangga aer, is vigorous and forms an upright, tight canopy with medium-sized light green leaves. The bloom panicles are a pale white and conspicuous. The fruit are green to light yellow at maturity, and the clone currently under evaluation averages 300 g. The flesh is watery and sweet, with a strong resinous aftertaste. The tree closely resembles the common mango (*Mangifera indica*) in appearance and growth habit. Anthracnose tolerance is excellent, but the blooms are susceptible to powdery mildew.

M. casturi, or kastooree, is a vigorous tree that forms a tight, upright canopy with shiny, dark green leaves contrasted with bright red new growth. The trees do not flower consistently in South Florida. Although inconsistent in flowering, the tree is well adapted to our climate and the leaves, blooms and fruit are tolerant of anthracnose, but susceptible to powdery mildew. The fruit are borne singly and are usually 40 to 50 g. They are highly fibrous, with a juicy, sweet flavor, but have scanty flesh. This species has been used as an interstock for *M. griffithii*, *M. quadrifida*, *M. lalijiwa*, and *M. merilli*. The interstock has allowed for better growth and vigor in the field for these species. We have also begun to test kastooree as a rootstock for our conditions.

M. griffithii, or ranca ranca, has been propagated with *M. casturi* as an interstock. The tree is compact and has small, leathery leaves with prominent venation. The new growth is a pale red, forming a beautiful contrast to the dark green color of the canopy. We have had no fruiting in South Florida. The fruit are small, produced in bunches and are generally considered of good flavor, albeit fibrous. Following the winter of 2010, small trees in the field were killed by temperatures at -1 to -2C for several hours. The leaves showed no infection to anthracnose under South Florida conditions. The poor flowering and susceptibility to cold indicate that this species may be poorly adapted to our conditions.

M. lalijiwa (lalejewo) has been grafted with the aid of interstocks of *M. casturi*. The tree is now in the seventh year and has remained small and has bloomed and fruit consistently for the past 3 years. The leaves are attacked by powdery mildew, but the blooms are tolerant of anthracnose and somewhat tolerant of powdery mildew. The fruit are often blemished by an as of yet unidentified fungi.

Further discussion is warranted about cold tolerance of these species. It was previously thought in Florida that all of these species would be more sensitive to cold than *M. indica*, but it now appears that in the case of *M. casturi*, *M. lalijiwa*, *M. laurina*, *M. odorata*, *M. pentandra*, *M. zeylanica*, Rampagni and several other species, their cold tolerance is similar to that of *M. indica*. All species were subjected to nights (3 to 4 hr) of 0 to -2C with no apparent twig or leaf damage. Following the winter of 2010, one of the coldest in the last 50 years, many of the *Mangifera* species held and matured a few fruit through the most severe of the conditions. None had leaf damage. *M. griffithii* and *M. quadrifida* were damaged during this winter, although in prior years they were not.

The results reported here are for only 11 of the 69 described species of *Mangifera* in Southeast Asia. If we are to address the potential of these species as marketable crops (fruit, fresh greens, and herbs), rootstocks or breeding material, the graft compatibility and horticultural traits must be further evaluated under a wide range of conditions. Additionally, other species must be evaluated and suitable rootstocks identified. In this way we can begin to collect improved clones that will better serve our horticultural needs.

Literature Cited

R.J. Campbell and N. Ledesma. 2002. The Acquisition and Introduction of Asian Tropical Fruit with Potential for Florida. Proc. Fla. State Hort. Soc. 115:87-88.

Kostermans, A.J.G.H. and Bompard, J.M. 1993. The Mangoes: Their botany, nomenclature, horticulture and utilization. Academic Press.