

The Collection and Conservation of Wild *Mangifera* Species for the Improvement of the Commercial Mango (*Mangifera indica* L.)

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Kostermans and Bompard (1993) recognized over 60 *Mangifera* species that bear edible fruit, with the greatest concentration of species on the islands of Borneo, Java and Sumatra and in Peninsular Malaysia. The authors point to the usefulness of these species as fruit crops in their own right, or in breeding with the major commercial mango species, *Mangifera indica*. Many species are locally rare and/or included on the IUCN Red List of Threatened Species [vulnerable (*M. pajang*, *M. zeylanica*), data deficient (*M. laljiwa*, *M. odorata*) and extinct in the wild (*M. casturi*)]. The current project began a decade ago, to identify, collect and establish living field collections of *Mangifera* species for use as economic crops and in improvement programs with *Mangifera indica*. Wild crop relatives of mango remain under-represented in world gene banks and are of critical importance to the commercial mango industry.



Mangifera pajang grafted and ready for field planting.



Mangifera pajang and *Mangifera caesia*



Mangifera species in local market, Brunei Darussalam.

Abstract. The mango (*Mangifera Indica* L.) has become a major world export commodity in the last decade. The mango is grown as a subsistence and/or export commodity in nearly all countries of tropical and subtropical Africa, America, Asia and the Pacific, with exports primarily destined for Asia, Europe or North America. As the mango has increased in importance as an export commodity, the commercial industry has come to rely on relatively few cultivars that conform to the current demands of the export market. The result has been a narrowing of the genetic diversity and a growing concern about the loss of wild crop relatives and the threat of devastating diseases or pests. There are over 60 wild *Mangifera* species currently recognized in Southeast Asia, with many species locally rare and/or included on the IUCN Red List of Threatened Species [vulnerable (*M. pajang*, *M. zeylanica*), data deficient (*M. laljiwa*, *M. odorata*) and extinct in the wild (*M. casturi*)]. These species are not well represented in genetic banks either within or outside of Southeast Asia. The current project has as its objective the identification, collection and propagation of *M. casturi*, *M. griffithii*, *M. laljiwa*, *M. laurina*, *M. odorata*, *M. pentandra*, *M. pajang*, *M. zeylanica*, *M. foetida* and *M. caesia* for long term maintenance and use in a living gene bank. We have been unsuccessful in the establishment of *M. caesia*, *M. foetida* and *M. pajang* using current grafting techniques on *M. indica* rootstocks. All other species have been established and are currently undergoing DNA characterization and evaluation for use in breeding with *M. indica*. *Mangifera casturi*, *M. griffithii*, *M. laljiwa*, *M. laurina*, *M. odorata* and *M. zeylanica* have shown the most horticultural potential for use with *M. indica*.

Advancing the Dreams and Teachings of David Fairchild

The Tropical Fruit Program of Fairchild Tropical Botanic Garden continues the pioneering work of Dr. David Fairchild, founder of the Seed and Plant Introduction Division of the United States Department of Agriculture. We are committed to his lofty goals for the collection, conservation, curation and distribution of superior tropical fruit from the Americas and Asia. With our roots firmly anchored in traditional horticulture, we apply the newest techniques to advance the cultivation, conservation and appreciation of tropical fruit resources. The mango, jackfruit, lychee, longan, canistel, durian, mamey sapote, mangosteen, rambutan and sapodilla are far from household names; however, through our research and horticulture, we will introduce their seductive pleasures to people throughout the world. Fairchild Tropical Botanic Garden is bringing to the world stage the best that science, and nature have to offer.

Field collections of *Mangifera* species were conducted primarily on the island of Borneo (Brunei Darussalam), where there is considerable *Mangifera* genetic diversity. Wild mangos are common in local markets throughout Borneo and clonal selections are recognized for many species. Clonal material was collected as scions and grafted to *Mangifera indica* rootstocks under greenhouse conditions in Miami, Florida. Scions were used to maintain superior clonal selections, to avoid quarantine restrictions for seeds and to evaluate horticultural adaptability. Resulting trees were established in the living genetic collections of Fairchild Tropical Botanic Garden, where they have been assessed for survival, growth and development, and genetic characterization. The living collections at FTBG are maintained according to standard commercial mango practices for the Western Hemisphere.

M. casturi, *M. griffithii*, *M. laljiwa*, *M. laurina*, *M. odorata*, *M. pentandra*, *M. pajang*, *M. zeylanica*, *M. foetida* and *M. caesia* were collected and propagated (Campbell, 2004). We were unsuccessful in the establishment of *M. caesia*, *M. foetida* and *M. pajang* using current grafting techniques. We are currently evaluating the suitability of interstocks to establish these species. All other species have been successfully grafted, established in the living collections and have been genetically characterized as part of diversity studies within the overall genetic collection of the USDA-ARS and FTBG.

M. casturi, *M. griffithii*, and *M. odorata* have shown the most horticultural potential as fruit crops themselves, due to their ease of care, adaptability and fruit quality. *M. laljiwa*, *M. laurina*, and *M. zeylanica* are under evaluation as rootstocks for *M. indica* with the potential for dwarfing and tolerance to physiological stresses. All species hold potential for the improvement of the commercial mango through breeding programs designed to address pressing economic challenges.

Future Research Recommendations

- Confirm CWR hotspots for mango, collect and propagate redundant and additional *Mangifera* species into living collections.
- Incorporate candidate *Mangifera* species into breeding programs.
- Develop *Mangifera* species as novel crops on regional and international scale.

Literature Cited

- Campbell, R.J. 2004. Graft compatibility between *Mangifera* species and *Mangifera indica* "Turpentine" rootstocks and their subsequent horticultural traits. Acta Hort. 645:311-313.
- Kostermans, A.J.G.H. and J.M. Bompard. 1993. The Mangoes: Their Botany, nomenclature, horticulture and utilization. Academic Press.

