Mammea americana L.

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CLUSIACEAE (MANGOSTEEN FAMILY)

Mammea emarginata Moc. & Sesse ex DC

Abrico do para, abricotier d'Amerique, abricotier des Antilles, mamey, mammee apple, mammy fruit, Saint Domingo apricot (California Rare Fruit Growers 1995, Guzmán 1980)

Mammea americana is native to the West Indies, but is widely cultivated in the tropics in Central America and the Caribbean islands (National Germplasm Repository 1995). It is found in tropical and subtropical life zones in dry and wet forests (Lamberts and Crane 1990).

Mammea americana is a slow-growing tree that reaches from 6 to 20 m in height (Schubert 1985) and 50 cm d.b.h. The crown has a pyramidal shape. This tree has coriaceous, gland dotted, bright, and dark green leaves. Although *M. americana* grows in poor soil (Schubert 1985), it grows best on a rich, well-drained, sandy loam (California Rare Fruit Growers 1995). It requires 109 to 203 mm of rain per year and its optimum temperatures are 19 to 27 °C. It grows at elevations from 70 to 1500 m.

The fleshy fruit pulp of *M. americana* is eaten fresh or used to prepare refreshments, jellies, preserves, or sherbets. The flowers are used in preparing the liqueur Eau de Créole in Santo Domingo. An aqueous solution with the crushed seeds help to kill common fly larva and to control mites and fleas on domestic animals as well as lice in humans (Aguilar Márquez and others 1996, González Ayala 1994, Guzmán 1980). A mash of the cut seeds is used to treat wounds. The wood has a specific weight of 0.878, and it can be used to make furniture (Guzmán 1980). *Mammea americana* is an attractive tree planted for shade or as an ornamental in urban areas (Schubert 1985). *Mammea americana* is a fruit tree with a lot of potential for exportation. Studies on post-harvest storage are necessary to increase the number of commercial plantations.

The flowers are white with four fleshy petals, many stamens, and a single ovary. The fragrant flowers attract honeybees and hummingbirds. The trees may fruit at 6 to 7 years (California Rare Fruit Growers 1995). In Puerto Rico, *M. americana* flowers May through October and fruits are observed most of the year. The fruits are round with orange-yellow pulp. Mature fruits are brown, 7 to 15 cm in diameter, with 2 to 3 seeds that are 2.5 to 4 cm long and 2 to 2.5 cm in diameter.

Seeds are collected by hand from the indehiscent fruit, cleaned of the fleshy pulp, sun-dried for 1 to 2 days, and kept at 5 °C in dry conditions or planted immediately. Seeds average 10 to 20 per kg.

Mammea americana is propagated primarily by seed or by air-layering (California Rare Fruit Growers 1995). One seed is planted in a 15 by 15 cm polyethylene bag containing loamy soil and placed in a sunny location. To avoid fungal growth, half the seed is buried in the soil while the other half is left uncovered. Seeds germinate 1 to 2 months after planting. Seedlings grow quickly and 1-year-old seedlings reach 50 cm in height (California Rare Fruit Growers 1995). One- to 2-year-old seedlings can be outplanted at the beginning of the rainy season in May or June. Manual weeding is recommended during the first year to prevent competition for nutrients and light. Chemical pesticides are not recommended (Navarrete-Tindall 1998).

Manihot dichotoma Ule

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EUPHORBIACEAE (SPURGE FAMILY)

No synonyms

No common names

Manihot dichotoma is native to northeastern Brazil in the states of Pernambuco and Bahia, and in northeastern Minas Gerais. As a tree that thrives under dry conditions, *M. dichotoma* grows more frequently in the Sertao (arid and semiarid parts of the Brazilian Caatingo). The species has been introduced in Colombia and also in Miami, FL (Allem 1997).

Manihot dichotoma is a neotropical tree that reaches 3 to 12 m in height and 25 cm d.b.h. Branching pattern is either dichotomous or trichotomous, and its smooth-stemmed branches may become slightly scaly with age (Rogers and Appan 1973).

New variations arising from naturally occurring mutations or genome reorganization are not documented for *Manihot* and can only be assumed to be part of long evolutionary processes as in any other genus (Hershey 1992). *Manihot dichotoma* has been used to form interspecific hybrids with *M. esculenta* as a source of resistance to the African cassava mosaic disease and other viruses (Jennings 1976, Storey and Doughty 1951).

From 1897 to 1916, *M. dichotoma* was an inexpensive source of rubber latex in northeastern Brazil. During this time, the species provided a means of support to 10,000 families in central Bahia, Piaui, Pernambuco, and Ceara, especially from 1903 to 1913. During World War II, interest in the species as a latex producer resurfaced. However, *M. dichotoma* is no longer used as a source of rubber latex (Allem 1997).

Inflorescence is monoecious racemose, short, terminal, and 4 cm long; every part except the interior surface of the tepals is glabrous. Setaceous bractlets and bracts are less than 0.5 cm long, less than 0.2 cm wide, and glabrous with serrated edges. Pistillate flowers (female) are restricted to the base of the inflorescence; tepals are 1.7 cm long, yellowish-green externally, and purplish in the interior part. The ovary has prominent wavy wings. Staminate buds are conical with tepals 1.7 cm long. The color of the tepals is the same as the tepals of the pistillate flowers, with 10 stamens forming two groups of 5 stamens each. The fruits are trilocular capsules of about 1 to 1.5 cm diameter, holding one seed each. The fruit has an epicarp layer and a fleshy mesocarp, which dries out at maturity, and a hard inner endocarp which splits open to release the seeds. After flowering, fruit development and seed set takes from 3 to 5 months (Ospina 1996, Toledo 1963). The obovate seeds are approximately 1.8 cm long, 1.1 cm wide, and 0.8 cm thick. The dark brown seed is smooth; the dorsal is convex with small, light and dark brown spots; the ventral is flat and without spots, with a visible raphe and a small caruncle (0.2 by 0.1 cm), light brown in color, located in the micropylar region (Rogers and Appan 1973). Leaves are glabrous and alternate with caducous stipules of serrated edges less than 1 cm long. Petioles are nonpeltate, approximately 8 cm long, erect, and glabrous with a basal union of the petiole to the lamina of 1 cm. The lamina is slightly coriaceous to membranous with a reticulate waxy pattern on the abaxial surface, camptodrome venation, and glabrous veins. The lamina is palmated with five lobes, three major and two smaller; the median lobes are obovate, frequently pandurate, approximately 8 cm long and 3.5 cm wide with a narrow base about 1 cm wide. The length of the lower lobes is half that of the middle lobes, with acute apex (Rogers and Appan 1973).

Like other *Manihot* species, seeds can be collected on the ground around the tree. To prevent fruit fly damage and seed dispersal, seeds may be collected by placing mesh bags around the peduncle of an inflorescence (Ospina 1996).

Information about germination and longevity in storage is nonexistent; data on other species of the same genus are reported as additional information.

In a 14-month study, it was suggested that the behavior of the sexual seeds of *Manihot* is similar to that of convention-

al, orthodox seeds. With a moisture content between 4 and 6 percent (wet basis), the seed was stored in sealed packaging under cold conditions (5 °C) without losing viability (Ospina 1996). On the other hand, Hong and others (1996) report that the *M. esculenta* seeds did not lose viability after 14 years in hermetic packaging at –20 °C with 6.1 percent moisture content. In this genus, the seeds differ in degrees of dormancy and many different treatments have been tested to improve germination. For example, treatments with sulfuric acid at 2, 5, and 10 percent resulted in a negative effect for seeds of *M. esculenta* (Institut National pour l'Etude Agronomique du Congo Belge 1952) while evaluation of constant and alternate ranges of temperature reveal that during 21 days, 30 to 38 °C; 8 to 16 hours is the most recommended condition for germination (Ellis and others 1982).

Manihot dichotoma is propagated through seeding and stem cutting.

ADDITIONAL INFORMATION

The stages of germination for *M. esculenta* Crantz, *M. aesculifolia* (Kunth) Pohl, *M. carthaginensis* (Jacq.) Müll. Arg., *M. chlorosticta* Standl. & Goldman, and *M. pseudoglazioii* Pax & K. Hoffm. (Ospina 1996) follow:

Days 3 to 5: The testa break longitudinally and the primary root emerges.
Day 7: The primary root lengthens, some secondary roots appear, and the cotyledons begin to show.
Day 10: More secondary roots appear, and the basal part of the somewhat long hypocotyl broadens.
Days 10 to 12: The roots continue to grow, the short epicotyl (small elongation of the plumule) appears and the cotyledons are partially or totally free of the testa.
Day 15: The cotyledons separate and photosynthesize, and in some cases, the epicotyl may have grown (growth of primary leaves).


2cm