Manihot grahami Hook.

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EUPHORBIACEAE (SPURGE FAMILY)

Janipha loeflingii var *multifida, Manihot tweedieana, Manihot tweedieana* var *lobata, Manihot tweedieana* f. *nana, Manihot lobata, Manihot enneaphylla* (Rogers and Appan 1973)

Guazu mandioca, mandio guazu, mandio quazu, mandioca brava, mandioca do matto, mandioca guazu, manidioca de veado, sacha mandioca

Manihot grahami occurs naturally in southeastern Brazil, northern Argentina, Paraguay, and Uruguay. It was introduced in the Southeastern United States and, although sometimes confused with *M. esculenta*, can be found from eastern Louisiana to Florida (Allem 1997).

Manihot grahami is a shrub with a dense crown, shaped like a parasol. The species can reach 7 m in height, 30 cm at the base, and 25 cm d.b.h. The trunk has a branching pattern, either dichotomous or trichotomous (Rogers and Appan 1973). *Manihot grahami* has nontuberous roots, dark coffee-colored epidermis, and white subepidermis. The reddish-brown, soft bark is approximatley 0.6 cm thick and can be peeled easily off the trunk, releasing a small amount of yellowish-white latex (Rogers and Appan 1973). Young stems are olive green and glabrous and form an obtuse angle. The leaves are alternate with long stipules, filiform, glabrous, and caducous.

New variations arising from naturally occurring mutations or genome reorganization are not documented for *Manihot* and must be assumed to be part of long-term evolutionary processes as in any other genus (Hershey 1992).

Manihot grahami is occasionally used as an ornamental and in botanical gardens.

The inflorescence is in panicle, monoecious, profusely ramified, and frequently 30 cm long; every part is glabrous and possesses setaceous bractlets and bracts. Pistillate flowers (female) are restricted to the lower two-thirds of the inflorescence; pedicels are 2 cm in length; sepals are 1.25 cm in length with a split toward the base in the five lobes; and the subglobose ovary is a glabrous, red-orange disk. The male flowers are a bright yellow-green with brown dots internally and a bright orange, globulous disk toward the base. The fruits (capsules), which are rounded from the base to the apex and measure 1.8 cm in length and 1.9 cm in width, possess septicidal dehiscence. There is no information on fruit and seed development for this species but, like other species within the genus, its fruiting may occur 3 to 5 months after flowering (Ospina 1996, Toledo 1963). The seeds are ovate, approximately 0.1 cm long, 0.8 cm wide, and 0.5 cm thick. These smooth seeds are a light coffee color with dark coffee-colored spots. The dorsal is convex and the ventral is planoconvex. The seeds have a visible raphe and a small, light, coffee-colored caruncle located on the micropylar region (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).

In a 14-month study, it was suggested that the behavior of the sexual seed of *Manihot* is similar to the conventional type of 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 on seeds of *M. esculenta* (Institut National pour l'Etude Agronomique du Congo Belge 1952), while evaluation of constant and alternate ranges of temperature revealed that during 21 days, 30 to 38 °C for 8 to 16 hours is the most recommended condition for germination (Ellis and others 1982).

Manihot grahami is propagated by seed. There is no information on how seeds are planted, type of substrate, or special care for the seedlings.

ADDITIONAL INFORMATION

The leaf's petioles are usually very long (aproximately 20 cm), straight, glabrous, and bright yellow-green. The union of the petiole to the leaf lamina is basal; the lamina is greenish and glabrous, with a soft waxy pattern on the abaxial surface; it possesses a camptodrome venation. Prominent veins on the adaxial surface of the lamina are bright yellow and glabrous. The leaf is palmated and has 7 to 11 medium, pandurate, oblong lobes with gradual widening from a narrow base to a prominently widened apical region, which abruptly narrows and ends in a pointed apex. The lobes are 15 to 20 cm long and approximately 0.5 cm wide at the base of the lobes. The lower lobes have a margin similar to the medium lobes but are smaller in size (Rogers and Appan 1973).

As in many other *Manihot* species, *M. grahami* is cyanophorous, and its tissues release varying levels of hydrogen cyanide on crushing. Analysis for *M. esculenta* indicates that although cyanogenesis is genetically determined, it is also influenced by various extrinsic and intrinsic factors such as soil moisture, climate, rates of synthesis, transport, and degradation of cyanogenic materials (Nartey 1978).


1 cm