Swietenia macrophylla King

ANÍBAL NIEMBRO ROCAS
Instituto de Ecología, A.C.
Xalapa, Veracruz, México

MELIACEAE (MAHOGANY FAMILY)

No synonyms

Acajou Amerique, acajou du Honduras, aguano, British Honduras mahogany, caoba, caoba centroamericana, caoba hondureña, Central American mahogany, chacalte, chiculte, cóbano, gateado, Honduras mahogany, mahogany, mara, mogno, oruro, rosadillo, venadillo, zopilote

Native to the tropical regions of America, *Swietenia macrophylla* is naturally distributed from southern Mexico, through Central America, to northern South America. The species forms part of the semideciduous tropical forests found along a coastal strip of the Atlantic slope, without reaching the Pacific slope, where *S. humilis* Zucc. is distributed.

Swietenia macrophylla reaches 45 to 60 m in height and 80 cm d.b.h. In exceptional cases, specimens can be found with a d.b.h. of up to 3 m. The trunk is straight and cylindrical, slightly grooved, with well-developed spurs. The open, rounded crown has thick, rising branches, and thick, dense foliage. The leaves are usually paripinnate, sometimes imparipinnate, 12 to 45 cm long, and made up of 3 to 6 pairs of lanceolate or ovate leaflets. The leaflets are asymmetric, 5 to 12 cm long, and 2 to 5 cm wide, with a whole margin and an acute or acuminate apex. The tree prefers rich, deep, and well-drained soils, with moisture available most of the year. Whether the tree is deciduous or evergreen depends on water availability. The species grows at elevations from sea level to 1400 m, in areas with an average annual precipitation of 1600 to 4000 mm, an average annual temperature of 23 to 28 °C, and a dry season that lasts 0 to 4 months.

Swietenia macrophylla produces one of the finest woods in the world. The wood is easy to work using hand tools. Specific gravity of the wood ranges from 0.40 to 0.85. It acquires a good polish and does not crack or bend, making it valuable in the manufacture of quality furniture. An infusion made with the bark is used to treat diarrhea and fevers (Niembro 1986).

The yellow-green flowers of both sexes are in the same inflorescence and arranged in panicles. The season of flowering and fruiting differs with geographic location. In the States of Campeche, Quintana Roo, and Yucatan in Mexico, the tree blooms April through June, and the fruits ripen January through March of the following year. The fruits ripen during the dry season, when the trees begin to lose part of their foliage and the warm air dries the fruits and promotes dehiscence. The fruits are capsular, oblong, or ovoid; 11.6 to 38.7 cm long; 6.7 to 12.0 cm in diameter; dehiscent; and light gray to brown with four to five valves (Holdridge and Poveda 1975, Pennington and Sarukhan 1968). Each fruit contains 22 to 71 developed seeds (Niembro 1995b). The mahogany seeds are samaroid, bulky at their base, 7 to 12 cm long, and 2 to 2.5 cm wide including the wing. The bulky part is comose, laterally flattened, and vaguely rhombic on cross section. The seedcoat is differentiated in testa and tegmen.

Fruits are collected before the valves open. In southeast Mexico, particularly in the States of Campeche, Quintana Roo, and Yucatan, the mahogany fruits are gathered January through March. When the fruits are ripe, the pericarp changes to a light coffee color just before the valves open and release the seeds. Collectors carefully climb the trees and, working above the fruits, use poles with metal hooks to cut them from the trees. The fruits are transported in jute sacks to the processing plant. The fruits are placed in wood boxes with metal mesh bottoms and set in well-ventilated sheds to facilitate air circulation and prevent the growth of microorganisms. The valves begin to open on the second or third day, releasing the seeds. Seed wings are removed by hand to facilitate handling and reduce volume. The wing is broken 1 cm above its base, and the seeds without wings are placed in a container. Impurities, such as pieces of fruit, branches, leaves, and aborted seeds, are removed by using sieves or a vertical column blower. Seeds

average 1,235 to 3,246 per kg (Patiño and Villagómez 1976, Vega and others 1981). This wide range in number of seeds per kg indicates that the seeds differ in size and fresh weight.

According to King and Roberts (1979), mahogany seeds are recalcitrant because loss of moisture irreversibly damages their viability. Gómez (1996) reports that the humidity content of the seeds, the container type, and the storage temperature significantly affect viability in less than 1 year. Drying fruits in the sun should be avoided because it reduces humidity content, hence viability. However, recent studies (Centro Agronómico Tropical de Investigación y Enseñza 1997d) show that the seeds are orthodox and that they maintain their germinative capacity up to 7 or 8 months when stored at ambient conditions. Stored in a refrigerator in hermetically sealed plastic bags, seeds remain viable for over 4 years. If they are stored at 4 °C with a moisture content of 4 percent, they conserve their germinative capacity for 8 years.

Niembro (1997a) compared germination of mahogany seeds after they had been stored in three different ways for 120 days. The results showed that seeds stored in hermetically closed bags in a refrigerator at a temperature of 8 °C germinated at 75 percent, whereas seeds stored under ambient conditions without any protection germinated at 62 percent. The fresh weight of mahogany seeds significantly affects germination and growth of the plantules. Niembro (1997b) also found that heavier seeds germinate more quickly, producing bigger and more vigorous plantules. Position at planting is also important to germination. In numerous places, it is customary to plant seeds with the base facing downward and the wing facing upward. This practice is not recommended because the frequency of pig tails, or roots shaped like a J, increases (Niembro 1997c). Actually, planting the seed with the wing pointing downward and the base pointing upward helps germination and decreases the incidence of pig tails (Liegel and Venator 1987, Niembro 1997d).

Seed germination is hypogeal or cryptocotylar (Duke 1969). The seeds do not show a latency period (Lamb 1966) and do not require pretreatment (Liegel and Venator 1987). Under favorable conditions (fertile soil, periodic watering, without attacks by pests and diseases at the nursery site), the newly gathered, fresh seeds germinate 10 to 28 days after sowing (Liegel and Venator 1987, Marrero 1949), with germination at 70 to 90 percent. In the Forest Tree Seeds Laboratory in the China Experimental Field of the National Institute of Forest, Agricultural, and Cattle Research, located in Campeche, Mexico, seeds are placed in germinators with continuous light and a constant temperature of 28 °C. Under these conditions mahogany seeds begin to germinate 15 and 18 days after sowing. Germination is considered complete 6 weeks after sowing.

The containers used for the propagation of mahogany are black polyethylene bags which measure 20 by 10 cm. The medium used is a mixture of soil, sand, and compost whose proportions vary among nurseries. *Swietenia macrophylla* is usually propagated by direct planting in containers. Seeds should be planted in March to ensure seedlings will be ready for outplanting at the beginning of the rainy season in July. Mixtures of soil and sand, compost, wood sawdust, rice husks, bark of trees, and agricultural haulm should be used as substrates (Patiño and others 1993a).

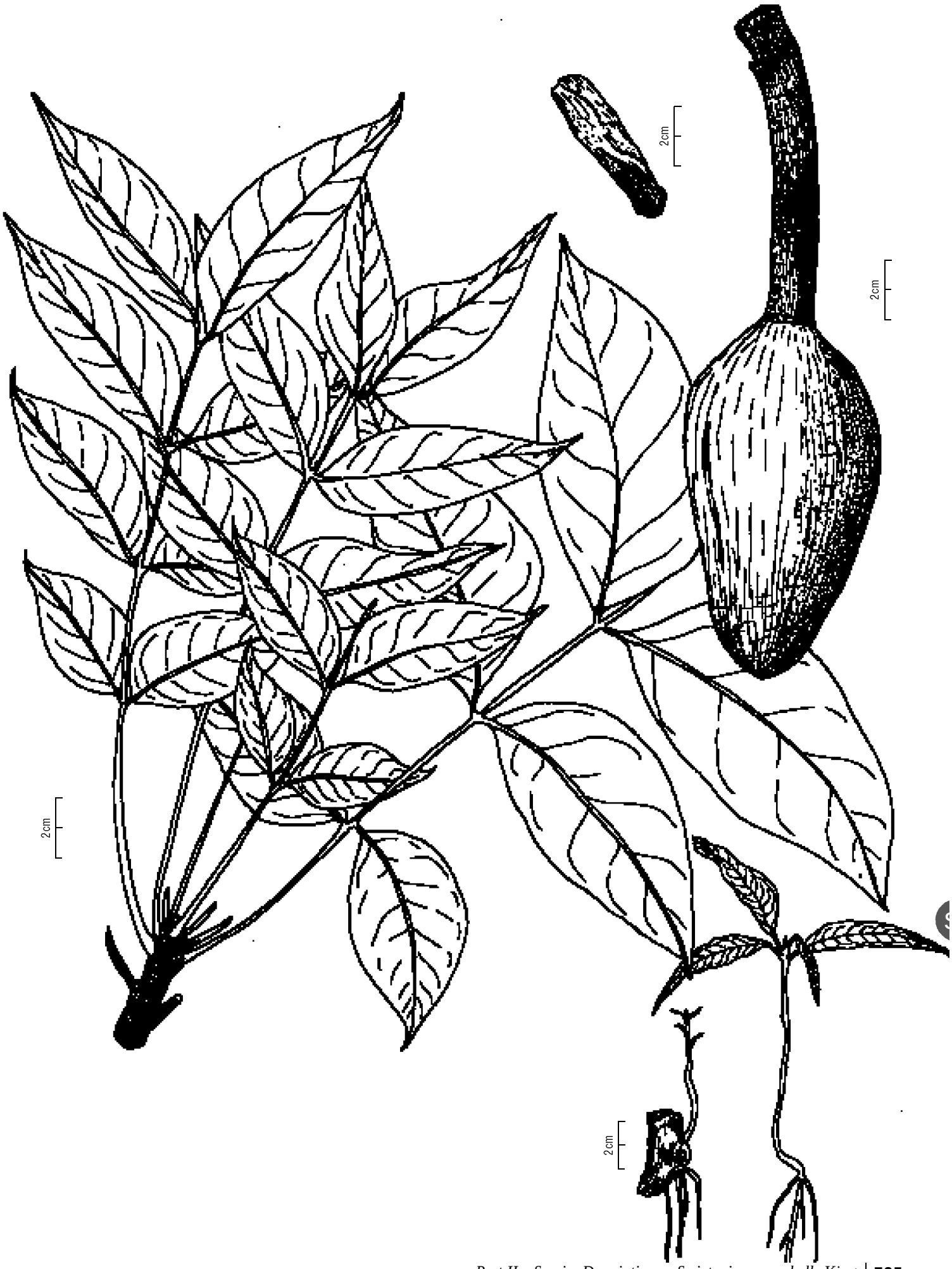
ADDITIONAL INFORMATION

The seed testa is light brown to red-brown, smooth, opaque, cartaceous, and internally full of numerous air pockets. The testa expands toward the apex in a thin, brittle, lateral wing, which results from an overgrown raphe-exostome. The tegmen is cream or white, granular, opaque, and firmly joined to the embryo. The hilum is at the end of the wing, set deep, and puntiform, and sometimes has remnants of funicular tissue. The vascular bundle is prominent, descending along the wing, and connected to the embryo in a prominent chalaza that is seen as a black, longitudinal protuberance located at the extreme opposite to the radicle. The micropyle is indiscernible. The endosperm is whole, white, thin, and pulpy, and firmly surrounds the embryo. The embryo is transversal, almost bilaterally symmetrical, and white, with a straight axis. The cotyledons are obovate, compressed, expanded, whole, flat, foliaceous, and merged to each other along their adaxial surface. The plumule is undifferentiated. The radicle is small, globose, and slightly prominent (Alvarenga and Flores 1988, Corner 1976, Niembro 1982, Pennington and Styles 1981, Pennington and van Rijn 1984, Standley and Steyermark 1946b, Stoffers 1984, Wilson 1924).

Germination begins with the distension and outward arching of the point of insertion of the cotyledons with the axis of the embryo because a type of petioles is formed among these structures. Subsequently, the epicotyl and the radicle lengthen. The plumule, made up of two leaves, begins to grow and differentiate when the epicotyl is 1 to 3 cm long. In this stage of growth, very fast changes occur in the morphology and physiology of the stem. The first two leaves increase in size and change from red to green—indicating the appearance of photosynthetic pigments. Simultaneously, the radicle develops secondary roots, thus finishing the germination phase. The plantules continue to grow and develop new leaves that provide nutrients for the tree.

Some seeds have two functional embryos (polyembryony), one usually smaller than the other, which germinate

almost simultaneously and produce two plantules of unequal sizes. If the plantules are separated at the right time, they can grow and develop. The occurrence of polyembryony is low. In the China Experimental Field, only 3 out of 500 seedlings (0.6 percent) showed polyembryony.


2cm
2cm
2cm
2cm