Guarea grandifolia DC.

E.M. FLORES
Academia Nacional de Ciencias de Costa Rica, Costa Rica

MELIACEAE (MAHOGANY FAMILY)

Guarea borisii Harms (Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem 13: 503; 1937); *Guarea chichon* C. DC. (Annuaire du Conservatoire et Jardin Botaniques de Genéve 10: 147; 1907) *Guarea culebrana* C. DC. (Smithsonian Miscellaneous Collections 68[6]: 5; 1917); *Guarea gigantea* Triana & Planch. (Annales des Sciences Naturelles, Botanique ser. 5[15]: 370; 1872); *Guarea longipetiola* C. DC. (Smithsonian Miscellaneous Collections 68[6]: 5; 1917); *Guarea mancharra* Cuatrec. (Fieldiana, Botany 27[1]: 71; 1950); *Guarea megalantha* Roem. (Familiarum Naturalium Regni Vegetabilis Monographicae 1: 120;' 1846); *Guarea megantha* A. Juss. (Mémoires du Muséum d'Histoire Naturelle 19: 241,292; 1830); *Guarea pittieri* C. DC. (Smithsonian Miscellaneous Collectiosn 68[6]: 6; 1917); *Guarea trompillo* C. DC. (Annuaire du Conservatoire et Jardin Botaniques de Genéve 10: 147; 1907) (W3 Tropicos 1999)

Apae, aycoy, azote, barafa, cabimbo, carapa, carbon, cedrilho, cedrillo, cedrillo blanco, cedrillo cimarrón, cedro macho, chichón de montaña, chohalate, cocora, cramantree, cuaimire, cuamo blanco, cuamo cimarrón, jatauba, javin, kusimsakis, kusipkakis, latapi, latapi de hoja menuda, mancharro, no-choc-che, ocora, piton, pocora, pronto alivio, requia de altura, sabino, tromopillo, trompillo de monte, turubuk, wildake (Croat 1978; Pennington and Styles 1975, 1981; van Roosmalen 1985; Smith 1965; Standley 1938)

The natural distribution of *Guarea grandifolia* extends from Veracruz, Mexico, throughout Central America, to northern South America, reaching the central and western Amazon River Basin (Pennington and Styles 1975, 1981; Standley and Steyermark 1946b). The species is a canopy emergent in the humid and very humid tropical forest.

Guarea grandifolia may reach 50 m in height and over 180 cm in diameter. It has buttresses 3 to 4 m long in the Amazonian forest. The crown is dense, wide, and rounded, with numerous branches. The bark is light brown, dark, brown, or gray (in gallery forests or pastures) and smooth or with vertical light brown fissures. It exfoliates in irregular scales or plates. Internally, it is creamy or yellowish brown. It oxidizes rapidly, becoming brown if exposed to air and light. The fresh bark is characterized by its soft aromatic odor. The mean thickness is 1.2 to 1.5 cm. Leaves are crowded in spirals at the distal end of the branches. They are compound and pinnate and may reach 1.5 m in length. The most important characteristic is the terminal bud with intermittent growth. The leaf has 8 to 34 leaflet pairs, chartaceous or coriaceous, elliptic or elliptic-oblong, sometimes oblanceolate, with entire margin, apex shape variable (acute, acuminate, obtuse or truncate) and truncate, round, cuneate, or attenuate base. *Guarea grandifolia* is a riparian species quite common near streamlets, creeks, and rivers, especially in areas with red clayey or bauxitic soils. It also frequently grows in alluvial banks. The elevation range extends from 0 to 800 m; the temperature range in these forests varies from 22 to 32 °C and the annual rainfall is 3500 to 8000 mm. The species is shade tolerant.

In green condition, the sapwood is yellowish brown; heartwood light brown. After air-drying, the sapwood is light brown and the heartwood brown, pinkish brown, or orange-brown. The wood has fine or medium texture, straight grain sometimes intercrossed, and medium luster; it is odorless and tasteless. The basic specific gravity is 0.50, with variations dependent on wood origin. The average green weight is 1132 kg per m^3. The volumetric contraction is moderate (11.2), and the tangential/radial contraction ratio is favorable (1:5). The mechanical properties are low or medium. Wood air-drying is moderately fast with few defects (cracks and curling). The wood is easily worked and has a soft, smooth finish without brushing defects. It is strong in relation to its weight and has

good natural durability. Because the Peteri's coefficient of flexibility is 67 and the Runkel factor 0.84 (group III), the fibers are good for making paper. In America, the timber has the same uses as mahogany (*Swietenia macrophylla*), royal mahogany (*Carapa guianensis* Aubl.), red maple (*Acer rubrum*), or green ash (*Fraxinus pennsylvanica*). The timber is used to make furniture, cabinets, closets, doors, doorframes, windows, moldings, veneers, floors, and lathed objects. The timber is classified as a structural wood of B type, usable in construction designed to support medium or heavy loading (Llach 1971). Bark extracts of *G. grandifolia* are used as an ingredient in the arrow poison made by the Jarawara and Jamamadi tribes living in the Brazilian Amazon area (Prance 1978).

The species is dioecious. Tree blooming starts on the crown side exposed to full sunlight. The flowering pattern is irregular subannual or episodic, and flowering within a population is asynchronous. The number of adult trees flowering in each episode varies, resulting in significant genetic variability. Furthermore, flowering is stepped and the same tree may have flowers and fruits in different developmental stages. Pollination is entomophilous. Floral anthesis occurs at night and the pollination vectors are moths (palaenophily). Inflorescences are axillary or ramiflorous, sometimes cauliflorous, ramified, slender or forming narrow pyramidal thryses. The thryses may be 50 cm long. The flowers are sericeous and short-pedicellate. The calyx has rounded lobes, internally glabrous and appressed puberulous outside. Petals are oblong or lanceolate; they open as a cup during anthesis. The staminal tube is truncate or undulate at margin, glabrous or sparsely pubescent, usually shorter than the corolla. Flowers have a cyathiform, green calyx with three to seven lobes. The corolla has four to seven petals, usually five, white or creamy, valvate or slightly imbircate, reddish with aging. The androecium has a fleshy staminal tube; it has 8 to 12 anthers, generally 10, inserted within a throat.

Fruit production is correlated to episodic flowering. The main crop occurs from February through May. Fruits are thick-pedicellate. They are dehiscent capsules with fleshy pericarp. They are 3.0 to 3.5 cm in diameter and tomentose or glabrous, with dark longitudinal grooves and retuse apexes. Dehiscence proceeds basipetally, along the longitudinal grooves, giving rise to four to eight, usually five, valves. The pericarp is greenish in early stages of development, taking a reddish color near maturity. Mesocarp and endocarp are very fleshy. The pericarp has a high sugar content (approximately 20 percent); sugars are concentrated mainly in the endocarp tissues.

There are one to two seeds per locule, which may reach a length of 2 cm. Seed form and size are variable. They are ellipsoid or truncate at the apex. The seedcoat is bright orange or bright red and is formed by a sarcotesta, a fibrous tegmen, and pachychalazal tissue. Most seed dispersal is endozoochorous and birds are the customary dispersers (Wheelwright and others 1984). Some monkeys and rodents are commensals of fruits and seeds. It is presumed that some fish are possible dispersers of those seeds falling into streams.

Partially open fruits are collected directly off the tree and a careful fruit and seed culling must be done. Small, malformed, or damaged fruits and seeds must be discarded. Fresh seeds can also be collected from the ground.

Seeds must be kept humid before soaking and sowing to maintain their viability. Seeds average 720 per kilogram. The seed water content is approximately 40 percent. Seeds are very recalcitrant and viability is lost in 7 to 8 days, depending on the level of seed dehydration. Germination is hypogeal and the seedling is cryptocotylar. Germination is stepped and may last several months. The radicle protrudes throughout the micropyle, causing the rupture of surrounding tissues. Cotyledonary buds may develop if the main shoot is damaged.

Seeds are sown in germination chambers or sand beds. The seedlings can be transferred to plastic bags when the plumule is 2 to 3 cm long. The greenhouse/nursery period lasts about 6 months. The seedlings are small but strong and resistant.

Because growth is slow under full sunlight and the plant shows low capacity to compete with climbers and herbs, the species is not appropriate for use in monospecific plantations. It must be planted under moderate shade or managed with silvicultural techniques.

ADDITIONAL INFORMATION

Guarea derives from *guara*, a native name used in Cuba to name the type species of the genus. Allamand rectified the original *Guara* used by Linnaeus (Pennington and Styles 1975, 1981). The species name refers to the large leaf size.

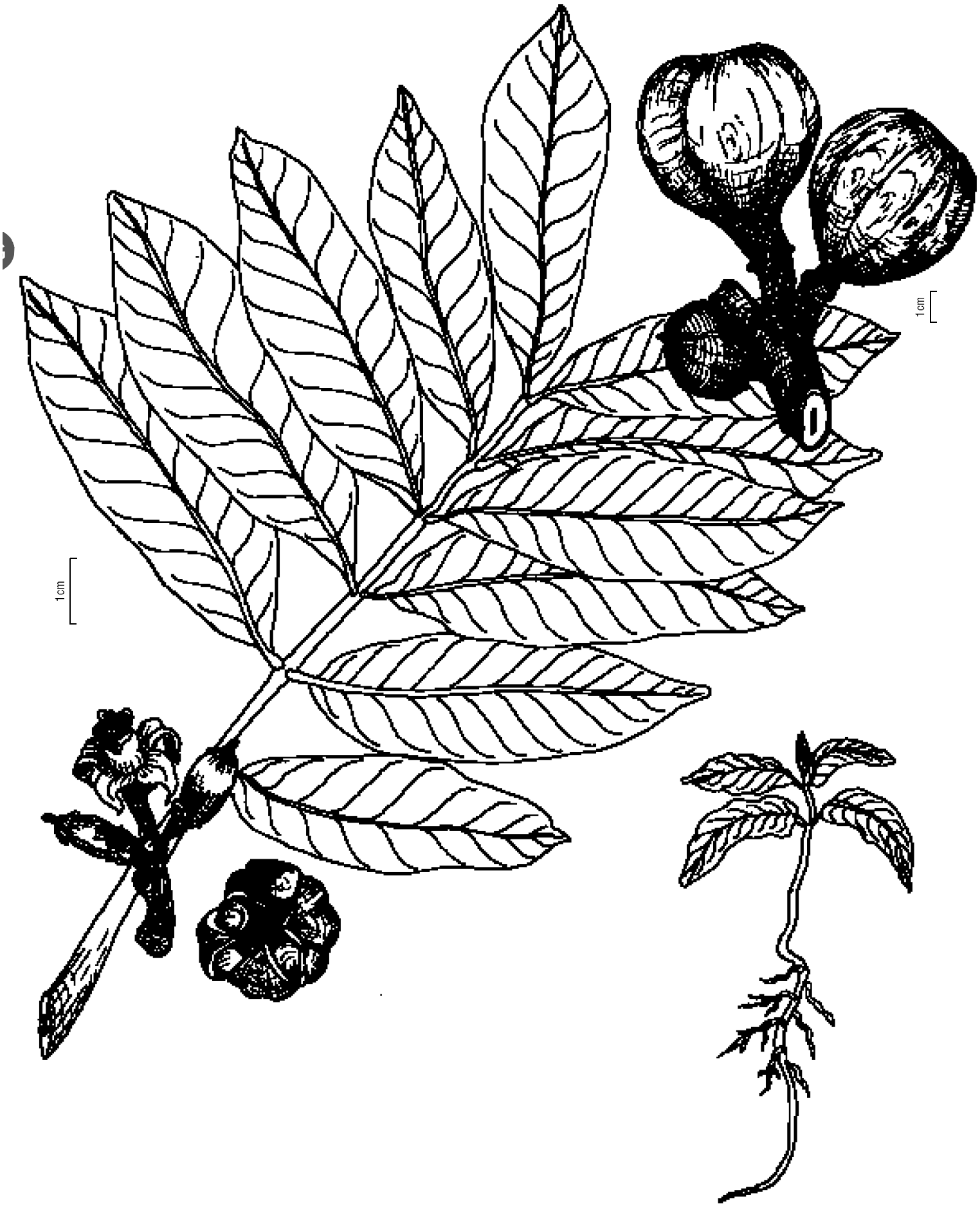
Among the Meliaceae, *Guarea* is one of the genera that has a higher number of species. The meliacins, tetranortriterpenoids, or limonoids (characteristic chemical compounds of the family) are also present in this genus (Taylor 1981). Although many species of the family have biologically active compounds, the *Guarea* limonoids, such as obacunone, show low biological activity against many insects and are unable to inhibit insect growth and activity.

The staminate flower has fertile stamens,; the pistillate flower has indehiscent sterile antheroids. The gynoecium of the pistillate flower is subtended by an annular nectariferous stipe; in the staminate flower, the stipe is longer and narrower. The ovary in the female flower is 5-sulcate, with 4 to 8 locules, sometimes 10. Each locule has two ovules. The style is short and thick, pubescent at the base; the stigma is discoid. Ovules are anatropous, bitegmic, crassinucellate, and superposed. In

the male flower, the gynoeciumis narrower; the ovules are well developed but are not functional.

The seed embryo is fleshy, thick, and plano-convex, with large, well-developed cotyledons, superposed or oblique. The radicle is short, dorsal or lateral, sometimes included; the plumule is minute. The seed is endospermic; it is nuclear and oily and is absorbed during seed development. The sarcotesta and the embryo are rich in lipid content.

On the forest floor, insect larvae attack many fruits and seeds; at groundline, guans (large birds) or rodents may damage seeds. *Hypsipyla ferrealis* larvae and other insect larvae develop inside the immature fruits, causing severe damage to developing seeds. Commonly, these damaged seeds do not germinate. Seedlings are shade tolerant and grow well on the forest floor, but the mortality level in young stages is high due to predation. Seedlings growing under full sunlight show slower growth and the leaves have a lighter green color.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