

Guarea glabra Vahl

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MELIACEAE (MAHOGANY FAMILY)

Carapa trijuga Willd. Ex C. DC. (Monographiae Phanerogamarum 1: 564; 1878); *Guarea brachystachya* Sessé & Mociño ex DC. (Prodromus systematis Naturalis Regni Vegetabilis 1: 624; 1824); *Guarea humilis* Bertero ex DC. (Prodromus Systematis Naturalis Regni Vegetabilis 1: 624; 1824); *Guarea swartzii* C. DC. (Prodromus Systematis Naturalis Regni Vegetabilis 1: 624; 1824); *Guarea excelsa* Kunth (Nova Genera et Species Plantarum 7: 227; 1825); *Guarea vahliana* A. Juss. (Mémoires du Muséum d'Histoire Naturelle 19: 240, 282; 1830); *Sapindus glabrescens* Hook. & Arn. (The Botany of Capitan Beechey's Voyage 281; 1838); *Guarea kegelii* Turczaninow (Bulletin de la Société Impériale des Naturalistes de Moscou 36[1]: 589; 1863); *Guarea fulva* Triana & Planch. (Annales des Sciences Naturelles, Botanique ser. 5 15: 371; 1872); *Guarea fulva* var. *mexicana* C. DC. (Monographiae Phanerogamarum 1: 575; 1878); *Guarea bijuga* C. DC. (Monographiae Phanerogamarum 1: 567; 1878); *Guarea filiformis* var. *cinerascens* C. DC. (Monographiae Phanerogamarum 1: 567; 1878); *Guarea filiformis* var. *pallida* C. DC. (Monographiae Phanerogamarum 1: 566; 1878); *Guarea filiformis* Ruiz & Pav. Ex C. DC. (Monographiae Phanerogamarum 1: 566; 1878); *Guarea purpurea* C. DC. (Monographiae Phanerogamarum 1: 564; 1878); *Guarea schomburgkii* C. DC. (Monographiae Phanerogamarum 1: 565; 1878); *Guarea lherminieri* C. DC. (Bulletin de l'Herbier Boissier ser. 2: 571; 1894); *Guarea luxii* C. DC. (Botanical Gazette 19[1]: 2; 1894); *Guarea palmeri* N. E. Rose ex C. DC. (Botanical Gazette 19: 39; 1894); *Guarea pauciflora* Sessé & Moc. (flora Mexicana 100; 1894); *Guarea tuerckheimii* C. DC. (Botanical Gazette 33[4]: 250; 1902); *Guarea bullata* Radlk. (Bulletin de l'Herbier Boissier ser. 25: 192; 1905); *Guarea donnell-smithii* C. DC. (Bulletin de l'Herbier Boissier ser. 25: 419; 1905); *Guarea erythrocarpa* C. DC. (Bulletin de l'Herbier Boissier ser. 25: 420; 1905); *Guarea microcarpa* C. DC. (Bulletin de l'Herbier Boissier ser. 25: 420; 1905); *Guarea syringoides* C.H. Wright (Bulletin of Miscellaneous Information Kew 3; 1906); *Guarea rovirosae* C. DC. (Annuaire du Conservatoire et Jardin Botaniques de Genève 10: 145; 1907); *Guarea virescens* C. DC. (Annuaire du Conservatoire et Jardin Botaniques de Genève 10: 140; 1907); *Guarea brevianthera* C. DC. (Smithsonian Miscellaneous Collections 68[6]: 1; 1917); *Guarea cook-griggsii* C. DC. (Smithsonian Miscellaneous Collections 68[6]: 2; 1917); *Guarea ternifoliola* C. DC. (Smithsonian Miscellaneous Collections 68[6]: 2; 1917); *Guarea tonduzii* C. DC. (Smithsonian Miscellaneous Collections 68[6]: 4; 1917); *Guarea makrinii* Blake (Contributions from the Gray Herbarium of Harvard University n.s. 53: 57; 1918); *Guarea obtusata* Blake (Proceedings of the Biological Society of Washington 33: 118; 1920); *Guarea chiapensis* Blake (Proceedings of the Biological Society of Washington 34: 116; 1921); *Guarea excelsa* var. *dubia* Blake (Proceedings of the Biological Society of Washington 34: 116; 1921); *Guarea heterophylla* Blake (Proceedings of the Biological Society of Washington 34: 116; 1921); *Guarea polyantha* Blake (Proceedings of the Biological Society of Washington 34: 117; 1921); *Guarea glabrescens* (Hooker & Arn.) Blake (Contributions from the U.S. National Herbarium 23: 559; 1923); *Guarea microcalyx* Harms (Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem 9: 429; 1925); *Guarea chiricana* Standl. (Publications of the Field Colombian Museum, Botanical Series 4[8]: 215; 1929); *Guarea matudai* Lundell (Lloydia 2[2]: 93; 1939)

Alligator wood, azote, bejuco colorado, cacahuatillo, cagaste, carapillo, carbon, carbonero, carimbo, cedrillo, cedrillo blanco, cedro macho, chichipate, cola de pavo, coquimbo, cramantree, dorita, duraznillo, guaraguao macho, guaraguillo, hoja blanca, huesillo, mameicillo blanco, pico de oro, pronto alivio, quitacalzon, small redwood, trompillo, wild orange, zapotillo (Pennington and Styles 1975, 1981; Record and Hess 1949; Standley 1938)

Guarea glabra is a neotropical species. Its geographic range extends from Sinaloa and Veracruz in Mexico, along both the Atlantic and Pacific drainages of Central America, to Colombia and Venezuela as far as Amapa in northeastern Brazil (Croat 1978, Pennington and Styles 1981). It is also found along both the Pacific and Amazonian basins of the Andes down to Peru and the southwest area of the Brazilian Amazon, as well as in the Lesser Antilles, Puerto Rico, and Jamaica.

Guarea glabra is a tree that reaches 25 to 30 m in height and more than 1 m d.b.h. The tree is evergreen. The bole is straight with small buttresses; the crown is dense and rounded. The bark is soft and vertically fissured or scaly. It is brown or grayish brown. Internally, the bark is creamy and aromatic. The fresh bark exudes a soft aromatic odor. The mean thickness is 1.3 to 1.6 cm. The young branches are pubescent, becoming glabrous and pale grayish brown or grayish white, with some lenticels (Pennington and Styles 1981). The leaves are compound, pinnate, and may reach 60 cm in length; the terminal bud with intermittent growth is typical of the species of the genus. Some races grow well in bauxite hills. The species is frequently riparian. The range of elevation is from 0 to 2000 m, although the species grows better in lowlands that are periodically inundated. The temperature varies from 18 to 35 °C and the annual precipitation is 1500 to 7000 mm.

Guarea glabra is the most variable species of the genus and has several races along its range of natural distribution.

The wood is brown or reddish brown, aromatic, fine or medium textured, with straight grain, sometimes intercrossed, and moderate luster. The wood's specific gravity is 0.49 to 0.52, varying with the source. The initial moisture content (110 to 119 percent) is too high for its density; the green weight is 980 to 1040 kg per m³. The volumetric contraction and the tangential/radial contraction ratio are similar to those of *G. grandifolia* DC. The mechanical properties are low or medium. Air drying is moderately fast. The wood dries with few defects (fissures and rollups), is easy to work, and has a smooth finish; brushing is easy and the surfaces obtained are smooth. The heartwood is durable and difficult to preserve. The wood is equivalent to royal mahogany (*Carapa guianensis* Aubl.), apamate (*Tabebuia rosea* (Bertol.) DC.), green ash (*Fraxinus pennsylvanica* Marshall), and red maple (*Acer rubrum* L.) and can be used with success as a substitute for mahogany (*Swietenia*

macrophylla King). The timber is mixed and frequently confused with woods of other species in the same genus and with royal mahogany. The wood is used in general construction, carpentry, furniture, window and door frames, cabinets, veneers, molding, floors, and lathed objects (Anonymous 1946, Llach 1971).

Because the flowering pattern is sub-annual, the species has flowers and fruits for several months. It is dioecious and the flowers are unisexual. Inflorescences are axillary or famiflorous pseudospicate panicles. The minor lateral branches are cymes or racemes. The calyx is rotate, pateliform or cyathiform, with four teeth or acute lobes, sometimes rounded. The corolla has four to five petals generally valvate, sometimes imbricate, whitish cream or greenish. The flowers are fragrant and entomophilous. Fruit ripening lasts 3 months and fruit production is correlated to episodic flowering. The main crop occurs January through May. The fruit is a dehiscent capsule, globose, flat at the apex, smooth or rough with a hard, thick pericarp. Dehiscence proceeds basipetally, along the longitudinal grooves, usually producing four to five valves (Van Roosmalen 1985, Wheelwright and others 1984). The endocarp is sugary. There are one to two seeds per locule, shaped like the segment of an orange (Pennington and Styles 1981). Shape and size vary from one fruit to another; seed length usually fluctuates from 1.5 to 3 cm.

Fruits are collected directly from the tree or the ground. Small, malformed, or damaged fruits and seeds must be discarded. Seeds must be kept humid until soaking and further sowing. Seed water content is 38 to 41 percent. Seed behavior is recalcitrant and viability is lost in 6 to 8 days, depending on the loss of moisture content. Germination is hypogeal and the seedling is cryptocotylar. On the forest floor, many fruits and seeds are attacked by insects, guans (large birds), and rodents (Van Roosmalen 1985). Damaged seeds do not germinate. Under greenhouse conditions, germination is good (80 to 82 percent) if healthy, fresh seeds are soaked in running water for 24 hours before sowing. The first evidence of germination is observed 65 to 70 days after sowing.

Seeds are grown in germination chambers or sand beds. The substrate must be kept humid and aerated. The seedlings can be transferred to plastic bags when the plumule is 2 to 3 cm long. The greenhouse and nursery periods must last about

6 months. Seedlings are small, but they are strong and resistant. Growth is slow under full sunlight and shows low capacity to compete with climbers and herbs. Because the species is shade-tolerant, it should be planted under moderate shade or managed with silvicultural techniques and is not appropriate for use in monospecific plantations. *Hypsipyla grandella* and other unidentified predators attack the young shoots and promote seedling mortality.

ADDITIONAL INFORMATION

The petiole and rachis are terete, sometimes adaxially grooved and pubescent. Leaflets are opposite, (1-)2-7(-13) pairs, subcoriaceous, glabrous, and sporadically have glandular dots (Pennington and Styles 1981). The foliar blade is elliptic or oblanceolate, sometimes oblong; the apex is acuminate, acute or rounded, and the base attenuate or acute, sometimes cuneate, obtuse, or rounded. Venation is eucamptodromous, in some cases brochidodromous; midrib flat or depressed, secondary veins ascending, arcuate, usually convergent, tertiary veins prominent (Pennington and Styles 1981).

In the female flower the staminal tube is wide, with

undulate or dentate margins, glabrous, with 7 to 10 functional stamens but usually 8. The male flower has small indehiscent antheroids. They lack pollen and the nectary subtending the ovary forms a ring below it; it has a narrow stipe. The pistillate flowers have a reduced nectariferous disc. The gynoecium is tri- to pentalocular but commonly has four locules. Each locule has two superposed ovules, anatropous, bitegmic, and crassinucellate. Some ovules are abortive. The style is short and glabrous (Pennington and Styles 1981).

The seed's embryo is thick and planoconvex with superposed or oblique cotyledons. The radicle is minute, dorsal or lateral, and sometimes included. The sarcotesta and the embryo are rich in lipids.

Germination is gradual and may last 1 or 2 months. The radicle emerges through the micropyle. When the root is 2.0 to 2.5 cm long (65 to 67 days), the cotyledonary petioles begin their extension. They are small, thick, hard, and concave adaxially; the plumule emerges afterwards. Eophylls are opposite. Cotyledonary buds may develop when the main shoot is damaged.

As are all the species of the genus, *G. glabra* is biochemically rich; the limonoid glabretal has been found in leaves and fruits (Taylor 1981).

