Minquartia guianensis Aubl.

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

OLACACEAE (OLAX FAMILY)

Secretania loranthacea Mull-Arg. (Prodromus Systematis Naturalis Regni Vegetabilis 15 [2]: 228; 1866); *Endusa punctata* Radlk. (Sitzungsberichte der Mathematish-Physikalischen Classe [Klasse] der Konigl. Bayer Akademie der Wissenschaften zu München 16: 311; 1886); *Eganthus poeppigii* van Teighem (Journal de Botanique [Morot] 13: 77; 1899); *Minquartia macrophylla* Ducke (Archivos do Instituto Biologico [Sao Paulo] 2: 33; 1935); *Minquartia parvifolia* A. C. Sm. (Brittonia 2: 149; 1936); *Minquartia punctata* (Radlk.) Sleumer (Repertorium Specierum Novarum Regni Vegetabilis 39: 282; 1936)

Acaiquara, acaiquara da varzea, acapd, acari, acaricoara, acariguara, acariquara roxa, acariuba, acary, alata-oedoe, alata-udu, alata-weri, arata o aratta, aratahoehoe, arataweri, arrataweri, baggie-baggie, black manwood, bois agouti, bois incorrupitble, camaroncillo, cricamola, criollo, huacapd, huambula, jewalidanni, kobakedive, konthout, kontoe-hoedoe, maka, makka, mand, mand negro, manwood, mekwa, mincoa, mincouart, minquar, paini yayo, palo criollo, palo de piedra, paramaka, pechiche, pechiche barbasco, plátano, senia'mba quini'cco, tomopio, urana-u-yek, urari, urodibe, wanania, wananin, yuwartu (Aublet 1775, Burger 1983, Sleumer 1984)

Minquartia is a monotypic genus. In Central America, *Minquartia guianensis* grows from southern Nicaragua to Panama; in South America, it is found in the Colombian, Ecuadorian, Brazilian, Peruvian, Venezuelan, and Bolivian Amazon and in the Guianas. The species also inhabits the forests of several Caribbean islands (Brako and Zarucchi 1993, Burger 1983, Hiepko 1993, Jorgensen and León-Yañez 1999, Renner and others 1990, Sleumer 1984, Spichiger and others 1989). *Minquartia guianensis* is an emergent tree, common in the lowland, premontane, and lower montane tropical forests of the Pacific and Atlantic watersheds. It usually grows associated with royal mahogany (C*arapa guianensis* Aubl.), vainillo (*Stryphnodendron microstachyum* Poepp.), oil bean tree (*Pentaclethra macroloba* [Willd.] Kuntze), monkey pot (*Lecythis ampla* Miers), and wild nutmeg (*Virola* Aubl.).

Minquartia guianensis is a large tree that may reach 73 m in height and 180 cm d.b.h. Although the South American trees are small to medium-sized, those from the tropical wet forest in the Corcovado zone (Osa Peninsula, Costa Rica) may reach a height greater than 70 m. The bole is straight and angular and frequently has buttresses and deep, long grooves in the basal third. Trees with a d.b.h. greater than 60 to 80 cm usually have bark and wood perforations and hollow pith colonized by ants and fungi. Young twigs are densely grayish or rusty-puberulent; trichomes are branched. The bark is grayish brown or dark brown. It exfoliates small oblong scales and bears vertical fissures, which may show whitish or yellow latex if cut or damaged. Internally, the bark is whitish or pale yellow, and sugary. It has many laticifers filled with white latex and schizogenous secretory cavities with abundant resin. The latex oxidizes if exposed to air and light. Bark thickness ranges from 1.5 to 2.5 cm (Flores 1994e). Leaves are alternate, simple, stipulate, chartaceous or coriaceous, elliptic, lanceolate or oblong-elliptic, with entire margin, apex cuspidate or abruptly short acuminate with acute or blunt tip, base round-truncate or obtuse; they are short-petiolated; petioles are grooved adaxially. The species may be found in primary, secondary, and gallery forests with alluvial, acid clayey, or sandy soils. It grows well in periodically flooded areas, as well as on slopes. The trees grow where temperatures range from 22 to 35 °C and the annual rainfall varies from 2500 to 6500 mm. The elevation range is 0 to 1000 m.

In green and dry conditions, sapwood is light brownish gray with darker stripes. The heartwood is brown in green condition and turns grayish brown when dried. The transition between sapwood and heartwood is abrupt; they are separated by a clear narrow stripe 1.5 to 2.0 mm in width. *Minquartia*

guianensis is intensively exploited because of its high wood quality. It has a straight, interlocked, or undulated grain depending on its origin. It has a fine texture and lacks luster. However, under the appropriate angle of incidence, the longitudinal surfaces reflect light. The wood does not have figure and is tasteless and odorless. The wood is very heavy (green weight 1200 to 1300 kg per m^3 with 62 to 68 percent moisture content; basic specific gravity is 0.75). The Peteri's coefficient of flexibility is 88, and the Runkel factor is 2.57 (group V: wood not usable for making paper). Fast drying may cause checking or produce superficial fissures and slight twistings. The wood is difficult to work due to its high density, but it takes a good finish; surfaces with straight grain are smooth after brushing. Differences in radial contraction may be found, depending on wood origin. When in use, the timber shows excellent natural durability and resistance to termites and fungal rotting. Wood preservation is difficult. It is used in heavy general construction, railroad ties, pilings and other marine construction (in waters lacking *Taredo* borers), bridges, posts, sticks, poles for fences and houses, turnery, inlay, and agricultural instruments (Flores 1994e, Llach 1971).

Inflorescence occurs from October to January, and sometimes extends to February; however, its development is delayed during the maturation period of the fruit crop from the previous year. Flowers are grouped in spikes; spikes are solitary in the axile of distal leaves in minor branchlets. Inflorescence is short-pedunculated, with a thick rachis and rusty pubescence. Flowering is irregular or episodic, and flowering within the population is asynchronous (Flores 1994e). The number of trees flowering in each episode is variable. Pollination is carried out by beetles, drones, bees, and sometimes birds. There are many flowers per inflorescence, but few fruits are produced. Flowers are small, perfect, epihypogynous, subsessile, subtended by an ovate bract that is small and deciduous; the flowers are creamy and fragrant. The calyx is pentaerous, gamosepalous, cupuliform, toothed distally, puberulous, and marcescent; it bears numerous basal glands; the corolla is pentamerous, gamosepalous, tubular, campanulate, toothed distally, and covered internally by erect trichomes. The androecium has two verticils, each with five epipetalous stamens; the alternipetalous verticil separates from the corolla above the antipetalous verticil. The ovary is globose, two- to five-locular, dusty ferruginous, and fused to the androecium, perianth, and hypanthium at base; the style is short and the stigma is pentalobed.

Fruit ripening occurs from January to March or April; however, fruits may be found in other months, especially November and December. The fruit is a monospermic drupe, ovoid, reaching 3.0 to 4.5 cm in length and 2.0 to 2.8 cm in width (Flores 1994e, Hiepko 1993). Fruits are dispersed by omnivorous birds, bats, and small rodents; gravity causes some fruits to fall. Bats are attracted by the purplish brown or black color of mature fruits and the rancid odor produced by the fermenting substances of the pericarp (butyric acid) (Flores 1994e). Seeds are ovoid or globose and have a brown seedcoat formed by testa and tegmen.

Fruits must be collected from healthy trees. Seeds average 220 to 240 per kg (seed plus endocarp) with 48 percent water content. Most water is found in the endosperm. Seeds surrounded by the endocarp keep their viability under natural conditions (those prevailing in the humid tropical forest floor: 24 to 30 °C, air humidity 95 percent or more), but viability is gradually lost with increasing dehydration. Fruits average approximately 190 to 200 per kg.

Fresh seeds (seed plus endocarp) must be soaked for 24 hours before sowing. Seed behavior is recalcitrant. Germination is epigeal and the seedling is cryptocotylar. Germination of freshly collected seeds (fruits), soaked 24 hours, is 85 percent. Endocarp removal increases dehydration and speeds embryo death (Flores 1994e).

Seeds do not require special treatment and can be sown in beds or plastic bags filled with humid sand or a mixture of soil and sand. Germination occurs in either the shade or direct sunlight, provided humidity is kept stable. Under greenhouse or nursery conditions, root protrusion begins 4 months after sowing. Four equidistant longitudinal fissures at the distal end of the endocarp are the first signal observed (Flores 1994e). Seedling growth is very slow; 12-month-old seedlings average 40 cm in length (Flores 1994e).

ADDITIONAL INFORMATION

French Guiana was inhabited by the Creoles, descendants of African slaves who were taken to this land by the colonists. They called the *Minquartia guianensis* tree "le minquar de la Guiane." This native name evolved into *Minquartia*, a term used by Aublet (1775) to name the genus in his book Histoire des plantes de la Guiane Françoise (Flores 1994e). The species name refers to the place of origin.

The leaf's adaxial surface is green-olivaceous, sometimes grayish, dull and finely pubescent in young leaves; mature leaves have a bright and glabrous surface. The abaxial surface is dull, verrucose, light grayish green and pubescent; trichomes are dendritic. Leaf blade is amphistomatic; stomata are paracytic. Leaf venation is pinnate eucamptodromous; the midvein is thick, straight, and abaxially prominent. Secondary veins are subparallel with an acute moderate angle (45 to 65°) of divergence with respect to the midvein; tertiary veins are transverse and subparallel, with few branches. Leaf length and width are quite variable (Flores 1994e).

Filaments are glabrous, distally filiform, and adnate to the corolla in the basal third; anthers are globose, minute, and longitudinally dehiscent. Pollen is tricolpate, finely grooved near the pores, angular in polar view and flat ellipsoidal in equatorial view, with a diameter of 23 to 25 mm; exine is smooth (Burger 1983, Hiepko 1993, Sleumer 1984). There is one anatropous, bitegmic, crassinucellate ovule per locule; a single ovule completes its development (Flores 1994e).

The ovary and tissues from the androecium, perianth, and hypanthium form the cup-like basal structure of the fruit wall. The exocarp is thin, membranous, and shiny green with glandular dots in the surface of immature fruits. The mesocarp is fleshy and slightly hard; it has abundant latex and an astringent taste. When fruits mature, the mesocarp softens and acquires a sugary taste. Fruits that fall on the ground undergo a rapid fermentation, acquiring a black coloration, which precedes mesocarp fermentation and rotting. The endocarp is thick, hard, yellowish, woody, and has a well-developed vascular supply; its external surface is irregular.

The seed has a thin testa that splits when root protrusion begins. The tegmen is thin but develops small ruminate invaginations which penetrate the endosperm. It dehydrates and reduces gradually during seed maturation, reaching a papyraceous texture. The endosperm is cellular, massive, hard, whitish, and slightly ruminate; it has a high content of starch and lipids. The embryo is minute (1.6 to 2.0 mm long), rudimentary, pyriform, whitish, with a violaceous basal end, and is surrounded by endosperm (Flores 1994e).

In the 4-month period from sowing to fissure formation and root emergence, the rudimentary embryo develops inside the seed and reaches 1.2 to 1.3 cm in length. It increases to 10 times its initial size and begins hypocotyl and cotyledon development. At 5 months, the embryo initiates root development; the root emerges throughout the endocarp distal opening produced by fissure formation; at least half the root remains inside the seed for several weeks. Cotyledon development increases inside the seed; the cotyledonar blades are fused distally and have an haustorial function. Six-month-old seedlings are 3.0 to 3.2 cm long; they exhibit an intense development of root, hypocotyl, and cotyledons. The cotyledonar blades elongate and widen, developing a complex vascular system inside the seed. The initially whitish blades change with age to pale pink, dark pink, and purplish pink; veins are dark purple (Flores 1994e). In 7-month-old seedlings the hypocotyl increases its development; the seed, surrounded by the endocarp, with the cotyledons enclosed, elevates from the ground. Cotyledonar petiole elongation takes place at 8 months. They enclose the plumule. When they extend longitudinally and bend backwards, they form an inner opening through which the plumule emerges. The cotyledonar petioles abscise approximately 1 month later and the seeds containing the cotyledonar blades and remains of the endosperm fall (Flores 1994e).


1cm
4cm