Laguncularia racemosa (L.) C.F. Gaertn.

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COMBRETACEAE (COMBRETUM FAMILY)

No synonyms

Akira, cinchuite, green turtle-bough, mangel, mangle, mangle amarillo, mangle blanco, mangle bobo, mangle marequita, mangle prieto, manglier blanc, mangue, mangue branco, palétuvier, palo de sal, patabán, white mangrove (Bohorquez 1996, Little and Wadsworth 1964)

Laguncularia is a monotypic genus in a moderately large, tropical, woody family consisting of about 20 genera and 500 species (Tomlinson 1986). The only other mangroves or mangrove associates in the Combretaceae are two Old World species of the genus *Lumnitzera* and the New World species *Conocarpus erectus*. The native range of *L. racemosa* includes the coast of central and southern Florida, Bermuda and most of the West Indies, both coasts of continental tropical America from Mexico south to Brazil and northern Peru, and the coast of West Africa from Senegal to Angola (Chapman 1976, Graham 1964, Little and Wadsworth 1964).

Laguncularia racemosa is a moderately fast-growing, small, evergreen, often multiple-stemmed tree. Usually shorter than 15 m in height and smaller than 30 cm d.b.h., the tree may reach heights of 25 m and 70 cm d.b.h. or more (Jiménez 1985, Nellis 1994). The species is restricted to coastal locations very near sea level. It typically occurs on the landward fringe of mangrove communities but occasionally grows on lower elevation, more frequently flooded sites. It also readily colonizes disturbed sites, where it may form nearly pure stands (Tomlinson 1986). *Laguncularia racemosa* grows on a wide variety of soil types, including silt, clay, sand, peat, and marl (Jimenez 1985). The species grows in areas with average annual rainfall of between 800 and 7000 mm per year and appears to be limited to areas where the coldest average temperatures are above 15.5 °C (Jiménez 1985). The species is often regarded as somewhat weedy in nature and frequently invades sites planted with *R. mangle* or *Avicennia germinans* (L.) L. (Padron 1996).

The wood of *L. racemosa* is moderately heavy (specific gravity is 0.6 to 0.8), hard and strong but not very durable (Little and Wadsworth 1964, Southwell and Bultman 1971). The sapwood is light brown and the heartwood is yellowish brown. The wood is used for a variety of purposes, including small poles, fenceposts, tool handles, fuelwood, and charcoal (Little and Wadsworth 1964). The bark contains a significant amount of tannin suitable for commercial uses (Walsh 1977). *Laguncularia racemosa* has also been referred to as a honey-producing plant (Nellis 1994, p. 111).

The greenish-white, fragrant flowers occur in loose terminal clusters (panicles). Some flowering occurs throughout most of the year, but in Florida and the Caribbean it peaks in May and June. *Laguncularia racemosa* may flower and produce fruit when less than 2 years old and 1.5 m in height (Holdridge 1940a, Little and Wadsworth 1964). *Laguncularia racemosa* has been described as functionally dioecious, with trees having male only or both male and perfect flowers (Tomlinson 1980). Both types of flowers are similar in appearance. The difference between trees with male-only flowers (non-fruiting) and perfect flowers (fruiting), however, is readily apparent in late summer (Tomlinson 1980).

The fruit is slightly fleshy and one-seeded (drupe); it is gray-green or pea green when immature and brownish at maturity (Little and Wadsworth 1964, Rabinowitz 1978a). Fruits are flattened-obovoid-ellipsoid (lens-shaped) and about 2 cm long. The mean weight of fruits collected in Panama was 0.41 g (2,440 per kg) with the pericarp and 0.21 g (4,760 per kg) without the pericarp (Rabinowitz 1978b). Fruits typically mature 2 to 3 months after flowering, with most available from July to October in Florida and the Caribbean (Jimenez 1985, Padron 1996, Tomlinson 1986) and from mid-August to late November in Panama (Rabinowitz 1978a). Rabinowitz (1978a) reported seeing no freshly dropped fruits between December and July. The fruits, which are generally referred to as propagules, float and are widely dispersed by water. The seed some-

times begins germination while still on the tree or while floating in the water, and floating propagules commonly have roots (Little and Wadsworth 1964, Rabinowitz 1978a).

Propagules can be collected directly from the trees, from the soil surface, or while they are floating in open water (Padron 1996, Snedaker and Biber 1996). One useful technique is to spread nets or tarps under the mother trees to capture the propagules as they fall. Propagules should be mature (freshly abscised or about to abscise) and free of insects or physical damage. Little information is available on storage of *L. racemosa* propagules (Snedaker and Biber 1996), but storage for longer than about 10 days is not recommended. Rabinowitz (1978a) found that the capacity of propagules to root declined after about 8 days of simulated dispersal, and the number establishing seedlings dropped dramatically after 10 days.

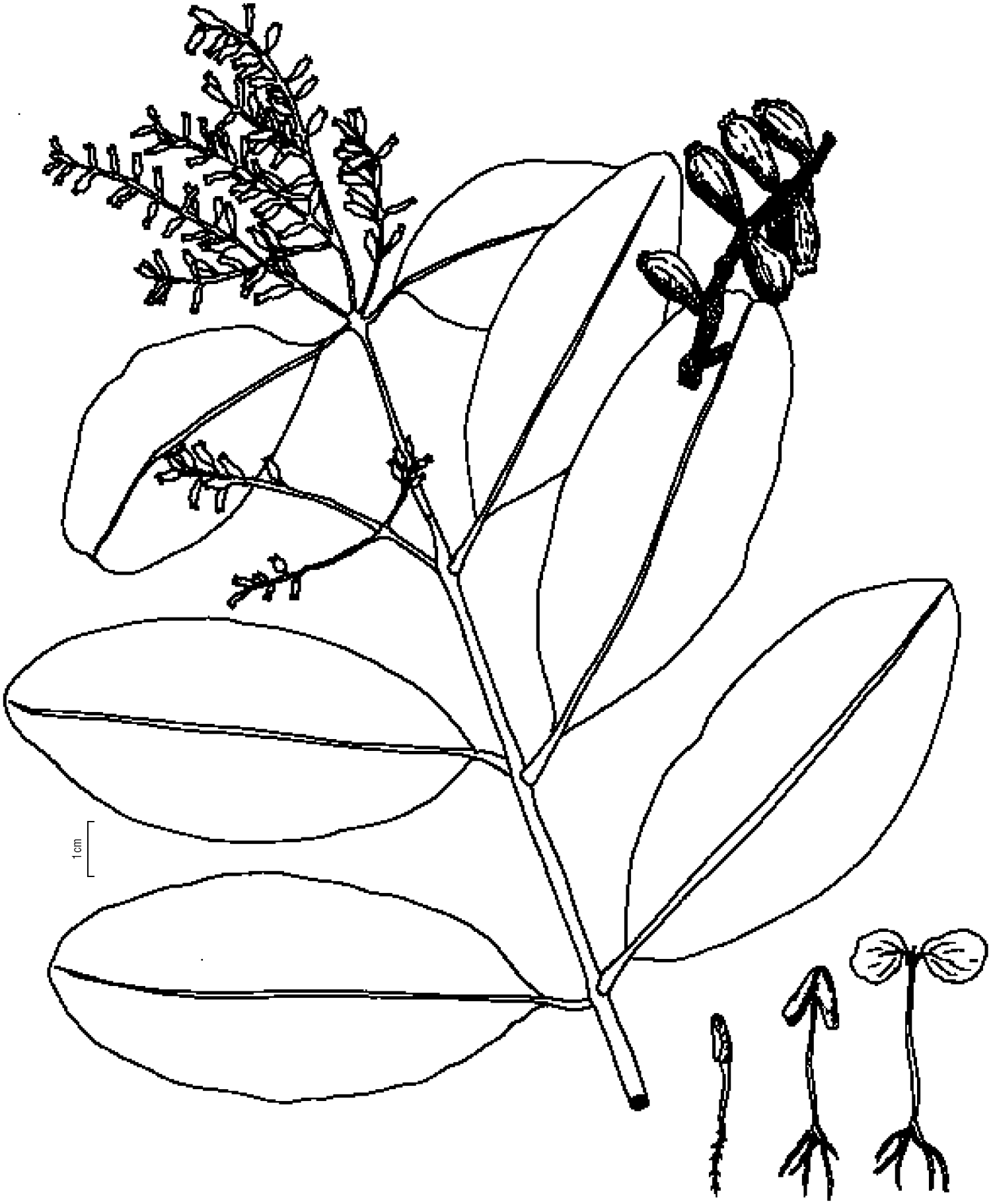
Propagules typically root in 5 to 10 days with no pretreatment. Propagules can also be soaked until the radicle emerges about 1 cm and then sowed by carefully inserting the radicle into the soil (Crewz 1998). If the propagules are soaked before sowing, the water should be changed frequently, ideally every day.

In the nursery, *L. racemosa* propagules are generally sowed in tubes or small pots and grown under ambient conditions. Keeping the pots half-filled with water prepares the seedlings for planting on anaerobic substrates, and periodic watering with brackish or saline water will reduce subsequent planting shock on saline sites. Although easy to grow in nurseries, seedlings are occasionally damaged or killed by scales, aphids, caterpillars, wood and propagule borers, and fungal infections.

Seedlings attain a height of approximately 60 to 90 cm after 1 year in the nursery and can be outplanted. Older, larger seedlings may be sold in 4, 12, 28, or occasionally even 40-liter containers (especially in Florida). To ensure a desirable root-shoot balance when planting, some people trim the terminal bud of larger seedlings once they reach about 1 m (Crewz 1998).

Establishment by direct sowing and by broadcasting propagules has been successful in Cuba (Padron 1996). Success with these techniques may be more limited in Florida, where high losses result when propagules are washed away before anchoring (Lewis and Haines 1981). Success increases on well-protected, low-energy sites and in areas with low levels of seed predation. Large seedlings with well-developed root systems or smaller seedlings in protectors, such as PVC pipes should be planted on exposed sites. In general, however, *L. racemosa* is not as well-suited for exposed sites as are common associates such as *R. mangle* and *A. germinans*.

In all but the most northern parts of its range, *L. racemosa* seedlings or propagules can be planted any time of the year, but cold and dry periods should be avoided (Snedaker and Biber 1996). The best time to plant nursery-grown seedlings produced using fresh water without acclimation to salt may be in seasonally rainy periods, which may reduce the shock caused by sudden exposure to high salinity (Barnett and Crewz 1989). Outplanted seedlings may grow about 60 to 75 cm per year (Barnett and Crewz 1989).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