

Pseudosamanea guachapele (Kunth) Harms

E. M. FLORES

Academia Nacional de Ciencias de Costa Rica, Costa Rica

FABACEAE (BEAN FAMILY)

Acacia guachapele Kunth (Nova Genera et Species Plantarum 6: 281-282; 1823); *Acacia guachapele* (Kunth) Dugand (Nova Genera et Species Plantarum 6: 281-282; 1823); *Lysiloma guachapele* (Kunth) Benth. (Transactions of the Linnean Society of London 30(3): 533; 1875); *Pithecellobium longepedatum* Pittier (Contributions from the U.S. National Herbarium 20[12]: 464-465; 1922); *Samanea samanigua* Pittier (Arboles y arbustos nuevos de Venezuela 4-5: 54; 1925); *Albizia longepedata* (Pittier) Britton and Rose ex Record (Tropical Woods 11: 14; 1927); *Pithecollobium samanigua* (Pittier) J.F. Macbr. (Candollea 6: 4; 1934); *Pithecolobium guachapele* (Kunth) J.F. Macbr. (Field Museum of Natural History, Botanical Series 13[3/1]: 54; 1943); *Albizia guachapele* (Kunth) Dugand (Phytologia 13: 389; 1966)

Cadeno, cenízaro macho, gavilán, genízaro macho, guachapele, guamarillo, guayaquil, samanigua, tabaca (Record and Hess 1949, Salas-Estrada 1993, Zamora 1991)

The geographical range of *Pseudosamanea guachapele* extends from southern Mexico, throughout Central America, to Ecuador in South America (Holdridge and Poveda 1975, Zamora 1991).

Pseudosamanea guachapele is a medium-to-tall tree reaching 20 to 30 m in height and 50 to 100 cm d.b.h. The crown is extended and flat; the young twigs are ferruginous tomentose and the bark is light gray, with wide plates between fissures (Bentham 1875, Holdridge and Poveda 1975, Zamora 1991). The leaves are bipinnate, paripinnate, with 2-(4-5)-6 pairs of opposite or subopposite pinnae, each with 3 to 9 pairs of foliolules (pinnules). *Pseudosamanea guachapele* is a canopy (emergent) tree and rare (abundance of 0.1 to 0.01 per ha or between 1 per 10 ha and 1 per 100 ha). The species grows primarily on plateaus or flatlands with slopes of 5 percent or less and alluvial or sandy soils with good or moderate drainage (Hartshorn and Poveda 1983, Nichols and González 1992a, 1992b). Although usually found at low elevations, *Pseudosamanea guachapele* can grow at elevations of 1200 m. This tree is typical of the tropical dry forests of the Pacific lowlands in Central America and grows where temperatures range from 22 to 32 °C (mean annual biotemperature above 24 °C) and rainfall fluctuates from 1000 to 2500 mm.

The dry heartwood is reddish gray and the sapwood brownish gray. The wood has straight or interlocked grain with dark stripes, low luster, and medium texture. The figure has

glare in the radial surface and dark vertical lines. The wood is heavy (green weight 1200 to 1300 kg per m³, with 60 to 62 percent of moisture; specific gravity is 0.65 to 0.70). Odor and taste are noncharacteristic (Creemers and Lemckert 1981). Volumetric contraction is low (9.9 to 10.2), and the mechanical properties are medium. The air-dried wood splits on the sides and ends. The wood is moderately easy to work; it saws and polishes well. The natural durability is medium, but the wood impregnates well. The treated wood can be used in heavy construction, posts, fences, floors, furniture, railroad foundations, boxes, and handles. It is good for papermaking (Runkel Factor = 0.51; Peteri's Coefficient = 52 to 53). The wood is also used as firewood. *Pseudosamanea guachapele* is a nitrogen-fixing tree with possibilities for greater use (Nichols and Rodríguez 1990). The species has been used primarily in monospecific plantations, although some experiments introduced it in mixed plantations, grasslands, and tacotales (lands in early natural regeneration) to improve soils (Nichols and González 1992a, 1992b).

The tree commonly flowers from December through March along its geographical range. The flowers are crowded in pedunculate, umbellate inflorescences; peduncles are ferruginous (Bentham 1875, Holdridge and Poveda 1975). Flowers are white or creamy, and pentamerous. The calyx is gamosepalous, valvate, narrow-campanulate, toothed apically, pubescent, and 6 to 7 mm long (Bentham 1875, Holdridge and

Poveda 1975, Zamora 1991). The receptacle is subglobose; the corolla is gamopetalous, valvate, infundibular, pubescent, and 9 to 10 mm long (Bentham 1875, Zamora 1991).

Pseudosamanea guachapele usually produces pods February through May. The pod is thin, flat, chartaceous, widely oblong-linear, 15 to 20 cm long, and 2.5 to 3.5 cm wide. Dehiscence takes place along the ventral suture while the dorsal suture, thicker than the ventral, remains indivisible; the valves reflex tardily (Bentham 1875). Pericarp is golden brown or yellowish, silky pubescent, and slightly wrinkled transversely. The mesocarp is inconspicuous, and the endocarp is shiny, whitish, and nonseptate. Pods usually average 12 to 13 seeds; the seeds are transverse, not overlapping, in one series; the funiculus is long, filiform, whitish, coiling or plicate (Gunn 1984). Seeds are ovate, laterally compressed, 0.8 to 0.9 cm long, 0.45 to 0.55 cm wide, 1.0 to 1.2 cm thick, and without funicular aril. The testa is thick, slightly glossy, creamy, monochrome (if fresh and healthy), and hard, with pleurogram, linea fissura open at the micropylar end, and fracture lines.

The pods must be collected before dehiscence, placed in open sacks, and exposed to full sunlight. Once the pods are open, the seeds are removed by hand (Nichols and González 1992a, 1992b). Seeds average 22,000 to 24,220 per kg (Centro Agronómico Tropical de Investigación Enseñaza 1985, Nichols and Rodríguez 1990, Ramírez and Morillo 1987), depending on the site of collection and moisture content of the seeds. The seeds are hard and orthodox, and viability under storage at ambient temperature (24 to 32 °C) slowly declines. The seeds are frequently attacked by weevils (Nichols and González 1992a, 1992b).

Seeds can be stored for 2 years and maintain acceptable germination success. Lighter colored seeds germinate better; those with a dark areole in the lateral faces do not germinate well because the embryo is dehydrated. Fresh seeds have 70 percent germination with no pretreatment (Centro Agronómico Tropical de Investigación Enseñaza 1985). Tresemer (1989) reported 60 percent germination of seeds sown directly in plastic bags with germination beginning in 4 to 8 days. Seeds soaked in hot water (80 °C) for 1 minute followed by a bath in lukewarm water (30 to 40 °C) for 24 hours have 82 percent germination if damaged seeds are discarded. After imbibition the seeds must be sown in greenhouse beds filled with sand at ambient temperature. The radicle protrudes in 3 to 5 days and germination is quite uniform. In another method, the seedcoat end opposite to the micropyle is cut and the seeds are placed in running water for several hours. Germination after this pretreatment has been greater than 90 percent (Nichols and González 1992a, 1992b). Germination is epigeal and the seedling is cryptocotylar. The first eophyll is pinnate. Seedlings

must be transplanted to plastic bags before the first eophyll completes its expansion.

Some seeds have been sown directly in the soil, and the seedlings outplanted as pseudosticks. If the seedlings develop in bags, they must be outplanted in 2 to 3 months (Nichols and González 1992a, 1992b). In the field, the seedling roots are attacked by joboto (insect larvae of *Phyllophaga* spp.), and the foliage is eaten by ants (*Atta* spp. and *Acromyrmex* spp.). Another insect (unidentified) eats the bark, forming rings around the shoot; bark and phloem damage frequently result in sapling death (Nichols and González 1992a, 1992b). Seedling survival in plantations is about 90 percent; survival diminishes drastically if the seedlings are unhealthy or the plantation does not perform appropriate maintenance procedures. The plantation must be cleared three to four times during the first year, and saplings require axis selection and pruning of undesired shoots (Nichols and González 1992a, 1992b). Planting distance is usually 3 by 3 m. Longitudinal growth in the first year is approximately 1 m. On the Osa Peninsula, 9-year-old juveniles reached 12 to 14 m in height and 10 to 12 cm d.b.h. (Tresemer 1989). In the dry tropical forest areas of Costa Rica, seedlings produced from Costa Rican seeds grow faster than those from Honduran seeds; 3-year-old saplings reached an average height of 3.53 m and an average d.b.h. of 6 cm (Paterson and others 1996a).

ADDITIONAL INFORMATION

Leaf foliolules are pubescent, ovate, and obovate, with the upper semilimb 2:1 trullate. The apex is round or emarginate, the base is irregular, and the blade silky pubescent abaxially. The petiole is ferruginous tomentose and pulvinate, with an extrafloral nectary in the middle. The pulvinus is adaxial, basal, and oblong. The rachis bears extrafloral nectaries toward the distal end. The petiolules bear basal and adaxial pulvinuli. The stipules are large, membranous, and sometimes long persistent, although finally falling away (Bentham 1875, Zamora 1991).

The androecium has 15 to 20 stamens; the stamens are long, monadelphous, and basally adnate to the corolla, forming a tube; each anther has a few polyads of pollen in each locule (Bentham 1875, Guinet 1981, Nilsen 1981). The gynoecium is monocarpellar, and placentation is laminar. The gynoecium has several anatropous, bitegmic, crassinucellate ovules.

The flowers are presumably pollinated by moths, although sometimes they are visited by birds. The pollen has internal pores, nonequatorial apertures of the simple porate type, exine areolate and tectum perforate (Guinet 1981).

The seed hilum is concealed by funicular remnants.

Endosperm and perisperm are absent. The embryo is large, laterally compressed, and investing; the embryo axis is slightly reflexed and the plumule is well developed with several foliar primordia. The cotyledons are large, thick, and ovate, with a simple, irregular split over the radicle, concealing all but the tip of the radicle. Many seeds are damaged by insect larvae while in the pod.

