

Fabaceae Pea family

Leucaena leucocephala (Lam.) de Wit.

leucaena

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Other common names. leadtree, zarcilla, popinac, koa haole.

Synonyms. *Leucaena glauca* (L.) Benth., *L. blancii* Goyena, *L. glabrata* Rose, *L. greggii* Watson, *L. latisiliqua* (L.) W.T. Gillis, *L. salvadorensis* Standl.

Growth habit, occurrence, and use. The genus *Leucaena* includes about 50 species of trees and shrubs that are native to Central America and southeast Asia. Leaves, legumes (pods), and young seeds of at least 4 *Leucaena* species have been used by humans for food since the time of the Mayans (Brewbaker and others 1970). *Leucaena leucocephala* (Lam.) de Wit. is the most widespread member of the genus, originated in Mexico and Central America (Brewbaker and others 1972) but is now considered pantropical. It is found throughout the West Indies from the Bahamas and Cuba to Trinidad and Tobago and has become naturalized in southern Texas and southern Florida; it also has been planted in California (Little and Wadsworth 1964). The species was introduced to Puerto Rico and the Pacific Islands during the Spanish colonial era. It was introduced to Hawaii about 1864. It invades cleared areas and forms dense thickets, either as a shrub or small tree up to 10 m in height (Takahashi and Ripperton 1949). This species is evergreen when moisture is not a limiting factor. Strains of leucaena can be categorized as one of two types: the common (or Hawaiian) and the giant (or Salvadorian) (Brewbaker and others 1972). The common type, representing the strains most commonly naturalized outside of the species' native range, is a drought-tolerant, branchy, abundantly flowering, and aggressive shrub or small tree. The Salvadorian type is an erect tree that attains heights up to 20 m (Brewbaker and others 1972; NAS 1984). In many parts of the world, the species is considered a weed.

Leucaena is used for a variety of purposes, including timber, fuelwood, forage, and organic fertilizer. It is planted as a shade tree for coffee, cacao, and other cash crops; for soil fertility improvement; erosion control; and site preparation in reforestation (Neal 1965; NAS 1984; Parrotta 1992; Whitesell 1974). The light reddish heartwood is easily worked but is of low to medium durability. It is used for light construction, boxes, and particleboard. The wood is considered a promising source of short-fiber pulp for paper production. The protein-rich leaves and legumes are widely used as fodder for cattle, water buffalo, and goats. The protein content of dry forage ranges from 14.0 to 16.2% (Oaks and Skov 1967). Depending on variety, the protein consists of 19 to 47% mimosine (Brewbaker and others 1972), an amino acid that can cause weight loss and ill

health in monogastric animals such as pigs, horses, rabbits, and poultry when leucaena fodder comprises more than 5 to 10% (by weight) of the diet. Ruminants (cows, buffalo, and goats) in most parts of the world (except for Australia, Papua New Guinea, and parts of Africa and the Pacific) have stomach microorganisms that render mimosine harmless.

Flowering and fruiting. Flowering phenology varies widely among varieties and with location. The common type varieties flower year-round, often beginning as early as 4 to 6 months after seed germination. The giant varieties flower seasonally, usually twice a year. The spherical, whitish flower heads are 2.0 to 2.5 cm in diameter and are borne on stalks 2 to 3 cm long at the ends or sides of twigs (Parrotta 1992). The fruits, generally produced in abundance from the first year onward, are flat, thin legumes that are dark brown when ripe; they measure 10 to 15 cm long and 1.5 to 2.0 cm wide. A legume contains 15 to 20 seeds (Parrotta 1992). The seeds are small (8 mm long), flat, teardrop-shaped, shiny, and dark brown with a thin but fairly durable seedcoat. The seeds are usually released from dehiscent legumes while still on the tree, although unopened or partially opened legumes may be carried some distance by wind. The legumes are commonly eaten by and pass through the digestive tracts of livestock, which appear to be important dispersal agents in pastures.

Collection, extraction, and storage. Legumes may be collected from branches when ripe, before dehiscence; they should be sun-dried and then threshed to release seeds. Threshing is commonly done by beating the dried legumes in cloth bags. There are about 17,000 to 24,000 clean seeds/kg (11,000/lb) (Parrotta 1992). Unscarified seeds will remain viable for more than 1 year when stored under dry conditions at ambient temperatures and up to 5 years stored at 2 to 6 °C. Dried, scarified seeds will remain viable for 6 to 12 months (van den Beldt and others 1985; Daguma and others 1988; Parrotta 1992).

In Hawaii the larvae of a recently introduced beetle *Araecerus levipennis* Jordan can destroy the seed. At times, virtually all of the legumes in certain stands are infested (Sherman and Tamashiro 1956). Seeds should be fumigated as soon as possible after collection to kill the larvae. Fumigation is accomplished by exposing the seeds to methyl bromide at a concentration of 32 g/m³ (0.032 oz/ft³) for 2 hours at 27 °C.

Pregermination treatments. Although seeds may be sown without scarification, mechanical scarification (abrasion with sandpaper or clipping the seedcoat) or either of the following 2 treatments are used to ensure more rapid and uniform germination (Parrotta 1992): (a) immersion in hot water (80 °C) for 3 to 4 minutes followed by soaking in water at room temperature for up to 12 hours or (b) soaking in concentrated sulfuric acid for 15 to 30 minutes. Scarification may be followed by inoculation with nitrogen-fixing *Rhizobium* bacteria (mixed with finely ground peat) after coating the seeds with a gum arabic or concentrated sugar solution. Presowing inoculation of seeds facilitates good field establishment in soil devoid of effective rhizobia strains.

Germination tests. Germination rates are commonly 50 to 98% for fresh seeds (Daguma and others 1988; NAS 1984). Scarified seeds germinate 6 to 10 days after sowing; unscarified seeds germinate 6 to 60 days after sowing (Parrotta 1992). Germination in leucaena is epigeal.

Nursery practice. Leucaena seeds germinate on or near the soil surface and should not be planted deeper than 2 cm (3/4 in). Nursery media should be well-drained, have good nutrient and

water-holding capacity, and have a pH between 5.5 and 7.5 (van der Beldt and Brewbaker 1985). Light shade is recommended during the first few weeks of seedling development, and full sun thereafter (Parrotta 1992). Taproot development is rapid in young seedlings. Seedlings generally reach plantable size (height of 20 cm or 8 in) in 2 to 3 months. Plantations may be established by direct seeding (Francis 1993); by planting container seedlings, bareroot seedlings, stem cuttings (2 to 5 cm in diameter).

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Figure 1 *Leucaena leucocephala*, leucaena: seed, × 4.

Figure 2 *Leucaena leucocephala*, leucaena: longitudinal section through a seed, × 12.