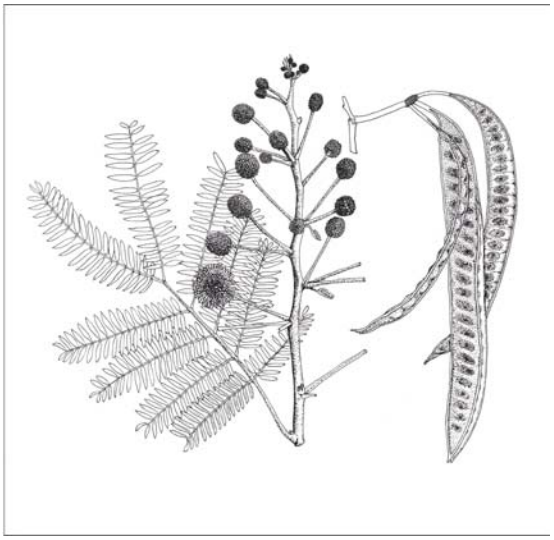
***Leucaena leucocephala* (Lam.) de Wit** leadtree
FABACEAE

Synonyms: *Leucaena glauca* Benth.
Mimosa leucocephala Lam.
Leucaena latisiliqua (L.) Benth.
Mimosa glauca L.
Acacia glauca Willd.



General Description.—Leadtree occurs in three forms or types known as the "Hawaiian" or common type, the "Salvador" or giant type, and the "Peru" type. The common type is widespread and shrubby and will be dealt with in this document. Leadtree is also known as white leadtree, leucaena, tantan, wild tamarind, koa haole, ipil-ipil, zarcilla, guaje, monval, macata, and a host of other names. It commonly reaches 2 to 5 m in height and 5 to 10 cm in stem diameter at breast height. Undisturbed, closed stands usually are of single-stemmed plants; disturbed plants, especially dispersed ones, almost always develop multiple stems. Leadtrees are supported by tap and lateral root systems. They root deeply and extensively and form nodules when appropriate strains of *Rhizobium* bacteria are available. The stem bark is gray or brownish gray, more or less smooth with many lenticels. The sapwood is light yellow, and the heartwood is brown, hard, heavy (specific gravity 0.7), and has visible annual rings. The branches and twigs are grey-green to gray-brown and somewhat brittle in older shrubs. Bipinnate leaves 9 to 25 cm long are borne alternately. There are three to 10 pairs of pinnae each with 9 to 20 pairs of leaflets that are linear-oblong to lanceolate and 8 to 15 mm long. Solitary or paired inflorescences are 12- to 20-mm diameter, axillary heads on 2- to 3-cm-long peduncles. The heads contain numerous fragrant, greenish-white flowers. Usually four to 10 flattened, brown legumes, 10 to 15 cm long, develop per inflorescence. Each legume contains 15 to 20 hard, shiny, brown seeds that are flattened and tear-drop shaped. Leadtree is a polyploid with 2n = 104 chromosomes (Brewbaker 1997, Howard 1988, Liogier 1988, Little and Wadsworth 1964, Pennington and Sarukhan 1968, Stevens and others 2001).

Range.—Leadtree is native to southern Texas and the lowlands of Mexico from about 20° N. south to Nicaragua at about 12° N (Parrotta 2000). The Mexican state of Oaxaca derives its name from the Native American word "Uaxia," which means the "place where *Leucaena* grows" (National Academy of Science 1977). Most authors treat the range in vague terms or state that it is uncertain. The species is established so completely in the West Indies and the tropical lowlands of Central and South America that apparently all adapted sites are occupied and the population supports many natural enemies. While it is assumed that leadtree was spread to these areas through early Spanish commercial activity (Parrotta 2000), earlier introductions by humans or animals cannot be ruled out without archeological evidence. From the mid-1500's onward, leadtree has been spread intentionally and unintentionally throughout the Tropics and the frost-free and lightly frosted subtropics including Florida, Georgia, Arizona, Hawaii, and the U.S. Territories in the Caribbean and Pacific (Natural Resources Conservation Service 2002, Pacific Islands Ecosystems at Risk 2002).

Ecology.—Leadtree can grow on most soils derived from most parent materials in a wide variety of site conditions. It grows fairly well on

disturbed, eroded, and partially compacted soils. However, the species does not grow well in poorly drained soils or periodically flooded soils, in soils with high salinity or those below pH 5.0 or above pH 8.0, at temperatures below 10 °C, and in areas with mean annual rainfall below 750 mm or above 2500 mm (Skerman and others 1988). Leadtree is intolerant of shade. It does best in the open, but competes aggressively in low stands of weeds and grass and will grow in low forests with low basal areas. It often forms thickets that briefly eliminate nearly everything underneath but soon self-thin to fairly open stands with normal understory vegetation. Leadtree is drought tolerant. It folds its leaves under water stress preventing water loss and, under severe conditions, will defoliate until the rains return (National Academy of Sciences 1977).

Reproduction.—Leadtree blooms throughout the year (Pennington and Sarukhan 1968) and may begin blooming as young as 4 to 6 months of age (National Academy of Sciences 1977). The flowers are largely self-compatible and self-fertilized. It takes about 4 months after flowering for pods to mature and liberate seeds (Binggeli 1997). From 10,000 to 21,000 seeds/kg are reported although it is sometimes unclear from what variety they were sampled (Brewbaker 1997, Parrotta 2000). A sample of seeds from shrubby plants from the north coast of Puerto Rico averaged 0.0392 $\pm$ 0.0006 g/seed or 25,500 seeds/kg (author's observation). Leadtree seeds have a hard coat that requires scarification for reliable germination. This can be done by abrasion, or treatments with hot water or concentrated acid. Germination of scarified seed is usually between 50 and 98 percent in 6 to 10 days after sowing. Seed can be stored for up to 5 years at temperatures of 2 to 6 °C (Parrotta 2000). Pods open while still attached to liberate their seeds and are dispersed by granivorous and herbivorous animals (Pacific Island Ecosystems at Risk 2002) and machinery. Detached pods are blown some distance by wind and occasionally retain attached seeds. Reproduction is common in disturbed sites near seed sources. Plants aggressively coppice when burned, cut, or broken off. The plant can be propagated vegetatively from cuttings (Parrotta 2000).

Growth and Management.—Leadtree grows moderately rapidly (not as fast as the giant variety for which most of the data are available). Seedlings may add about 1 m of height in the first year and 0.5 to 0.75 m for 2 or 3 years thereafter. Diameter growth may vary from 2 to 10 mm per year. Individual shrubs live 10 to 20 years or more. Plantations are relatively easy to establish with containerized seedlings or by direct seeding scarified seed into prepared seedspots at the beginning of the wet season. Because of its aggressive nature, it is not advisable to introduce leadtree into areas where it does not already occur. Within the native or naturalized range, disturbed wildlands are usually quickly colonized by leadtree from the soil seedbank or from nearby seed trees. However, where seed is not present, planting the species may be an excellent way of rehabilitating damaged sites. Grass swards should be cultivated or burned or sprayed followed by cultivation before planting. About 5,000 to 10,000 plants/ha should be established for erosion control and sward conversion. Dense stands of leadtree needing control may be slashed and grazed or sprayed with broadleaf herbicide.

Benefits.—Leadtree quickly invades disturbed areas and prevents further erosion while allowing succession to secondary forest cover. It is one of only a few species that can invade and rehabilitate dense tall grass swards such as *Panicum maximum* Jacq. and *Imperata cylindrica* (L.) Raeusch. (author's observation, National Academy of Sciences 1977). Leadtree furnishes food and cover for wildlife, especially browsing animals. The species has been planted widely in agroforestry applications. It is useful for forming erosion barriers, windbreaks, for shade and support, green manure, and cut fodder. It is known to fix useful quantities of nitrogen (Parrotta 2000). Plantations are established for pasture and cut for hay. The foliage is highly digestible (60 to 70 percent) (Brewbaker 1997). Young leaves are reported to contain 68 calories/100 g and 80 percent moisture (Duke 1983). By dry weight, leaves contain 21 percent crude protein, 18 percent crude fiber, 8 percent ash, 6 percent fat, and 46 percent total digestible nutrients (FAO 2002). Cattle readily eat the forage but suffer symptoms of mimosine toxicity if given a pure diet of the species. Pigs and chickens must not be given more than 5 to 10 percent in their diet, but goats have no difficulty with the forage, and sheep can become accustomed to diets rich in leadtree foliage (National Academy of Sciences 1977). The wood is a preferred fuel that burns slowly with little smoke or ash and makes an excellent charcoal (Brewbaker 1997). The stems are used for stakes and tool handles. The seeds are widely employed for making jewelry and placemats (Howard 1988). The young pods and green seeds are cooked as a vegetable,

and the mature seeds are used as a coffee substitute and parched for snacks (Duke 1983). The flowers are a pollen source for honeybees (Little and Wadsworth 1964). Extracts of the roots and bark are a powerful emetic and have been used as an abortifacient (Liogier 1990).

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