

## Leucaena esculenta

guaje rojo, guaje colorado

(Sesse & Moc. Ex DC.) Benth.

Fabaceae - Mimosoideae

### LOCAL NAMES

Spanish (guaje rojo, guaje colorado); Trade name (guaje rojo, guaje colorado)

### BOTANIC DESCRIPTION

*Leucaena esculenta* is a deciduous, small to medium-sized tree 10-15 m tall, 20-70 cm bole diameter, typically multi-stemmed and branchy when young, older trees with a short clear bole to 5 m, heavy spreading branches and an open spreading rounded crown. Bark thick, corky, pale silvery grey, with a metallic sheen like galvanized zinc, smooth, becoming horizontally gnarled; slash bright green then orange-red, shoots angular with 5-6 longitudinal corky ridges.

Leaves bipinnate, 30-40 pairs of pinnae, leaflets 3.5-6.6 mm long by 0.9-1 mm wide, 60-75 pairs per pinna, asymmetric, linear, acute or subacute, glabrous. Petiole gland large, maroon-red, sessile, elliptic, shallowly concave 5.5-8 by 3-4 mm.

Flower head 25-28 mm in diameter, 150-170 flowers per head, in groups of 2-7 at nodes on often one-branched terminal determinate shoots with complete or partial suppression of leaf development, flowers white.

Pods 15-25 cm long, 23-26 mm wide, 1-2 per flower head, oblong to oblong linear, flat, (few) 15-20 seeded, glossy reddish maroon unripe, turning mid orange-brown when ripe, glabrous, opening along both sides. Seed 9-11 mm long, 7-9 mm wide, circular to ovoid, aligned transversely in pods.

The specific epithet means edible.

### BIOLOGY

The main flowering period is between October and November, while fruiting follows between February and March. Trees are deciduous, losing most or all of the leaves during the dry season from January to April in the species natural range.



Mature tree: Etna, Oaxaca, south-central Mexico. (Colin Hughes)



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Group of trees: Tehuacan Valley, Puebla, south-central Mexico. (Colin Hughes)

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### ECOLOGY

*L. esculenta* forms a canopy tree in mid-elevation seasonally dry deciduous tropical forest and at higher elevations in oak, oak-juniper and juniper forest. It can withstand up to seven months dry season and occasional light frost but it does not thrive above 2 000 m. Rainfall in its natural range is highly seasonal and the dry season lasts up to 7 months. Soils are mainly calcareous.

### BIOPHYSICAL LIMITS

Altitude: 400-2 000 m

Mean annual rainfall: 800-1 300 mm

Soil type: *L. esculenta* occurs mainly on soils derived from calcareous parent material, unstratified regosols, shallow and rocky soils which are free draining.

### DOCUMENTED SPECIES DISTRIBUTION

Native: Mexico

Exotic: Honduras, Senegal, Taiwan, Province of China, United States of America



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

**PRODUCTS**

**Food:** In the trees native region, the pods, seeds, and young leaves are gathered from wild populations. The immature pods, leaf and flower buds are edible. They are the traditional greens of the indigenous people of Mexico. They are gathered from June to September. Galls frequently develop on leaves and pods, these are consumed raw, roasted or boiled. Immature seeds are the products most consumed and are either eaten raw, roasted, milled and added to traditional sauces, or cooked in stews. Seeds are gathered in from November to February, when they are still immature. They may be consumed fresh or ground into a paste and sun dried for long term storage. They are also stored after being dried and salted.

**Fodder:** In Mexico, trees are lopped for livestock fodder. Both leaves and unripe pods are consumed. However, low edible fraction, in vitro dry matter digestibility and high-condensed tannin levels limit its importance.

**Fuel:** The tree provides high quality fuelwood.

**Timber:** The wood of *L. esculenta* has an average density of (0.7), with slow early formation of heartwood. It is rarely used in Mexico because trees are protected for pod production. Non-seedy or seedless clones are attractive options for most of leucaena's wood uses, including fuelwood, pulpwood, roundwood, charcoal, parquet, and craftwood.

**Gum or resin:** Analysis of several leucaena gums has revealed that they have the closest match to gum arabic of any gums tested from a hundred or so tropical trees. Although toxicity and related studies are needed, leucaena gum may have potential for use as a substitute for gum arabic. *L. leucocephala* x *L. esculenta* hybrid trees exuded gum copiously. Nine hybrid trees of this pedigree were grown at Waimanalo, Hawaii for four years during which approximately a third failed to produce gum, another third exuded gums sporadically and another third exuded gums heavily. These high gum yielders exceeded the mean annual per-tree gum production (250 g/tree) of gum arabic by *Acacia senegal*. Gum production appeared as balls or drippings from mature bark, and was heaviest in the dry season. Hybrids of this type are seedless, have good vigor and psyllid resistance, and could prove promising for gum production.

**SERVICES**

**Shade or shelter:** It is used as a shade tree especially for coffee.

**Nitrogen fixing:** The tree is nitrogen fixing.

**Soil improver:** Lopped leaves and twigs can be applied as green manure.

**Ornamental:** Hybrids such as *L. retusa* x *L. esculenta* make attractive home ornamentals.

**Boundary or barrier or support:** The tree is planted at field boundaries or as living fences.

**Intercropping:** The species is widely incorporated in cropping systems with annual or fruit crops.

**Other services:** *L. esculenta* is highly resistant to the psyllid (*Heteropsylla cubana*), and it has been used in breeding programmes.

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### **TREE MANAGEMENT**

There are 3 forms of management of *L. esculenta* in its native range: cultivation, selective retention or tolerance of particular individuals in disturbed areas and gathering from purely wild populations. The tree is tolerant of annual lopping and is adaptable to a range of management regimes in agroforestry. Trees are heavily lopped each year during the dry season when pods are produced and resprout vigorously with the onset of rains. In addition, trees are frequently cut to produce livestock fodder. The tree's rapid growth, moderate drought and cold tolerance, and high resistance to the psyllid attack indicate that *L. esculenta* has considerable untapped potential for wider planting.

### **GERMPLASM MANAGEMENT**

There are around 8 700 seeds/kg. Seeds tend to harden with storage. Seed production, although abundant in its native range, can be very sparse under some climatic conditions, such as Hawaii and this may have limited its wider spread.

### **PESTS AND DISEASES**

The seeds of *L. esculenta* are attacked by several bruchid species in the genus *Acanthoscelides* including *A. macrophthalmus*, *A. mankinsii*, *A. boneii* and *A. leucaenicola*.

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### **FURTHER READING**

Bray RA et al. 1997. The World Leucaena Catalogue. Department of Agriculture, The University of Queensland, Brisbane, Australia, 48pp + PC Diskette.

Casas A. and Caballero J. 1996. Traditional management and morphological variation in *Leucaena esculenta* (Fabaceae: Mimosoidea) in the Mixtec region of Guerrero, Mexico. *Economic Botany*. 50(2): 167-181.

Hughes CE. 1993. *Leucaena* genetic resources. The OFI leucaena seeds collections and a synopsis of species characteristics. Oxford Forestry Institute. University of Oxford, UK.

Hughes CE. 1998. *Leucaena*; a genetic resources handbook. Tropical forestry Papers No. 37. Oxford Forestry Institute, Department of Plant Sciences, University of Oxford and Department for International Development.

### **SUGGESTED CITATION**

Orwa C, A Mutua, Kindt R, Jamnadass R, S Anthony. 2009 *Agroforestry Database: a tree reference and selection guide* version 4.0 (<http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp>)