# *Myroxylon balsamum* (L.) Harms

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## FABACEAE (BEAN FAMILY)

*Myroxylon balsamum* var. *punctatum* (Klotzsch) Harms (Notizblatt des Königlichen botanischen Gartens und Museums zu Berlin 43: 97. 1908). *Myroxylon punctatum* Klotzsch (Getreue Darstellung und Beschreibung der in der Arzneykunde Gebräuchlichen Gewächse 14: 12. 1843).
*Myroxylon toluiferum* Kunth (Nova Genera et Species Plantarum 6: 375. 1824).
*Myroxylon toluiferum* A. Rich. (Annales des Sciences Naturelles (Paris) 2: 171-172. 1824).
*Myrospermum toluiferum* (A. Rich.) DC. (Prodromus Systematis Naturalis Regni Vegetabilis 2: 95. 1825)
*Toluifera balsamum* L. (Species Plantarum 1: 384. 1753)

Bálsamo, bálsamo de San Salvador, bálsamo de tolú, bálsamo del Perú, chirraca, chucte, estoraque, nabá, palo de bálsamo, quina, sándalo, yaga-guienite (Chudnoff 1984, Holdridge and Poveda 1975, Record and Hess 1949)

*Myroxylon balsamum* occurs from southern Mexico to the Amazonian region of Peru and Brazil (Berendsohn and Araniva de González 1989, Chudnoff 1984, Ducke 1949, Holdridge and Poveda 1975, Macbride 1943, McVaugh 1987, Standley and Steyermark 1946). The tree has been planted for balsam production in West Africa, India, and Sri Lanka. *Myroxylon balsamum* is an emergent tree, typical in the canopy of pristine primary forests.

*Myroxylon balsamum* is a slow-growing, large tree that reaches up to 45 m in height and 1m d.b.h. The crown is quite round, sometimes open, with dense foliage. The bole is straight with slim, ascending branches and a smooth, grayish brown outer bark bearing abundant lenticels. The inner bark is yellowish and fragrant with a pungent, obnoxious odor (Croat 1978, Holdridge and Poveda 1975). The leaves are alternate, petiolate, imparipinnate, and 8 to 20 cm long including the petiole. The petiole is 1 to 4 cm long and the rachis 5 to 15 cm long. The rachis and petiolules are pubescent and terete. The leaves have five to ten pairs of leaflets that are 3 to 11 cm long, 1.8 to 4 cm wide, lanceolate or elliptic, and alternate on the rachilla. Leaflets have acute to acuminate apex, an obtuse base, and entire margin; they are glabrous, with scattered translucent glandular oil dots or lines (Croat 1978, Holdridge and Poveda 1975). The species is found in evergreen tropical humid forests in low to medium elevations from 100 to 600 m. It grows well on hills or in well-drained areas with moderate slopes with an annual rainfall above 2500 mm and a temperature range of 24 to 30 °C (Croat 1978, Holdridge and Poveda 1975).

The fresh heartwood is reddish brown with an occasional yellowish hue; it turns deep red or purplish upon exposure. It is fairly uniform or striped and sharply demarcated from the white sapwood. The wood is tasteless but has a pronounced, pleasant, spicy, or cedary scent. It is very hard, heavy, tough, and strong. The basic specific gravity (ovendry weight/green volume) is 0.74 to 0.81. Luster is medium to high and golden; texture is medium; and the grain is typically interlocked. The wood is moderately difficult to work but can be finished smoothly with a high natural polish. Radial shrinkage (green to ovendry) is 3.8 percent; tangential shrinkage 6.2 percent; and volumetric shrinkage 10 percent. These values are considered very low for a wood with this density (Record and Hess 1949). The heartwood is reported to be highly resistant to attack by decay fungi (Chudnoff 1984, Record and Hess 1949). Both sapwood and heartwood are difficult to preserve. The wood is used for flooring, furniture, interior trim, and railroad ties (Chudnoff 1984, Record and Hess 1949, Salas 1993). *Myroxylon balsamum* is often used to shade coffee plantations, where it attains a height of 10 m in 10 to 12 years, and 20 m in 25 years. Its vanilla-scented resin, known as bálsamo del Peró, has commercial value. Although formelry credited with great medicinal value, particularly for skin and lung diseases, the

balsam is now used chiefly for perfumery, ointments, and proprietary preparations (García 1974, Record and Hess 1949).

Flowering begins after 5 years and occurs February through June. The flowers are whitish, pubescent, medium-sized, entomophilous, and grouped in simple axillary or terminal racemes 20 cm long. The flowers have small caduceus bracts and bracteoles and a campanulate calyx 3.5 to 4.5 mm long, with fine ribs. The flower shows the typical descending aestivation, which is characteristic of the petals of papilionaceous flowers (Polhill and Raven 1978). There are five irregular lobes; the standard is clawed, broad, and orbicular. The wings and keel petals are subequal, free, narrow, and spatulate. The flower has 10 stamens, free or shortly united at the base, which fall with the petals. The anthers are uniform, acuminate, and longer than the filaments. The ovary is stipitate, sparsely villous, with one or two suspended ovules. The style is short, filiform, and incurved and has a well-defined terminal stigma.

The fruit is a flat, indehiscent, samaroid, winged pod that is stipitate, narrowly obovate, 7 to 11 cm long, and 2 cm wide; it narrows toward the base. The pod wings mimic seeds; they are up to 8 cm long and 1 to 2 cm wide and have many veins crowded submedially; the lower wing is narrower than the upper wing. The fruit is monochrome yellowish brown when dried. Fruit dispersal is anemochorous. Dry fruits are found on the ground November to January. The apical seminiferous area is turgid and has one subreniform seed that is 15 to 18 mm long. The seedcoat is membranaceous and compressed by the pericarp. The seed lacks pleurogram and fracture lines (Allen and Allen 1981, Croat 1978, Gunn 1981, Holdridge and Poveda 1975, Polhill and Raven 1978).

Fruits must be soaked in running water for 24 hours to soften the pericarp and facilitate seed extraction. The species is reproduced by seed. Seed behavior is orthodox. Germination is hypogeal and seedlings are cryptocotylar. Under greenhouse conditions, germination is 60 to 75 percent. Root protrusion begins 8 to 10 days after sowing.

Natural regeneration is abundant mainly under the crown of parent trees, where seeds attain up to 80 percent germination. However, fungi, insect larvae, and other pathogens may cause fruit, seeds, and embryos to rot. The scarce seedlings face low light availability, which hinders their chances for survival; very few reach intermediate ages in the forest.

## ADDITIONAL INFORMATION

The Spaniards introduced the balsam produced by *M. balsamum* into Europe in the 16$^{th}$ century. El Salvador is the primary producer of balsam; however, during the colonial era the product was often sent to Peru for shipment to Spain. Balsam harvesting proceeds throughout the year, particularly during the dry season, December to April. The method consists in making numerous V-shaped incisions in the bark and collecting the balsam, which flows through the incisions into vases. Another method involves removing 15 to 25 cm of bark 30 cm above the ground and covering the wound with a piece of cotton cloth to absorb the liquid. When the natural flow ceases, scorching stimulates it. The impregnated rags are boiled in water and pressed. The best trees yield 1.5 to 2.5 kg of balsam per year for almost 30 years, but many trees die as a result of tapping (García 1974, Record and Hess 1949).

The balsam is yellowish brown, transparent, and a little viscous. It often solidifies into small, bright, crystalline pieces, which have a pronounced, pleasant, spicy scent. In addition to resins, the balsam also contains free benzoic acid, benzoic ethers, and a little vanillin. The active components of the balsam are benzilbenzoic and benzilcinnamic ethers (75 percent), cinnamic and benzoic acid (12 to 15 percent), and vanillin (0.08) (García 1974).


2cm
2cm