# Factsheet
# Botanical Data: Tara

*Caesalpinia spinosa* (Molina) Kuntze

## Project

# Drafting botanical monographs (factsheets) for five Peruvian crops

**Factsheet – Botanical Data: Tara - Caesalpinia spinosa (Molina) Kuntze**

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# I. BOTÁNY

**Genus.** *Caesalpinia* L. *sensu lato* is a member of the Caesalpiniaceae family (= Fabaceae, subfamily Caesalpinioideae), pantropically distributed in forests, savannahs, and semi-deserts; it includes close to 150 species, 40 of which are found in South America (11). Two subgenera are currently accepted in this genus: *Caesalpinia* L., with species in the Americas, Africa, and Asia that present fruit without wings, and *Mezoneuron* (Desf.) Vidal ex Herendeen & Zarucchi, with exclusive Old World species that feature fruit with wings.

*Caesalpinia* species are trees, shrubs, or perennial herbs, some being climbers, with pari- or imparipinnate, uni- or bipinnately compound leaves. Leaves may or may not be armed. Flowers possess imbricate and falling sepals. Ovary is comprised of one carpel, develops after pollination, and produces one papyrus-like or woody legume that can be smooth, thorny, glandular, or covered with ramified hairs.

**Morphology.** *Caesalpinia spinosa* (Molina) Kuntze is a 3 m – 5 (- 8) m tall evergreen shrub or tree with thorns on the trunk and branches; it is known by a wide range of vernacular names: tara, algarroba, huarango, guaranga, tanino, taya, and caranca (3, 5, 6, 11).

*C. spinosa* trunk is round, thorny, and sometimes twisted with gray colored bark; it is broadly ramified in leafy and spiny axes. In several cases, axes are ramified close to the trunk base, producing the impression of having several trunks. Dark green leaves, smooth or slightly thorny, can grow to 10 cm long and are paripinnate and bipinnately compound with 2 – 3 (- 5) pairs of leaflets that possess 5 – 8 pairs of opposing, elliptical to ovate, 1.4 cm – 4 (- 4.5) cm x 12.5 cm secondary leaflets.

Leaflet venation is reticulate with pubescent or not undersides and a obtuse to emarginate tip. Flowers, 15 cm (- 20 cm) long, open in multi-flowered, finely pubescent and sometimes spiny terminal clusters. Each flower, 9 mm – 10 mm (-15 mm), has a 5 mm long, finely pubescent peduncle. The calyx is pentamerous, asymmetric, and with sepals up to 6 mm long fused at the base. Canoe shaped ventral sepal is the longest and possesses visible teeth at the tip. Reddish-yellow, 8 mm – 9 mm long petals are not quite twice the length of the calyx yet almost as long as the 10 yellow stamens. Only in rare cases do stamens grow longer than the corolla (5, 11).

Fruit is reddish to light brown, flat, and frequently finely pubescent. It is a coriaceous, indehiscent legume, 6 cm – 10 cm long, and (1-) 1.5 cm – 2.5 cm wide. When mature, it possesses (4 –) 5 cm – 8 cm round black seeds (4, 5, 7, 11).

# II. DIAGNOSTIC FEATURES AND POSSIBLE CONFUSIONS

Besides *C. spinosa*, another six species are recognized in Peru: *C. ancashiana* Ulibarri, *C. cassioides* Willd., *C. decapetala* (Roth) Alston, *C. glabrata* Kunth, *C. pulcherrima* (L.) Swartz, and *C. trichocarpa* Griseb (9, 11). These can, however, be known by their differentiating characteristics, such as flower length, degree of leaf division, and trunk and branch nature; on *C. spinosa*, for instance, only the trunk and branches are conspicuously thorny (see Table 1). Another good indicator for recognizing *C. spinosa* in Peru (that leaves no doubt whatsoever) is the asymmetric calyx with a further developed abaxial sepal and visible teeth on the tip, in combination with the high density of thorns (especially in younger branches).

**Table 1:** Diagnostic features of Peruvian *Caesalpinia*, according to Ulibarri (11)

| Feature | C. spinosa | C. ancashiana | C. cassioides | C. decapetala | C. glabrata | C. pulcherrima | C. trichocarpa |
|---|---|---|---|---|---|---|---|
| **Growth form** | 3 m – 5 m (-8 m) shrub or tree | Subshrub<br>0.3 m | 1 m – 4 m shrub or tree | 2.5 m – 10 m climbing shrub | 3 m – 6 m shrub or tree | 1 m – 9 m shrub or tree | 0.3 m – 1.5 m shrub |
| **Stem and branch** | Generally thorny | Unarmed | Somewhat armed | Older plant parts thorny | Somewhat armed | Somewhat armed | Unarmed |
| **Leaflet** | 2 – 3 (-5) pairs | 1 pair and 1 terminal | (1 -) 2 – 5 pairs and 1 terminal | 4 – 10 pairs | 3 – 8 pairs | (3 -) 5 – 8 (-10) pairs | 2 – 5 pairs |
| **Secondary leaflet** | 5 – 8 pairs | (4 - ) 8 – 10 (- 11) pairs | 3 – 7 pairs | 8 – 12 pairs | 4 – 7 (- 10) pairs | 6 – 10 pairs (- 12) pairs | (4 -) 6 – 8 pairs |
| **Flower length** | 9 mm – 10 mm (- 15 mm) | 10 mm – 12 mm | 13 mm – 17 mm | 13 mm – 17 mm | 8 mm – 9 mm (14 mm) | 20 mm – 25 mm | 8 mm – 11m |

## III. DISTRIBUTION

**Worldwide distribution**. *C. spinosa* is predominately found in seasonally dry regions of Bolivia, Peru, and northern Chile, on western Andean slopes, as well as in inter-Andean valleys. The species is also found in Venezuela, Colombia, Ecuador, the Antilles, and Cuba, where it is widely cultivated. It has been introduced and cultivated in north and east Africa, the United States, Brazil, and Argentina, as well (2, 4, 5, 8, 9, 11).

**Distribution in Peru.** *C. spinosa* is distributed along the entire coastal strip of Peru, from Piura in the north, southward to Tacna, as well as in the mountains in the departments of Ancash, Apurimac, Ayacucho, Cajamarca, Cusco, Huanuco, Huancavelica, Junin, and Pasco. Brako & Zarucchi (2) also report its existence in Madre de Dios, but this could just be cultivated individuals. It grows on the western side of the Andes on slopes, valleys, and river banks, from sea level to elevations to 3000 m (6).

The species was also found in Peru in the past growing on rolling hills (such as in Lachay in the department of Lima, < 1000 m). Yet it was practically exhausted due to overuse as a fuel and construction material. In terms of climate, distribution area encompasses warm temperate dry to tropical very dry and tropical wet forest (4). It is primarily cultivated in the departments of Cajamarca, La Libertad, Ayacucho, Huancavelica, Apurimac, Ancash, and Huanuco, in an elevation range of 1000 m to 2900 m (6).

**Table 2**: Estimates of *C. spinosa* frequency in Peru based upon herbarium specimens from USM, HUT, HAO, AMAZ, CUZ, HUSA, and field observations. Species abounds in Andean departments, but as a common species, it is not very well represented in herbariums**.**

| **Region** | **# specimens** | **# provinces** | **Estimated frequency** |
|---|---|---|---|
| Amazonas | 3 | 2 / 7 | Locally common |
| Ancash | 12 | 5 / 20 | Common |
| Arequipa | 15 | 3 / 8 | Locally common |
| Cajamarca | 11 | 4 / 13 | Common |
| Cuzco | 5 | 1 / 13 | Locally common |
| Huánuco | 5 | 2 / 11 | Locally common |
| Huancavelica | 2 | 2 / 7 | Locally common |
| Ica | 1 | 1 / 5 | Locally common |
| Junín | 2 | 2 / 9 | Locally common |
| Lima | 35 | 7 / 10 | Locally common |
| Moquegua | 6 | 3 / 3 | Rare |
| La Libertad | 6 | 3 / 12 | Common |
| Piura | 1 | 1 / 8 | Rare |
| Puno | 1 | 1 / 13 | Rare |
| Tacna | 3 | 1 / 4 | Rare |

## IV. ECOLOGY AND POSSIBLE CULTIVATION AND HARVESTING AREAS

**Habitat**. *C. spinosa* grows naturally in semi-arid regions that experience an annual rainfall of 230 mm – 500 mm and average yearly temperatures of 14.7º C – 27.5º C. It is often used as a hedge, shade tree (for domesticated animals) in dry crops, or even an ornamental tree (5, 6, 11). Average lifespan is close to 60 years, but it has been known to reach 100 years.

**Growth**. *C. spinosa* features very slow juvenile growth, thereby limiting its use in reforestation programs. Annual growth in the first few years is just 5 cm – 15 cm, yet it shows remarkable resistance to drought after taking root, which the plant harnesses in marginal growth sites and in elevations above 3000 m.

**Cultivation region**. Primary tara producing departments in Peru are Cajarmaca, La Libertad, Ayacucho, Huanuco, and Lambayeque. There have been successful tara crops grown in the

department of Cajamarca, as well. Yet, in all small scale cultivation regions, it is used as a hedge or shade plant (14).

## V. CULTIVATION AND USE

National Institute of Natural Resources (INRENA) has records of tara pod production from 1989 to 2007 for seventeen Peruvian departments. During that period, national production rose from 4000 tons in 1998 to 25,500 tons in 2006 (most productive year), and its grand total reached 125,000 tons, with chief producing departments being Cajamarca (more than 51,000 tons), La Libertad (25,000 tons), Ayacucho (14,000 tons), and Huanuco (10,000 tons). Tara is harvested in natural areas and in cultivation. Natural populations are frequently restricted to semi-domesticated groups, and they are usually cut down (4).

**Cultivation**. Because *C. spinosa* withstands pruning, is easy to propagate, and possesses a high density of thorns, it is frequently planted as a hedge, while its fruit is often harvested, as well (1, 4, 12). Seedlings are used to propagate tara in cultivation.

Fresh seeds have a high germinative capacity (>90%), even without treatment. If seeds are kept for one year, they should be pre-treated. All normal treatment methods for seeds with hard seedcoats are successful: prolonged soaking (7 days or more; afterwards, all swollen seeds are taken from the water and sown), hot water soaking and then 24 hours of cold water soaking, concentrated sulfuric acid treatment, scarification with sand, physical seedcoat wear, etc. Germination rates using these methods can surpass 90%. As with all seedlings, whose main root develops rapidly, transplanting should be done 1 – 2 weeks after germination.

Plants are sensitive to high humidity and especially standing water but tolerate moderate shade fairly well. Later (around the time sixth leaf develops), they require sunlight. In fields, plant density is somewhere between 1000 and 2500 plants/ ha. Planting begins at the rainy season when it is assured that rainwater will completely penetrate the soil. To cultivate successfully, recommendations include pest control, fertilizing, and silvicultural management, the latter includes clearing the land, thinning, and pruning (for treetop formation, production, health, and rejuvenation), sprout management, deworming, removal, and irrigation (14).

**Soil.** Siliceous or sandy soil (usual pH of 6.8 – 7.1) is best for cultivating tara, such as what are found in Ayacucho, Ancash (Cordillera Negra), and other sites (6). Likewise, development is optimal in deep soil.

**Pests and Diseases.** Except in its seedling state, tara is not threatened by many serious diseases, the exception being certain insect attacks on mature seeds (5). Main pests include aphids, spittlebugs, moths, rats, and ants. Research conducted on natural tara forest management in Cajamarca uncovered the most significant problems being parasitic plants, aphids, and the fungus, *Oidium* (14).

These pests were controlled biologically, usually with mixtures of “biol“ (liquid organic fertilizer) and sulfur (not to mention clothing detergent).

**Harvesting and yield.** Plants begin to fruit around six years and experience greatest productivity between twenty and fifty years. Fruit is harvested at different times depending on the region: Cajamarca (between Jan – Aug), Ayacucho (between May – Aug), and sometimes between July and the beginning of November. It is possible to produce 10 kg of legumes/ plant in less than favorable conditions, but figures can reach as high as 20 kg – 40 kg/ plant under favorable ones. In cultivation or as an ornamental plant, it generally produces all year long. For wild populations grouped in small

or isolated areas, production is 10 kg /plant, but this could increase with adequate irrigation and fertilizer.

Economic estimates are generally based upon an average production of 20 kg/ plant. Productive cycle is prolonged in irrigated fields and averages up to eighty-five years. Plants begin premature production at four years, but, from fifteen to sixty-five, production reaches its peak, declining from that point until it is practically nil at eighty-five. Average life span in dry and, possibly, in natural forests is sixty-five years.

**Sustainability.** Harvesting, as far as it is known today, is neither regulated nor has been determined using a scientific database. The PROTAYA Network recommends harvesting by shaking trees to make pods fall when all have reached maturity (14). When flowers are still present or not all fruit has fallen because they have not matured at the same time, recommendations are to knock mature bunches off with a stick or snag them with a hook. In Ayacucho, pods are harvested by smacking the branches with a hook tied to the end of a cane rod or reed (10). Farmers do not carry out any agronomic management since tara harvesting complements their more important farming activities.

Using these harvesting methods, it is most likely that smaller trees with more legumes and those presenting more mature, larger fruits at the same time are harvested more often, which in the midterm could genetically erode natural populations (meaning a relative rise in the number of smaller trees with lower fruit production, less suitable for harvesting). Controlled, artificial regeneration (an eventual manual planting of seeds from the best trees) in natural populations could stop or even reverse this trend.

Controlled management of the largest natural populations, a sort of semi-domestication, might also be reasonable. Something else that would make sense is a study on midterm consequences of current harvesting methods. It would be a priority for cultivation, selection (quality and quantity), and most productive methods. This should consider selecting specimens with rapid juvenile development and growth forms favorable to harvesting (early branching).

## VI. POST HARVEST

Post harvest, legumes are dried in the open, preferably protected from dust and shade. When they have dried, they are sufficiently brittle to crush easily; seeds are kept intact and pods (raw material for obtaining tannins – almost 50%) are stored in sacks (jute or other material). Dried legumes stored in dry places are practically imperishable. Pod fragments are sold directly or after having been ground (5).


1) Harvested tara fruit, 2) Tara fruit hanging on the plant, 3) Flowers, 4) Habit, 5) Habitat (spiny thickets) in Ayacucho, 6) Leaflets. Photos: 1—2, 4—6: Jose Roque; 3: Markus Ackermann

# VII. LITERATURE


1. Barriga, C.; Salazar, J. 1993. El cultivo de la tara. Proyecto viveros forestales en la cuenca alta del río Rímac. U.N.A. La Molina.
2. Brako, L.; Zarucchi, J.L. 1993. Catalogue of the Flowering Plants and Gymnosperms of Peru. Monogr. Syst. Bot. Missouri Bot. Gard. 45: i–xl, 1–1286.
3. Cano, A.; La Torre, M.I.; Castillo, S.; Aponte, H.; Morales, M.; Mendoza, W.; León, B.; Roque, J.; Salinas, I.; Monsalve,C.; Beltrán, H. 2006. Las plantas comunes del Callejón de Conchucos (Ancash, Perú). Guía de Campo. Museo de Historia Natural (UNMSM). Serie de Divulgación 13 :1-303.
4. Coppen, J. J. W. 1995. Non-wood Forest Products: 6-gums, resins and latexes of plant origin. FAO, Rome.
5. Duke, J. A. 1981. *Caesalpinia spinosa*. In: Handbook of Legumes of World Economic Importance. Plenum Press, New York. 32-33.
6. De la Cruz Lapa, P. 2004. Aprovechamiento integral y racional de la tara. Revista del Instituto de Investigación, Universidad Nacional Mayor de San Marcos. FIGMMG Vol. 7(14): 64-73.
7. Hickman, J. C. 1993. Jepson Man.: Higher Pl. Calif. i-xvii, 1-1400.
8. Jørgensen, P. M.; León-Yánez, S. (eds.). 1999. Catalogue of the vascular plants of Ecuador. Monogr. Syst. Bot. Missouri Bot. Gard. 75: i–viii, 1–1182.
9. Macbride, J. F. 1943. Leguminosae, Flora of Peru. Publ. Field Mus. Nat. Hist., Bot. Ser. 13(3/1): 1–506.
10. Novoa, S.; Ramírez, E.K. 2007. Evaluación del estado de conservación de *Caesalpinia spinosa* ‘‘tara’’ en el departamento de Ayacucho. Serie de publicaciones de flora y fauna silvestres. Instituto Nacional de Recursos Naturales (INRENA). Lima, Perú. http://www.inrena.gob.pe/iffs/iffs_biodiv_estud_flora_fauna_silvestre.htm.
11. Ulibarri, E. A. 1996. Sinopsis de *Caesalpinia* y *Hoffmannseggia* (Leguminosae - Caesalpinioideae) de Sudamérica. Darwiniana 34:329.
12. Vilela, P.J. 1989. Resultados preliminares de ensayo de introducción de especies y procedencias en las zonas áridas de Sechura, Piura, Perú. INIAA.
13. Wrann, H. J.; Arriagada, B. M. 1988. Experimental plantations of tannin-producing species in the semi-arid zone of Chile. Ciencia e Investigacion Forestal. 3: 51-66.
14. Vigo, E.; Quiroz, V.; Tierra, A.C. 2007. Cadenas de Valor Sostenibles: Producción, Comercialización y Agroexportación. Manual: EL cultivo de Tara en Cajamarca. http://www.contactorural.com.pe/images/documentos/Manual_El_cultivo_de_tara_en_Cajamarca-2da_impresion.pdf

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