Paullinia cupana H.B.K.

Sapindaceae

LOCAL NAMES
English (guarana,Brazilian cocoa)

BOTANIC DESCRIPTION
Paullinia cupana is a scandent shrub or woody liana.

Leaves compound alternate with five folioles and, when tendrils exist, they are axillary.

Inflorescences on axillary racemes or originate on the tendrils. Flowers yellow, male and female, zygomorphous and have five petals and sepals, eight stamens and a trilocular ovary with a glandular semi-disc at the base.

Fruit pear shaped, orange-red, and 3 sided with three-celled capsules, partially open when ripe, revealing 1-3 black or greenish seeds which are covered at the base with a white aril.

There are two varieties of P. cupana; var. cupana differs from var. sorbilis in that it has no tendrils, its folioles are more strongly lobed and its flowers and fruit are bigger. There is no information on the genetic variability of var. cupana, which is little known and studied, var. sorbilis shows a high degree of variability.

The name 'Guaraná' comes from Guaranis, a tribe of South American Indians. The genus name, Paullinia was taken from a German medical botanist, C.F. Paullini, who 'discovered' the plant.

BIOLOGY
Guarana is a monoecious, allogamous species. It is fertilized by bees of the genera Melipona and Apis. It is dispersed by birds.

Illustration off all plant parts (Köhler's Medicinal Plants)

Detail of flowers and leaves, Brazil, Acre, 7.38°S 72.35°W, 150 m above sea level (TROPICOS)

Detail of ripening fruits (Rain-tree)

ECOLOGY
The genus Paullinia is predominantly neotropical, native to the Brazilian Amazon. The climate of the region of origin is Am in Köppen's classification, with an isothermal temperature, mean annual temperature between 22 and 20 deg C. The minimum temperature tolerated is 12 deg C. Annual precipitation must exceed 1400 mm, with rain well distributed during the year. Soils must be deep, medium or heavy in texture, well drained and with high organic matter content.

BIOPHYSICAL LIMITS
Mean annual temperature: 20-22 deg C
Mean annual rainfall: 2 200-2 500 mm
Soil type: The soils in the natural habitat are generally gley or dystrophic lateritic soils with low pH (3.5-4.5).

DOCUMENTED SPECIES DISTRIBUTION

Native: Brazil, Colombia, Uruguay, Venezuela
Exotic: Argentina, Mexico, US

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: Guarana is used mainly to produce soft drinks. Seeds contain 2.7-5.8 % caffeine as well as theophylline and theobromine. Seeds are roasted and their seed coat removed; this is marketed as guarana en rama (raw guarana). Seeds are usually immersed in water to form a paste. From this are made sticks, which, after being dried over a slow fire and smoked for one month, are marketed. The traditional way of preparing the drink consists of grating part of the stick in water to produce an infusion. The guarana carbonated drinks industry began in 1907 and the product became Brazil's national drink during the 1940s. Nowadays, guarana is marketed as sticks and soluble or insoluble powder and is used industrially for the production of carbonated drinks, syrups and herbalists' products.

Essential oil: The essential oil isolated from powdered seeds of guarana has 9 identifiable constituents: 2 methylbenzenes, a cyclic monoterpene, 2 cyclic sesquiterpene hydrocarbons, 2 methoxyphenylpropenes and 2 alkylphenol derivatives.

Medicine: Guarana is attributed antipyretic, antineuralgic and antidiarrhoeal properties and is reputed to be a powerful stimulant, an analgesic comparable to aspirin and an anti-influenza agent. The Rainforest tribes have used guarana mainly as a stimulant, astringent and in treating chronic diarrhoea.

Other products: Guaraná contains a high amount of guaranine (thein, caffeine, methyltheobromine, No-Doz (chemical name; 3,7-Dihydro-1,3,7-trimethyl-1H-purine-2,6-dione {C8H10N4O2}) a chemical substance with the same characteristics as caffeine. The seed kernel and the seed coat have high concentrations of alkaloids, particularly caffeine (4.28 and 1.64% dry weight basis, respectively); the aril is alkaloid-free, but contains glucose, fructose and sucrose (68.5% dry weight basis). Tannic acid, catechutannic acid starch, and a greenish fixed oil have also been isolated from seeds.

SERVICES
Other services: Guaraná plays an important role in the culture of the Guarani tribe, as this herb is believed to be magical, a cure for bowel complaints and a way to regain strength. They also tell the myth of a 'Devine Child', that was killed by a serpent and whose eyes gave birth to this plant.

TREE MANAGEMENT
Traditional cultivation of guarana is carried out with full exposure to sun on soils with low fertility, low acidity and with high concentrations of aluminium. Spacing of the plants is approximately 4 m x 5 m, which gives 500 plants per hectare. After the second year, pruning is carried out to remove old and diseased branches and those that flowered the previous year. Since 1980, a new type of management has been adopted, using the same layout but with fertilizers and pruning to direct the branches along supports. Guarana must be grown in areas with a climate similar to its region of origin.

GERMPLASM MANAGEMENT
Seeds are recalcitrant and lose their viability in 72 hours under normal conditions. Germination can take more than 100 days.

PESTS AND DISEASES
Meloidogyne arenaria and M. thamesi cause wrinkles and fissures on the juncture between the roots and the stem of seedlings of the guarana tree. Fusarium decemcellulare, imperfect state of Calonectria rigidiuscula, causes swelling of the collar leading to death. Xiphinema americanum is the commonest parasitic nematode in nurseries of P. cupana and Xiphinema sp. On mature species.

FURTHER READNG

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SUGGESTED CITATION

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