Gnetum gnemon

L.

Gnetaceae

LOCAL NAMES
Burmese (hyinbyin,tanyin-ywe); English (kampong tree,Spanish joint fir,gnetum,joint fir); Filipino (banago,bago,lamparan,nabo); Indonesian (melingo,melinjo,bagoe); Malay (meninjau,belinjau); Thai (peesae,phak kariang,phak miang,liang); Vietnamese (gam cay,bét)

BOTANIC DESCRIPTION
Gnetum gnemon is a shade tolerant, slender evergreen tree, up to 15 m tall. Usually branching in whorls from the base and deeply rooted with a strong tap root system.
G. gnemon does not develop buttresses, the trunk is most recognisable with regular swollen rings around the girth, marking the position of old branches.

Leaves broad (10-20 cm), opposite, dark green, shiny, elliptic with netted veins.

Flowers are monosexual; in catkin-like formations; the male flower consists of a stamen and perianth ;female flowers, 5-8 at each node have an ovule with two integuments and a perianth.

Fruits ellipsoid usually in clusters,1-3.5 cm long and half as wide, turning yellow to orange-red then purple at maturity.

G. gnemon exists in several varieties, such as the tree form (var. gnemon) and the shrub forms (vars. Brunonianum, griffithii and tenerum).

BIOLOGY
A coupled process of double fertilization and post-fertilization endosperm formation occurs in the genus Gnetum. However the product of the second fertilization event in Gnetum is diploid and expresses the developmental programme of an embryo. In G. gnemon, egg cells are not formed and maternal provisioning of the embryo-nourishing female gametophyte takes place entirely after fertilization. The lack of differentiated egg cells in G. gnemon is unparalleled among land plants, the biological significance of double fertilization that does not form endosperm, in Gnetum, is currently unknown. This process may be biologically neutral.

Seeds produced three times yearly in Indonesia, March-April, June-July and September-October. The strobili are visited by nectar-seeking moths of Pyralidae and Geometridae. The sticky pollen of Gnetum attaches on proboscides and antennae of these moths. Lack of showy petals, an apparent disadvantage in entomophily is compensated for by floral fragrancy.

Bears one seed per fruit, a maximum yield for 100 year old trees could reach 80-100 Kg of seed/ year. Several varieties have been recognized on the basis of variation in tree habit and fruit /seed size. However two varieties are broadly accepted var. tenerum and var. gnemon.

G. gnemon trees: Gnetum gnemon planted as a windbreak and source of food on an agroforestry farm in Indonesia. (Rafael T. Cadiz)

G. gnemon potted seedling (Rafael T. Cadiz)

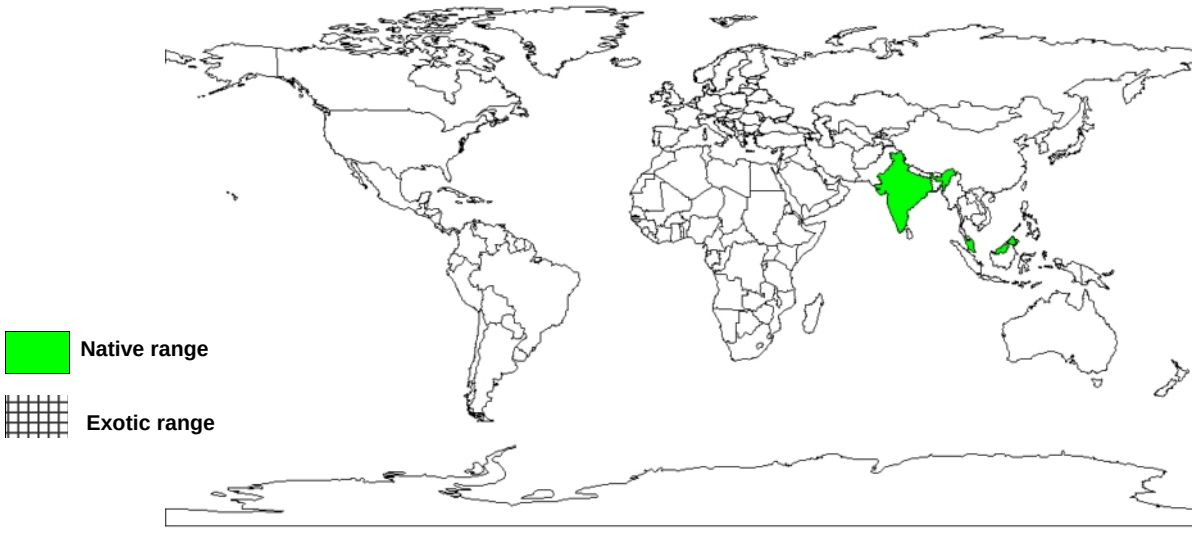
Seed pods: Cluster of seed pods. (Rafael T. Cadiz)

ECOLOGY
Occasional in lowland ridges and mature fallow forest. Commonly found in secondary humid evergreen dipterocarp forests of S.E. Asia. Commonly cultivated in or near gardens and in home gardens in South East Asia.

BIOPHYSICAL LIMITS
Altitude: 0-1 200 m
Mean annual temperature:
Mean annual rainfall: 750-5 000 mm
Soil type: Melinjo can grow on soils high in clay or sand content, and also on calcerous rocks however moisture must be available during the dry season.

DOCUMENTED SPECIES DISTRIBUTION

Native: Fiji, India, Malaysia, Papua New Guinea, Solomon Islands
Exotic:



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: The nutritious seeds are consumed as a snack called emping, and the young leaves, flowers and fruits are used as vegetables; eaten either raw, boiled or roasted. The seed is cooked or preserved as pounded flat cakes from which crispy snacks can be made. An active trade in the seeds exists and small to medium size emping industries exist in Indonesia, specifically in west Java, central Java and northern Sumatra.

Fibre: Its bast fibers provide durable cordage for fishing nets, lines, string bags and other durable tools. A potential economic use of this plant is the utilisation of its bark in rope making.

Timber: Wood used in Indonesia for pulp and house construction and in Malaysia, and Hong Kong for paper, boxes, and housing.

Alcohol: Prospects of making a potable sap from this species should be explored.

Poison: Woodsmoke and topical applications reduced biting of human volunteers by the anopheline mosquitoes (Anopheles punctulatus, A. koliensis, A. bancroftii, A. karwari and A. farauti) by 79% and 51%, respectively (Paru et al. 1995). Enzymic inhibition prevents insect predation of foliage.

Medicine: Leaf sap used medicinally to cure an eye complication.

Other products: The fungus, Scleroderma sinnamariense, usually associated with this tree produces a fruiting body that is edible. Under experimental conditions thermal-shock treatment of seedlings asssociated with S. sinnamariense resulted in early formation of the edible fruiting bodies.

SERVICES
Shade or shelter: Provides shade for sciophytic plant species.

Reclamation: It is possible to use this tree for dryland rehabilitation and afforestation. It can survive annual rainfall of 750-1000 mm

Nitrogen fixing: Has the ability to improve nitrogen levels due to its mycorrhizal associations.with the ectomycorrhizal fungus Scleroderma sinnamariense. In experimental conditions, mycorrhizal inoculation appears to enhance seedling growth under shaded conditions in acidic soils.

Soil improver: Has the ability to improve physical soil properties.

Intercropping: When intercropped with yams, can act as stakes for climbing yams, pana and other understorey shrubs.

GERMPLASM MANAGEMENT
Daily watering of the sand and seed mixture will hasten germination, possibly to three months. Without a pre-germination treatment, germination may be 1-2% in 6 months and may reach 100% in 12 months. Greater seedling height in inoculated seedlings can be achieved by providing compost and rock phosphate.

FURTHER READNG

Carlquist S and Robinson AA. 1995. Wood and bark anatomy of the African species of Gnetum. Botanical Journal of the Linnean Society. 118(2): 123-137.

Cooke FP et al. 1984. Herbivory, foliar enzyme inhibitors, nitrogen and leaf structure of young and mature leaves in a tropical forest. Biotropica. 16(4): 257-263.

Goenadi DH and Sudharama IM. 1995. Shoot initiation by humic acids of selected tropical crops grown in tissue culture. Plant Cell Reports. 15(1-2): 59-62.

Henderson CP and Hancock IR. 1988. A guide to the useful plants of Solomon Islands, Research Dept., Ministry of Agriculture and Lands, Honiara, Solomon Islands.

Kato M et al. 1995. Pollination biology of Gnetum (Gnetaceae) in a lowland mixed dipterocarp forest in Sarawak. American Journal of Botany. 82(7): 862-868.

Magness JR, Markle GM & Compton CC. 1971. Food and feed crops of the United States. Interregional Research Project IR-4, IR Bul. 1 (Bul. 828 New Jersey Agr. Expt. Sta.).

Paru R et al. 1995. Relative repellency of wood smoke and topical applications of plant products against mosquitoes. Papua New Guinea Medical Journal. 38(3): 215-221.

Roshetko JM. Ed., Evans DO. ed. 1999. Domestication of agroforestry trees in southeast Asia: proceedings of a regional workshop, Yogyakarta, Indonesia November 4-7 1997. Arkansas USA: Winrock International Institute for Agricultural Development. 248p.

Suhardi. 1999. Gnetum gnemon and its prospects in agroforestry. In: Roshetko JM. and Evans DO. (eds.). Domestication of Agroforestry of trees in South East Asia. 171-174, Winrock International.

SUGGESTED CITATION

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