

Dacryodes edulis

(G. Don.) H. J. Lam.

Burseraceae

LOCAL NAMES

English (native pear, bush butter tree, African plum, African pear, African palm); French (safoutier, prunier, atanga)

BOTANIC DESCRIPTION

Dacryodes edulis is a medium-sized, evergreen tree attaining a height of 18-40 m in the forest but not exceeding 12 m in plantations. It is generally branched from low down, with a deep, dense crown. The bole is rather short, slightly fluted, 50-170 cm in diameter and more or less sinuous. The scented, pale grey, rough bark exudes a whitish resin. Buttresses are absent.

Leaves compound, imparipinnate, with 5-8 pairs of leaflets; glossy above, pubescent, the pubescence disappearing with age.

Flowers subtended, 3 lobed, conspicuous, caducous bracts, fragrant, about 5 mm across, trimerous except for the ovary, arranged in dense, ferruginous, stellate-tomentose inflorescence; sepals 3, brown; petals 3, cream-yellow; stamens 6, white; disc 6 lobed, surrounding the 2-celled, glabrous ovary; inflorescence axis 10-42 cm long or longer, deeply grooved.

Fruits ellipsoidal drupes rather variable in size, 4-12 x 3-6 cm, resembling olives; exocarp thin, pink, becoming dark blue to violet at maturity; pulp firm and thin.

On the basis of long-term and extensive field observations in Nigeria, 2 varieties of *D. edulis* were distinguished: *D. e. var. edulis* and *D. e. var. parvicarpa*. Fruit of *D. e. var. edulis* is large, elongated, cylindrical, usually more than 5 x 2.5 cm. The fruit pulp is thick, about 3.5-9 mm. The tree often has whorled branching, the branchlets stout and ascending. The fruit of *D. e. var. parvicarpa* is small, rounded or more or less conical, usually less than 5 x 2.5 cm. The fruit pulp is thin, about 2-3.5 mm. Often the tree has bifurcate branching, with slender, drooping branchlets.

The generic name is derived from the Greek word 'dakruon' (a tear) in reference to the resin droplets on bark surface of its members. The specific name 'edulis' means edible.

BIOLOGY

D. edulis is dioecious. The trees are male, female, or hermaphroditic. Male trees may produce a limited number of female flowers, and thus some fruit. Bees pollinate the flowers. Flowering time and duration depend on latitude and genotype. In the natural habitat, flowering takes place from January to April, followed by the major fruiting season between May and October. The minor fruiting season is between November and March. Some *D. edulis* trees flower early, while others flower late and may produce blossoms continuously for several months.



Fruit on tree in Cameroon, vernal differences (see other photos) (Anthony Simons)



Fruit on tree near Abondo, Cameroon. (Anthony Simons)



Vegetative propagules (from cuttings) in Mbalmayo nursery, Cameroon (Anthony Simons)

ECOLOGY

D. edulis is a shade-loving species of non-flooded forests in the humid tropical zone. Where there is a well-marked season, it is found only in gallery forest and on swampy ground. *D. edulis* can be cultivated widely, since it adapts well to differences in day length, temperature, rainfall, soils and altitude. It is planted in southern Nigeria, Cameroon and Democratic Republic of Congo for its nutritious fruit, which has a high oil content.

BIOPHYSICAL LIMITS

Altitude: 1 000 m

Mean annual rainfall: 1400-4000 mm

Mean annual temperature: 23-25° C

Soil type: Grows in a wide range of soils but prefer deep ferralitic or volcanic soils.

DOCUMENTED SPECIES DISTRIBUTION

Native: Angola, Benin, Cameroon, Central African Republic, Congo, Cote d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria, Sierra Leone, Togo, Uganda

Exotic: Malaysia



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 principle value of the tree lies in its fruit. The leathery, shelled stone is surrounded by a pulpy, butyaceous pericarp about 5 mm thick, which is the portion eaten either raw or cooked in form of a sort of butter. It has a mild smell of turpentine and is oily. The fruits are boiled in saltwater, fried or roasted over charcoal. The fruit pulp yields about 48% edible oil, is rich in vitamins and contains a range of amino acids.

Fodder: The kernel, which contains about 3.3% protein, is commonly fed to domestic livestock such as sheep and goats.

Apiculture: The native pear has attractive flowers because of the existence of nectar. During anthesis phases, the ovary produces a sweet substance which attracts bees and other insects. The species can be thus used as a melliferous tree.

Timber: The wood is elastic, greyish-white to pinkish. The sapwood and heartwood are difficult to distinguish. The wood has general use for tool handles, particularly axe shafts, and occasionally for mortars, and is suitable for carpentry.

Gum or resin: The bark is aromatic; on injury, it yields a resin that is used as pitch on calabashes and for mending earthenware. It can be burnt as a primitive lamp oil or bush candle.

Tannin or dyestuff: The leaves of *D. edulis* contain a dye.

Lipids: The wood contains an oil that on petrol-ether extraction has been found to be composed of fatty acids and their esters. The fresh pulp is rich in lipids (35-65%) with a considerable amount of palmitic and linoleic acid. The tree can produce 7-8 t/ha of oil.

Essential oil: Under steam distillation, the resin has been reported to yield a peppery essential oil rich in sabinene, beta-phellandrene and limonene.

Medicine: A perennial cure for a variety of ailments, ranging from ear infection to fevers and oral problems. In Nigeria the resin is used for treating parasitic skin diseases and jiggers. Pulped bark is used to cicatrize wounds. In the Democratic Republic of Congo, a bark decoction is used for gargle and mouthwash and for tonsillitis. It is taken in a powdered form with maleguetta pepper as an anti-dysenteric and for anaemia and for spitting blood and as an emmenagogue. With palm oil, it is applied topically to relieve general pains and stiffness and to treat cutaneous conditions. A decoction of the root bark is taken for leprosy. In the Democratic Republic of Congo, the leaves are eaten raw with kola nut as an anti-emetic. Leaf sap is instilled into the ear for ear problems, and a leaf decoction is prepared as a vapour bath for feverish stiffness with headache.

SERVICES

Shade or shelter: In Nigeria the tree is planted for shade.

Ornamental: Because of its rythmical growth process and the colour of young leaves, the plum tree can be used as an ornamental during the first ages. It is therefore often found as a garden tree in and around villages.

Soil improver: Leaves and the remains of the fruits can provide considerable quantities of biomass to improve soil fertility. Research carried out in the forest humid lowland of south Cameroon, showed that the peasant farmers use the tree as a good indicator of soils fertility.

Intercropping: The plant canopy can allow its integration into the traditional farming systems involving food crops, mainly shade tolerant species such as *Xanthosoma sagittifolium*, *Colocasia esculenta* etc. The double revolution of the African plum tree in the forest zone of Cameroon which doesn't necessarily go together with the flowering of the food crops, leads to a progressive harvesting during the year. The tree is usually grown to provide shade, mainly for perennial crops such as cocoa and coffee, in Nigeria.

TREE MANAGEMENT

The recommended spacing for planting *D. edulis* in orchards is 10 x 10 m. Care for the trees is minimal, often limited to slashing the weeds around each tree. Except when planting, fertilizing or manuring is not used; pruning and crop protection are not practised.

GERMPLASM MANAGEMENT

Germplasm collections have not been initiated for *D. edulis*, nor have any strategies been drawn up for genebanks or in situ reserves for the species. The seeds are recalcitrant, so ex situ collections will entail establishing orchard seed banks.

Storage behaviour is uncertain; whole seed moisture content is 42%; 25% germination following 14 days open storage at 15 deg. C, while no seeds germinate when stored at 25 deg. C or 5 deg. C.

PESTS AND DISEASES

Diseases: Polyphagous fungi with the symptoms range from dieback of branches and leaf and fruit drop, to necrotic spots and galls on leaves and fruit have been recorded on the butter fruit tree, in Gabon. Fruit are usually attacked by four post-harvest rots; *Botryodiplodia theobromae* and *Rhizopus stolonifer* are most important, accounting for 80% of the affected fruit; *Aspergillus niger* and an *Erwinia* bacterium being the other causal organisms.

Pest: A dipterous insect that mines the young leaves leads to continuous growth of the shoot because the leaflets drop before they mature. In Congo, a caterpillar of *Sylepta baltoata*, a pyralid moth is the most important pest, leading to a burnt appearance of the leaves. In Cameroon, the larvae of a *Carpophilus* sp., a nitidulid beetle, eat the seed and when the adult bores its way out of the fruit secondary infections often lead to decay. Much fruit is spoilt on the tree by birds.

FURTHER READING

- Aiyelaagbe IOO, Adeola AO, Popoola L & Obisesan KO. 1998. Agroforestry potential of *Dacryodes edulis* in the oil palm-cassava belt of southeastern Nigeria. *Agroforestry Systems*. 40: 263-274.
- Anand KK, et al. 1994. Hepatoprotective studies of a fraction from the fruits of *Terminalia bellerica* Roxb. on experimental liver injury in rodents. *Phytotherapy Research*. 8: 287-292.
- Anegbeh PO, Ladipo DO, Tchoundjeu Z. 2005. Using marcotting technique for fruit development in the African pear *Dacryodes Edulis*: *Scientia Africana*. 4(1&2):102-108.
- Anegbeh PO, Tchoundjeu Z, Iruka CG, Nkirika CN. 2005. Vegetative propagation of indigenous fruit trees: influence of defoliation on survival of rooted marcots air-layered plants of *Irvingia gabonensis* and *Dacryodes edulis* in Onne, Niger Delta Region of Nigeria: *International Journal of Agricultural and Rural Development*. 6:119-125.
- Anegbeh PO, Ukafor V, Usoro C, Tchoundjeu Z, Leakey RRB, Schreckenberg K. 2005. Domestication of *Dacryodes edulis*: 1. phenotypic variation of fruit traits from 100 trees in southeast Nigeria: *New Forest*. 29(2):149-160.
- Awono A, Ndoye O, Schreckenberg K, Tabuna H, Isseri F and Temple L. 2002. Production and marketing of Safou (*Dacryodes edulis*) in Cameroon and internationally: market development issues. *Forests, Trees and Livelihoods* 12(1/2): 125-147.
- Ayuk ET, Duguma B, Franzel S, Kengué J, Mollet M, Tiki-Manga T & Zekeng P. 1999. Uses, management, and economic potential of *Dacryodes edulis* (Burseraceae) in the humid lowlands of Cameroon. *Economic Botany*. 53(3): 292-301.
- Burkill HM. 1994. Useful plants of West Tropical Africa. Vol. 2. Families E-I. Royal Botanical Gardens, Kew.
- CABI. 2000. Global Forestry Compendium. CD-ROM. CABI
- Department for International Development DFID, London UK . Forestry Research Programme. 2003. African plum: *Dacryodes edulis*. London, UK: DFID. 30p.
- FAO. 1982. Fruit-bearing forest trees: technical notes. FAO-Forestry-Paper. No. 34. 177 pp.
- Hong TD, Linington S, Ellis RH. 1996. Seed storage behaviour: a compendium. *Handbooks for Genebanks*: No. 4. IPGRI.
- Kapseu C, Mapongmetsem PM, Silou T and Roques M. 1999. Physico-chemistry of Cameroonian safou tree fruits *Dacryodes edulis*. *Tropicicultura*. 16-17(1): 98-99.
- Kengni E, Tchoundjeu Z, Mbofung CMF, Tchouanguép MF, Asaah KE. 2004. Value-added processing of tree products in agroforestry systems: description and consumer preferences of African plum *Dacryodes edulis* fruit pulp spread: Rebuilding Africa s capacity for agricultural development: the role of tertiary education. p.146-154.
- Kengni E, Tchoundjeu Z, Tchouanguép F.M, Mbofung CMF. 2000. Sensory evaluation of *Dacryodes edulis* fruit types: *Forests Trees and livelihoods*. 11(1):57-66.
- Kengué J & Nya Ngatchou J. (Editors). 1994. Le safoutier, the African pear. Actes du Séminaire sur la valorisation du safoutier, 4-6 Octobre 1994. Douala, Cameroon. 188 pp.
- Kengué J and Nya Ngatchou J. 1990. Problem of preserving the germination power of the seeds of African pear (*Dacryodes edulis*). *Fruits*. 45(4): 409-412.
- Kengué J. 1990. Le safoutier (*Dacryodes edulis* (G.Don) H.J.Lam). Thèse doctorat 3e cycle, Université du Cameroun, Yaoundé, Cameroon. 154 pp.
- Kengué J. 1995. Le safoutier (*Dacryodes edulis* (G.Don) H.J. Lam). *Le Flamboyant*. 33: 4-7.
- Kengué J. 1996. Étude et contrôle du rythme de croissance chez le safoutier. *Fruits*. 51: 121-127.
- Leakey RRB and Ladipo DO. 1996. Trading on genetic variation - fruits of *Dacryodes edulis*. *Agroforestry Today*. 8(2): 16-17.
- Leakey RRB, Atangana AR, Kengni E, Waruhiu AN, Usoro C, Anegbeh PO, Tchoundjeu Z. 2002. Domestication of *Dacryodes edulis* in west and central Africa: Characterisation of genetic variation: *Forests, Trees and Livelihoods*. 12:57-71.
- Leakey RRB, Tchoundjeu Z, Smith RI, Munro RC, Fondoun J, Kengue J, Anegbeh PO, Atangana AR, Waruhiu AN, Asaah E, Usoro C, Ukafor V. 2004. Evidence that subsistence farmers have domesticated indigenous fruits *Dacryodes edulis* and *Irvingia gabonensis* in Cameroon and Nigeria: *Agroforestry Systems*. 60(2):101-111.
- Leakey RRB, Tchoundjeu Z. 2001. Diversification of tree crops: domestication of companion crops for poverty reduction and environmental services: *Experimental Agriculture*. 37(3):279-296.

Mialoundama F, Avana M-L, Youmbi E, Mampouya PC, Tchoundjeu Z, Mbeuyo M, Galamo GR, Bell JM, Kogpuep F, Tsobeng AC, Abega J. 2002. Vegetative propagation of *dacryodes edulis* G. Don H.J. Lam by marcots, cuttings and micropropagation: Forests, Trees and Livelihoods. 12:85-96.

Ngatchou JN & Kengué J. 1989. Review of the African plum tree (*Dacryodes edulis*). In: Wickens, G.E., Haq, N. & Day, P. (Editors). New crops for food and industry. Chapman & Hall, London, United Kingdom. pp. 265-271.

Okafor JC. 1983. Varietal delimitation in *Dacryodes edulis* (G. Don) H. J. Lam. (Burseraceae). The International Tree Crops Journal. 2:255-265.

Onocha PA, Ekundayo O, Oyelola O & Laakso I. 1999. Essential oils of *Dacryodes edulis* (G.Don) H.J.Lam (African pear). Flavour and Fragrance Journal. 14: 135-139.

Schreckenber K, Degrande A, Mbosso C, Baboule ZB, Boyd C, Enyong L, Kanmegne J, Ngong C. 2002. The social and economic importance of *Dacryodes edulis* G.DON H.J. Lam in Southern Cameroon: Forests, Trees and Livelihoods. 12:15-40.

Silou T. 1996. Le safoutier (*Dacryodes edulis*): un arbre mal connu. Fruits. 51: 47-60.

Simons AJ, Leakey RRB. 2004. Tree domestication in tropical agroforestry: Agroforestry Systems. 61:167-181.

Smith JHN et. al. 1992. Tropical forests and their crops. Cornell University Press.

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>)