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Erythrina abyssinica Lam. ex DC.

Protologue

Prodr. 2: 413 (1825).

Family

Papilionaceae (Leguminosae - Papilionoideae, Fabaceae)

Chromosome number

$2n = 42$

Synonyms

Erythrina tomentosa R.Br. ex A.Rich. (1847).

Vernacular names

Red-hot-poker tree, lucky bean tree, flame tree, Abyssinian coral tree (En). Arbre de corail d'Abyssinie (Fr). Mjafari, mlungu, mbamba ngoma, mwamba ngoma (Sw).

Origin and geographic distribution

Erythrina abyssinica is widespread from Sudan and Ethiopia south to Angola, Zimbabwe and Mozambique. It has been introduced as an ornamental in Mauritius and various places in tropical Asia and Central America.

Uses

Erythrina abyssinica is a veritable multipurpose tree. The wood is commonly used for making carvings, stools, drums, mortars, beehives, tool handles, brake blocks and floats for fishing nets, and sometimes also in house construction; wood from the roots is used for making walking sticks. The wood serves as firewood; it smoulders readily without flaming and keeps smouldering for long periods.

The tree is recommended for soil conservation programmes, for erosion control, and for use as green manure. It is the main planted shade tree for coffee in Ethiopia. It is extensively used as a live fence around homesteads, and is also planted as an ornamental. The flowers provide nectar and pollen for bees at the end of the dry season, strengthening bee colonies in this difficult period. The



wild

bark is sometimes used as a brown dye for textiles and the sap gives a red colour. Cork from the bark is used as floats for fishing nets. The leaves are eaten by sheep and goats. The seeds are locally popular for making curios and necklaces.

Erythrina abyssinica is well known as a medicinal plant. The bark is most commonly used in traditional medicine, to treat snakebites, malaria, sexually transmittable diseases such as syphilis and gonorrhoea, amoebiasis, cough, liver inflammation, stomach-ache, colic and measles. Roasted and powdered bark is applied to burns, ulcers and swellings. The liquid from crushed bark of green stems is used to cure conjunctivitis caused by *Chlamydia trachomatis* (trachoma), whereas bark sap is also drunk as an anthelmintic. The bark is also applied against vomiting. Pounded flowers serve to treat dysentery. A maceration of the flower is drunk as an abortifacient, and applied externally to treat earache. Roots are taken to treat peptic ulcers, epilepsy, malaria, blennorrhagia and schistosomiasis. Leaves are taken to treat peptic ulcers; they are also used for treatment of diarrhoea. A leaf decoction serves as an emetic. Leaves are applied externally to wounds and painful joints; they are also applied to treat skin diseases in cattle. Fruit extracts are taken to treat asthma and meningitis.

Properties

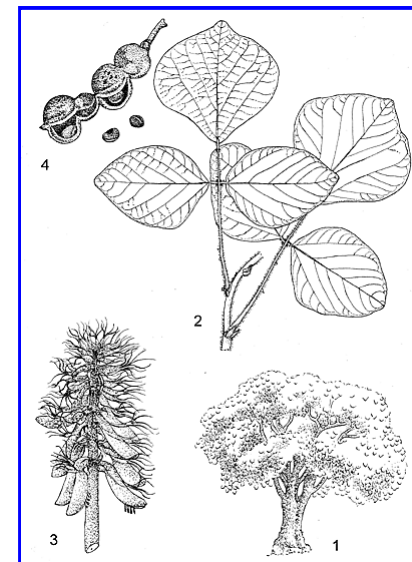
The wood is lightweight and soft. It is greyish white, sometimes with shades of red. The grain is usually straight, texture coarse. The wood is easy to work, but planed surfaces may be woolly. It does not split when nailed, but the nail-holding capacity is poor. It is not durable and is prone to fungal and wood-borer attacks; however, it is moderately resistant to termites.

In a test in Ethiopia it was concluded that leafy twigs can effectively serve as a cheap source of protein supplement for low-quality diets during the dry season for resource-poor farmers with stall-fed sheep and goats. As a general-purpose fodder it is less suitable, as the palatability of the leaves to sheep is rather poor.

Several compounds exhibiting a broad spectrum antimicrobial activity have been isolated from the root bark. A crude extract of the root bark showed antiplasmodial activity against *Plasmodium falciparum*; flavonoids and isoflavonoids are the active compounds. Stem bark extracts also showed antiplasmodial activity, including activity against chloroquine-resistant strains of *Plasmodium falciparum*, and flavonoids have been isolated as active ingredients. Seeds contain a curare-like poison.

Description

Deciduous, small tree up to 12(–15) m tall; bole usually short, stout, up to 60 cm in diameter, usually armed with woody knobs; bark thick, corky, deeply fissured, yellowish brown, exuding a brown, gummy sap; crown rounded, with thick, spreading, somewhat twisted branches; twigs armed with strong curved prickles, initially densely hairy, glabrescent. Leaves alternate, 3-foliolate; stipules



1, tree habit; 2, part of leafy twig; 3, inflorescence; 4, fruit and seeds.

Redrawn and adapted by Iskak Syamsudin



tree habit

lanceolate, caducous; petiole 6–20 cm long, often prickly, rachis 3–8 cm long, petiolules 0.5–1 cm long; leaflets broadly ovate to rhombic or almost circular, 2.5–20 cm × 2.5–21 cm, cordate to rounded or truncate at base, obtuse to notched at apex, densely hairy especially below, 3-veined from the base, veins sometimes with prickles. Inflorescence an axillary or terminal, pyramidal, dense, erect false raceme up to 20 cm long; peduncle 2–20 cm long; bracts up to 9 mm long, soon caducous. Flowers bisexual, papilionaceous; pedicel 2–6 mm long; calyx cylindrical to spindle-shaped, split at one side, tube 0.5–2 cm long, densely hairy, lobes elliptical to linear, 0.5–6 cm long; corolla orange-red to scarlet red, standard elliptical to obovate, 3–5 cm × 1–1.5 cm, wings 7–11 mm × 4–6 mm, keel petals free, 5–6 mm × 3–4 mm; stamens 10, fused but 1 almost free; ovary superior, narrowly cylindrical-oblong, stiped, 1-celled, style long, incurved. Fruit a linear-oblong pod 4–16 cm × 1–2.5 cm, markedly constricted between the seeds, brown to black, usually hairy, opening by 2 valves, 1–10-seeded. Seeds ellipsoid, 6–12 mm long, bright red with area around the hilum black.

Other botanical information

Erythrina comprises approximately 120 species: about 30 in continental Africa, 6 in Madagascar, 70 in tropical America and 12 in tropical Asia and Australia.

Erythrina latissima E.Mey. from Botswana, Zimbabwe, Mozambique, eastern South Africa and Swaziland closely resembles *Erythrina abyssinica*, but has larger leaflets, flowers and seeds. Its wood is undoubtedly used for similar purposes. In traditional medicine the powdered bark of *Erythrina latissima* is applied to wounds. The effectiveness is supported by pharmacological research, which showed the presence of antimicrobial flavonoids.

Erythrina burttii Baker f. is a small tree up to 15 m tall restricted to Kenya and Tanzania. Its wood is used for stools and camel bells and as fuelwood. The leaves are used for making a tea. The seeds are used in traditional medicine to treat throat pain, and in veterinary medicine to treat cough in camels. Stem bark extracts showed in-vitro antifungal and antibacterial activities, with flavonoids as the active principles.

Erythrina melanacantha Harms is a small to medium-sized tree up to 20 m tall, occurring in Ethiopia, Somalia, Kenya, Tanzania and Socotra (Yemen). The wood is used to make headrests, stools, jugs, cups and pots. In Ethiopia the roots have been used as famine food and they are a source of potable water. *Erythrina melanacantha* is browsed by livestock and is occasionally planted as ornamental. Its fruits are eaten in Ethiopia.

Erythrina sacleuxii Hua is a small to medium-sized tree up to 25 m tall, known from Kenya and Tanzania. The wood is used for making headrests and mortars. It also serves as fuelwood and for charcoal making. The tree is planted as an amenity and roadside tree. A root decoction is used to treat gonorrhoea and leprosy. Antiplasmodial flavonoids have been isolated from the bark.

Anatomy



tree habit



flowering trees



leafy branch

Wood-anatomical description (IAWA hardwood codes):

Growth rings: 2: growth ring boundaries indistinct or absent. Vessels: 5: wood diffuse-porous; 13: simple perforation plates; 22: intervessel pits alternate; 23: shape of alternate pits polygonal; 26: intervessel pits medium (7–10 µm); 29: vested pits; 30: vessel-ray pits with distinct borders; similar to intervessel pits in size and shape throughout the ray cell; 43: mean tangential diameter of vessel lumina \geq 200 µm; (45: vessels of two distinct diameter classes, wood not ring-porous); 46: \leq 5 vessels per square millimetre. Tracheids and fibres: 61: fibres with simple to minutely bordered pits; 66: non-septate fibres present; 69: fibres thin- to thick-walled. Axial parenchyma: 85: axial parenchyma bands more than three cells wide; (90: fusiform parenchyma cells); 91: two cells per parenchyma strand. Rays: 98: larger rays commonly 4- to 10-seriate; (99: larger rays commonly > 10-seriate); 109: rays with procumbent, square and upright cells mixed throughout the ray; 110: sheath cells present; 114: \leq 4 rays per mm. Storied structure: 120: axial parenchyma and/or vessel elements storied. Mineral inclusions: 136: prismatic crystals present; 142: prismatic crystals in chambered axial parenchyma cells.

(E. Ebanyenle, A.A. Oteng-Amoako & P. Baas)

Growth and development

Seedlings develop a deep root system before stem growth starts. Trees grow moderately fast, but growth rates vary widely depending on soil conditions. They are deciduous and flower when leafless. In this period they are conspicuous and decorative. Flowering is erratic, but occurs over a long period: September to April in Ethiopia, January to March in Kenya and July to November in southern Africa. The flowers are mainly pollinated by birds, often sunbirds. Seeds are ripe about 2 months after flowering. *Erythrina abyssinica* is a nitrogen fixing tree.

Ecology

Erythrina abyssinica occurs in woodland and wooded grassland, also in secondary scrub vegetation, in regions with (500–)800–1500(–2000) mm annual rainfall. Its optimal temperature range is 15–25°C. In Sudan it is found up to 2000 m altitude, in Tanzania up to 2300 m. It can be found on loamy to clayey soils, and prefers deep well-drained soils on plateaus and slopes, with a pH of 3.5–5.5. Trees are fire resistant, and even seedlings resprout after fires, due to their deep root system. *Erythrina abyssinica* does not tolerate frost.

Propagation and planting

Erythrina abyssinica can be propagated by seed. The 1000-seed weight is about 150 g. Seeds should be collected from ripe pods still on the tree; they are widely available. They are sun dried for one day before storage. Seeds can be stored for long periods if they are kept in a cool and dry place and kept free from insects, e.g. by adding ash. The germination rate of seeds is generally low: 10–30%. Pre-treatment with hot water or concentrated sulphuric acid may increase the germination rate up to

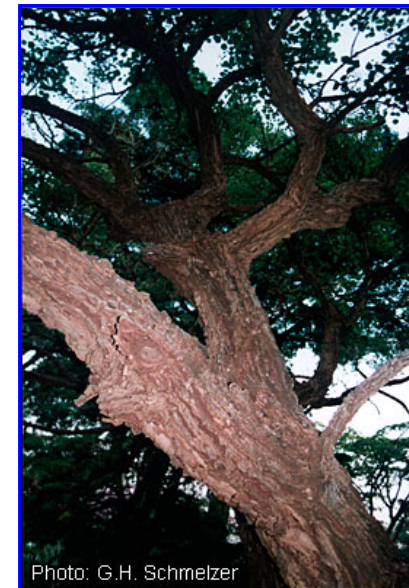


Photo: G.H. Schmelzer

crown



flowering branches



Photo: P. Latham

90%. Scarification of seeds is also beneficial for germination; this can be done by rubbing with sandpaper or nicking with a knife, after which the seeds should be immersed in water for some hours until they begin to swell. To obtain optimal growth, seeds are inoculated with appropriate *Rhizobium* bacteria immediately before sowing. Seeds can be sown in seed beds of sterile sand or in polythene bags with a mixture of soil, sand and compost (2:1:1). They should be sown with the hilum facing downward and covered with a thin layer of potting medium. Seedlings can be transplanted when 20–30 cm tall. Direct sowing in the field is also possible.

Propagation by cuttings is often successful when these are planted in the rainy season. Cuttings are stripped of leaves and planted directly. Air-layering is also possible.

Management

Trees can be managed by pollarding and coppicing. Seedlings should not be pruned before they are one year old. Planting large stakes of 2.5 m long and 8–10 cm in diameter is sometimes practised for its use as shade tree; these stakes can produce a canopy of 3–4 m in diameter in 6 months.

Truncheons are commonly used to make living fences.

Genetic resources

Erythrina abyssinica is widespread in various habitats and currently not under threat. It is included in several germplasm collections, e.g. in the ILRI genetic resources collection (12 samples collected from the wild in Ethiopia) and the USDA/ARS NGRL desert legume program (seed collected from the wild in Zimbabwe).

Prospects

Although *Erythrina abyssinica* is not a very important timber tree, it is an outstanding multipurpose tree that provides not only wood, but also serves as shade tree and for soil improvement. It is also very useful for living fences and as an ornamental. Moreover, it has interesting applications in traditional medicine that deserve more research attention.

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flowering branches



inflorescences



infructescences

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Photo: L.J.G. van der Maesen, Biosystematics Group, Wageningen UR

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