



## **Alchornea cordifolia** (Schumach. & Thonn.) Müll.Arg.

### **Protologue**

Linnaea 34: 170 (1865).

### **Family**

Euphorbiaceae

### **Chromosome number**

$2n = 36$

### **Vernacular names**

Christmas bush, dovewood (En). Arbre de djeman (Fr).

Bugi-bugi, bunce, pô d'arco (Po).

### **Origin and geographic distribution**

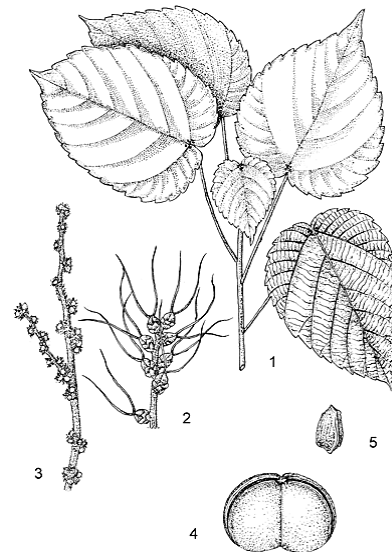
*Alchornea cordifolia* occurs from Senegal east to Kenya and Tanzania and south throughout Central Africa to Angola. It is cultivated in DR Congo for its medicinal use.

### **Uses**

*Alchornea cordifolia* is commonly used as a medicinal plant throughout its area of distribution. The leaves are mostly used, but also the stem bark, stem pith, leafy stems, root bark, roots and fruits enter in local medicine. The leaves or leafy stems, as an infusion or chewed fresh, are taken for their sedative and antispasmodic activities to treat a variety of respiratory problems including sore throat, cough and bronchitis, genital-urinary problems including venereal diseases and female sterility, and intestinal problems including gastric ulcers, diarrhoea, amoebic dysentery and worms. As a purgative, they are also taken as an enema; high doses taken orally are emetic. They are also taken as a blood purifier, as a tonic and to treat anaemia and epilepsy. In Senegal a leaf decoction is taken to treat tachycardia. Young stem pith is bitter and astringent and is chewed for the same use. The pith may also be rubbed on the chest to treat respiratory problems. The leaves are eaten in West Africa and Congo as an emmenagogue and to facilitate delivery, and in Gabon as an abortifacient. A cold infusion of the dried and crushed leaves acts as a diuretic. Leaf and root decoctions are widely used as mouth wash to treat ulcers of the mouth, toothache and caries, and twigs are chewed for the same purposes. Crushed fresh leaves or powdered dry leaves are applied externally as a cicatrisant to wounds, to relieve pain, e.g. backache and headache, to



*wild*



1, leafy branch; 2, part of young male inflorescence; 3, tip of female inflorescence; 4, fruit; 5, seed.

Redrawn and adapted by Iskak Syamsudin

fractures to improve healing and to treat eye infections and numerous skin afflictions including venereal diseases, sores, abscesses, yaws and filariasis. A decoction or paste of leafy twigs is applied as a wash to treat fever, malaria, rheumatic pains, enlarged spleen and as a lotion or poultice to sore feet; vapour baths can also be taken. In Côte d'Ivoire and Ghana the leaves are applied as a haemostatic to stop prolonged menstruation and a decoction of roots or leaves is applied in the vagina to stop post-partum haemorrhage and to treat vaginitis. In Sierra Leone and Congo young leaves or pounded bark are made into a suppository to treat haemorrhoids. In DR Congo bruised leaves are applied as an enema to treat impotency. In West Africa pulped root is widely taken to treat venereal diseases. Dried leaves or roots, alone or with tobacco, are smoked to cure cough. The leaves and root bark are externally applied to treat leprosy and as an antidote to snake venom. In Gabon and Congo a root decoction or maceration is taken to treat amoebic dysentery and diarrhoea and used as eye drops to cure conjunctivitis. In Nigeria a decoction of bruised fruit is taken to prevent miscarriage. The sap of the fruit is applied to cure eye problems and skin diseases. In veterinary medicine a leaf or root infusion is given to livestock to treat trypanosomiasis. In Nigeria the stem bark is thrown in dammed streams as a fish poison. *Alchornea cordifolia* is used for alley cropping for in-situ mulch production in banana or maize plantations in West and East Africa. In Burkina Faso the plant is used as a windbreak around crops. In West Africa the leaves are used as forage for small ruminants and poultry. Chicken produce egg yolks with a deeper yellow colour when fed regularly with the leaves. In West Africa the leaves are used for packing cola nuts and 'okpeye', a Nigerian condiment produced by fermenting seeds of *Prosopis africana* (Guill. & Perr.) Taub. Pipe stems are made from the branches with the pith removed. The Iwo people of Nigeria chew the leaves as an appetizer. Dried leaves are a tea substitute.

In West Africa mats and cloth are cooked with the fruits and natron to colour them black; the fruits are often combined with fermented *Parkia* pods or the bark of *Bridelia ferruginea* Benth. This dye is also used on pottery, calabashes and leather. The leaves are often added to indigo to darken its colour. In Nigeria fishermen use leaves and fruits for dyeing and preserving fishing nets; dried leaves give a darker colour than fresh ones. In Gabon bark and leaves are used to blacken cloth and pottery. The wood ash serves as a mordant. The wood is light, soft and perishable and is used for house



*leaves*



*male inflorescences*



*fruiting branches*



*leafy branch with inflorescences*

construction, stakes and kitchen utensils, and also benches when large stems are available. The wood is also used as fuel. In DR Congo the split stems are used to line baskets. In Cameroon and Gabon the acidulous fruits are considered edible and are also used as bait to trap birds. The infructescences are used in decorations.

*Alchornea cordifolia* extract has been patented for various other applications: antifouling adjuvant in paints, coatings and polymers, and alchorneic acid was proposed as a raw material for hemi-synthesis of plastic.

### **Production and international trade**

In Ghana and Burkina Faso the leaves, root bark and fruits of *Alchornea cordifolia* are sold in local markets from November to January. The Centre National de Semences Forestières of Burkina Faso sells seeds at a price of US\$ 10 per kg in the region and US\$ 14 outside the region.

### **Properties**

The leaves, roots and stem bark contain terpenoids, steroid glycosides, flavonoids ( 2–3%), tannins (about 10%), saponins, carbohydrates and the imidazopyrimidine alkaloids alchorneine, alchornidine and several guanidine alkaloids. The leaves also contain a range of hydroxybenzoic acids: gallic acid and its ethyl ester, gentisic acid, anthranilic acid (vitamin L1) and protocatechuic acid, and also ellagic acid (alzarine yellow). A C<sub>20</sub> homologue of vernolic acid, named alchorneic acid, was found in the seed oil.

Different leaf, stem bark and root extracts (macerations or decoctions and methanolic, ethanolic or acetonic extracts) have shown significant activities against a range of bacterial and fungal pathogens of humans. The root bark showed the strongest activity. The results of tests on anti-HIV activities of the seed extract are contradictory; in African tests, HIV-1 strains were sensitive to the seed extract, whereas American tests seemed inconclusive.

Methanol or ethanol extracts of leaf and root at a concentration of 100 µg/ml did not show cytotoxic activity against 60 different tumour cell lines from 8 organs. The ethanol extracts of the leaf and fruit showed significant trypanocidal, anthelmintic and amoebicidal activities. The amoebicidal activity of the root bark was even much higher. The ethanol extract of the leaf exhibited mild in-vitro activity against *Plasmodium falciparum*, whereas chloroform and ether extracts were inactive. Ellagic acid was found to be the active constituent of the extract. Crude ethanol extracts of the leaves showed moderate in-vitro anthelmintic activity against *Haemonchus contortus*, a nematode pathogenic to small ruminants.

Different leaf extracts showed a significant anti-anaemic

activity by increasing the level of haemoglobin and iron in the blood after oral administration to anaemic rats. Crude extracts of the leaves coagulated blood plasma in vitro.

The high tannin content was thought to be responsible for this activity.

The ethanol extract of the leaf showed significant activity against castor oil-induced diarrhoea in mice. The presence of tannins and flavonoids may account for the increased colonic water and electrolyte reabsorption. The crude methanol extract of the leaf has a moderate relaxing effect on smooth muscles in vitro, which is attributed to the flavonoid quercetin and its derivatives. The ethanol extract of the root significantly delayed the effect of histamine-induced broncho-constriction characterized by shortness of breath in guinea pig. The crude methanol extract of the leaves and several fractions of it have shown anti-inflammatory activity in the croton oil-induced ear oedema test in mice and in the egg albumen-induced hind paw oedema test in rats. The cytotoxicity of the crude extract was very low. Alcohol extracts from root bark, stem bark, leaves, fruits and seeds disrupted mitotic cell division in onion (*Allium cepa* L.). A methanol extract of the seed has shown inhibition of vascularization in chicken embryos.

The approximate nutrient composition of leaf meal for use in chicken feed was per 100 g dry matter: energy 1930 kJ, crude protein 18.7 g and crude fibre 16.4 g. While the production of leaves is high, their palatability to cattle, goats and sheep is rather low.

### **Description**

Straggling, laxly branched, evergreen dioecious shrub or small tree up to 8 m tall; young shoots erect, later becoming horizontal, hollow, glabrous. Leaves alternate, simple; stipules triangular, c. 1.5 mm long, acute, soon falling; petiole (3–)5–15 cm long; blade ovate to elliptical-ovate, (5–)10–25 cm × (3–)7–15 cm, base cordate, with basal lobes slightly auriculate and overlapping, apex acute to acuminate, margins toothed, shortly hairy when young, later almost glabrous, 3–5-veined at the base with 4 glandular patches in the angles of the veins. Male inflorescence an axillary panicle up to 30(–45) cm long, sparingly hairy, bracts minute; female inflorescence an axillary spike or lax panicle up to 30(–45) cm long, 1-several together, bracts broadly triangular-ovate, c. 1 mm long, acuminate. Flowers unisexual, sessile; male flowers with 2 cup-shaped sepals, petals absent, stamens 8, the united filaments forming a basal plate; female flowers with 2–4-lobed calyx, lobes obtuse, hairy, petals absent, ovary superior, conical, c. 2 mm × 2 mm, smooth, densely silky hairy, styles 2–3, 1–2 cm long,

free or fused at base, dark red. Fruit a 2-lobed capsule c. 1.5 cm × 1.5 cm, lobes somewhat compressed, smooth, shortly hairy, green to red, 2-seeded. Seeds ovoid-ellipsoid, c. 6 mm long, smooth, bright red.

#### **Other botanical information**

*Alchornea* is pantropical and comprises about 60 species of which 6 occur in tropical Africa.

#### **Growth and development**

In West Africa *Alchornea cordifolia* flowers at the start of the dry season, in October–November; in DR Congo flowering is from June to August. The nectar glands at the leaf base attract ants, which protect the plant from attacks from other insects.

#### **Ecology**

*Alchornea cordifolia* is widespread in secondary forest and riverine forest, especially in marshy areas but sometimes in drier sites, from sea-level up to 1500 m altitude. It often forms thickets in disturbed, unburned localities. It is well adapted to acid soils. In DR Congo the tree is reported to improve soil fertility and is known to be effective in restoring calcium levels in acid soils. It is one of the first trees to appear in vegetation dominated by *Chromolaena odorata* (L.) R.M.King & H.Rob.

#### **Propagation and planting**

*Alchornea cordifolia* is propagated by seed or stem cuttings. The weight of 1000 seeds is about 77 g. Plants are most easily propagated from stem cuttings, which root in 9 weeks. When grown from seed, germination takes 3–12 weeks when directly planted in moist soil.

#### **Management**

Coppice regrowth of *Alchornea cordifolia* is vigorous. In Nigeria field tests with *Alchornea cordifolia* showed that it is a promising alley crop. As a mulch crop it has good potential for restoration of soil fertility considering its standing biomass, root distribution, nutrient content in the biomass, decomposition and nutrient release patterns, and association with mycorrhiza.

#### **Diseases and pests**

*Alchornea cordifolia* is a preferred feed plant of the desert locust *Zonocerus variegatus*.

#### **Harvesting**

For medicinal purposes *Alchornea cordifolia* is mainly harvested from the wild.

#### **Yield**

The yearly biomass production of *Alchornea cordifolia* is 2000–3000 kg/ha.

#### **Handling after harvest**

In traditional medicine, the leaves and root bark are used fresh or dried in the shade for later use.

#### **Genetic resources**

*Alchornea cordifolia* is widespread and common in secondary forest and produces much seed; it is therefore not threatened.

### **Prospects**

*Alchornea cordifolia* is an important medicinal plant in traditional medicine and much pharmacological research has been effected including its antibacterial, antifungal and antiprotozoal properties, as well as its anti-inflammatory activities, with significant positive results. However, the link between activity and particular compounds is often not clear, although the flavonoids and tannins seem to play a major role. More research is needed to elucidate these relations. It is probable that *Alchornea cordifolia* will remain a major medicinal plant. Its use as an alley-cropping component is promising, especially as a mulch crop for restoration of soil fertility, but other, especially leguminous, species are preferred in most situations.

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#### **Sources of illustration**

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