

## Endangered *Allanblackia* Species:

*Allanblackia gabonensis*

*Allanblackia stuhlmannii*

*Allanblackia ulugurensis*



## Prota 14: Vegetable oils/Oléagineux Record display

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### *Allanblackia stuhlmannii* (Engl.) Engl.

#### Protologue

Engl. & Prantl, Nat. Pflanzenfam. II–IV Nachtr. 1: 249 (1897).

#### Family

Clusiaceae (Guttiferae)

#### Vernacular names

Mkange, mkanye, mkimbo, mshambo, mwaka (Sw).

#### Origin and geographic distribution

*Allanblackia stuhlmannii* is endemic to Tanzania, where it occurs in the Eastern Arc Mountains, extending through Iringa Region to the Southern Highlands.

#### Uses

The seed yields an edible fat called ‘allanblackia fat’ or ‘kanye butter’. It is used in cooking and has been used as a substitute for butter and cocoa butter, and to make candles. Recently, the international food industry has become interested in the fat as a natural solid component for margarines and similar products. The presscake is bitter and contains tannins, but is sometimes used as animal feed. The seeds are used as bait for small game. The wood is used for construction, cheap joinery, boxes, crates, beehives and water containers. It is also used as fuel. In traditional medicine, the leaves are chewed to treat cough, while the leaves, bark and roots are used to treat impotence. A seed extract is rubbed in to treat rheumatism. The fat is applied as a liniment on aching joints, wounds and rashes and small quantities are taken to treat rheumatism. Hehe people rub the fat mixed with pounded seeds of *Psorospermum febrifugum* Spach on deep cracks in the soles of the feet. The bark yields a yellow dye. Female trees of *Allanblackia stuhlmannii* are retained when land is cleared for cultivation and are possibly occasionally planted for shade in crops and for amenity. The fruit’s slimy jelly-like pulp can be used in jam making.

#### Production and international trade

The seed and timber of *Allanblackia stuhlmannii* are of mainly local importance. The seeds were exported to Europe in the 1970s and 1980s for their fat. Recently, international demand for *Allanblackia* fat has increased sharply.

#### Properties

Air-dried seeds contain about 50% fat. The fatty acid composition of the fat is remarkable as it consists mainly of stearic acid (45–58%) and oleic acid (40–51%). Only traces of other fatty acids are present. Its composition and resulting high melting point (35°C) makes the fat a valuable raw material that can be used without transformation to improve the consistency of margarines, cocoa butter substitutes and similar products. The approximate composition of the air-dried presscake is:

water 13 g, protein 14 g, fat 7 g, carbohydrate 55 g, crude fibre 7 g, ash 8 g. The presscake is bitter and contains tannins and its suitability as cattle feed is limited.

Trees of a size exploitable for timber have only a small heartwood core, a bole of 65 cm in diameter having a heartwood core of about 10 cm in diameter; the properties given below therefore refer to the sapwood. The sapwood is pale grey-brown with straight grain and medium texture. The density at 12% moisture content is about 690 kg/m<sup>3</sup>. The heartwood is dark brown to purplish; at 10% moisture content its density is about 770 kg/m<sup>3</sup>. The wood air dries slowly, with a moderate tendency to cup, but with little or no splitting. In kiln drying distortion is severe unless low temperatures are used. Boards of 2.5 cm thick air dry in 2 months, or kiln dry in about 12 days. Shrinkage from green to oven dry is 3.2% radial and 10.0% tangential. At 12% moisture content the modulus of rupture is 73–99 N/mm<sup>2</sup>, modulus of elasticity 11,100–14,500 N/mm<sup>2</sup>, compression parallel to grain 39–51 N/mm<sup>2</sup>, compression perpendicular to grain 8 N/mm<sup>2</sup>, shear 8–9.5 N/mm<sup>2</sup>, cleavage 42 N/mm radial and 44 N/mm tangential, Janka side hardness 3900–5600 N and Janka end hardness 6600 N.

The wood is difficult to saw when green, but once dry it saws easily and machines well. It holds nails well. The sapwood is not durable, but is permeable to preservatives; the heartwood is very resistant. From the wood of the roots of *Allanblackia stuhlmannii* guttiferone F, a prenylated benzophenone, was isolated. The compound is related to a group of compounds that has been investigated for its anti-HIV properties.

#### **Adulterations and substitutes**

The fat from the seeds of *Allanblackia floribunda* Oliv. from Central Africa and *Allanblackia parviflora* A.Chev. from West Africa is very similar in composition to that of *Allanblackia stuhlmannii*.

#### **Description**

Evergreen, dioecious, medium-sized to fairly large tree up to 35(–45) m tall; bole straight, cylindrical, slightly buttressed; bark surface smooth or rarely flaking with square scales, dark grey to black, inner bark red to pale brown with white stripes, fibrous to granular, exuding a clear sap later turning yellowish; branches drooping, hollow, longitudinally wrinkled. Leaves opposite, simple and entire; petiole 1–2 cm long; blade oblong to elliptical-oblong, 5–20 cm × 1–7 cm, base cuneate, apex shortly acuminate, leathery, dark green, pinnately veined with numerous lateral veins. Flowers solitary in leaf axils or crowded at the end of branches, unisexual, regular, 5-merous, cream to reddish, fragrant; pedicel (3.5–)6.5–8 cm long; sepals orbicular to ovate, unequal, outer ones 4–9 mm in diameter, inner ones c. 2 cm in diameter, pale yellow; petals orbicular to spatulate, 27–37 mm × 18–26 mm, glabrous; male flowers with numerous stamens grouped in 5 thick, fleshy bundles opposite the petals, c. 2 cm long, inner surface angled, anthers arranged on the 2 faces of the bundles; disk star-shaped; female flowers with superior, incompletely 5-celled ovary and sessile stigma, staminal bundles reduced to a few free, c. 4 mm long staminodes. Fruit a large oblong to globose or cone-shaped berry 16–34 cm × 15–17 cm, weighing 2.5–6 kg, red-brown, 60–140 seeded. Seeds 4-angular, c. 4 cm × 2–3 cm, one angle with a small fleshy aril; embryo small, embedded in oily endosperm. Seedling with hypogeal germination.

#### **Other botanical information**

*Allanblackia* comprises about 10 species and is restricted to tropical Africa. *Allanblackia ulugurensis* Engl. is endemic to Tanzania, where it occurs in the Udzungwa, Nguru and Uluguru Mountains, extending to Iringa Region, generally on steeper slopes and at higher altitudes than *Allanblackia stuhlmannii*. It is used for similar purposes.

#### **Growth and development**

Under natural conditions, trees first flower when about 12 years old. Flowering is during the short

rainy season in November–February. Pollination is done by short-tongued insects, birds and bats. Fruits take more than 1 year to develop and mature in January–March. Other reports indicate that in the Eastern Usambara Mountains fruits mature twice per year in November–March and August–October. Rodents and monkeys feed on the fruits and may disperse the seeds. Natural regeneration is currently not adequate to maintain stands.

### **Ecology**

*Allanblackia stuhlmannii* occurs on seaward slopes and valley bottoms of evergreen submontane and montane forest at 800–1200(–1600) m altitude. Average annual rainfall in its habitat is 1100–2400 mm with more than 180 rainy days. The mean annual temperature in the eastern Usambara Mountains is 18°C, maximum temperatures range from 25°C to 35°C; minima are occasionally as low as 3°C. It is found on mostly acidic clay soils derived from granite, gneiss or siliceous rock. The small isolated forest patches in the Udzungwa Mountains are drier than the rest of the habitat. *Allanblackia stuhlmannii* trees are fire-tolerant.

### **Propagation and planting**

*Allanblackia stuhlmannii* can be propagated by seed, but the seeds are recalcitrant. There are about 100 seeds per kg. Well-matured fruits are kept for about 2 weeks to allow the pulp to become soft and to make extraction of the seed easy. Fruits may be kept for up to 3 months if covered with banana leaves. Clean seeds are placed in a nursery where they take about 3 months to start to germinate, but germination may take more than 7 months to start and another 18 months to complete. The plant hormone GA<sub>3</sub> does not have any effect on the germination. After germination the seedlings are transferred to polythene tubes filled with soil. Mycorrhizae are necessary for successful growth of the seedlings and it is therefore important to add soil from around the base of mother trees to the substrate.

Because propagation by seed is difficult and because male and female trees are very difficult to distinguish until they flower, methods of vegetative propagation are being developed. Vegetative propagation is possible by cuttings, marcotting and grafting. Cuttings are placed a few cm deep in soil at a 45° angle in polythene tubes with at least 1 node above the substrate. Cuttings strike root in 8–12 weeks, after which sprouted and rooted cuttings are transferred to polybags. Methods of layering and budding are being developed. Initial tests with wildlings have shown good survival rates both with farmers and in experiments.

### **Management**

Female trees are often retained when clearing land for agriculture, but planting is still rare. It is estimated that 1 male tree per 10 female trees is needed to ensure adequate pollination. ICRAF, Kenya, is studying possibilities to domesticate this species and develop appropriate management techniques. A complete seed marketing chain is also being developed.

In forest reserves in the western Usambara Mountains the stocking rate of *Allanblackia stuhlmannii* trees has been estimated at 2.0 stems per ha for all diameter classes; for trees with a bole diameter of more than 80 cm it was 0.2 trees per ha.

### **Diseases and pests**

Apart from seed predators, no diseases or pests are known.

### **Harvesting**

Well-matured fruits are collected from the ground. The maturity of fruits on the tree cannot be estimated.

### **Yield**

A mature tree may yield up to 150 fruits or up to 50 kg fat per year.

### **Handling after harvest**

Seeds are extracted from the fruits by crushing them between the hands and rubbing them clean. The

seeds are then dried to avoid the development of moulds before being transported to the buying centres, where seeds are graded. Fat is extracted locally by traditional methods, or seeds are dried and sold to extraction plants. Traditionally, the seeds are dried and crushed; the resulting mass is mixed with water and boiled until the fat separates and floats to the surface from where it is scooped off.

### **Genetic resources**

*Allanblackia stuhlmannii* and *Allanblackia ulugurensis* are both listed in the IUCN Red List as vulnerable because of their small and severely fragmented areas of distribution and declining habitat.

### **Breeding**

Selection of high-yielding trees for vegetative reproduction has started in Tanzania.

### **Prospects**

The international food industry has taken an active interest in the domestication of *Allanblackia* species. *Allanblackia stuhlmannii* is more easily propagated by seed than other large-fruited *Allanblackia* species tested and its cultivation is being promoted in Tanzania. If productive management techniques can be developed, and if efficient marketing structures can be established, it may become an important new crop in the humid submontane and montane equatorial areas. Its utilization as a source of timber from wild stands should be discouraged as the species is already vulnerable.

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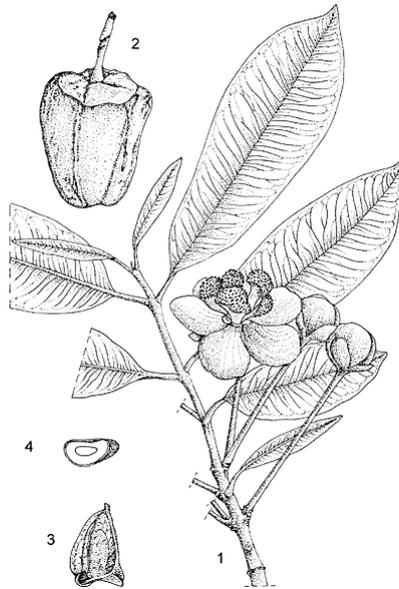
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1, twig with male flowers; 2, fruit; 3, seed; 4, seed in cross section.

Redrawn and adapted by Achmad Satiri Nurhaman



male flowers



female flowers

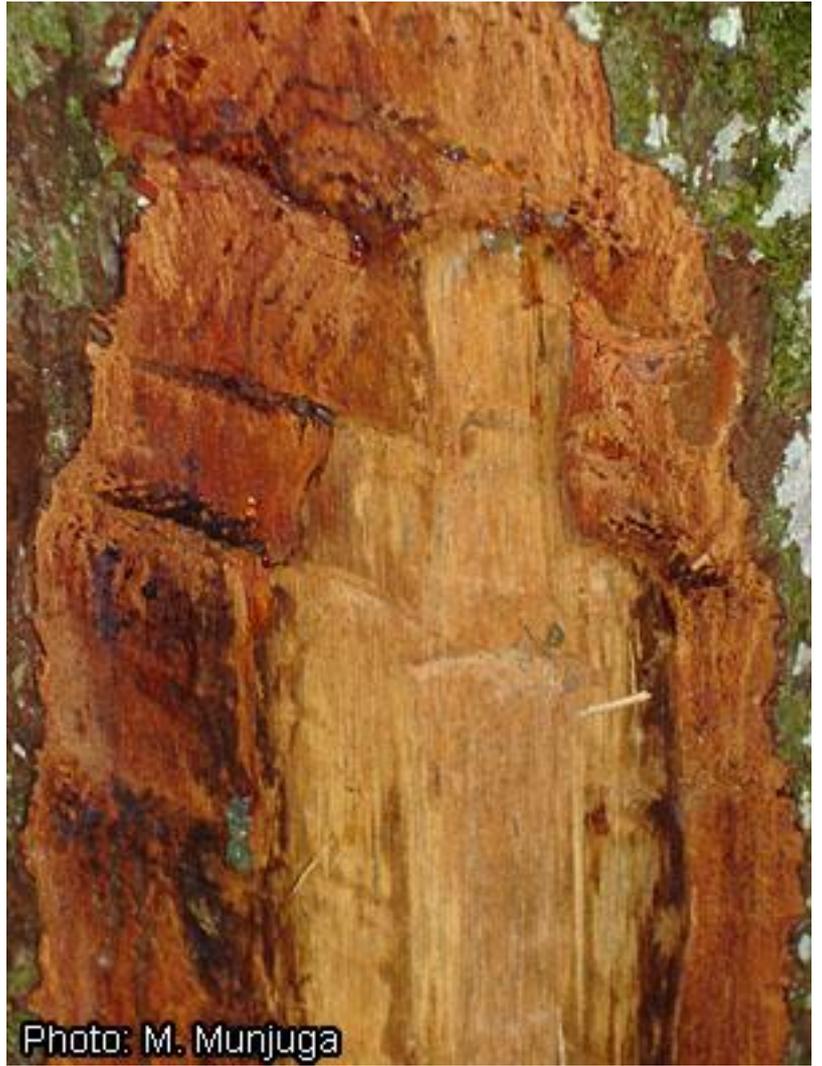


Photo: M. Munjuga

*slash of bole*



Photo: M. Munjuga

*fruits*



*seeds*



*seedlings in nursery*



*planting a young tree*

