

## Aleurites moluccana

tung

### LOCAL NAMES

Creole (alèrit,nwazèt,nwa); English (candle-nut tree,belgian walnut,candleberry,varnish tree,candle nut oil tree,Indian walnut); French (noyer,noix,noyer des Indes,aleurites,noisette); German (Lichtnussbaum,Kerzennussbaum); Hawaiian (kukui); Indonesian (kamiri); Italian (Albero della vernice); Luganda (kabakanjagala); Portuguese (calumbàn,noz da India); Spanish (nogal de la India,avellano criollo,avellano,arbol llorón,nuez); Trade name (tung)

### BOTANIC DESCRIPTION

*Aleurites moluccana* is a medium-sized tree, up to 20 m tall, with wide-spreading or pendulous branches. Bark grey-brown, fairly smooth with fine vertical lines.

Leaves simple, variable in shape, young leaves large, up to 30 cm long, palmate, with 3-7 acuminate lobes, shining; whitish above when young, becoming green with age, with rusty stellate pubescence beneath when young that persists on veins and petiole; leaves on mature trees ovate, entire, acuminate, long-petioled.

Flowers in rusty-pubescent paniced cymes, 10-15 cm long; petals 5, dingy white or creamy, oblong, up to 1.3 cm long; ovary 2-celled.

Fruit an indehiscent drupe, almost spherical, 5 cm or more in diameter, with thick, rough, hard shell making up 64-68% of fruit; difficult to separate from kernels; containing 1-2 hard-shelled black seeds.

The generic name 'Aleurites' comes from a Greek word 'aleuron', meaning 'floury'. The Hawaiians strung nuts on sticks and used them for lighting houses; this use of the kernels gave rise to the name 'candle nut'.

### BIOLOGY

In Sri Lanka, the flowering period is from April to May. In Uganda, flowering may be several times each year. Pollen vectors are honeybees and other hymenopteran species. Major dispersal agents of the fruits are birds.

(L.) Willd.

Euphorbiaceae



Leaves and fruits at Wahinepee Maui, Hawaii (Forest and Kim Starr)



Seedling at Keanae Arboretum, Maui, Hawaii (Forest and Kim Starr)



*Aleurites moluccana* tree, showing fruits at ICRAF HQ campus, Nairobi, Kenya (AFT team)

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### ECOLOGY

The striking *A. moluccana* is found on hillside forests of the Pacific and Southeast Asia, where its pale, mealy foliage stands out from darker tropical vegetation. The tree thrives in moist tropical regions, ranging from subtropical dry to wet through tropical very dry to wet forest life zones.

### BIOPHYSICAL LIMITS

Altitude: 0-1 200 m, Mean annual temperature: 18-28 deg. C, Mean annual rainfall: 650-4300 mm

Soil type: A pH of 5-8 is ideal for growth.

### DOCUMENTED SPECIES DISTRIBUTION

- Native:** Brunei, Cambodia, China, Cook Islands, Fiji, French Polynesia, Indonesia, Kiribati, Laos, Malaysia, Marshall Islands, Myanmar, New Caledonia, Norfolk Island, Papua New Guinea, Philippines, Samoa, Solomon Islands, Thailand, Tonga, Vanuatu, Vietnam
- Exotic:** Antigua and Barbuda, Bahamas, Bangladesh, Barbados, Brazil, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, India, Jamaica, Japan, Kenya, Martinique, Montserrat, Netherlands Antilles, Puerto Rico, Sri Lanka, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Trinidad and Tobago, Uganda, US, Virgin Islands (US)



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.

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**PRODUCTS**

**Food:** Kernels when roasted and cooked are considered edible; may be strung as candle nuts. After removing the hard outer coat, the seed is pounded and eaten as a sauce. Per 100 g, the seed is reported to contain 626 calories, 63 g fat, 19 g protein, 8 g total carbohydrate, 7 g water, 3 g ash, 200 mg phosphorus, 80 mg calcium, 2 mg iron, and 0.06 mg thiamine.

**Fuel:** Seed oil is suitable, with modification, for use as a substitute for diesel, the residues for conversion to alcohol or pyrolysis. In Uganda, it is planted as a backyard tree for firewood.

**Timber:** Wood whitish and soft and suitable as a timber species.

**Tannin or dyestuff:** Bark contains about 4–6% tannin.

**Lipids:** Seed yields 57-80% of inedible, semi-drying oil, liquid at ordinary temperatures, solidifying at -15 deg. C, containing oleostearic acid. The oil, quicker drying than linseed oil, is used as a wood preservative, for varnishes and paint oils, as an illuminant, for soap making, waterproofing paper, rubber substitutes and insulating material. Oil is painted on bottoms of small crafts to protect against marine borers; also prevents feeding by striped cucumber beetle. The oil is inferior to tung oil, extracted from a related Chinese species, *A. fordii*, and used mainly for varnishing wood.

**Commercial production of oil** yields 12-18% of the weight of the dry, unhulled fruits, the fruits being air-dried to about 12-15% mc before pressing. Oil yields as high as 300 kg/ha have been reported.

**Poison:** Seeds are moderately poisonous. The oil cake, containing about 46% protein, is said to be poisonous.

**Medicine:** Bark used to treat tumours in Japan. The oil is purgative and sometimes used like castor oil. Kernels are laxative, a stimulant and a sudorific. The irritant oil is rubbed on scalp as a hair stimulant. In Malaya, the pulped kernel is used in poultices for headache, fevers, ulcers and swollen joints. In Java, the bark is used for bloody diarrhoea or dysentery. Bark juice with coconut milk is used for sprue. Malaysians apply boiled leaves to the body for headaches and gonorrhoea.

**SERVICES**

**Shade or shelter:** The leafy rounded crown provides shade.

**Soil improver:** Seed press cake is suitable as a fertilizer.

**Ornamental:** *A. moluccana* is an attractive tree with its cream white flowers that may appear more than once a year.

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### **TREE MANAGEMENT**

Seedlings are planted at a density of 300/ha. Once established, trees require little to no attention. Bears 2 heavy crops each year; harvested when mature. In plantations nut yields are estimated at 5-20 t/ha nuts, each tree producing 30-80 kg. Oil production varies from 15 to 20% of nut weight. Most oil produced in India, Sri Lanka and other tropical regions is used locally and does not feature in international trade.

Coppices when young and responds to pollarding when old.

### **GERMPLASM MANAGEMENT**

Seed storage behaviour is orthodox, 79% germination following 79 years of storage. There are about 345 seeds/kg.

### **PESTS AND DISEASES**

The following fungi are known to attack *A. moluccana*: *Cephalosporium* spp, *Clitocybe tabescens*, *Fomes hawaiiensis*, *Gloeosporium aleuriticum*, *Physalospora rhodina*, *Polyporus gilvus*, *Pythium ultimum*, *Sclerotium rolfsii*, *Sphaeronema reinkingii*, *Trametes corrugata*, *Ustulina deusta* and *Xylaria curta*. Nematodes include *Meloidogyne* spp.

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**FURTHER READING**

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**SUGGESTED CITATION**

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