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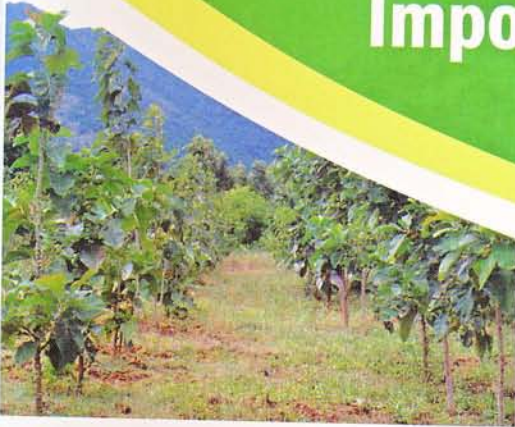
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# Manual of Economically Important Forestry Species in South India



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# Manual of Economically Important Forestry Species in South India

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# *Calophyllum inophyllum* L.

Kannan C.S. Warriar

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## 1. Taxonomy and Nomenclature

*Calophyllum inophyllum* L. is a medium sized to large tree belongs to the family Clusiaceae. It is commonly called as Poon. In English, it is known as Alexandrian Laurel. The vernacular names are Sultanachampa (Hindi), Nagachampa (Sanskrit), Punnai (Tamil), Pouna (Telugu), Punna (Malayalam) and Vuma (Kannada). The generic name comes from the Greek words 'kalos'-beautiful and 'phullon'-leaf, meaning *beautiful-leafed* and the specific epithet is derived from the Greek words 'in'-fibre and 'phullon'-leaf, alluding to the pronounced veins on the underside of the leaves (Allen, undated).

## 2. Distribution and Environmental Conditions

World distribution: The species is widely distributed throughout the tropics. As a native species it is found in Aruba, Cambodia, Cook Islands, Fiji, French Polynesia, India, Indonesia, Japan, Kiribati, Laos, Madagascar, Malaysia, Marshall Islands, Myanmar, New Caledonia, Norfolk Island, Papua New Guinea, Philippines, Reunion, Samoa, Solomon Islands, Sri Lanka, Taiwan, Province of China, Thailand, Tonga, Vanuatu and Vietnam. As an exotic, *C. inophyllum* occurs in Djibouti, Eritrea, Ethiopia, Kenya, Nigeria, Somalia, Tanzania, Uganda and United States of America (Allen, undated).

Distribution in India: It is essentially a littoral tree of the tropics occurring above the high tide mark along the sea coasts of the Indian Peninsula and the Andaman and Nicobar Islands. On the West Coast, it is found from Mumbai southwards to Southern Kerala and along the East Coast, from Orissa southwards. It is a characteristic species of the Littoral forest where it occurs in association with *Manilkara littoralis*, *Casuarina equisetifolia*,

*Terminalia catappa*, *Heritiera littoralis*, *Pongamia pinnata*, *Barringtonia asiatica* and *Erythrina variegata* (Troup, 1921). *C. inophyllum* grows in areas with an annual rainfall ranging from about 750 to 5000 mm. The tree grows in a wide variety of soils, from nearly pure coastal sands to clay, and is capable of growth on degraded and poorly drained sites. It can not withstand indefinite water logging. It is sensitive to frost and fire. Though the tree is a light demander planting in areas with light shade may improve success. It will not grow under dense forest canopies (Friday and Okano, 2006).

### 3. Botanical Descriptions

It is a medium-sized evergreen, ornamental, submaritime tree with a broad spreading crown of irregular branches. Height is 8–20 m sometimes reaching upto 35 m and DBH is 0.5–1.5 m. This tree has sticky latex clear or opaque and white, cream or yellow; bole usually twisted or leaning, without buttresses. Outer bark often with characteristic diamond to boat-shaped fissures becoming confluent with age, smooth, often with a yellowish or ochre tint, inner bark usually thick, soft, firm,



*Calophyllum inophyllum* tree

fibrous and laminated, pink to red, darkening to brownish on exposure. Though the stem is reported to be short and often crooked, clear boles reaching upto 15 m and a girth of 7 m have been reported from Andaman.

Its leaves are dark green and shining, 10 to 18 x 7.5 to 10 cm, broadly elliptic, rounded and often notched at the apex with





*C. inophyllum* fruits (Courtesy : Michele Dale, 2008)

wavy margins and very close lateral nerves giving a striate appearance to the blade, base acute; petioles 1 to 1.6 cm long stout, flat. The inflorescence is axillary racemose or paniculate consisting of 4 to 15 flowers. Flower is 1.9 to 2.5 cm in diameter, pure white, fragrant. Sepals 4, ovate-orbicular, concave, reflexed, fringed with fine hairs; Petals 4, oblong, obtuse, spreading. The ball-shaped, light green fruits grow in clusters are 2.5 to 5.0 cm in diameter. The skin, which turns yellow and then brown and wrinkled when the fruit is ripe, covers the thin pulp, the shell, a corky inner layer, and a single seed kernel (Friday and Okano, 2006; Troup, 1921).

#### **4. Reproductive Biology and Breeding System**

The flowering period is reported to vary depending on the area. In Tamil Nadu, the tree flowers during December-January and in Kerala, March-April. In some areas two flowering seasons have been observed as in the cases of Orissa (May-June and October-November). In Andaman profuse flowering occurs during the rainy season and to a smaller extent at other times of the year. Fruiting season also vary. Tamil Nadu: March; Kerala (May-June), Orissa (July-August and December-January) and Andaman

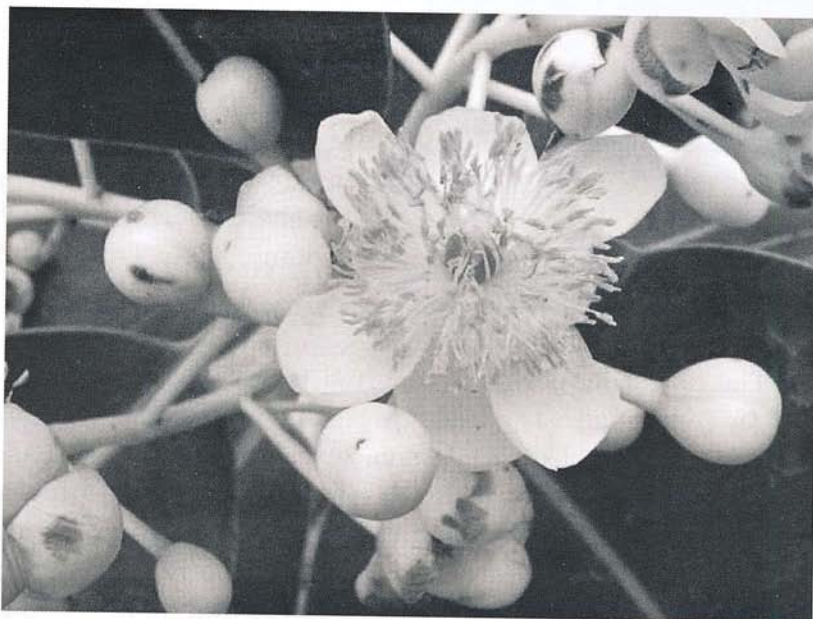
(June-August). The bisexual flowers are pollinated by insects such as bees. It has been suggested that apomixis may occur in *Calophyllum*, resulting in polyembryony. Hybridization may occur with *C. inophyllum* as one of the parents (Troup, 1921). The fruit is dispersed by sea currents and by fruit bats.

## 5. Genetics and Tree Improvement

*C. inophyllum* has been identified as a priority species for genetic research by the South Pacific Regional Initiative on Forest Genetic Resources (SPRIG). Studies on distribution, genetic variation, selection and germplasm bank establishment can be taken up to initiate genetic improvement of the species.

## 6. Seed Collection, Processing and Nursery Techniques

Seeds can be collected from trees by picking individual fruits or lopping off branches with pruning poles, but it is generally more practical to collect them after the fruits fall to the ground. Ripe fruits (skin is yellow or brown and wrinkled) may be soaked overnight to remove skin. Just prior to planting, it is best to crack



*C. inophyllum* flowers (Courtesy : Michele Dale, 2008)



shells or shell seeds entirely using a mallet, pliers, or hammer. No additional treatments are required. Seed storage behaviour is recalcitrant the seeds are very oily, quickly losing their germinative power.

It is found to be desiccation and low temperature sensitive with high seed moisture during maturity. Seeds can be stored in sealed polythene bags within a temperature range of 10 to 20°C (Anandalakshmi and Sivakumar, 2008). The tree can usually be grown from seed without difficulty, provided the seed is sown soon after ripening. Complete removal of the seed shell is very effective in improving the germination to more than 90 per cent.

Sowing seed directly into containers is the most efficient method. Small dibble tubes can be used when the seed is extracted from the shell or use of larger tubes (more than 6 cm diameter) or small pots or sowing in seedbeds followed by transplanting is recommended. Seedlings can be moved safely into full sunlight 1 to 2 months after germination. Seedlings should be hardened in full sunlight for 4 months before outplanting (Allen, Undated).

## 7. Silviculture, Plantations and Management

A report from Indonesia revealed that the spacing adopted is usually 2 x 3 m. It is regarded as a slow growing species. Fertilizer can boost its initial growth. While there are no specific fertilizers recommendations for *C. inophyllum*, seedlings have grown well with 50–170 g of a complete fertilizer of NPK (15:15:15) applied per seedling at planting and again after 6 months. Young, actively growing trees benefit from application of fertilizers containing 1–3 kg N per 100 m<sup>2</sup> of canopy or planting bed area per year. Fertilizers containing N and K are best applied in several small applications over the course of the year rather than all at once and best placed in holes dug around the trees. Alternately, or in addition to chemical fertilizers, well composted manures or other organic fertilizers can be added to the planting hole and spread around the base of the tree occasionally. Trees benefit from mulching, but deep mulch should be kept out of direct contact with the trunk (Friday and Okano, 2006). In India it is not used for plantation programme.

## 8. Agroforestry Practices

It is grown as part of the mixed garden agroforestry systems in many Pacific islands. In the Solomons, *C. inophyllum* has been traditionally retained or planted along with other trees such as breadfruit, sago palm, *Terminalia*, *Burckella*, *Pometia*, and *Canarium* in fallow yam and sweet potato fields (Yen, 1976).

## 9. Growth and Yield

It is generally described as slow growing. Young trees in Hawaii may grow up to 1 m in height per year for the first few years, but after that the growth rate slows. In Malaysia one stand of trees attained a diameter of 50 cm at breast height in 70 years (Soerlanegara and Lemmens, 1994).

## 10. Important Insect-pests and Diseases

The tree does not have many pest problems. Thrips may attack new leaves, but the trees usually outgrow the infestation and no treatment is needed. Fungus rot may affect adult trees. A fungal pathogen namely, *Leptographium calophylli* (*Verticillium calophylli*) causing vascular wilt disease was detected on *C. inophyllum* in the Seychelles (Hill *et al.*, 2003).

## 11. Wood Properties and Utilization

The wood can be used for furniture, beams, heavy packing boxes, tent poles, veneers and plywood. It is a well known material for boat and ship building; logs of long lengths are used as masts and spars. The wood is also a prized timber for carving and cabinet making. The timber is mostly used for constructional purposes (Suited for bridges, poles, ceiling boards, panelling, planking and rafters).

Sapwood and heartwood fairly sharply demarcated in the freshly felled timber, but usually less so on ageing, sapwood pale reddish-white to yellow, heartwood yellowish to reddish-brown with darker streaks on the longitudinal surface.

It is a moderately heavy wood and weighs  $655 \text{ kgm}^{-3}$  at 12% moisture content. Its specific gravity varies from 0.47 to 0.84.



The timber is fairly strong (Hardness, 1455 lbs). Bending strength in the air-dry condition (about 12% moisture content) is high - comparable to teak. Maximum crushing strength, or compression strength parallel to grain, is high. Some familiar species with high crushing strength parallel to grain include hard maple, teak, and white oak. It is fairly hard, resisting wear, denting, and marring fairly well. It can be worked to a smooth surface which takes a fine polish (Chowdhury and Ghosh, 1958).

The timber seasons well but is liable to develop short surface cracks. Drying defects that may occur in this species include end-splits and warp. Surface checking may also occur, but it is minimal.

The mechanical properties of the wood (Wood worker resource, Undated) are given below

Modulus of rupture	:	765.6 kg cm <sup>-2</sup>
Modulus of elasticity	:	70,300 kg cm <sup>-2</sup>
Maximum crushing strength	:	7370 psi
Bending strength	:	14495 psi
Shearing strength	:	2176 psi

Being mostly twisted or interlocked-grained, the timber is rather hard on the tools and is therefore, not recommended for the manufacture of rotary cut veneers and plywood. It is however, quite suitable for conversion into veneer sheets by the sawing method (Troup, 1921).

## 12. Medicinal Uses

The latex or a decoction of the bark is sometimes used medicinally. Bark of the tree is an astringent. Decoction of the leaves was used to treat eye ailments over much of Polynesia and westward into Malaysia. Oil from the seed is used for cosmetic and topical applications for healing of burns and skin diseases. Kathiresan *et al.* (2006) reported that this species is an under explored source of anticancer drugs. It is also a source of anti-HIV compounds (Thengane *et al.*, 2006)



### 13. Other Relevant Information

It is a high potential bio-diesel tree. Seed yields 65% oil from its dry weight of 3744 kg/ha from 400 trees (Azam *et al.*, 2005). It can be used in conventional diesel engines in its pure form or as a blend with mineral oil.

The thick, dark green oil extracted from the seeds is used in a number of products, including oil for lighting, medicines, soaps and body and hair grease. The seed oil is also used as a wood finish. Oil cake can be used as manure (Troup, 1921). Oil cake could be used for the management of disease complex caused by *Fusarium solani* and *Meloidogyne incognita* (root-knot nematode) on brinjal (Mittal and Goswami, 2001). The mature fruit is burned for mosquito repellent. Latex from the cut bark has been made into a poison to kill rodents and stun fish. The bark of the tree contains tannin (around 12%). In ancient Hawaii, a brownish-mauve dye was made from the fruit husks (Friday and Okano, 2006). The tree is a favourite ornamental in the Pacific.

A new prenylated pyranoxanthone, inophyllin A, was isolated from the roots of *C. inophyllum* and was found to be toxic to the larvae of *Aedes aegypti* mosquito, the results of which will go a long way in controlling the Dengue Fever (Ee *et al.*, 2006). Several antimicrobial and cytotoxic agents have been isolated from the root bark and nuts of this species (Yimdjo *et al.*, 2004).

Lesari and Yoswita (2003) reported that *C. inophyllum* is a suitable species for best quality pulp. It is an ethnobotanically important species for the Jarawas tribes in the Andaman Group of islands (Rao *et al.*, 2001). The tree is regarded as sacred in some parts of the Pacific and is commonly featured in chants and other folklore of the region.

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