

GMELINA ARBOREA

Family: Verbenaceae

Local name: Kumbil

1. Introduction

Gmelina arborea Roxb. (syns. *Premna arborea* Roth, *Gmelina rheedii* Hook.) is locally known as Kumbil.

- The tree belongs to the flowering plant family Verbenaceae.

The species is fairly common in the moist deciduous and semievergreen forests of Kerala and it is also distributed in Sri Lanka and Philippines.

The tree is shade-loving, especially when young. It is suited to sandy loam, clayey loam or red gravel soils. Fully grown trees require direct sunlight for better growth.

The tree grows to an average height of 10-25 m and are deciduous in nature.

Bark of the tree is smooth and whitish grey to pale white in colour.

The leaves are simple, opposite, ovate-deltoid, coriaceous and densely tomentose below. The brownish yellow flowers are arranged on axillary and terminal panicle inflorescence.

Fruit is a drupe, yellow in colour, ellipsoid, fleshy and usually 2-3 or rarely one seeded.

Logs attaining about 15-20 m length and 50 cm diameter are quite common for the tree.

Sapwood and heartwood are not distinct. The wood is creamy white to pale yellowish grey or buff, turning to yellowish brown on exposure. It is soft to moderately hard and light to moderately heavy (415-610 kg/m³).

The wood can be air-seasoned and kiln-seasoned, easily sawn, works well to smooth finish and takes good polish. The wood is also usually quite uniform in colour, except for occasional roe-mottling, imparting a silvery sheen colour.

- After seasoning, the wood is very steady and therefore, it is considered as a first class workshop wood, quite durable also. The wood is mainly used in construction, ship building and as class one plywood for various purposes. Furniture, tool handles, rehabilitation aids, textile mill accessories, sports items, musical instrument parts, etc are also made from the wood of *G. arborea*.

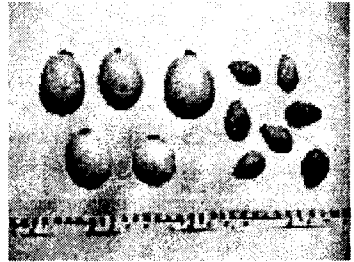


2. Plantation technology

2.1. Seed collection and processing

2.1.1. When and how to collect seeds

- Trees of *G. arborea* flower during March to April and fruits ripen during May and June.
- When the fruits on the mother trees become pale yellow in colour, it is the right time to collect them for the extraction of seeds.
- The time of ripening of fruits can be ascertained from those which are fully ripened and fallen on the ground.
- Sweep the forest floor below the mother trees or spread a plastic sheet before lopping the branchlets for seed collection. This is to avoid mixing of fruits with litter, debris, stones, etc.
- From the lopped branchlets, the fruits can be plucked by hand and filled in plastic or gunny bags and transported with out delay to the nursery site for processing.



2.1.2. How to process the fruits/seeds

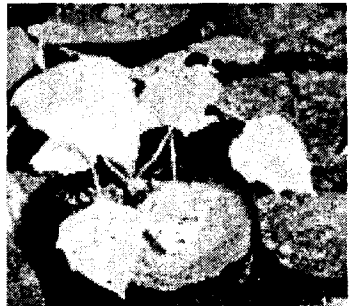
- Depulp the fruits collected, by soaking them in water for one or two days and then washing repeatedly in water.
- Malformed fruits of light weight float on the surface of water. Remove them before depulping. The cleaned stones (seeds) obtained after depulping are to be dried under shade.

2.1.3. How long the seeds can be stored

- Store the seeds after depulping and drying in sunlight for 3-5 days.
- Seeds can be stored in gunny bags or other containers of suitable sizes.
- Keep the seeds in dry, well-ventilated rooms. Seeds can be stored up to two years without considerable loss in germinability.

2.1.4. Seed germinability

- Fresh seeds have about 80 per cent germinability, without any pre-treatment.
- Seed samples, collected from the droppings of deer have a germination of almost 94 per cent.



2.1.5. How to control seed pests and diseases

- There is no major pest affecting the fruits or stored seeds of *G. arborea*.

- Rich growth of spermiophyte microflora may occur on seeds, which include 13 species of fungi and an actinomycete also.
- Seed dressing with Captan @ 4 g/kg of seeds can effectively reduce the storage moulds of *G. arborea*.

2.1.6. Quantity of seeds required for one hectare plantation

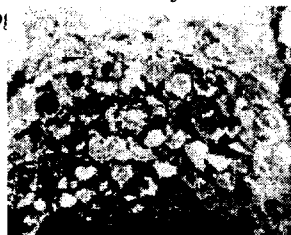
- Mature fruits are ellipsoid in shape with an average size of 2.1 cm x 1.4 cm. About 120-128 fresh fruits weigh one kilogram.
- On an average, the seeds are 1.2 cm x 0.8 cm in size and brown in colour. About 980-1060 dried seeds weigh one kilogram.
- For raising one hectare plantation at 2m x 2m spacing, about 3125 fruits, weighing almost 26 kg, are to be collected and depulped to get about 3 kg of seeds. As the germination rate is about 80 per cent, 3 kg of seeds will produce about 2500 seedlings.

2.2. Nursery establishment

2.2.1. How to raise seedlings

2.2.1.1. Standard nursery beds

- Fresh, dried seeds can be used for germination.
- Use raised standard nursery beds of size 12m x 1.2m for raising seedlings.
- Establish the nursery during May-June. Dibble the dried seeds 10-15 cm apart, in drilled lines, and cover with a thin layer of soil.
- About 1000 seeds which weigh one kilo standard nursery bed.
- The sown seeds start germinating within 21 days, which will be completed by about 45 days.
- Watering once a day is essential till the germination is complete.
- Data on optimum shade, water and manure requirements in the nursery are not available.
- Almost 80 per cent is the germination rate of fresh seeds sown in nursery beds. Seedlings grow fairly fast and can be pricked and poly-potted within 30 days.
- Polythene bags of 23 cm x 17 cm size, filled with a mixture of soil and sand in 3:1 ratio can be used for potting.
- The poly-potted seedlings, initially require shade and watering, once in a day, till they are field-planted. Remove shade 15-30 days before planting.



2.2.1.2. Root-trainer method

- Use root-trainers of 10 cm x 5 cm size, filled with either mixed weed compost (8 compost : 1 soil : 1 sand) or coir pith compost (3 coir pith : 1 soil).

- Dibble the seeds in the filled root-trainers. Data on optimum sizes of root-trainers not available.
- The sown seeds start germinating within 7 days and the germination will be completed by about 30 days.
- Sometimes two or three seedlings arise from a single stone which can be pricked into those root-trainers where there is no germination. Almost 88 per cent of the seeds sown in root-trainers germinate.

2.2.1.3. Rooting of cuttings

- Collect tender, apical stem cuttings with 2-3 nodes from seedlings or saplings and dip in water immediately after collection.
- Remove half portion of the leaf blade at lower nodes without damaging the apical bud, and immerse the cuttings in Carbendazim solution (1 g/1 litre) for 15 minutes, to prevent any fungal attack.
- To prepare the rooting hormone Indole Butyric Acid (IBA) at 3000 ppm concentration, 300 mg of the chemical has to be thoroughly mixed with 100 g of purified talc taken in a mixer.
- Dip the lower end of the Carbendazim treated cuttings in the mixture and then plant in root-trainers of 10 cm x 5 cm size, filled with vermiculite.
- Keep the hormone treated cuttings in the mist chamber for rooting, where the temperature is maintained at 35-40°C and humidity is around 70-80 per cent.
- Rooting will take place within 20-30 days, and then the root-trainers have to be taken out of the mist chamber and kept in a glass house.
- As new leaves emerge, the rooted cuttings can be poly-potted. By this method 100 per cent of the cuttings can be converted into potted seedlings, which need hardening for few days before field-planting.



2.2.2. Control of nursery pests and diseases

- Moderate to heavy attack by an epiplemid caterpillar *Epiplima fulvilinea* causes damage to the leaves of seedlings maintained in the nursery.
- The pest can be controlled by the application of 3 per cent solution of Econeem, a bio-pesticide.
- The larvae of *Calopepla leayana* also feed on the leaves of seedlings in the nursery, destroying about 10 per cent of them which needs no control measure.



- Collar-rot and seedling-blight caused by *Sclerotium rolfsii* are potential diseases in the nursery seedlings of *G. arborea*.



- Application of Bavistin (0.01% a.i.) can control these diseases.
- Leaf-spot disease caused by *Colletotrichum gloeosporioides*, *Corynespora cassicola*, *Pseudocercospora ranjita* and *Rhizoctonia solani*. and seedling stem infection caused by *Phoma glomerata* and *Fusarium solani* are other minor infections recorded in the nursery seedlings of *G. arborea*.
- All the above mentioned diseases can be controlled by two consecutive application of Bavistin (0.1% a.i.), at fortnightly intervals.

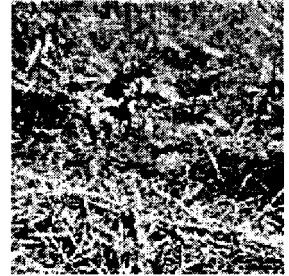
2.3. Plantation establishment

2.3.1. How to prepare the field for planting

- Select a suitable moist deciduous forest area to out-plant the seedlings of *G. arborea*.
- Weed the area to remove undergrowth and ground flora.
- Align the plot at a spacing of 2 m x 2 m or more.
- The tree can also be raised at spacing of 1.2m x 1.2m, 1.8m x 1.8, 2.5m x 2.5m, 3.6m x 3.6m and 4.5m x 4.5m depending on the end-uses of timber, as reported in literature.
- Take pits of 30cm x 30cm x 30cm size for planting the seedlings.
- Direct sowing of seeds and stump planting methods are also reported.

2.3.2. How to out-plant seedlings

- Plant the poly-potted seedlings maintained in the nursery by the onset of South-West monsoon in June.
- Remove the polythene covers without damaging the root system of the seedlings and the cover may be hanged on the stakes, which are fixed at each pit-point, while aligning the plot.
- The seedlings can be planted in such a way that the level of ground is tallying with the level of soil around the seedling.
- Provide little terracing around the field-planted seedlings to avoid stagnation of water.



2.3.3. Control of pests and diseases in plantation

- No major pest or disease problem was encountered in the field-planted seedlings of *G. arborea*.

- There are records of defoliating beetle (*Calopeda leayala*), sap-sucking bug that causes die-back (*Tingis beesoni*) and shoot boring scotyliid (*Xyleborus fornicatus*) in plantations of the species.
- Attack by *Tingis* can be controlled by the application of 0.03 per cent Roger 20 EC.
- Occurrence of leaf-spot disease in the seedlings of the species growing in natural conditions has also been reported.

2.3.4. Plantation maintenance and growth of seedlings

- Almost 86 per cent of the field-planted seedlings survive during the first six months after planting.
- Trampling and grazing by wild animals can reduce the survival rate in the first year of planting.
- On an average, the field-planted seedlings grow to a height of about 46 cm over a period of nine months.
- Data on nutrient deficiencies and their symptoms are not available.
- Thinning at intervals of 2,3,5 and 7 years are reported in the plantations of the species.

3. Calender of operations

	JA	FB	MA	AP	MY	JU	JL	AU	SE	OC	NV	DC
Seed collection												
Nursery establishment												
Planting (next year)												
Weeding/mulching												

4. Further reading

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