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Taxonomy and Nomenclature

Species Name: *Kavalama urens* (Roxb.) Raf.
Synonym: *Sterculia urens* Roxb
Family: Malvaceae
Vernacular (Common name): Kullu, gulu, karaya, kavalam (India); karaya, kadaya (Trade)

Distribution and habitat

The species is native to India where it is found in tropical dry deciduous forests of northern, central and peninsular India. It is also found in Sri Lanka and Malaysia. It grows at an altitude of 300-750 m.a.s.l. The maximum shade temperature of its natural habitat varies from 40°-48°C and minimum 0°-10°C. The rainfall ranges from 750-1250 mm. The tree is found growing in hill slopes, ridges, rocky crevices, eroded slopes and the like. It survives in stony and rocky soils, both on sandstones and trap on metamorphic rocks, especially gneisses and schists, or in shallow and ferruginous well-drained soils. It is resistant to drought, but does not thrive in waterlogged, loamy and heavy soil. The species is often associated with *Boswellia serrata* Roxb. ex Colebr.

Botanical Description

Kavalama urens is a deciduous tree with short, often gnarled, crooked and irregular bole reaching a height of 15m. Branches are large and spreading. Under favorable conditions, it can grow to long straight bole. Bark is thick, smooth, grayish white, shinning with a thin white outer coat, peeling off in papery flakes. Leaves are crowded at the end of the branchlets, palmate, 5-7 lobed with long petiole and leaf diameter 20-30 cm, glabrous above and tomentose below. Flowers are greenish-yellow, polygamous produced in axillary panicles, covered with sticky tomentose of glandular, stellate hairs. The calyx has five lobes, yellow, campanulate, hairy on both surfaces. Petals are absent; male flowers have a staminal column with 10 anthers at its tip while bisexual flowers have a ring of anthers round the five free radiating carpels.

Use

Wood is heavy, hard and strong, but poor in splitting coefficient and retention of shape. The timber is used for making posts, beams, rafters and tool handles. The tree is also used as fuelwood. The bark can be stripped off easily and produce fiber for making coarse cloth and ropes. The importance of the tree lies in the production of gum called 'karaya gum' or 'Indian tragacanth', which has great demand in India and abroad. The gum, a complex polysaccharide is produced from the pith and cortex of the tree. It is used in paper, petroleum, textile, cosmetics, pharmaceutical, food and dairy industries. It is used as an ingredient in preparation of emulsions, lotions, denture fixative powders, bulk laxatives, as pulp binders in the preparation of thin papers. It is also used in preparation of varnishes, inks, rubber, oil cloth, polishes and engraving processes. Seeds can be eaten after roasting. The tree is also useful for reclamation of bare rocky land.

Fruit and seed description

Fruits: Fruits are follicles and form an aggregate of 4-6 sessile, hard, radiating ovate-lanceolate carpels, densely pubescent, mixed with stinging hairs, red turning green when mature. The follicles contain 3-6 seeds and open through ventral sutures to disperse seeds.
Seeds: Seeds 0.5-1.1 cm long and 0.5-0.9 cm wide, oblong with grey seed coat. 800-6500 seeds per kg.

Phenology, flowering and fruiting habit

Trees shed leaves in November-December and remain leafless till about May. New leaves appear from April-June. The flowers appear from December to March before leaf flushing where the panicles are borne at the ends of leafless branches. The tree produces a large number of male and a smaller number of bisexual (functionally female) flowers. The pollen grains of bisexual flowers are sterile and their anthers serve to attract pollinators as the flowers do not produce nectar. Insects like bees does pollination. The species is self-incompatible and fruit-set by open pollination are often poor, probably

because of pollination limitations. The follicles ripen about April-May and split in hot and dry weather. Seed dispersal by birds.

Seed collection

Fresh fruits are collected from the trees. Follicles should be collected 1½-2 months after anthesis in last week of April - first week of May, when the fruit color is yellowish green and seed color is mostly black or grey. The collection method is to spread a tarpaulin under the tree and collect the fruits by lopping the branches or plucking.

Processing

After collection seeds should be extracted from the fruits and white and brown seeds should be discarded just after collection, as some may turn grey under ambient condition and therefore become indistinguishable from high quality grey seeds. After extraction, black and grey seeds should be dried under shade to reduce moisture content and attain maximum germinability.

Dormancy and pretreatment

Germination can be improved by removing two layers of seed coat (grey and white). Seeds are filled in cloth bag and rubbed to remove the two layers, and then the seeds are washed and dried in shade.

Storage and viability

Seeds are orthodox type and tolerate desiccation to 4-5% moisture content. Seeds will remain viable at least for 2 years, if stored 4-8% moisture content at ambient temperature. Seed viability can be maintained more than 3 years at 15°C or below. In moisture content 10% and above, seed germination decreased if stored above 15°C.

Sowing and germination

Germination is epigeal. The species can be raised by direct sowing in lines 30 cm wide and 1.8 m apart. Seeds may be sown in patches at a spacing of 1.8 m x 1.8 m with 3 seeds in each patch. Sowing is done soon after collection at the onset of rains. Germination takes place in 10 – 15 days. Preferred planting material is nursery raised plants with balls of earth or bagged plants. In Jabalpur, 4 month old seedlings with height of 4.5 cm were successfully raised in trial plantations. The seedlings should be planted during the onset of rains in June-July.The species is intolerant to even short-term water-logging. The period of establishment in the field can be reduced by applying chemical fertilizers, e.g. 25 gm of a mixture of ammonium sulphate and superphosphate per plant applied in 2 dosages with 3 weeks' intervalThe seedlings and saplings may be damaged by fire, so clear weeding around the plants is desirable. Seedlings should be protected from damage by cattle, sambhar, chital and rodents.

Phytosanitary Problem

Defoliators are *Sylepta balteata* and *Oglasa separata* which attack in nurseries, young plantations and forest trees. The fungal infestation caused by *Cercoseptoria sterculiae*, *Alternaria macrospora var. sterculiae*, *Myrothecium roridum*, *Macrophomina phaseolina*, *Phoma jolyana* and *P. macrostoma* are recorded in this species. The stem-borer *Plocaederus obesus* also affect the growth of the plant.

Selected readings

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