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Pinus kesiya Royle ex. Gordon

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Pinus kesiya Royle ex. Gordon

Taxonomy and nomenclature
Family: Pinaceae
Synonyms: *Pinus khasya* Hook f., *Pinus insularis* Endl.,
Vernacular/common names: khasiya pine, khasi pine (Eng.); benguet pine (Philippines); pin a trois feuilles (France); son-sambai (Thailand); thong ba la (Vietnam).

Note: the taxonomic delineation of *P. kesiya* is disputed as it appears morphologically indistinguishable from *P. yunnanensis* Franch.

Distribution and habitat

Range of distribution covers large area of SE Asia including Thailand, Burma, Laos, S. China and Vietnam to the Philippines. Normally confined to altitudes 700 -1200 m.a.s.l., in east India however, reported up to 3000 m. Often forming pure stands. When growing in the same area as *P. merkusii* the two species may be co-dominant in an overlapping altitude with *P. merkusii* being more frequent at lower altitudes and *P. kesiya* at higher. At higher altitudes occasionally co-dominant with *Keteleeria*. Very adaptable to different ecological conditions. Usually occurring where rainfall is about 700 mm per year with distinct dry and rainy season. Most provenances are frost tolerant and quite fire resistant. Occurs on a variety of soil types from sandy to clay, but seemingly with preference for poor well-drained soil. In the Philippines also found on limestone soil. Widely planted outside its natural distribution e.g. in southern Africa.

Uses

General purpose softwood timber, used for e.g. construction, pulp and furniture. Also used for resin although it is less productive than *P. merkusii*. Widely grown as an industrial plantation species.

Botanical description

Tree growing to a large size of 30 (-40) m height, straight round bole albeit often with basal sweep. Brownish bark, splitting or flaking in old trees. Needles dark green, soft, usually with 3 needles in a fasicle at the tip of short twigs. Needles 15-20 cm long, ocrea 1.2-1.5 cm long, persistant. Male strobili 4-5 cm long, cylindrical, female conelets greenish purple. Old empty cones remain attached to the tree for a long time after seed dispersal.

Female cones and male strobili at the time of pollination. Photo: Lars Schmidt

Fruit and seed description

Fruit: dehiscent cones, ovoid, sessile, 5-9 cm long, 3-5 cm in diameter, cone scales dense. Old cones dark grey and persistant on the tree up to several years after dehiscence.
Seed: seed including wing 1.5-2.5 cm long. 1 kg pure seed contains 60,000-70,000 seeds. 1000 seeds weight 14-17 g.

Flowering and fruiting

Anthesis and pollination in Vietnam occurs from January to March with significant variation from year to year. Cone development takes 2 years. Cone harvest in February (to early March) when cones turn from green to brown. Reproduction is regular every year but in Vietnam good fruit years are usually only encountered every 3-4 years. In seedling seed orchards male strobili are produced at age 9-11 years, females often 1-2 years later, i.e. 11-13 years. Cone bearing age begins at 13-15 years. In clonal orchards male flowering starts after 6-7 years, females 1-2 years later. Although time of anthesis varies from year to year it is fairly synchronised within the population.

Harvest

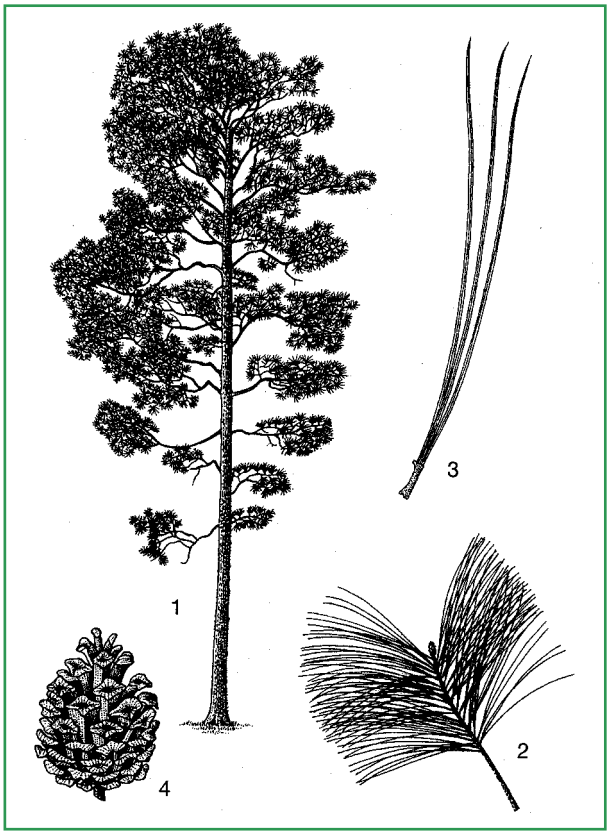
Seeds are mature when the cones have yellowish coat or part of cone turns brown, the seed endosperm is firm with much oil and some cone scales have opened to release seeds.

Cones must be picked from the trees before they open

to avoid loss of seed. The cones are firmly attached to the branches and the peduncles must be cut or broken off individually, preferably with a long handled sharp hook. Care must be taken not to damage one-year old conelets or buds during collection. Climbing by e.g. tree bicycle or spurs.

Processing and handling

If collected at the appropriate time, cones may be dried directly in the sun. It is recommended to sort cones before processing and after-ripen immature green ones in the shade for some days until they turn brown before sun drying. Seeds are normally easily extracted by shaking or raking. In climates with high humidity dehiscence may be difficult and kiln drying and tumbling may be necessary. Seeds are usually de-winged before storage. De-winging can be done by spraying a thin film of water over the seed after drying, and then expose them to a new drying; a gentle mechanical tumbling will then usually release the wing from the seed. Wings are separated from seed by winnowing. 1 kg cones may yield 1.75-2 kg seed.



1, tree habit; 2, sterile twig; 3, bundle of needles; 4, mature female cone. From: PROSEA 5(1).

Storage and viability

Seeds are orthodox and can be dried to low moisture content and stored cool. Under these conditions the seed retain high viability for more than 10 years. However, under highland conditions even with relatively high moisture content of 7-8%, high viability can be maintained for at least up to two years under ambient temperature.

Dormancy and pretreatment

Some highland provenances have a slight temperature dormancy, and it is recommended to cool down imbibed seed for 2-3 weeks in a refrigerator before sowing. Before sowing, soaking in warm water 40-50°C, and cooling down for a night enhances germination.

Sowing and germination

Germination is quite fast for pre-treated seed - usually 5-20 days. Seeds can be sown any time of the year. Sowing in sand in seedbed and transplanting into polythene tubes is most common. Time in nursery is 6 months to 1 year and planting out when plants are 14-20 cm. high. Mychorrhiza inoculants should be applied in the nursery or when planted in the field.

Vegetative propagation

For seed orchard establishment, air-layering or top cleft grafting can be applied. Mass propagation by rooting cuttings from hedged orchards is technically possible but not yet operational on large scale.

Selected readings

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