

LAO TREE SEED PROJECT



SPECIES MONOGRAPH NO. 38



Quercus serrata
Oak

(Fagaceae, oak family)

Mai Ko Khae, Mai Khae

NAFRI

DANIDA



Published species monographs

1. *Acacia auriculiformis*
2. *Acacia crassicarpa*
3. *Acacia mangium*
4. *Azalia xylocarpa*
5. *Ailanthus triphysa*
6. *Albizia lebeck*
7. *Albizia procera*
8. *Alstonia rostrata*
9. *Alstonia scholaris*
10. *Anisoptera costata*
11. *Anthocephalus chinensis*
12. *Aquillaria crassna*
13. *Azadirachta indica*
14. *Bauhinia variegata*
15. *Betula alnoides*
16. *Bischofia javanica*
17. *Carpinus poilanei*
18. *Castanopsis echinocarpa*,
C. hystrix and *C. ceracantha*
19. *Castanopsis tribuloides*
20. *Chukrasia tabularis*
21. *Dalbergia cochinchinensis*
22. *Dalbergia cultrata*
23. *Dipterocarpus alatus*
24. *Eucalyptus camaldulensis*
25. *Gliricidia sepium*
26. *Gmelina arborea*
27. *Hopea odorata*
28. *Keteleeria evelyniana*
29. *Leucaena leucocephala*
30. *Melia toosendan*
31. *Nyssa javanica*
32. *Ormosia semicastrata*
33. *Paramichelia baillonii*
34. *Peltophorum dasyrhachis*
35. *Pinus kesiya*
36. *Pterocarpus macrocarpus*
37. *Quercus griffithii*
38. *Quercus serrata*
39. *Sapindus rarak*
40. *Schima wallichii*
41. *Sindora siamensis*
42. *Spondias axillaris*
43. *Swietenia mahagoni*
44. *Toxicodendron (Rhus)*
succedanea
45. *Tectona grandis*
46. *Toona ciliata*
47. *Vatica harmandii*
48. *Wrightia arborea*
49. *Xylia xylocarpa*
50. *Zanthoxylum rhetsa*

This species monograph is prepared by: Lutz Lehmann

Design by: Chongkham Phonekeo

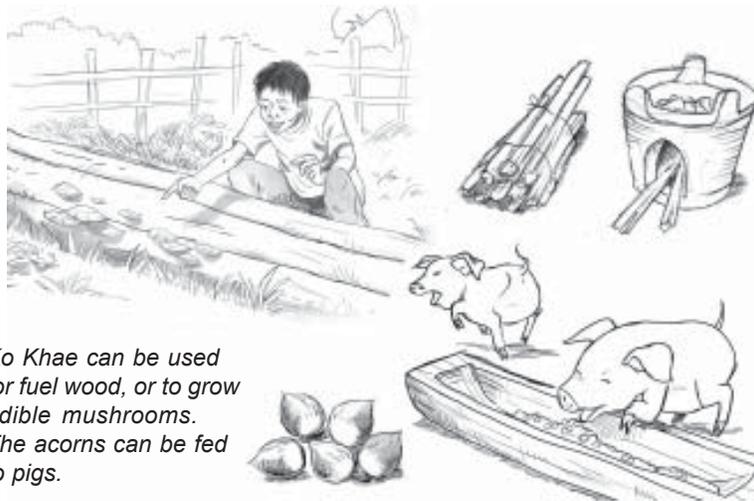
Description

Ko Khae is a large tree up to 40 m tall and 1 m in diameter. Leaves are shed during the dry season. Growth is rather fast. Ko Khae grows in pure stands or mixed with *Quercus griffithii* (Ko Sa), *Pinus kesiya* (Paek Sam Bai) and *Keteleeria evelyniana* (Hing).

Flowering is in March and fruiting is in November, later than *Quercus griffithii* (Ko Sa).

Use

Ko Khae is mainly used for fuel wood. It has good coppicing ability. Nuts can be fed to pigs and are very nutritious. The wood can be used as a substrate for growing edible mushrooms. Ko Khae improves the humus layer of the soil with its shed leaves.



Ko Khae can be used for fuel wood, or to grow edible mushrooms. The acorns can be fed to pigs.

Site requirements

Climate

Ko Khae grows on altitudes from 600 to 1,200 m. It needs a cool climate with a mean annual temperature of 19–22 degrees Celsius. Ko Khae is frost tolerant. Mean annual rainfall is about 1,500 mm. The dry season can last up to 6 months, usually from November to April. During this time frequent fog occurs, in particular in December and January.

Soil

Ko Khae grows on a variety of dry soils from red laterite soils to fertile limestone and loamy soils. It can be found on lower and middle slopes in hilly areas as well as on flat areas.

Establishment of plantation

Ko Khae seedlings can grow in full sunlight and are therefore suitable for planting in open land. Site preparation can be done by strip ploughing in January and harrowing in March. The strips should follow the contour lines of the slope. Another method is to dig planting holes in June just before planting. Planting can be done in June and July, with 6 months old seedlings with a height of about 30-40 cm. For each seedling 25 gram of fertiliser NPK 16-20-0 is applied during planting to stimulate growth. One more application is given in August. During planting fertiliser is mixed with loose soil and put in the bottom of the planting

hole. The second dose of fertiliser in August is put on top of the soil in a circle of 20 cm around the seedling. Usually Ko Khae is planted on less fertile soil so weeds are not a problem. Ko Khae seedlings are able to resprout after they are damaged by fire, but a firebreak is necessary to make to avoid loss of growth. A firebreak around the planting site can be made by ploughing, digging or controlled burning.

Ko Khae seedlings do not need protection against cattle and buffaloes, as they do not eat them. Replacement planting can be done 1 year later in May or June. It is not necessary to carry out thinnings in the first 10 years. After the young trees have reached pole sizes of about 10 cm in diameter they can be thinned. The wood of the thinnings can be used as fuel wood. The tree stumps will regenerate through coppice shoots.

Seed handling

Basic data

About 250 to 500 seed per kg, depending on the size. Ripe nuts have a red-brown colour. If the nuts lie in the sun the colour becomes pale brown. Germination rate is about 95 %.

Seed collection

Seed can be collected from November and December. One has to wait until the ripe red-brown acorns fall down

to the ground. The cupula can be removed by pulling it apart by hand from the acorn. Seed collection should be done once a week in order to avoid that rats and squirrels eat too many acorns. Seed with a hole in the surface should not be collected because their interior is already eaten by larvae, and they do not germinate.



Remove the cupule from the acorn by hand.

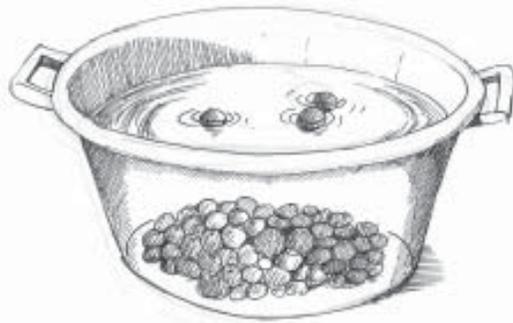
Storage

Ko Khae seed can be stored in rice bags in a cool and dry place for about 6 months. The bags should allow air circulation otherwise the nuts start to mould. If loss of moisture is too much then seed lose the ability to germinate.

Pre-treatment of seed

Ko Khae seed germinate well without pre-treatment. Before the acorns are sown in the nursery one has to separate the empty ones by putting the acorns into a bucket of water and remove the floating ones. The acorns sink-

ing to the bottom can be sown in the nursery. One method to stimulate germination is to put the acorns in a plastic bag and add wet rice straw. After that close the bag carefully. The moisture will let the acorns start to germinate faster than usual.

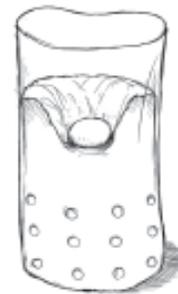


Floating test: throw away the floating acorns and sow the ones that sink.

Nursery techniques

Seed sowing

Ko Khae seed is sown directly in polythene bags, 1 acorn per bag is enough because of its high germination rate. Besides this, transplanting seedlings from a sowing bed often damages the taproot. Seed should be sown in mid January, when temperatures in the highlands start to rise after the cold season. Push a finger into the soil of the polythene bag so that a hole of 3-4 cm deep is created. Then put one acorn into it, with the tip side-ways.



Direct sowing in polythene bag of Ko Khae acorn, planted sideways in the hole.

Container

Polythene bags of 3/5 x 7 inches are suitable to raise Ko Khae seedlings.

Soil

Soil mixture for the sowing bed and potting mix should contain 1 part sand and 2 parts topsoil. Up to 10 % rice husks can be used in the potting mix. Ko Khae is a tree species that requires mycorrhiza fungi for better growth. Therefore soil from Ko Khae forest should be used in the potting mix.

Transplanting

Transplanting seedlings is not necessary since the acorns are sown directly into polythene bags.

Fertiliser

Per seedling 5 of gram of fertiliser NPK 16-20-0 can be applied to stimulate the growth of the seedlings.

Weed control

Weed control is usually not necessary since seedlings grow very fast and shade out weeds.

Root pruning

The development of Ko Khae seedlings is quite fast. Sometimes the root system develops beyond the polythene bag. However this is only for a small percentage of seedlings, which makes root pruning unnecessary.

Hardening off

Hardening off can be done by removing the shade net in the beginning of May, 1 month before planting the seedlings out.

Shade and shelter

Ko Khae seedlings are raised under 50 % shade. They are planted out at the beginning of the rainy season so protection against heavy rain is not necessary.

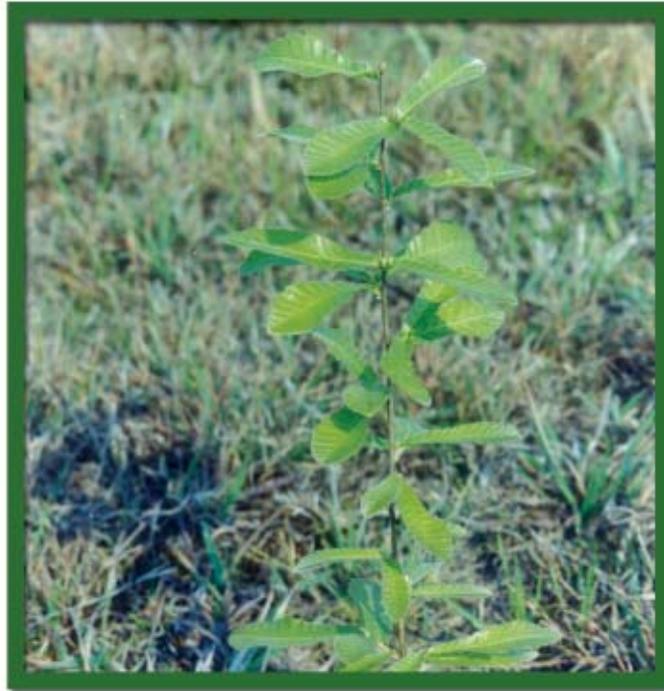
Insects and fungi

The most serious problem with Ko Khae seed is insect infestation already in the forest. One larvae develops in only one acorn but does not move to other acorns. In mid December all larvae have left the acorns. Infested acorns are then easily recognised by the hole in the outer layer of the nut and should not be collected. Attacks by fungi and other insects in the nursery have not been observed.

Remarks

Ko Khae seed have been successfully used for direct sowing in the field. The germination rate is about 70 % after storing of six months. Sowing can be done at the beginning of the rainy season in May after seed collection. Make a hole of 5 cm deep and put 2-3 acorns in the hole. After that the hole is covered with soil.

LAO TREE SEED PROJECT



Copies of the species monographs can be obtained from:

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