LECTURE-17

"LEARNING OBJECTIVE: ECONOMICS OF CULTIVATION-NURSERY AND PLANTING OF *Quercus leucotricophora* A. AND *Dendrocalamus hamiltonii* Nees."

Plate 17.1 Flowering of Ban oak

Plate 17.2 Nuts of Ban oak

Botanical Name: *Quercus leucotrihophora* A.

Common Name: Ban oak

Family : Fagaceae

Description

- It is moderate sized to large evergreen tree with almost rounded crown
- It attains a height of 20m and diameter of 60cm,
- The bole is irregular and short.
- The bark is greyish brown, rough with cracks and fissures exfoliating in irregular oblong.
- Young leaves are pinkish and woolly all over mature dark green and glabrous above.
- Male spikes slender, drooping 5-10cm long
- Male flower axillary
- Acorn generally solitary usually born on current year shoot
- Ripe nuts ovoid conical brown when ripe 2.5cm long

Distribution

- Occurs in the moist and cooler aspects in Western Himalayas between altitudes 800m to 2300m on southern aspects,
- The limits are lower by 200 to 300 m on the northern aspects.
- In Kangra valley, it is reported to occur even at 600m elevation.
- It is principal species of ban oak forest of lower West Himalayan Temperate Forest
- It is associated with *Quercus dilatata*, *Cedrus deodara, Pinus wallichiana* however, at lower elevation with *Pinus roxburghi*, *Quercus glauca* and *Quercus lanuginose.*

Site Factors

Climate

- It is a tree of temperate climate
- In its natural zone maximum shade temperature never exceeds 35°C while in lower limit in subtropical zone temperature may reach 38°C
- During January most of the area in its upper limit of its distribution receives snowfall but it make small part of precipitation, the major part is received in the form of rainfall during June to September.
- The total annual rainfall varies from 1000-1800mm

Soil

- It grows on wide variety of geological formations and soils such as shale, gneiss, schist, quartzite and limestone rocks and mostly sandy or clayey loam soils.
- It grows best on cool Northern aspect with deep moist shale soils

Phenology

- It is an evergreen tree, old leaves falls after the appearance of new leaves and thus trees are never leafless
- New leaves appear in the month of March-April
- Shading of old leaves and appearance of new leaves first starts at lower elevation of its occurrence
- Male catkins and female spikes appear on new shoots in April-May
- The fruit ripens in December-January after 19-21 month of flowering

- Seedings starts comparatively at early age tree of 26 years and coppice of ten year age have been reported bearing fruit

Silvicultural characters

- It is moderate light demander,
- It can withstand fair amount of shade in early age,
- Trees growing under shade develop restricted crown while those grown in the open have well developed crown
- Tree are resistant to ordinary frost but severe frost kills seedling and sapling
- Seedlings are sensitive to drought particular in first two years,
- Due to massive root system tress are wind firm,
- Trees are susceptible to fire
- It coppice well in young age and it declines with age.

Regeneration

Natural –

- ✓ With favourable conditions germination takes place after early showers.
- ✓ Germination takes place in June to July after receiving of first showers.
- ✓ Germination may takes in heavy or moderate shade but seeds fail to germinate in places expose to direct sun.
- ✓ Drought is the most adverse factor causing seedling mortality.
- ✓ The growth of seedling under natural condition is slow and they attains height of 10cm in first season and about 25cm in four years.
- ✓ Seedling develops a long tap root and the growth of root is generally more than that of shoot during the first few years

Artificial –

- ✓ It can be raised easily through direct sowing, planting out of nursery raised seedlings.
- ✓ Air layering is also possible and with application of auxins encourages rooting.
- ✓ On dry slope transplanting ensures more survival.

Seed collection and storage

- Good seed years are frequent

- Acorns are collected in December to January preferably from tress
- Acorns are dried under shade only and stored in cool place protected against insect-pest
- The seeds can be stored for one year
- About 400-800 acorns weigh one Kg
- Storage of acorns at low temperature and high humidity is advocated

Direct sowing

- Ban oak can be successfully raised by direct sowing either dibbling the seed in cultivated line or patches
- The seeds are sown about 2cm deep during December to January or before the onset of the rains
- About 5 Kg of acorns are sufficient for one hectare area
- Fresh seed registered 60-70% germination
- Sown area should be protected against grazing and fire

Nursery technique

- Seeds are sown in February-March in well manure and raised beds.
- Seeds are sown in lines about 20cm and seeds are spaced at 5cm in the lines at a depth of 2cm.
- Deep sowing delays the germination and also reduces germination percentage.
- Beds should be prepared under light shade, not under direct sunlight.
- Germination starts in about 10-12 days and takes to 4-5 days to complete.
- Regular weeding also required.
- Seedlings are spaced at 10cm in lines in the second rainy season after pruning the roots
- The growth of seedlings is fast and they attains a height of 50-60cm in two year

Planting technique

- Seedlings of about 15-20cm height are suitable for planting out as taller seedlings are difficult to handle due to their massive roots.
- Rainy season gives better results than winter planting.

- Planting is preferably completed by July as later planting brings out poor survival.

Tending

- Species is slow growing and it needs weeding and cleaning for several years.
- Planting should be guarded against cattle browsing and forest fires.
- Improvement fellings and thinning in natural seedlings is to be done at 10years intervals.

Economic importance

- The major use of ban oak is for fuelwood and charcoal making, for which it is in great demand.
- Calorific value of fuelwood is 4600 k cal/Kg.
- Charcoal conversion factor is about 16-20%.
- Tree is lopped for fodder and a mature tree can yield 20-25Kg leaves annually.

Plate 17.3 *Dendrocalamus hamiltonii* Nees.

Botanical Name	**:**	*Dendrocalamus hamiltonii* Nees.
Common Name	**:**	Magar bans
Family	**:**	Poaceae/Graminae
Sub Family	**:**	Bambusoideae

Description

- It is a large bamboo, culms growing at an angle
- Culm are greyish white when young and dull green when old
- About 12-25m height and 10-19cm diameter
- Internodes are 30-50cm long
- Culm sheath is glabrous, rough with brown hairs on outer side

Distribution

- Found throughout in North-West Himalayas, Sikkim, Bhutan, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura
- Cultivated in Himachal Pradesh between altitude 350-1400 m at Chamba, Mandi and Bilaspur

Site factor

Climate

- Rainfall varies from 750-5000mm in its natural range
- Temperature maximum 46°C and minimum -5°C

Soil

- It grows on wide variety of soils having good drainage
- Sandy loam soils underlain by boulders are most suitable
- It is rarely found on heavy soils such as clay or black cotton soils

Phenology

- Flower sporadically or gregariously
- New culms arise from buds on the rhizome during August
- New culms attain their full length by November-December

Natural regeneration

- Reproduction of bamboos is through rhizomes
- Rhizome is underground portion of the stem, closely similar in structure to the above ground portion of the stem i.e. culms and branches
- The buds on rhizomes, which usually develop are generally one year old
- It is affected by careless fellings, non observance of cutting and grazing rules are the other causes which lead to congestion, reduce the yield as well as deteriorate the quality of bamboos

Artificial regeneration

Rhizome planting

- Separated out rhizomes can be planted in the rainy season
- Traditional method of planting is by offsets at the onset of rainy season in June-July and about 50% survival rate is expected
- Culm is cut at a height of 1-1.5 m just above the joint and rhizome severed at the desired oldest narrow point
- A pit of 60 cm^3 and spacing of 6 m × 6 m and 7 m × 7 m is desirable
- The established plants yield culms of exploitable size in 4-5years

Single node cutting

- One node cuttings, each with major length of its basal and minor of distal internode are taken from the under one year old culms and planted in March
- Before planting the cuttings, their branches are trimmed above third to fifth node beyond the condensed basal portion
- The cuttings are planted horizontally with the branch or bud upward, 10-15 cm deep in rows and covered with soil having well decomposed farm yard manure

Mass production

- A new technology for mass production of seedling developed by the FRI
- Sowing seed in July in the germination trays, when the seedlings reach 3-4 leave stage they are planted in polybags containing equal proportion of soil, sand and FYM
- At the age of eight month seedlings are removed from polybags in April
- Proliferated tillers of these seedlings are separated by cutting rhizome to act as propagules
- Each propagules consists of a tiller along with rhizome and roots

Economic importance

- It is used for rafters, house posts, ladders, tent poles, shafts of tongas, scaffoldings etc.
- Shoots are used as vegetable and pickles
- Important raw material for paper mills