LECTURE-14

"LEARNING OBJECTIVE: ECONOMICS OF CULTIVATION-NURSERY AND PLANTING OF *Morus alba* L. AND *Grewia optiva* Drumm."

Plate 14.1 *Morus alba* tree

Botanical name **:** *Morus alba* L.

Common names (Hindi) **:** Shahtut, tut, tutri, chinni

Family Name **:** Moraceae

Description

A full grown *M. alba* is a moderate sized tree with short clean bole and spreading crown. The bark is smooth in young and rough in old trees. It is a short lived tree and the trunk starts becoming hollow in old trees.

Climate

- *Morus alba* grows in areas with subtropical or mild temperature climate. Maximum shade temperature seldom exceeds 43^0C while the minimum temperature may drop below

freezing point for a few days in January; the absolute maximum shade temperature touches even 48^0C in some areas of its cultivation.

- For optimum growth, adequate water supply, particularly during the growing period, is essential. The annual rainfall varies from about 400 mm to 4500 mm and most of it is received during monsoon season.
- In areas with less than about 1200 mm annual rainfall, irrigation is necessary for its good growth.

Distribution

- *Morus alba* is cultivated in Northern India from Jammu and Kashmir to Assam. In the Himalayas, it ascends up to an elevation of about 1200 m.
- In the hills, it is mostly confined to stream beds or such other places where sufficient moisture is available for its growth.
- It does not grow on dry slopes or shallow soils where moisture becomes the limiting factor.

Soil

- *Morus alba* grows on a variety of soils ranging from sandy loam to clayey loam,
- Alluvial, deep, loamy soil with sufficient moisture supply supports its best growth.
- The tree cannot tolerate alkalinity and grows best on soils with pH ranging between 6.0 and 7.5.
- In hills, moisture availability limits the growth and on dry slopes, the trees remain stunted.

Phenology

- Leaf-fall - November - December
- Leaf renewal - March - April
- Flowering - March -April
- Fruit ripe - April-June
- The fruits are white or red and sweet in taste.
- Trees of about five years age start producing viable seed.

Silvicultural characteristics

- *M. alba* is a shade bearing tree and it can with advantage be grown as an under-storey with other light demanding species.
- It coppices and pollards very well.
- The coppicing power of trees bigger than 30 cm diameter is generally poor.
- It can withstand light frost.
- Its water requirement is high
- It suffers from droughts as may be expected from its being a surface feeder.
- It is susceptible to fire and browsing.

Natural Reproduction

- *M. alba* regenerates either through seed or coppice.
- The seed is dispersed either by water or by birds.
- Such seed as it gets lodged at suitable places, germinates readily.
- For germination, the seed requires moist and well drained soil.
- Light shade is favourable for germination and seedling establishment,
- Thick shade is harmful.
- The seedlings can establish under canopy of trees having light crowns.

Factors considered favourable for seedling establishment are

- Adequate shade,
- Soil free from tall and thick weeds,
- Adequate soil moisture,
- Soil should be free from salinity,
- Protection against browsing animals,
- *M. alba* tends to be aggressive in irrigated plantation areas,
- The tree coppices well and can be regenerated through coppice.

Artificial Propagation

M. alba can be propagated either by planting out nursery raised seedlings or through rooted branch cuttings.

Nursery raised seedlings are planted out either as entire plants or as stumps, the latter give better results than the former.

Direct sowing does not produce good results.

SEED COLLECTION AND STORAGE

- Ripe fruits should be collected from the trees
- Fruits should never be collected from the ground as the seed in such fruits is generally insect attacked
- The fruits are heaped in the shade, rubbed and washed in water to separate out the seed which is dried in sun for a few days before storage
- The fruits may be pressed in a cloth to extract the juice and the pulp is then dried in sun, rubbed by hand and winnowed to remove the seed
- About 430-460 seeds weigh one gram.
- Seed stored in gunny bags is reported to lose vitality completely after one year's storage.
- Carefully prepared seed can be stored in sealed tins in which it keeps well.
- The seed stratified in layers of fine dry sand or ash keeps well for over two years.

NURSERY TECHNIQUES

- Sowing in the nursery is done in May-June, soon after seed collection.
- Sowing is done in lines about 20 cm apart.
- Stratification in moist sand at about 5^0C temperature for about 30-90 days is reported to improve germination.
- Soaking of the seed in cold water for about a week is also reported to hasten and ensure uniform germination.
- Pre-sowing treatment of the seed with kerosene oil is also recommended to protect it from being carried away by ants.
- One bottle of kerosene oil is sufficient to treat about 37 kg seed.

Plate 14.2 Clonal nursery of *Morus alba*

- The seed is mixed with ash or sawdust to ensure uniform sowing.
- It is covered only lightly with fine soil.
- Germination commences in about a week and may be complete in another 10 days
- The seedlings are transplanted when about 10 cm tall at a spacing of about 60 x 60 cm.
- Transplanting may be done in winter.
- For the production of stumps, the seedlings may be retained in the nursery for one or two years depending on their growth rate.
- About 2 cm collar diameter is considered to be the most suitable size for stumps.

PLANTING TECHNIQUE

- Out of the two common methods namely, planting out of entire plants and stump planting, the latter ensures higher success and is preferred.
- Stumps are prepared out of one or two years old seedlings ensuring that their collar diameter is normally not less than 1 cm.
- Stumps of about 1.5-2 cm collar diameter perform better.
- Stumps with about 22 cm root and 8 cm shoot are prepared with a sharp tool so that these do not spilt during preparation.
- These are wrapped in moist gunny bags during transport.

- Planting is done either in crow bar holes or in 30 cm^3 pits.
- *Morus alba* can be raised by planting branch cuttings also. This method is however, not employed for raising plantations and is employed to multiply clonal material of good varieties.
- The spacing depends upon the objectives of raising the plantations.
- Close spacing may suffice if the trees are to be pollarded for leaf production.
- Wider spacing of 4 x 4 m or 5 x 5 m may be necessary if timber and leaf production are to be combined.

ECONOMIC IMPORTANCE

- Wood is in chief demand for sports industry especially used for hockey sticks, tennis and badminton rackets and cricket bats etc.
- Used for boat-building, house construction, furniture
- It is good fuelwood having calorific value of sapwood and heartwood 4658 and 5003 kcal/kg respectively.
- The leaf fodder of mulberry is of good quality
- The leaves are used for silk worm rearing

Plate 14.3 *Grewia optiva* tree

Botanical Name: *Grewia optiva* Drumm.

Common Name: Beul, Dhaman

Family : Tiliaceae

Description

- It is a very popular tree of the farmers of the sub-Himalayan tract for its fodder and fibres.
- A full grown tree is moderate sized with spreading crown, reaching a height up to 12 m with a clear bole of 3-4 m and a girth of about 80 cm.
- Bark is smooth and whitish-grey.
- Flowers 1-8, solitary and axillary, petals yellow or white.
- The fruit is a fleshy drupe, 2-4 lobed, olive green when immature and black when ripe, and edible.

Distribution:

- It is distributed from the foothills of the Western Himalayas from Jammu and Kashmir to Nepal up to 2000 m elevation.
- It is not a common forest tree and is generally grown on field boundaries or terraces raised by the hill farmers.

Site factors

- It is a tree of sub-tropical climate.
- In its natural habitat, the maximum shade temperature seldom exceeds 38^{o}C and the minimum rarely drops below -2^{o}C.
- Tree is hardy and grows on a variety of soils. Sandy loam soil with adequate moisture supply supports good growth.

Phenology

- Leaf-fall - March-April
- Leaf renewal - April-May
- Flowering - April-May
- Fruiting - June-July
- Fruit ripe - October-November

Silvicultural characteristics

- Strong light demander
- Require complete over head light
- Seedling suppressed by weed
- It is frost hardy tree
- Young seedling dieback due to severe frost
- It coppice very well
- Susceptible to fire and browsing

Natural Regeneration

- Natural regeneration occurred sporadically
- Seed coat is hard
- Germination take place after the seed get soaked for more than 12 hours
- Long tap root is formed during the first year which is longer than the shoot length

Artificial regeneration

Grewia optiva can be propagated by seeds, transplanting of nursery raised seedings, by cutting or planting stumps.

Seed collection and storage

- The fleshy drupes are edible,
- A substantial quantity of fruit crop is devoured by the birds, if seed collection is delayed.
- The fruits are not borne on the current year's shoot, tree lopped completely do not bear fruits.
- Therefore, trees reserved for seed production should either not be lopped at all or if necessary only partially.
- The fruits are rubbed and washed in water to separate out the seeds.
- Each fruit contains 2-4 seeds;
- There are about 12,000 to 15,000 seeds per Kg.
- The seeds have a hard testa and can be stored well for at least a year without any appreciable drop in vitality.

Nursery Technique:

- Pre-treatment of seed is necessary as seed coat is hard.
- Sowing should not be done on raised beds as moisture needed for germination.
- The dibbling method of sowing with twice a day irrigation proved to be the best in germination percent.
- The seed is sown in March-April, about 2 cm deep in lines 15 cm apart
- Watering is done regularly till germination is over. Germination starts in about 10 days and takes a month to complete.
- Sowing in March results in prolonged and scattered germination with heterogeneous stock.
- The seedlings are spaced about 10 cm apart in lines.
- The growth of the seedlings is fairly fast and they attain a plantable height of 30 cm or more by July.

Planting Out:

- Planting is done at the onset of monsoon, late planting generally fails.

- Seedlings uprooted from the nursery with balls of earth are wrapped in moist gunny bags and transported safely.
- Planting is done in 30 cm^3 pits at a spacing of 4x4 m for block planting and 4-5 m for single row planting along the field bunds. For stump planting 15 month aged seedlings are used.

Vegetative Propagation:

- It can be successfully propagated by cuttings, under intermittent mist.
- Soaking the cutting base for 20 hrs in 100 mg/litre IAA gave a maximum rooting of 77.5 % in June.
- The technique used for mass multiplication of cuttings for plantation and seed orchard establishment.
- It can also be propagated by air layering.

ECONOMIC IMPORTANCE

Small timber:

✓ The wood is white, heavy, hard, elastic, strong and fine-textured.

✓ It is used for oar-shafts, axe-handles, shoulder poles, cat frames, bows and several other purposes, where strength and elasticity is required.

✓ The wood is difficult to saw when green but also difficult to work by hand after seasoning. It is reported to be suitable for paper-making.

Fibres:

✓ The bark yields a fibre of inferior quality used for cordage.

✓ The elastic branches are used for making baskets.

Fuel-wood:

✓ Though used as a fuel wood, not liked very much because of the foul foetid smell it emits on burning.