

Lec.15. Silvicultural practices for Ailanthus,Neem, Pungam and Prosopis

1. Ailanthus

Scientific Name	: <i>Ailanthus excelsa</i>
English name	: Tree of Heaven
Tamil name	: Pimaram, Pinari, and Perumaram
Hindi name	: Arna, Ardu, Maharukh, Arusa
Family	: Simarubiaceae

Distribution

Ailanthus excelsa is considered a native of the Indian peninsula, but occurs throughout the tropical and subtropical regions of India, especially in the dry districts of Gujarat, Rajasthan, Haryana, Punjab, Uttar Pradesh, Bihar, Orissa and the Deccan plateau. It is not found in the high rainfall regions of the West Coast.

Physiognomy

It is a large deciduous tree, attains a height of 18-24 m. Bark is light grey and smooth in young trees, with large conspicuous leaf scars, rough, granular and greyish brown in older ones. Leaves are pinnately compound, up to 1m long, with 8-14 pairs of leaflets and an unpleasant smell when crushed. In seedlings and saplings imparipinnate leaves are the rule for the first three or four years, after which the terminal leaflet becomes reduced in size or is represented by a mere prolongation of the rachis and finally the typical abruptly paripinnate leaves are formed about the fourth or fifth season. The fruit is a red one-seeded samara 5-7.5 cm long and 1.2-1.5 cm wide, prominently veined, acute at both ends and twisted at the base; about 9 to 10 fruits weigh one g. The fruit being winged is adapted for dissemination by wind.

Phenology

The panicles of small yellowish flowers appear in February - March and the fruits ripen in May - June. Old leaves fall during February and new ones appear in March - April. In Central India, flowers appear during February and March and in the North during April.

Silvicultural Characters

It is a strong light demander and is susceptible to frost and prolonged drought, though poles and trees are resistant. It coppices well and produces root suckers freely. It is very susceptible to water-logging and wind break.

Climate and Soil

It grows well in semi-arid and semi moist regions, both in the plains and the hills. In Rajasthan, it grows in areas with an average annual rainfall of 400 mm. It avoids moist areas with high monsoon rainfall. The average mean temperature is about 10 ° C and maximum about 30oe. Average annual temperature is above 27°e. Though it can grow on a wide variety of soils, it thrives best on porous sandy loams. It avoids clay with poor drainage and waterlogged areas. It can be grown on shallow dry soils but growth is poor.

Nursery Techniques

For maximum viability and vigour, fruits are collected when the colour of the pericarp changes from yellowish brown to brown. The samaras are dried in the sun. These lose their viability in about four months. Nicked samaras are kept in wet gunnies for 48 hour. At the end of storage sprouted samaras are separated and sown in polybags. By this method, the number of empty containers is considerably minimized. Samaras number about 9600 in a kg. Germination takes about 5-12 days and is completed in about 30 days. The radical and plumule emerge through the winged covering, the cotyledons being carried up and the testa usually left inside the fruit. The hypocotyl arches somewhat at first, soon straightening. The cotyledons usually persist for about 2-3 months after which they turn yellow and fall.

Planting

Nine month old seedlings are planted at a spacing of 5 x 5m. Seedling growth is fairly fast attaining a height of 0.2, 0.6, 2.4 and 4.2 m at the end of first, second, third and fourth growing seasons respectively.

Utilization

A ten year old tree approximately yields 50-75 tonnes of match wood. The wood is soft, white, very light but fairly strong and easy to saw. It is used for match splints, packing cases, fishing catamarans and floats. It is also used for commercial plywood. The wood is perishable in the open but not under water. It is grown as shade and avenue tree in hotter parts of India. It yields an inferior type of gum. Its bark and gum are of medicinal value. Leaves are highly palatable and nutritious fodder for sheep and goats; and extensively used in Rajasthan. The green

fodder yield is 500-700 kg twice a year. The chemical composition of the leaves shows that the leaves are rich in crude protein, ether extract and calcium but poor in phosphorus when dry or when chaffed with twigs. The crude fibre content is also low. Green leaves are considered highly palatable and animals relish them more than dry leaves even when the latter are treated with molasses. Digestibility coefficients are fairly high for all nutrients except ether extract whose digestion from leaves in the ruminants is low.

2. Neem

Scientific Name : *Azadirachta indica*

English name : Neem, Nim, Indian Lilac, Chinaberry

Tamil name : Vembu, Vempu, Veppamaram, Veppan

Hindi name : Bal-nimb, Neem, Neim, Nimb, Nind

Family : Meliaceae

Distribution

The tree is believed to be a native of upper Myanmar. Its occurrence in the Siwalik forest of Uttar Pradesh is also considered natural. In India, neem occurs in tropical dry deciduous and thin forests in drier parts upto 1500 m. It is found in almost all states of India.

Physiognomy

A large evergreen tree, it attains a height of 12 to 15 m and occasionally upto 25 m with a clear bole of 3-7.5 m, 1.8-2.8 m girth. It branches early and forms a broad rounded crown of bright green foliage. Bark is moderately thick with scattered, small tubercles between numerous longitudinal and oblique wrinkled furrows, dark grey outside and reddish inside. Leaves are imparipinnate, 20-38 cm long, crowded near the end of branches, leaflets 9-13 nearly opposite, 2.5-7.5 x 1.2-4.0 cm oblique, lanceolate, some times falcate, acuminate, deeply and sharply serrate, glabrous on both surfaces, petioles very short. Inflorescence, an axillary, many flowered panicle, shorter than the leaves. Flowers are white, fragrant. Smelling of honey, shortly pedicelled, bisexual and male flowers occur on the same tree (polygamous). Fruit is a drupe, 12-18 mm long, ovoid-oblong, yellowish/green smooth, dark yellow or purple when ripe, endocarp

thin cartilaginous, intercellular spaces appear between the epicarp and the endocarp; their walls break down and form the mucilaginous pulpy mesocarp. Seeds 1-2, reticulate.

Phenology

Neem is almost evergreen but becomes near leafless in dry localities for a short period during February-March. New leaves appear in March-April, before the old ones are shed. Flowering occurs from January-March; in the southern parts of India. In Kerala flowering starts in January, in Karnataka, Tamil Nadu and Andhra Pradesh during February-March; in Central India during the first week of April. Thus flowering is progressively delayed from South to North in the sub-Himalayan area, flowering occurs during the first week of May. Fruiting also follows the pattern of flowering; fruits ripens from June to August. The tree starts fruiting at the age of five years but economic yield of fruits is obtained at the age of 10-12 years. About 3300-4500 seeds weigh one kg and on an average, a medium sized tree produces 37-55 kg fruits.

Silvicultural Characters

It is light-demander. It is sensitive to frost and fire. It is drought-hardy;

Climate and Soil

The species grows on almost all kinds of soils including sandy, clayey, saline, alkaline, black and cotton soils and laterite crusts. However, it does not grow on salty flats, inundated areas and soils with finely divided mica. The tree has a very wide range of climatic adaptability and grows well in areas with a mean annual temperature ranging between 0°C to 45°C. It is a light demander species but survives under shade. The rainfall in the areas of its occurrence varies from 450 to 1150 mm.

Nursery Techniques

Physiologically mature seeds with maximum germination capacity and longevity are obtained 10-12 weeks after flowering. The fruit attains peak-green weight and the embryo is fully developed. Green fruits are collected by beating the branches and heaped in the shade by mixing ash, till the seed becomes easily extractable. Seeds are dried in shade for 3-4 days and then sown or stored. Neem seeds do not require any special pre-treatment but seeds do not retain viability very long and have to be sown within 2 or 3 weeks after collection. De-pulping and cleaning of seed improve the germination per cent and seeds passed through digestive system of birds show better germination. Seeds are sown in the nursery beds 15-cm apart in rows, 25 cm apart at a depth of 2.5 cm germination normally takes one or two weeks and it may vary from 9

to 55 days. The beds should be sparingly watered and soil kept loose to prevent cutting, excessive water should be avoided.

Seedlings are pricked out to transplanting beds at 15 x 15 cm spacing or to polypots when they are about 5 cm high; neem seedlings do not require shade except during pricking out stage. In frosty localities, the plants should be provided with shelters. Seeds can also be sown in polypots directly.

Planting

Polypot seedlings or root-shoot cuttings are more successful for agroforestry, silvi-pastoral and roadside avenue plantations. One year old seedlings are preferably planted at a spacing of 5 x 5 m.

Utilization

For centuries the neem tree, has provided man with twigs for tooth brushes, pharmaceuticals for aches and pains and pest control agents against insects. The drought tolerant neem helps to reduce soil erosion and produces soap, lamp oil, lubricant and lumber. It is also a good shade tree. Every part of neem has its own importance.

Neem wood is moderately heavy, stable and resembles mahagoni in appearance; is resistant to fungi and most borers. It is used for making furniture cart axles; yokes, naves and felloes, boards and panels, cabinets, packing cases, ornamental cuttings, ship and boat building, helms, oars, oil-mills, cigar boxes carved images, toys, drums and agricultural implements. The leaves are palatable to cattle and buffaloes and constitute a traditional feed in several parts of the country. In Andhra Pradesh, these are regularly fed to cattle and goats to increase secretion of milk immediately after parturition. They are carminative and aid digestion; leaves also used as mulch and manure. Tender leaves in combination with *Piper nigrum* are found to be effective in intestinal helminthiasis. Neem oil and its derivatives are mainly used in soap making and in preparation of toothpaste. Used in pharmaceutical industry. Oil is a remedy in some chronic skin diseases and ulcers and is externally applied for rheumatism, leprosy and sprain. Warm-oil relieves ear trouble, cures dental and gum troubles and provides relief in asthma when taken with betel leaf. Oil is reported to have anti-fertility properties and it possesses antiseptic and anti-fungal activity.

3. Pungam

Scientific Name : *Pongamia pinnata*

Tamil Name : Ponga, Pungam

Hindi Name : Karanj, Paper, Kanji

Family : Leguminosae

Distribution

Pongamia pinnata grows throughout the greater part of the country chiefly along streams and rivers and in beach and tidal forests. It is considered to be a native of the Western ghats, ascending up to an elevation of about 1200m. It is a characteristic tree mixed forests in the Andamans. As a scattered tree it grows in to Sub-Himalayan tract also, ascending in the other hills up to an elevation of about 600m. It has been widely planted in differed parts of the country.

Physiognomy

Full grown *Pongamia pinnata* is a moderate sized tree with a short bole and spreading thick crown. Branches are stout. Leaves are imparipinnate, glabrous and light green leaflets are opposite, without stipules 5-12 cm long and shortly acuminate. The stem bark is thin, smooth, grey and yellowish inside. Pods are indehiscent, turgid almost woody pointed at both ends, 4-5 cm long, and 1-2 seeded. Seed is compressed, wrinkled, reddish brown and oily.

Phenology

Pongamia pinnata is almost an evergreen tree exception in dry localities where it becomes leafless for a short period during May, the leaf shedding occurs several times in a year. Flowering takes place during April to June. Pods ripen from March to May of the following year. Pods are generally collected during December to May and the time of collection in different parts of the country differs according to the climate.

Silvicultural Characters

It is a drought resistant; can withstand frost. It is shade tolerant but does well with full over head light. It is an excellent coppicer; puts forth root suckers readily. It is frequently pollard in South India for green manure

Climate and Soil

Its wide distribution in the country shows that *P.pinnata* can adapt itself to a spectrum of climatic conditions. In areas where it has been successfully grown, the absolute maximum shade

temperature varies from about 27 to 38°C rainfall from about 500-2500 mm. It can grow on a wide variety of soils, ranging from sandy to black cotton soils, but it grows best on deep and well drained alluvial soils with abundant supply of soil moisture.

Nursery Techniques

Pod collection is done by beating the branches or from ground. The pods are dried in the sun and thrashed to extract the seed, which is dried in shade before storage. Seed yield per tree varies from 9 to 90 kg. Soaking of seeds in cold water for 24 hr hastens and improves germination. About 1200 seeds weigh one kg. Seed length varies from 1.3 cm to 2.30 cm. and seed breadth from 0.90 cm to 1.3 cm seed length - breadth - ratio varies from 1.0 cm to 107 cm. About 250 g of seed is needed to sow one m of nursery area. Seeds are sown in drills 15 cm apart and at a depth of about 2 cm.

Germination starts in about 10 days and takes about a month, to complete. The percentage of fertility is high and a germination percentage of about 60 to 80 can be expected. One kg seed will produce about 1000 plants. *Pongamia pinnata* can be raised by direct sowing or by planting out of entire plants or stumps. Branch cuttings can also be used for raising this species.

Planting

One year old seedlings which attain a height of about 50-60 cm are planted out. Entire plants or stumps may be used for planting; the use of the latter is more convenient for large scale plantation. For making stumps, plants of about 1-2 cm collar diameter are preferred. Spacing adopted is either 2 x 2m or 3 x 3 m. For avenue planting a spacing of about 8m is adopted. Pits of 30 cm³ are dug for planting.

Utilization

Leaves of the trees are lopped for fodder, even though their digestibility is poor. Green pods are also fed to cattle in Maharashtra. The seed cake after extraction is used in poultry ration.

4. Prosopis

Scientific name : *Prosopis juliflora*

English Name : Mesquite, Mesquite bean

Tamil Name : Velikaruvel, Seamaikaruvel, Delhimul

Hindi Name : Vilayati babool, Vilati khejra
Family : Mimosae

Distribution

Mesquite tree is native to Central America and South America. The tree has been planted in many arid zones of the world. It is widely propagated in Africa and Asia, particularly in India. *P.juliflora* was first introduced into India from Mexico in 1877 from seeds obtained through Kew Botanical Gardens, England. It occurs throughout the districts of Tirunelveli, Ramanthapuram, Virudhunagar in Tamil Nadu. Sparse occurrence of *P. juliflora* is restricted to stream courses and road margins in Pudukottai and Thanjavur districts. *Prosopis juliflora* has proved to be a great social asset at no cost to the Government. It has brought back vast stretches of land into use and labour into productive employment in Tamil Nadu (6.34 million man - days and 7.03 million women days per annum).

Physiognomy

Five forms of *Prosopis juliflora* are recognized in India viz., Mexican, Australian, Argentinean, Peruvian and the Arid; the first two named are more common. These forms are however not readily distinguishable. Leaves are alternate on the branchlets of current year and fascicled on those of the previous year; 3 to 13 cm long with petioles enlarged and often glandular at the base; rachis 2 to 13 cm, long slender terete or slightly winged, prolonged beyond the last pinnate as a soft bristle leaflets 8-48 pairs, 5 to 50 mm in length and 4 to 5mm in breadth, linear or oblong reticulately veined. Stipules linear deciduous. Branches are long, zig-zag struggling or pendulous, sometimes armed with scattered stout, subulate thorns, 1 to 5 cm long and often marked with minute dark lenticels and irregularly shaped red blotches. Bark is thick, dark, reddish brown, divided by shallow fissures. Flowers are creamy white, in axillary pedunculate spikes, flowers are creamy white in axillary pedunculate spike, 4 to 10 cm long, solitary or in fascicles of 2-4; peduncles 5 to 18mm long. Pods are 12 to 25 cm by 0.7 to 1.0 cm, linear, compressed when young subterete at maturity, straight or falcate, contracted at the two ends usually with a long stout, base; pale yellow or straw coloured when ripe; mesocarp pulpy; endocarp cartilaginous, surrounding each seed separately. Seeds number 12 - 34 in a pod, oblong, flattened, with thin light brown lustrous testa and thin thorny albumen.

Phenology

The Australian variety of *Prosopis juliflora* flowers and fruits in India twice a year. First flowering commences September- October and may continue upto end of February. The second flowering which is profuse occurs during February - March. Pods ripen in November - January and again during April -June. The interval between flowering and fruiting is nearly 1 to 1Y2 months. Trees begin to bear fruit in the third year and sufficient quantity of seed is available from the fifth year. Almost every year is a good seed year.

Silvicultural Characters

It is a strong light-demander, hardy, drought-resistant, fast growing. It is a frost -tender. It coppices well and root-suckers freely.

Climate and Soil

It is the only exotic species capable of growing on a wide variety of soils including heavy clays, black soil, red loam, coastal sandy soil, alluvial soils, saline and neutral soils, inland as well as loamy soils. It comes up in low as well as high rainfall areas, in hills and plains alike. A hot, dry climate with mild winter clear atmosphere suits the species best. In areas where it has been naturalized, the absolute maximum shade temperature varies from 40.6° C to 45.6°C It comes under a rainfall regime of 150 to 750 m; it can be grown even in areas of still lower rainfall of 70 mm per year. It does not tolerate heavy rainfall.

Nursery Technique

Ripe pods are collected from trees by lopping branches or from the ground, and sun - dried. The fruits turn yellow when mature and fall to the ground. When dry, the pods can be broken into segments by beating with a mallet. Pounding also breaks the pods into bits, each bit containing a seed. The one seeded segments can be separated by winnowing to remove the impurities. It is very difficult to extract the seed from the dry broken bits as the endocarp is hard and does not yield to mechanical pressure. Protracted soaking in water, drying and beating can separate the seeds which then be stored for about two years. As the germinative capacity of the seed is diminished due to attack by some insects the pods are better fumigated with carbon disulphide or hydro cyanic acid before storage. The seed treated with naphthalene powder at the rate of 1g l⁻¹ and stored in sealed tins may retain 60% viability at the end of 5 years. Seeds stored in gunny bags retain only 36% viability after 3 years. Naphthalene is harmless to man and treatment with this chemical is safer. Storage in bins with 5 cm layer of sand on top is stated to prevent entry of beetles. The number of seeds per pod varies from 4 to 32. Seed number varies from

32,000 to 35,000 in a kg. The germinative capacity of clean treated fresh seed is 80-90%. The seed is very hard with an impermeable seed coat and requires pretreatment to hasten germination. The seed requires dt1eof the following sowing treatments (i) soaking the seed in cold water for 48 hr. (ii) soaking the seed in commercial H₂SO₄for about 20 min; iii) covering the seed with boiling water, allowing it to cool and soak for 24 hr. After pretreatment the seed should be sown in polythene containers of 13 x 25 cm size filled with a mixture of FYM and soil in the proportion of 1:3.

Planting

When the seedlings attain a height of 20-30 cm, they are ready for planting.As the tree has a tendency to become branchy, pruning is of importance when it is grown in avenues and all shoots except one may be cut down. Leading shootsoccasionally require mechanical support for the first one or two year. In 3-4years, the leading shoot makes headway and takes the pleasant appearance initially of a well grown shrub and eventually of a tree. The trees are cut once in three years. The first felling promotes good coppice growth. The second felling is at the end of sixth year. If the growth is very good and if immediate cash is desired the interval may be reduced to two years. The rootstock is generally uprooted at the third felling. At every cutting an approximate yield of 10-15 t ha-I can be expected. Its rotation is 20 years; it attains 28 cm in diameter at the age of 20 years.

Utilization

It is a versatile multipurpose plant; used as fuel, fodder, and several utility timber and therefore described as "Loyal Timber of the poor" *Prosopis juliflora* wood is moderately hard and moderately heavy (specific gravity 0.83 to0.88 air dry and 0.78 oven dry). It is excellent for firewood and makes superior charcoal. Because of its high heat value, the wood has been termed "Wooden anthracite". It bums slowly and evenly and holds heat well. The wood is very durable and is used for fence posts, door and window frames and other light carpentry. The wood is used in making paper pulp. An important wood - consuming activity is brick making and *Prosopis* is the main fuel for pottery, cottage industries also. Heart wood is durable and is suitable for tool handles of all sorts, crushers and such other purposes where both strength and hardness are of importance. The flowers are a source of high quality honey. The mesquitepods are sweet, succulent and edible, having a high nutritive value. The pods are eaten by livestock (sheep and goats) and also made into flour for human consumption during famine.

Small young leaflets 'are also eaten by cattle, sheep and goats, Foliar analysis revealed the magnesium and phosphorus contents are less than 1.0% sodium is high indicating the plants tolerance to salinity. The experiment .conducted to assess the possibility of utilizing *Prosopis juliflora* pods as cattle feed revealed that even at 45% of pod feeding, there was no adverse effect on dry matter intake and digestibility in Kangeyam bullocks. The bark is a source of tannin; it also produces gum and is used for sizing cloth. The roots yield a fibre for cordage and coarse fabric. It also yields a gum which is used for adhesive purposes. Investigations on the suitability of *Prosopis juliflora* for the production of paper was undertaken at F.R.I Dehra dun. Some difficulty was experienced in chipping this wood due to crookedness of billets. The results show that satisfactory yields of bleached pulps with satisfactory strength properties for production of writing and printing paper can be prepared from *Prosopis juliflora* by sulphate processes. However, the yield is low and the strength property of the pulp is poor as compared to most other hardwoods. The plant makes an impenetrable" live fence" around agricultural fields. Shelter belts and windbreaks are provided by this tree in the arid zone and it has been used widely for this purpose.