

Safed Siris (*Albizia procera*)

Knowing the Species

(a) Natural Habitat and Classification

The tree is commonly found on alluvial ground along streams, and in moist even swampy places. It is particularly common in low lying moist Savannahs.

The species is found in the sub-Himalayan tracts from Yamuna eastwards to West Bengal, Satpura range, Gujarat, South India and in the Andamans. It has good adaptability for growing in moist as well as fairly drought conditions. The tree is classed as a light demander although it stands moderate shade in the pole stage. It is fairly drought resistant and frost-tender. It produces root suckers when the stem is mutilated or the tree becomes old.

Albizia procera occurs in tropical semi-evergreen forests, tropical moist deciduous forests, dry tropical forests and northern sub-tropical broad-leaved forests. In the areas of its natural distribution the absolute maximum shade temperature varies from about 36° to 46°, the absolute minimum from -1 °C to 18 °C and the normal annual rainfall from about 1,000 to 5,000 mm. Its common name is White Siris and trade name Safed Siris.

The tree belongs to family the Leguminosae, sub family Mimosoideae.

(b) Growth Statistics

A large deciduous tree with a tall, erect or more often somewhat curved stem with pale yellowish or greenish white bark and light crown. In some localities it may reach 36 m in height and 2-3 m in girth with a clear bole of 12 m, but is usually 18 to 24 m in height. In the drier regions, such as Madhya Pradesh, the Satpura, Gujarat and parts of Tamil Nadu, the trees are commonly found up to a girth of 1.2 to 1.5 m. The bark is about 1.2 cm thick, peeling off in thin flakes often with horizontal lines. Leaves are bipinnate with rachis 25 – 26 cm long with a large oblong gland near the base. Flowers are greenish yellow in peduncled heads arranged in large lax terminal panicles.

The rate of growth is rapid. In northern India it attains a girth of 1-1.3 m in twelve years and upto 2 m in thirty years giving a mean annual girth increment of 4-10 cm. In Tripura plantations of this tree attain a average height of 10.66 m in 10 years.

The leaf fall takes place in January-February and the new leaves appear in April-May. In favourable localities, the tree is rarely leafless. Out of the climatic factors, temperature is more important than rainfall and humidity, affecting leaf fall and leaf initiation. The pods are formed soon after the flowering, develop rapidly to attain full size by November – December and ripen from February to May; under north Indian conditions the pods ripen from January to March. Ripe pods are dark reddish brown, 10-20 cm long, 6-12 seeded and dehiscent. The seeds are smooth, greenish brown with a leathery testa.

(c) As a Plantation Tree

Being a fast growing species and having an immense potential for introduction in different types of soils and climatic conditions, it is planted in various states by the Forest Departments

and also by farmers under Agro-forestry programmes. This is an important fast growing species in Assam and other eastern states, particularly Tripura. It is also planted in Bihar and Uttar Pradesh. *Albizia procera* has been used in experimental planting in saline and alkaline areas with considerable success. Being a legume, it fixes nitrogen through symbiotic bacteria present in root nodules and thus enhances soil fertility.

Utilization of the Species

(a) Properties Including Strength Properties

The sapwood is white with a yellowish cast, subject to sap-stain; weight at 12% moisture content about 641 kg/cum and the specific gravity 0.579 for timber of Dehradun origin; heartwood golden brown with lighter and darker streaks; straight or broadly and shallowly inter-locked grained; very coarse and even textured. The timber is strong, elastic, tough and hard. Tests at Dehradun show that it is stronger than Burma teak. Young's modulus for Burma teak is 18,30,000 against 20,71,000 for white siris. The relative suitability of the wood in terms of Teak taken as 100 is, strength as a beam, 88; stiffness as a beam 85; suitability as a post 88; shock resisting ability, 128; retention of shape, 80; shear, 111; hardness, 97; refractoryness, 71; nail or screw holding property, 98.

The timber is moderately refractory to seasoning. Conversion from green logs gives best results. If the timber is left in the log, hard-shake is liable to result unless ends are coated with a suitable covering such as cowdung and mud, tar, or other special preparations. The timber is about two and half times harder than teak.

(b) Use as Timber, Poles, Pulp and Paper, etc

It is a valuable timber and is used in general construction (house posts, beams, scantlings, planks, boards), carriage and carts, motor-lorry and bus bodies, agricultural implements, tool handles, packing cases and crates, etc. It is a high grade furniture timber, though not so decorative. It is used for a variety of other purposes such as well construction, canoes and dug-outs, oars, cane-crushers, oil presses and rice pounders. It is largely used in Assam and Tripura. Due to the more broadly interlocked nature of the grain, it is more suitable for use in large sections where a bolder effect is desired, such as in large-sized panels, table-tops, etc. The wood is resistant to termites.

It is not an easy timber to treat with preservative as the heart wood is only partially treatable; but treatment is commercially profitable and feasible. It is hard and somewhat difficult to saw, as the grain is broadly interlocked. With care, it works to a smooth surface and takes a good polish. It is preferable to use the poles of Safed siris after treatment as mine props and for other purposes.

Fibre length varies from 0.70 to 1.65 mm, average being 0.90 mm. Similarly the minimum diameter of fibres is 0.014 and maximum 0.028 mm with an average of 0.021 mm. The proximate chemical analysis of the wood indicated that it is a suitable material for paper pulp. Bleached pulp in satisfactory yields (50.3%) can be prepared from white siris wood by the sulphate process. The fibre length being short, its pulp is required to be mixed with long fibre pulp such as bamboo in suitable proportion for paper manufacture on a commercial paper machine. The pulp is suitable for writing and printing paper.

(c) Use as Fodder

The leaves are readily eaten by cattle, sheep and goats. The branches from favourite fodder for elephants. In plantations, deer browse the saplings to almost bare sticks, the tree is lopped for fodder in Maharashtra, Orissa, Punjab, Tripura and Uttar Pradesh. It contains 18.9% protein, 3.3% fat, 39.7% carbohydrates, 1.51% calcium, 0.30% phosphorus, 31.9% fibre and 6.2% ash (minerals).

(d) Use as Fuel

The calorific value of dried sapwood is 4870 Kcal per kg and that of heartwood 4865 Kcal/kg. Excellent charcoal (39.6%) can be prepared from the wood. It is widely used by the people as fuel. The wood is an excellent fuel. Wood having 6.84% moisture contains 89.56% carbon and other organic matter, and 3.6% ash; its calorific power is 86.9 compared to pure carbon 100; and 13 litre of water is evaporated by 1 kg wood at 100⁰ C.

(e) Use for Environmental Conservation

The species finds favour in plantation programmes especially in poor, marginal, dry and degraded lands due to its varied adaptability. Its resistance against drought has made this species popular in dry zones. *Albizia procera* has been extensively used in experimental planting in saline and alkaline areas. Besides its good soil binding capacity due to fast growth it has excellent power to fix the nitrogen and thereby enrich soil status. It is often grown in gardens and avenues for ornamental purposes.

(f) Other Uses

White siris alongwith other forest wastes has been found to be useful for making chipboards of satisfactory strength properties. The leaves are valued as insecticide and for the treatment of ulcers. All parts of the plant are reported to show anti-cancer activity. The roots contain alphaspinasterol and a saponin. The saponin has been reported to possess spermicidal activity at a dilution of 0.008 per cent. The tree gives a copious gum. The bark is used for tanning as it contains about 12-17 per cent tannin. In times of scarcity the bark is ground with flour and eaten. A decoction of the bark is given in rheumatism and haemorrhage. It is used as a fish poison. The seeds of *Albizia procera* contain Proceranin A, which is toxic to mice and rats when administered parenterally and orally. The intraperitoneal LD 50 for mice is 15 mg/kg body weight. The branches (twigs) are used by tea-planters as stakes for laying out tea-gardens. These are found to split well.

Natural Regeneration of the Species Including Calendar

The natural regeneration of *Albizia procera* is good. The conditions for natural regeneration are quite favourable. It produces an abundant crop of pods almost annually. The pods ripen from December to May. They fall from the trees for most part for the hot season, dehiscing before or about the time of falling. The pods are blown by wind to considerable distances. Germination of the seeds take place readily, provided there is sufficient moisture; in the forest, seedlings may be found in quantity in the neighbourhood of seed-bearers during the rainy season from seed which germinated early in the rains. Some of the seeds may lie ungerminated till the second rains. The factors favourable to natural reproduction are good moisture and bare loose soil where the seed gets buried with the early showers. Thus on new soft alluvial ground near rivers, seedlings in all stages may often be seen in abundance. Natural seedlings may also be found in some quantity in moist grassy tracts.

Under natural conditions, the seedling reaches a height of 10-20 cm by the end of the first rains. It is capable of struggling through low grass and weeds. Its rate of growth is slow but increases considerably later, when it overtops the weeds. The sudden removal of weeds around seedlings, previously unweeded, is however, not advisable, as they are liable to die due to sudden exposure to the sun. Vigorous seedlings produce long stout tap roots which may reach a length of 60 cm in 3 months from germination. The lateral roots are usually covered with nodules. Under natural forest conditions, if left unweeded in full sunlight, the seedlings reach a height of 15 cm by the end of the first season and 60 cm by the end of the second season. In the third year the height ranges from 70 cm to 2.5 m, and in the fourth year up to 5 m.

During weeding, the soil should not be unduly exposed; only weeds actually interfering with plants should be removed, the remainder being left to shade in the ground during the hot weather. Climber cutting should be done when necessary. Thinning of the crop is done according to the silvicultural requirements.

In the mixed deciduous forests generally coppice system is adopted with about 40 years of rotation. In Kerala, this tree is worked under the selection system. In Assam and some eastern States the forests containing this species are worked under the clearfelling system with artificial regeneration on a sixty year rotation.

Nursery Practices of the Species Including Calendar

(a) Nursery Site

The nursery beds are prepared on well drained sites. The sandy loam soil with pH around 7 is ideal. The nursery beds are prepared in unshaded space.

(b) Seed Collection and Storage

Seeds usually ripen from January to May, depending on the locality. Ripe pods are dark coloured. The seeds may be collected from ripe pods. It is advisable to collect the pods from the tree without waiting for them to drop down. Pods are dried in the sun till they open up. The seeds can be extracted by hand or by gentle thrashing. The seeds are cleaned of pod fragments and defective ones by winnowing. These are dried thoroughly under the sun. One kilogram of dry pod yields about 250-375 gram of seeds. One kilo of dried seed contains approximately 20,000 seeds.

The seeds retain viability for a long time. Seeds kept in a gunny bag for 2 years, germinate as freely as fresh seeds. The seeds should be kept carefully in sacks in a dry well-ventilated shed. It is advisable to spread the seeds out on mats occasionally to air, otherwise they may become mildewed. It has been observed that seeds stored for 15 years showed a germinative capacity of 20%.

(c) Sowing

The sowing is done in April-May under irrigated conditions in the nursery. The seed is put in cooling boiled water and allowed to soak for 24 hours to soften the seed coat. It results in quicker and more even germination. Sowing is done in lines about 8 cm apart and the seedlings are spaced about 5 cm in the lines. About 30 g seed is sown per square meter of

nursery area. The seed rate in West Bengal is about 8g/m^2 for a spacing of 7.5×7.5 cm. The germination of the treated seed commences in about 3-4 days and takes about 2-3 weeks to complete. A germination percentage of 50-90 can be expected. The seedlings raised from April-May sowing attain a height of about 15 cm by July-August when these are planted out in pits in the field. In case the seedlings do not attain plantable size by July, these are retained in the nursery for one more year. In drier areas 15 month old seedlings only planted in the field.

(d) Vegetative Propagation/Clonal Techniques

Stumps prepared from one or two year old plants give very good success and are used for planting new areas or for filling the gaps. In Bihar, seeds are sown close in drills 15 cm apart, in March-April and watered well. When about 7.5 cm high, the seedlings are pricked out to $38 \text{ cm} \times 38 \text{ cm}$ apart if the plants are required for stump planting in the following year. A spacing of $15 \text{ cm} \times 15 \text{ cm}$ is adopted if the plants are to remain in the nursery only till the first rains. Stumps can be prepared from either 3 months old or 15 months old seedlings; the later give better results. They should be put out at the break of monsoon rains. For still better results the stumps made from one year old seedlings i.e. in March-April are planted in polythene bags filled with a mixture of soil, sand and FYM in equal proportions. These are regularly watered. With the onset of rains these develop into healthy plants which give almost 100% success in the field.

(e) Pricking Out

The pricking out of germinated seedlings is done either in nursery beds or in polythene bags. In case stumps are aimed at to be made from 15 month old plants, the seedling when 7.5 cm high are pricked out at 38×38 cm spacing. A spacing of 15×15 cm is adopted if the plants are to remain in the nursery till the first rains only. Pricking out of seedlings with two pairs of leaves are also done in polythene bags filled with soil, sand and farm yard manure. In Dehradun conditions polythene bags of 23×13 cm and potting mixture soil, sand and FYM in the ratio of 3:1:1 have been found to be the best. The seedlings raised in polythene bags are planted out in the field in the next rainy season. Since the seedlings develop strong tap roots, the polythene containers are shifted periodically to avoid the root from striking and penetrating into the ground. This is done to avoid shock to seedlings and their drying which results due to damage to roots at the time of lifting and transportation for planting out in the field.

(f) Fertilization

Application of leaf mould manure is helpful but not essential. *Albizia procera* nodulates well through the native strains of rhizobium which fix enough atmospheric nitrogen needed for growth. The nodules are solitary or in groups and are rounded to dichotomously branched. Cultures of rhizobium are easily prepared on yeast mannitol agar medium. The inoculation is done by pelleting the seeds with lignite based culture or drenching the seedlings with broth culture. The nodule development is maximum from October to February. Artificial inoculation improves the growth and development of seedlings. Application of nitrogen at the rate of 10-20 kg N/ha of soil as a starter dose helps in early establishment of seedlings without suppressing the development of nodules. Phosphorus application at the rate of 20-40 kg P/ha enhances the growth and development of seedlings. Application of VAM culture develops resistance in seedlings against drought conditions.

(g) Irrigation

After sowing the seed in beds they are covered with straw and daily watering with rose can is done. The straw is removed after germination and watering is continued.

Regular watering in the nursery to keep the pricked out seedlings in beds or in polythene bags is necessary to keep the soil moist. The watering should preferably be done in morning or evening hours. After the seedlings get fully established, watering is recommended on alternate days. In case the seedlings are maintained in pricked out beds for another year watering is done, through flow irrigation in channels made around the beds. In polythene bags, however watering by rose can is preferred.

(h) Weeding

Regular weeding of nursery beds or polythene containers is very essential to keep the seedlings free from any weed competition.

Planting Practices of the Species Including Calendar

(a) Planting Site and Its Preparation

The species prefers alluvial soils although it also comes up in clayey or moderately alkaline and saline soils, where it attains a smaller size. The planting site is cleared of undesirable growth by cutting and burning on suitable sites; 30 cm x 30 cm pits are dug before the summer season. The soil gets weathered during the hot months. In U.P. in alkaline and saline soils larger size pits such as 60 cm x 60 cm x 90 cm, 60 cm x 60 cm x 120 cm or even 120 cm x 120 cm x 120 cm are dug out which are refilled with imported non-saline and non-alkaline soils. Vermiculite, gypsum and farmyard manure are also mixed in the imported soil. It is also raised as a shade tree in tea gardens and planted in mine spoils. Since the species is vulnerable to browsing by cattle etc. the plantation areas has to be well protected generally by providing barbed wire fencing. In wet climate as in Assam, pit digging is not necessary as stump planting in crowbar holes is fairly successful.

(b) Planting

Entire plants as well as stumps are generally put in previously prepared planting pits with the break of the monsoon showers. Small as well as large 1 year to 15 months old plants can be successfully planted depending upon the climatic conditions; success with smaller plants is however, achieved in moist areas. *Albizia procera* is susceptible to break in gales hence this species should be planted in blocks or in central row in road, rail or canal side strips. The methods followed in some of the states is given below:

Assam and other eastern states: In these States, it is generally raised by premonsoon sowing in parallel continuous lines 2.3 m apart from centre to center. Stumps made out of one year old nursery plant and planted in field in crowbar holes give about 60-75 survival and on the average a height of 75 cm. Planting out of small naked root plants from nurseries planted out in August also give up to 70% survival. Stump planting any time between April-December gives best results provided that the peak rainy season and the early summer drought are avoided.

Bihar: Stumps made from 15 months old seedlings are planted in 30 cm x 30 cm x 30 cm dug up and refilled pits. This is the usual planting practice. Although direct sowing in prepared lines with the break of the monsoon is also done.

Uttar Pradesh: This species is raised through direct sowing in mechanized plantations in the tarai and bhabar tract. Elsewhere entire plants and stumps are planted. Entire plant planting is superior to stumps as far as height growth is concerned. In alkaline and saline lands *Albizia procera* gives better survival and growth as compared with other species such as neem, sissoo, eucalyptus, mahua, karanj, bahera, arjun, khair, etc.

(c) Spacing

In Assam and North Bengal in case of line sowing 2-3 m spacing between lines is adopted. The seedlings are spaced about 0.5 m in the lines at the end of the first growing season. Spacing of 2m x 2m or 3m x 3m are recommended for planting of entire transplants or stumps. Around the agricultural fields the species can be planted in a single row at 3m or 4 m spacing.

(d) Mixed Plantations

In the tarai and bhabar tract of Uttar Pradesh Safed Siris has been raised by sowing in admixture with other species like khair, sissoo, semal etc., in continuous ridges 4m apart. In areas subject to strong wind it is mixed with other wind firm species in plantations. In multi row strip plantations along roads, rail lines and canals, this species is planted in the middle row.

(e) Fertilization

Application of 5 ml rhizobium broth and 75 g single super phosphate per plant in the year of planting significantly increases the growth and development, and establishment of plantation in Jabalpur conditions having soils of Typic Ustorthent.

(f) Irrigation

In moist localities irrigation is not done. However, in drier and refractory sites irrigation during summer months and winter, if there are no rains, is needed for ensuring the survival as well as better growth. As many waterings as possible should be done. Mulching has a very good effect in retention of moisture. In agroforestry plantations watering may not be required as the plants get sufficient moisture from the irrigation of agriculture crops. Where sufficient moisture is not available the plants die-back during the first and second year in summers, and resprout in the following rainy season.

Cultural Operations and Its Calendar

(a) Weeding

Three weedings are carried out in the first and second year in high rainfall areas, elsewhere two in the first and second year and one in third year, irrespective of whether the plantation is raised by direct sowing, entire transplants or stumps. Climbers and bushes likely to shade the plants are also cut. In the case of direct sowing thinning of the plants is done to reduce competition.

(b) Cleaning and Thinning

These operations are carried out depending upon the development of the crop and its silvicultural requirements.

Pests, Diseases and Deficiencies

(a) In Nurseries

Five species of insects bore the seeds, out of which *Bruchus bilineatopygus* causes up to 80% damage. It is a light brown, about 4.45 mm long beetle that lays oval, light yellowish eggs on young pods. The eggs hatch into small grubs, which enter fleshy pods. The damage can be seen in the form of oozing of gummy fluid on the outer surface of the pods. The grub turns into pupa and then beetles emerge out of pods. These beetles again lay eggs on fresh pods and stored seeds. There are five generations in a year. The pest is controlled by spraying of 0.05% monocrotophos on the tree in the first half of September. Mixing of folidal 2% dust with seeds in the ratio of 1:100 is recommended for protecting seeds from damage.

Eurema blanda, a butterfly, that migrate in large swarms, lay eggs in clusters on the lower surface of the leaves. The larvae after hatching out from eggs feed gregariously on the leaves. *Eurema hecaba*, *Cusiala raptaria*, *Hyposidra successaria*, *Semiothisa emersaria*, *Ascotis selenaria* and other Lepidopterous insects also feed on the foliage and other soft tissues of seedlings. For controlling all these pests, collection and destruction of conspicuous clusters of pupae, and spray of 0.05% water emulsion of malathion, endosulfan or sevin is recommended. Another insect *Oxyrhachis mangiferana* (Hemiptera) lays eggs in V-shaped slits in thin bark of shoots. After the eggs have hatched, a broad oval scar is left, which distorts the growth of the shoot or kills it. The pest may be controlled by application of 0.04% monocrotophos.

Seedling wilt is caused by *Fusarium oxysporum*. The lower leaves initially turn yellow and then fall off. The yellowing proceeds towards the growing shoot and within a month the seedling dies. The roots of affected seedlings get discoloured. It is controlled by application of 0.3% Dithane M-45 or 0.2% Bavistin. Treating the seed beds with 0.2% Bavistin before sowing prevents the occurrence of damage.

Leaf spot disease is caused by attack of foliage by *Collectotrichum dematium*. The disease manifests on older leaves of seedlings as a small water soaked yellowish spot which later develops into a circular light brown lesion with a distinct yellowish margin. The spot hole develops in the advanced stages of infection causing premature defoliation. The disease is aggravated under high humid conditions. The tender shoots of seedlings are also infested and damaged. The disease can be controlled by spraying 0.2% captaf fungicide. Little leaf disease caused by Mycoplasma like organisms is often observed in seedlings after the germination of seeds. The cotyledons and first pair of leaves turn yellow. Later on the foliage becomes bunchy with much reduced sized of leaves. *Ravenelia clemensiae* attacks leaflets of the seedlings. Profuse development of postules takes place on the leaf surface adversely affecting the metabolic activity of plants resulting even in death. The disease is controlled by application of 0.2% diathane M 45 or sulfex.

(b) In Plantations

The larvae of *Xystrocera globosa* bore into the inner bark and sapwood and may hasten the death of injured or sick trees. A heavy infestation may kill less resistant trees in one season only. Spraying a mixture of Paradichlorobenzene 1 part and kerosene 10 parts kills the larvae and callous quickly, covers the wound. The larvae of *Indarbela quadrinotata* bores in the wood of standing green trees. They are minor pests. Removing the silken mat and then brushing the eaten bark with any insecticidal emulsion, kills this borer. The larvae of a number of moths of families Geometridae, Eucosmidae, Noctuidae, Lycaenidae, Pieridae and Pyralidae defoliate the tree.

The young trees of Siris 15-20 years old are subject to attack by a highly virulent bark and stem disease which produces a grayish black canker on the stem. The disease is called pit canker disease and it is caused by the fungus *Fusarium solani*. The canker seems to start where the branches are broken off by wind, and to extend upto 2-4 m in length and sometimes to cover three quarters of the diameter of the trees. Either the crowns die above canker or the stems break off at the place where the canker is deepest. It can be controlled by application of 0.3% Fytolon solution. *Ganoderma lucidum* cause root rot and *Ganoderma applanatum* as well as *Polyporus gilvus* cause heart rot but these are of minor importance only.

Growth Yield and Management of the Species

It is a fast growing species. The mean annual girth increment has been recorded from different regions varying from 2.5 to 12.4 cm. In Tripura, plantations of average height of 10.66 m and average diameter of 17.8 cm in 10 years have been reported. In Allen forest, Kanpur, in a group of three trees growing close together, at the age of 14 years the largest was 21.3 m high and 173 cm in girth at breast height. *Albizia procera* under silvipastoral system in association with *Cenchrus* and *Stylosanthes* pasture, in Jhansi, U.P. gave a mean height of 10.75 m and 30.60 cm diameter at breast height in 8-9 years. The average dry matter production of tree parts (kg/tree) was, main bole 87.54, branches 62.72, total wood 150.26, leaves 18.39, pods 2.45 and total biomass 174.07 in the above mentioned silvipastoral system. Annual wood production of about 10m³/ha has been recorded in Java.

The mixed deciduous forests where this tree occur, are managed generally under the coppice system with a rotation of about 40 years. In Kerala State, this tree is worked under selection system. Although natural reproduction is generally good near seed bearers, artificial reproduction would be necessary for completing the stocking. In southern West Bengal, where plantations are raised for fuel supply, a rotation of 20 years is indicated. In Assam and some eastern States the forest containing this species are worked under the clearfelling system with artificial regeneration on a sixty year rotation.

Harvesting and Its Calendar

Trees are generally harvested from December to May. Collection of pods is done before they split on the tree otherwise the fallen seeds are quickly infested and damaged by pests. For

fodder the leaves are best collected from October to December when the availability of foliage is maximum

Market and Marketable Products, Used as Raw Material in Forest Based Industries

Timber and fuelwood are main marketable products which are sold in almost all the timber markets and fuelwood depots throughout India. The wood is also used for making paper pulp and chipboards in industries along with other species. Bark finds commercial use in the tanning industry.

Source Institutions for Detailed Information

Detailed information can be obtained from Institutes listed below:

- Forest Research Institute, Dehradun, Uttranchal.
- Tropical Forest Research Institute, Jabalpur, M.P.
- Institute of Forest Genetics & Tree Breeding, Coimbatore, T.N.
- Institute of Wood Science & Technology, Banglore, Karnataka.
- State Forest Research Institute, Jabalpur, M.P.
- Indian Grassland and Fodder Research Institute, Jhansi, U.P.
- State Forest Departments.

Source: Indian Council of Forestry Research and Education, Dehradun. Safed Siris (*Albizia procera*). Dehradun, Forest Research Institute. 12p.