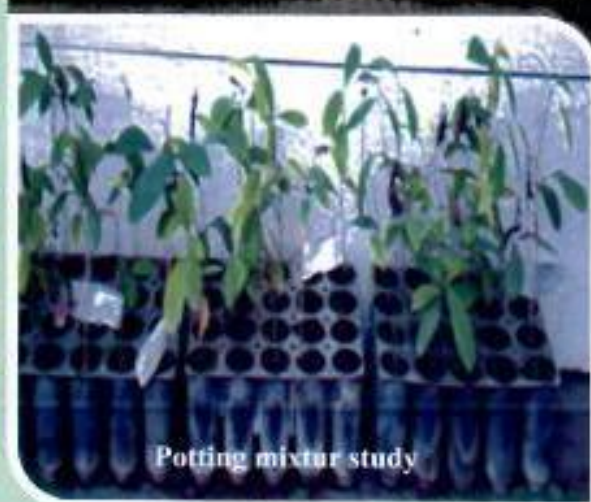
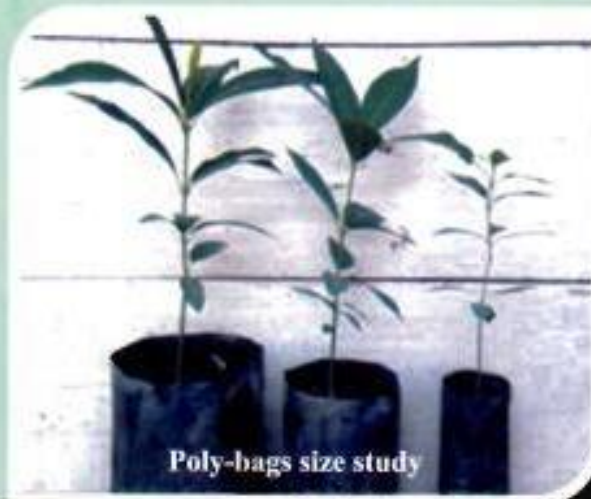


**PROPAGATION TECHNIQUES OF ECONOMICALLY IMPORTANT
ENDANGERED AND RARE SPECIES (SALAI, SHISHAM, ACHAR,
MAIDA LAKDI AND BIJA) OF MADHYA PRADESH**



TREE IMPROVEMENT BRANCH

State Forest Research Institute, Jabalpur (M.P.)

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**PROPAGATION TECHNIQUES OF ECONOMICALLY IMPORTANT
ENDANGERED AND RARE SPECIES (SHISHAM, SALAI, ACHAR, MAIDA
LAKDI AND BIJA) OF MADHYA PRADESH**

INTRODUCTION

Plants are vital part of the world's biological diversity and an essential resource for human well being. Of particular concern, many forestry species are in danger of extinction and threatened by many reasons. It is estimated that more than 60,000 plant species are threatened worldwide due to combination of factors such as over-collection, urbanization, unsustainable agriculture and forestry practices, pollution, land use changes and the spread of invasive alien species. Over 60,000 species have been evaluated for conservation status according to internationally accepted criteria, of which, 34,000 species are classified as globally threatened with extinction (IUCN, 1997).

The disappearance of such vital and large amount of biodiversity sets one of the greatest challenges for the world community. The global strategy for plant conservation is proposed to address this challenge by *in-situ* conservation as the primary approach for conservation, complementing, where necessary, with *ex-situ* measures. The propagation techniques of Salai, Shisham, Achar, Maida Lakdi and Bija were developed for raising nursery plant of these species which are given below:

I. *Boswellia serrata* (Salai)

Boswellia serrata Roxb. is commonly known as Salai (belongs to the family Burseraceae), a strong light demander in its natural habitat. It thrives well in temperature ranges from 43°C to 48°C (Maximum), from 1.1°C to 7°C (Minimum) and normal rainfall from 20" to 50". It can be propagated through root suckers, coppices, branch cuttings and also by seed.

(A) Phenological behaviour of species

It is deciduous in nature, its leaf fall starts in November / December and almost complete by December, initiation of flowering starts in February, fruit ripens in April and fruit fall ends in first week of May (Table 1).

The preparation of seed collection starts when 60% of the fruit become brown in colour, fruit splitting starts and all fruits become green to reddish brown in colour. Seeds should be collected in April month when 90% of fruit became reddish-brown in colour and splitting starts at fruit tip. Whole bunch of fruit can be plucked with bamboo stick with fixed hook at the end. After the collection, fruit should be dried in shade for 2-3 days and heart-shaped brownish seeds (2-4 in numbers in each fruit) were collected after fruit splitting (Table 2).

One kg of Salai seed consist of approximately 27,500-28,000 no. of seeds. Average wt of seed is 46.33 mg, average length is 8.49 mm, average width is 8.18 mm and average seed thickness is 3.7 mm. Emptiness of seed varies from place to place from 5 to 10%.

Problem of Regeneration in Salai

There are many reasons for problem of regeneration in Salai. Initially, it observed that in flowering period the diptera larva feed the ovule at early stage. Absence of kernel in seed varies from 5 to 10%, but it may increase up to 50%. The dispersed seed on forest floor does not germinate if the soil is hard. It has also been observed in the field, most of the seeds were eaten by rodents. The tender seedlings are very soft and leaves are highly palatable and consequently cattle browse and trample them. During the survey in Salai forests, Salai trees below 50 cm girth were hardly seen. In early stage of growth, die-back phenomenon is very prominent in Salai. The above ground part dries up in summer, but with the commencement of rains it sprouts with the help of stored food in tap root.

(B) Seed Study (emptiness, viability, germination & dormancy)

No seed dormancy observed. Seed soaked for 8 hours in warm water give higher and early germination. Seed sowing in root trainer in mist chamber give good germination and the germinated seedling is highly sensitive to excess water. Seed can be sown in polybags in potting mixture of 1:1:1(soil, sand & FYM). It store food in underground tuber part.

(C) Propagation technique

The propagation techniques developed are given in following steps-

(i) Seed pre-treatment

Seed soaking with hot water found the best seed pre-treatment.

(ii) Cutting treatment through IBA

Any concentration of IBA can be used for rooting. IBA concentration (500 ppm) is the best option for rooting in Salai cutting because it is economical, but rate of success is not feasible.

(iii) Standardization of root trainer size

Large cup (315 cc) root trainer found the best for better growth of seedlings.

(iv) Standardization of polythene bags size

Medium size (25 cm x 11 cm) poly-bag found the best for the better growth of seedlings.

(v) Potting mixture study

Vermicompost treatment in the ratio of 1:1:1 with soil and sand found the best potting mixture for the better growth of seedlings.

2. *Dalbergia latifolia* (Shisham)

Common name: Indian rosewood, Shisham (Hindi), Sissu (Manipuri), Sitral (Bengali) Family: *Fabaceae* (pea family). Shisham is a medium to large deciduous tree, native to India, with a light crown which reproduces by seeds and suckers. It is primarily found along river banks below 900 m elevation, but can range naturally up to 1300 m. Shisham is best known internationally as a premier timber species of the rosewood genus. However, Shisham is also an important fuelwood, shade and shelter giving tree species. With its multiple products, tolerance of light frosts and long dry seasons, this species deserves greater consideration for tree farming, reforestation and agro forestry applications.

(A) Phenological behavior of species

Plant gets fully green in June up to November, in December leaf fall starts and completed in May. Flower initiation starts in September and fruits fully ripe in last week of March. The proper time of seed collection is first week of April, when the pod becomes coppery brown in colour. The ripe bunches of fruits should be collected with hooked bamboo stick. The pod should be sun-dried and crushed in gunny (jute) bags. Healthy brown seeds are viable, while the black seeds are discarded (Table 1).

One kg of Shisham seed consists of 7000 pods consisting of 35% seeds. One kg seed consists of approx. 18,000 numbers of seeds. Average wt of seed varies from 41 to 75mg, length of seed from 8 to 10mm, width from 5 to 6.3mm, and thickness from 1.5 to 2mm (Table 2).

(B) Seed Study (emptiness, viability, germination & dormancy)

There is no dormancy in seed. Seed soaked in cold water for 8 hours gave better germination of about 80%. Only 2% seed remain viable when stored for one year in polythene bags. Therefore, it is recommended that seeds should be used within 2-3 months of storage.

(C) Propagation technique:

The propagation techniques developed are given in following steps-

(i) Seed pre-treatment

Seed soaking with cold water found the best seed pre-treatment.

(ii) Cutting treatment through IBA

Cutting treated with rooting hormone (1000 ppm of IBA) found successful but rate of success found low as compared to seed germination technique. So, this technique can be used only when, we have no alternatives.

(iii) Standardization of root trainer size

Small cup (126 cc) root trainer found the best for better growth of seedlings.

(iv) Standardization of polythene bags size

Small size (23.5 cm x 8 cm) poly-bag found the best for the better growth of seedlings.

(v) Potting mixture study

FYM treatment in the ratio of 1:1:1 with soil and sand found the best potting mixture for the better growth of seedlings.

3. *Buchanania lanzan* (Achar)

Achar belongs to family *Anacardiaceae*. It is also referred as '*Chironji*', an edible dry fruit used in Indian homes in various sweet preparations and locally used in cosmetic preparations, although, it is an important NWFP which is commercially traded in the state of Madhya Pradesh.

(A) Phenological behaviour of species

Achar is a very important MFP species contributing about 20-25 % in to rural economy, but due to ill practices of fruit collection, majority of the tree population and its good traits of bearing capacity, fruit size and oil contents have been going down. So, there is an urgent need to identify existing plants of quality fruits with their protection and production, impart training on proper time and methods of collection to rural population. It has been observed that Achar is a good coppicer when young but with ageing affect its ability of coppicing becomes very-very meager i.e. it is highly vulnerable to felling injury due to the trunk causing bacterial attack resulting gummosis and after some time it dries up. Loranthus attack which directly affects fruit production which can be controlled scarifying the infested branches.

In Achar, the leaf fall starts in November and almost completed in December. Initiation of flowering starts in January. Pollination occurs mostly by insect during February. The fruits ripe in last week of April and first week of May (Table 1). Proper time of fruit collection is last week of April and first week of May, when the 80% of the fruit become blackish and purple in colour. The method of collection with the help of branch pruner or a hook-tied to bamboo sticks at its end so that the fruit bunch can be cut down. The riped and fleshy fruits are depulped and dried in shade (Table 2).

(B) Seed Study (emptiness, viability, germination & dormancy)

The fleshy fruit should be collected, de-pulped, washed with water and dried in shade. This will give germination $90 \pm 5\%$. The unriped fruit collection gives germination $50 \pm 5\%$. The viability of riped de-pulped seed remains $30 \pm 5\%$ up to one year.

The excised embryo (with the help of special designed nut cutter) gives 95 % germination within 3-7 days in sand + FYM; (50:50). Seed sowing can be done in root

trainer or in poly bags. The transplantation of seedling from nursery bed to poly bags causes heavy causalty due to root disturbance. Special care should be taken against rats and squirrels from seed sowing to four leaves stage. The seed surface is sterilized with mercuric chloride 0.01% or parathion 1g/kg seed to control fungal infection.

So, it is therefore, suggested that seed sowing should be direct in root trainer or polythene bags as the transplantation of seedlings from seed bed to poly bags resulted damage up to 80% due to root disturbance. It is good coppicer particularly from root in younger age.

(C) Propagation technique

The propagation techniques developed are given in following steps-

(i) Seed pre-treatment

Use of extracted kernel was the best seed pre-treatment.

(ii) Cuttings treatment through IBA

Rooting found successful as cuttings treated with 1500 ppm of rooting hormone (IBA) but rate of rooting success was very low.

(iii) Standardization of root trainer size

Large cup root trainer (315 cc) found the best for the better growth of seedlings.

(iv) Standardization of polythene bags size

Small size (23.5 cm x 8 cm) and medium size (25 cm x 11 cm) polybags were suitable for the better growth of seedlings.

(v) Potting mixture study

FYM treatment in the ratio of 1:1:1 with soil and sand, found the best potting mixture for the better growth of seedlings.

4. *Litsea glutinosa* (Maida Lakdi)

Maida is a moderate sized tree belonging to family *Lauraceae*. Its bark is thin, grey or pale brown; live bark 3 mm thick, pale brown, very slim. Leaves spirally arranged, very variable in size, usually oblong-oval or elliptic, shortly acuminate or obtuse, base acute. Fruits 6 mm diameter, globose, purplish black, 4 mm in diameter thin disc; fruiting pedicel slender.

It was widely distributed in India around a decade back particularly in Madhya Pradesh. But due to its over exploitation as a binding agent, now it has become a rare or endangered species.

Regeneration is not found normally in natural habitat. No efforts have so far been made to establish plantation of *Litsea glutinosa*.

(A) Phenological behaviour of species

Maida is deciduous in nature, but its leaf fall is gradual and prolonged flowering in the months of Jan, Feb and March. It flowers in May, June and fruit ripens in October, November, fruit fall is completed in December. At ripening, the fruit becomes black and eaten by birds, it should be depulped, dried in shade and kept in jute bag/cloth bag. Seed is physiologically dormant (due to embryo) for 5 months. Seed should be sown after soaking in warm water for 12 hours in root trainers or in poly bags.

One kg Maida seed consist of 3700 no. of seeds, average seed wt is 311mg, and diameter of seed is 8.55 mm. The seed moisture percent is 2.6 to 4.4 (Table 3).

(B) Seed Study (emptiness, viability, germination & dormancy)

It has been observed that after collection of fresh seed, it does not germinate with any of treatments i.e. cold water, hot water, excised embryo and hormonal treatment which indicate that the seed is having physiological, specially embryonal dormancy of 4 to 5 months. After this period seed responds for warm water treatment (soaking for 12 hours) and sown in sand + organic matter (50:50) which resulted in better germination of 27%. 5 to 10% seeds are empty and viability of seed is for 8 months. There is significant variation in seed germination depends on seed sources. The reason of variation in germination may be due to limitation in pollination, selfing and variation in male and female ratio. This is a matter to be investigated.

(C) Propagation technique

The propagation techniques developed are given in following steps-

(i) Seed pre-treatment

Seed soaking with cold water found the best seed pre-treatment. Depulped seed should be stored in cloth bags for 4-5 months (Embryonal dormancy) after collection and then sown in Sand+ FYM (50:50)

(ii) Cutting treatment through IBA

Cuttings treated with rooting hormone (IBA) found successful, but rate of success was found low.

(iii) Standardization of root trainer size

Medium cup (187 cc) root trainer found the best for better growth of seedlings.

(iv) Standardization of polythene bags size

Large size (28 cm x 14 cm) polybag found suitable for the better growth of seedlings.

(v) Potting mixture study

FYM treatment in the ratio of 1:1:1 with soil and sand found suitable potting mixture for the better growth of seedlings.

5 *Pterocarpus marsupium* (Bija)

The Indian Kino Tree is a medium to large, deciduous tree that can grow up to 30 meters height. It is also known by the names Malabar Kino, Benga, Bijiayasal (in western Nepal), Piasal (Oriya), Venkai, and many others. The heart wood is used as an astringent and in the treatment of inflammation and diabetes. Similipal Kol tribes in Orissa (India), pound a paste mixture of the bark of *P. marsupium* with the barks of *Mangifera indica*, *Shorea robusta* and *Spondias pinnata* to treat dysentery illness.

(A) Phenological behaviour of species

Bija is an annual seed bearer tree. Flowering starts in it during June-September when it is fully covered with new foliage. Fruit growing period observed from October to January. February to March is fruit ripening period and fruit fully ripens in April when the pod becomes green to brown and gradually fruit dropping takes place. Fruits from tree or fall on ground can be collected (Table 1 & 2). The physical parameters of seeds/fruits are: Average weight of fruit is 61.14mg, length 9.13mm, width 5.6, thickness 2.09 mm. (Table 3). One kg of Bija seed consist of 2500 to 2800 no. of seeds.

(B) Seed Study (emptiness, viability, germination & dormancy)

The emptiness in fruit is around 50% and viability of seed ranges 6 to 10 months. There is no seed dormancy. The best seed pretreatment is soaking the seed in warm water for 8 hours and keeping seed in jute bags. Germination starts, in 3-4 days and the germination almost completed in 20 days. Plant percent is 20 to 30% .

(C) Propagation technique

The propagation techniques developed are given in following steps –

(i) Seed pre-treatment

Seed should be collected from March to April. Use of extracted kernel found the best seed pre-treatment.

(ii) Cutting treatment through IBA

Cuttings treated with rooting hormone (IBA) found successful and rate of success was good.

(iii) Standardization of root trainer size

Small cup (126 cc) root trainer found the best for better growth of seedlings.

(iv) Standardization of polythene bags size

Small size (23.5 cm x 8 cm) polybags found suitable for the better growth of seedlings.

(v) Potting mixture study

Vermi-compost treatment in the ratio of 1:1:1 with soil and sand found suitable potting mixture for the better growth of seedlings.

Table - 1 : Phenological observations of targeted rare & endangered tree species

S. No.	Species	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	Salai (<i>Boswellia serrata</i>)	LF	Initiation of flowering	Fruit growth period	Fruit ripening period & SD	Fruit fully ripe 1 st week of May	Initiation of leaf	Foliage	Foliage	Foliage	Foliage	LF started	LF completed
2	Shisham (<i>Dalbergia latifolia</i>)	Fruit dev. L.F.	Fruit fully dev. & LF completed	Fruit ripe & SD	Fruit fall completed & SD	initiation of new foliage	Foliage	Foliage	Foliage	F.P.	FP Fruit setting & dev.	Fruit setting & FD	FD & LF
3	Achar (<i>Buchanania lanzan</i>)	Initiation of F.B. LF completed	Opening of flowering pollination	Fruit setting and growth period	Fruit fully grown ripening start & SD	Ripening completed fruit fall & SD	Initiation of new leaves	Foliage period	Foliage period	Foliage period	Foliage period	LF started	LF
4	Maida lakdi (<i>Litsea glutinosa</i>)	LF	L.F.	L.F.	New leaves appear	Initiation of flowering & Leaf flushing period	Flowering period & L.F.	Fruit setting FD & L.F.	FD & L.F.	FD & L.F.	Fruit ripening period & L.F.	Fruit ripe climax SD & L.F.	Fruit fall & LF
5	Bija (<i>Pterocarpus marsupium</i>)	Fruit growth & L.F.	Fruit growth, LF completed	Fruit ripening & fruit fall started SD	Fruit fall completed New foliage appear & SD	New foliage	Full foliage stage Flowering	Full foliage stage	Full foliage stage	FP	Fruit growth period	Fruit growth period	Fruit growth period

Note: FB - Flowering bud; LF- Leaf fall; FD-Fruit development; FP- Flowering period; SD-Seed collection

Table - 2 : Proper time and method of seed collection of targeted rare & endangered tree species

S No.	Species	Collection Time	Stage of Ripening	Method of plucking of seed	Pre-storage Drying
1	Salai (<i>Boxwellia serrata</i>)	April May	More than 60% of the fruit bunch become dried and splitting started. (Green fruit collection not recommended)	Ripe fruit bunches should be plucked with sharp hook (fruit become brown + splitting started). Seed collection from ground is difficult but give good performance in germination.	Sun dried
2	Shisham (<i>Dalbergia latifolia</i>)	March April	Pod should be coppery bright, the plant become leafless	Ripe pod bunches should be plucked with hooked bamboo stick	Sun dried, crushed pod in gunny bags and winnowed.
3	Achar (<i>Buchanania lanjan</i>)	April last week May First week	When 80% of seed became blackish brown	Without damage to tree and branches only fruit bunch should be plucked with sharp hook (hasia)	De-pulped and dried in shade.
4	Maida Lakdi (<i>Litsea glutinosa</i>)	October- November	Fruit ripe gradually when it become black it should be plucked (80% of bunch should be black.)	Ripe fruit flex should be collected and depulped and kept in cloth bag. Special care of watch and ward is needed of fruit bearing trees because ripening fruits are eaten by birds.	De-pulped and keep air dried (not in sun dried)
5	Bija (<i>Pterocarpus marsupium</i>)	March April	All fruit bunches turn green to brown	seed can be collected from ground	Dried in sun light

Table - 3 : Physical parameters of fruit / seeds of targeted rare & endangered tree species

S N.	Name of species	No. of fruit / (kg)	No of seed/ (kg)	Avg. wt. (mg)	Length (mm)	Width (mm)	Thickness (mm)	Empty seed (%)	Seed Feature bearing	Viability	Dormancy Treatment
1	Salai (<i>Boswellia serrata</i>)		27,500	46.33mg (26 to 99)	8.47 (7.2 to 10.5)	8.18 (6.7 to 9)	3.7(3.3 to 4)	5 - 10%	Insect damage Hollow Annual bearer	10 to 60%	Nil, Soaking seed in warm water for 8-10 hrs
2	Shisham (<i>Dalbergia latifolia</i>)	7000 (35" seed)	18,000	41-75 mg	8 to 10 (mm)	5-6.3 (mm)	1.5 to 2	30 to 80%	Pollination problem (Barghat) Balaghat Mandla Annual bearer	2% only	Nil, Seed soak in cold water for 8 hrs and sown in polybags
3	Achar (<i>Buchanania lanjan</i>)	13,000 - 14,000	12,000	289.5 (234 to 403)	19.8	9.7	6.6	20 -30%	abort fruit alternate year bearing.	One year	Seed soak seed in water for 2 hrs and sink seed use for germination
4	Maida Lakdi (<i>Litsea glutinosa</i>)	2,320- 2,600	3,700	311+	Dia.8.55+	--	--	5 -10%	Seed moisture 2.6 to 4.4% Annual bearer	8months	5 month physiological Seed soak in warm water for 12 hrs and sown in room temp
5	Bija (<i>Pterocarpus marsupium</i>)	2,500 - 2,800	2,500	61.14 (41 to 102 mg)	9.13 (8 to 11.5)	5.6 (4.8 to 6.4)	2.09 (1.9-2.4)	50%	Regular bearing	6-10 months	Nil, soak seed in water for 8 hrs, keep in gunny bags for 3-4 days and germinated in seed transplanted in poly pot

Karnel % in Achar = 28.6



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