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MULTIPLICATION OF SHISHAM THROUGH BRANCH CUTTINGS

Dr. Muhammad Afzal[1], Aqeela Mobeen Akhter[2]
and Masood Amjad[3]

Abstract

An experiment was conducted at Research Nursery, Punjab Forestry Research Institute, Faisalabad to check the possibility of raising Shisham (*Dalbergia sissoo*) through branch cuttings. The cuttings were prepared from one-year-old branches of resistant plus trees of Shisham having 15-20 year age and 35-40 cm diameter from different places of district Faisalabad. These cuttings were collected during January-February. The length of cuttings was kept uniform as 23 cm with a thickness of 10 mm. The cuttings were treated with bleach with 1:4 ratio for ½ hour to disinfect them from any pest/pathogen infestation. Auxins used were Indole Acetic Acid (IAA), Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA) and other commercial rooting hormone (powder form) with different concentrations and combinations. It has been researched out that true to type Shisham tube plants can be produced vegetatively through the application of rooting hormones, which are fit for field planting with in a period of 4 months. NAA with a concentration of 100 mg/l among the other rooting hormones proved to be more economical for production of these true to type tube plants. These tube plants showed promising growth in the field with more than 80% survival.

Introduction

Shisham (*Dalbergia sissoo*) is one of the most important timber species in Pakistan. It is a nitrogen-fixing and multipurpose tree species. In neighbouring countries, it is found in India, Nepal, Bangladesh, Bhutan, Myanmar, Afghanistan and Malaysia. It is often encountered up to 900 m, occasionally ascending up to 1500 m. It is a large deciduous tree growing 2.4 m in girth and 30 m in height (Shukla, 2002). It is extensively planted in the irrigated plains of Pakistan. It is a preferred species for afforestation along roadsides and canal banks. It is an economically valued timber tree used for construction and ornamental woodwork, fuel and charcoal. Farmers adopt it for plantations in the agricultural land and on the field boundaries especially in the province of Punjab. It can

1 Director, Punjab Forestry Research Institute (PFRI), Faisalabad, Pakistan.
2,3 Research Officer, PFRI, Faisalabad
Assistant Research Officer, PFRI, Faisalabad.

be grown in combination with maize, mustard, rapeseed, gram, peas, wheat, sugarcane and cotton. Shisham thrives well on sandy-loam soils with good drainage. The conventional method for propagation of Shisham is through seed. But the problem of mortality of Shisham in the recent years necessitates that superior and resistant clonal material be vegetatively multiplied for healthy growth and higher productivity.

Vegetative propagation is not a breeding method but a way to rapidly multiply desired genetic/clonal material and capturing most of the genetic potential. When vegetative propagation is used, most of the genetic potential including the non-additive variance is transferred to the new plant (Libby, 1974; Chaperon et al., 1983). Moreover, tree population is highly heterozygous and vegetative propagation helps to utilize maximum genetic gains in the shortest time. However, the success of vegetative propagation depends upon proper environment, genetic component and the physiological status of cuttings (Brix and Barker, 1975; Foster et al., 1984; Cunningham, 1986; Puri and Thompson, 1989). The present study was initiated to determine the proper hormone for enhancing the rooting of cuttings of *Dalbergia sissoo* and verify success and performance of planting stock so produced in the field.

Materials and Methods

The experiment was carried out at Research Nursery of Punjab Forestry Research Institute (PFRI), Faisalabad during January, 2002. The cuttings were prepared from one year old branches of resistant plus trees of Shisham with 15-20 year age having 35-40 cm diameter from different places of district Faisalabad i.e. Poliani Bangla, Shahkot Minor, Munianwala road, Jaranwala road as well as PFRI campus. These cuttings were collected in the months of January and February. The length of cuttings was kept uniform as 23 cm with a thickness of 10 mm. The cuttings were treated with bleach with 1:4 ratio for ½ hour to disinfect them from any pest/pathogen infestation.

Auxins used were Indole Acetic Acid (IAA), Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA) and other commercial rooting hormone (powder form) with different concentrations and combinations. The cuttings were treated as under:

Table 1. Different concentrations and combinations of Auxins used for rooting in *Dalbergia sissoo*

Treatments	Auxins	Concentration	No. of cuttings
T1	Control	-	1000
T2	NAA	100 mg/l	1000
T3	NAA	500 mg/l	1000
T4	IBA	100 mg/l	1000
T5	IBA	500 mg/l	1000
T6	IAA	100 mg/l	1000
T7	IAA	500 mg/l	1000
T8	Commercial Rooting Hormone	-	1000
T9	IBA+NAA	100 mg/l each	1000
T10	IBA+IAA	100 mg/l each	1000
T11	NAA+IAA	100 mg/l each	1000
T12	IBA+NAA+IAA	100 mg/l each	1000

Cuttings were treated by dipping basal $^1/_3$ portion in respective solution for 24 hours. Then these cuttings were inoculated in polythene bags (23cm x 10cm) filled with silt as a rooting medium. The controlled conditions of temperature (about 30-40° C) and humidity (about 70-80 %) were maintained by covering the cuttings with polythene sheet during root development. Watering was carried out as and when required to avoid any fungal growth. Weeding was also done during this period. The observations recorded after the period of two months were as under:

Table 2. Effect of Auxins on rooting behaviour in D*albergia sissoo*

Treatments	Cuttings treated (No.)	Cuttings developed root (No.)	Rooting %age
T1	1000	230	23.00
T2	1000	627	62.70
T3	1000	240	24.00
T4	1000	620	62.00
T5	1000	220	22.00
T6	1000	655	65.50
T7	1000	240	24.00
T8	1000	85	08.50
T9	1000	700	70.00
T10	1000	230	23.00
T11	1000	460	46.00
T12	1000	320	32.00

After root formation polythene sheet was removed to let the plants grow in the open atmosphere. Silvicultural operations were carried out as usual. Plants attained more than 30 cm height and became fit for field planting at about 4 months of age.

Figure 1. Vegetative Nursery

Results and Discussion

Table 2 presents the response of growth regulators on rooting behaviour of branch cuttings of *Dalbergia sissoo*. Variations were observed among different treatments for rooting percentage. It was generally observed that the application of Auxins triggered and enhanced rooting. However, a higher concentration of Auxins i.e. 500mg/l of NAA, IAA and IBA rather inhibited rooting of cuttings. A number of researchers have reported that Auxins, naturally or artificially applied, trigger adventitious roots on stem cuttings (Nanda, 1975; Puri and Shamet, 1988; Verma et al., 1992). Maximum rooting of 70% was observed for treatment (T9) in the combination of IBA and NAA with a concentration of 100 mg/l each, followed by 65.5% rooting for treatment (T6)

with 100 mg/l IAA, 62 7% rooting for treatment (T2) with 100 mg/l NAA, 62% rooting for treatment (T4) with 100 mg/l IBA and 46% rooting for treatment (T11) in the combination of NAA and IAA with a concentration of 100 mg/l each. Poor rooting was observed in control and other treatments i.e. T1, T3, T5, T7, T8, T10 and T12 as 23%, 24%, 22%, 24%, 8.5%, 23% and 32% respectively. The above discussion reveals that IBA+NAA in combination and NAA, IBA and IAA individually have good response on rooting behaviour of Shisham cuttings. The present study also indicates that the higher concentrations of Auxins instead of enhancing rather inhibit root formation in branch cuttings of *Dalbergia sissoo*.

Figure 2. Vegetative Sibling

Field Performance

The plants produced through the application of hormones were tested in the field which showed > 80% survival with promising growth.

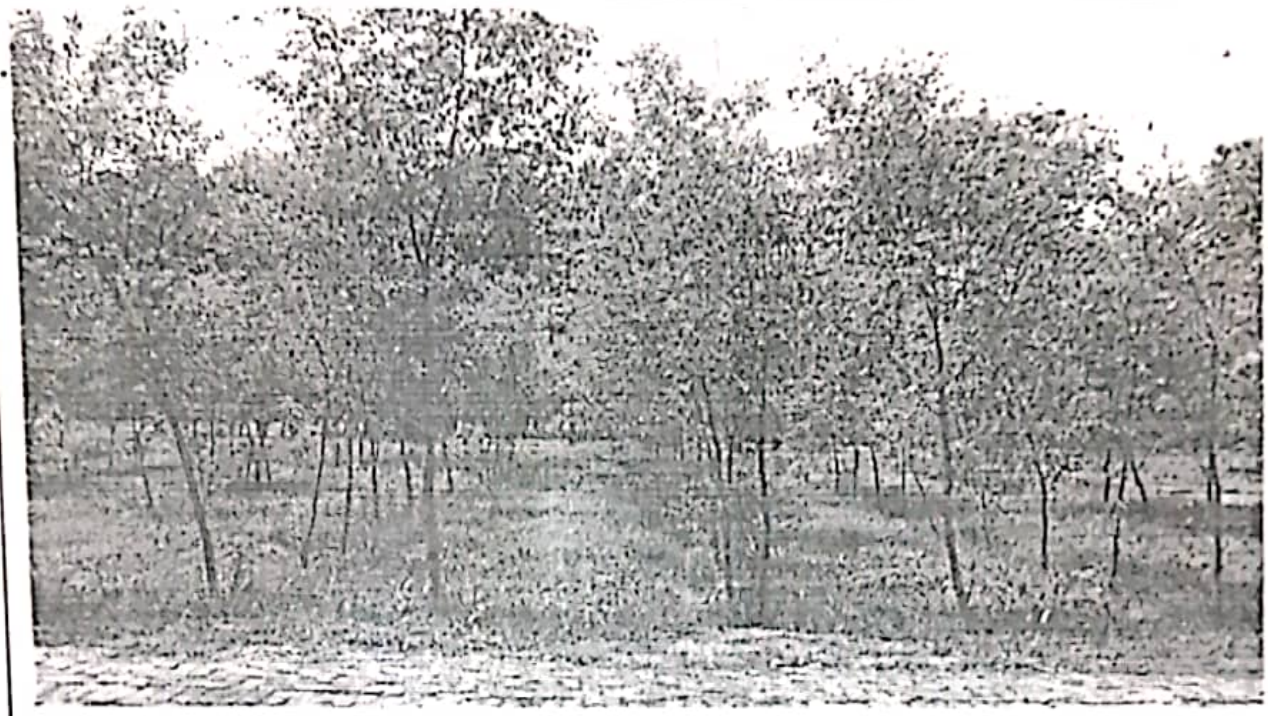

Figure 3. Vegetative Plantation

Conclusion

From the above study it has been concluded that Shisham (*Dalbergia sissoo*) can be raised vegetatively through the application of rooting hormones. Since the plants are genetically identical to parent plants, the clones offer the advantage of genetic uniformity and the plants produced have similar growth and form. Thus it provides an opportunity to harness and exploit genetic variation directly. It also helps to utilize maximum genetic gain in a shortest time. However, these advantages cannot be attained through conventional method of producing stumps from seed in a yearlong.

From economic point of view NAA is much cheaper than IBA and IAA and it has given almost the same result. Therefore, it is suggested that NAA with a concentration of 100 mg/l may be used for rooting of Shisham cuttings. The study also signifies the scope for further studies to be undertaken to make the technique more cost effective and applicable to other economic species.

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