

CLONAL VARIATION IN ROOTING ABILITY OF BRANCH CUTTINGS OF *DALBERGIA SISSOO*, ROXB.

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Introduction

Dalbergia sissoo, commonly called 'sissoo', is a fast growing, highly priced tree species. It is widely distributed through the deciduous forests of India, Nepal, Bhutan, Pakistan, Afghanistan, Myanmar and Malaysia. It is also found under cultivation in tropical to subtropical Africa and Asia. The occurrence of *D. sissoo* over a wide range of edapho-climatic conditions is reflected to be in the genetic constitution of its diverse populations. The species, therefore, offers an opportunity for studying variations for developing effective tree improvement strategies. Significant variations in seed, germination and seedlings traits have been observed among sources and provenances of the species (Vakshasya *et al.*, 1992; Gera *et al.*, 1999). Dhiman *et al.* (1997) observed clonal variation in macro-propagation through leafy shoot cuttings in this species. Nanda (1970) also viewed that site condition may effect the rooting potential of stem cuttings of *D. sissoo*. Likely, there is a wide range in rooting ability for species, geographic origin, and genotype just as there is for other more commonly measured traits of forest trees (Land and Cunningham, 1994). However, one of the first reports of tree-to-tree variation in rooting was for red maple

(Snow, 1939). Since then genetic variation in rooting ability has been reported for a large number of tree species (Haissig and Riemenschneider, 1988). The selection of good genotypes can dramatically improve overall rooting response, provided rooting ability is under genetic control.

As *D. sissoo* responds well to vegetative propagation so for the production of quality planting stock, vegetative multiplication gardens of the species has been established in various states of India. Vegetative propagation is generally considered as important part of tree improvement programme in regeneration where, the goal is to get the best planting stock with highest genetic quality materials (Hartmann and Kester, 1983). Accordingly, this research paper reports on the clonal variation in rooting percentage, length, and number of adventitious roots in branch cuttings of *Dalbergia sissoo* at nursery stage.

Material and Methods

The study was carried out at Johro Research Nursery (Altitude : 742 m, Latitude: 30° 27' N) at Paonta Sahib in the state of Himachal Pradesh. Fifty branch cuttings (20cm long and 1-1.5 cm thick) were collected during February 2000 from

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four year old clonal seed orchards of *Dalbergia sissoo* raised at Gondpur, Paonta Sahib (Altitude: 740m, Latitude: 30°27' N). The cuttings collected belong to 41 clones raised from plus trees scattered over the states of Uttar Pradesh, Rajasthan, Haryana, Punjab and Nepal also. These cuttings were planted in polythene bags of size 22.8 x 15.2 cm (9"x6") size filled with soil, sand and farm yard manure in the ratio of 1 : 2 : 1. The lower ends of the cuttings were treated with 1000 ppm Indole Butyric Acid (IBA) in talcum powder before planting. The polythene bags were kept in the poly-tunnel where approximately 70-80% relative humidity and a temperature of 30-35°C was maintained. The experiment was designed in Randomized Block Design with five replications. Initiation of rooting was observed after 15 days of planting and polythene bags were transferred from poly tunnel to the open after 21 days for further growth in the nursery. At the time of field planting during July 2000, the observation on number of adventitious roots and root length of five randomly selected plants from each clone were recorded. Analysis of Variance (ANOVA) was applied to the data obtained from rooting, root length and number of roots using version 10 of Statistical Package for Social Sciences (SPSS) as given in Table 1.

Results and Discussion

Table 2 lists the mean, standard error (SE) and critical difference (CD) for rooting response, root length and number of adventitious roots of different clones of *Dalbergia sissoo*. Results showed that rooting percentage varied significantly at 5% level among the 41 clones of the species. The rooting percentages ranged from 21.67 to 93.18% with an average of 58.70%. The root length and number of adventitious roots also varied significantly among various clones with an average of 29.77 cm and 19.66, respectively. Such clonal variation in macro-propagation through leafy shoot cuttings in this species was also reported by Dhiman *et al.*, (1997). Maini (1967) also reported variation in the vegetative propagation of *Populus* in natural populations, which may be employed in the management of natural Aspen stands by encouraging desirable clones that have performed well under a given set of ecological conditions. The variations in rooting percentages were also reported in *Eucalyptus spp* with an extreme range from 0 to 100 per cent (Campinhos and Ikemori, 1980). Good *et al.* (1978) also observed considerable variation in rooting of cuttings of different clones of *Betula pendula*, *B. pubescens*, *Salix atrocinerea*, *S.*

Table 1

Analysis of Variance Table (ANOVA)

Source of Variation	Degrees of freedom	Mean square	Expectation of mean square
Replication	R-1	Ms_1	$s^2e + R s^2 r$
Clone	C-1	Ms_2	$s^2e + R s^2 c$
Error	(R-1) (C-1)	Ms_3	s^2e
Total	(RC-1)		

where r = no. of replication; c= no. of clones

Table 2

Variation in rooting ability in branch cuttings of *Dalbergia sissoo* clones.

Clone		Rooting (%)	Root length (cm)	No. of roots
Area	Clone No.			
1	2	3	4	5
U.P.	33	85.32	29.70	17.00
(23°52' -	34	49.50	28.00	18.00
31°28' N	41	77.28	31.50	27.00
	42	63.18	32.40	17.20
	44	58.25	29.30	16.60
	200	77.93	26.20	21.00
	204	36.75	30.22	25.60
	215	70.06	30.10	17.80
	236	25.57	24.40	11.80
	237	88.05	28.70	20.40
	21	75.87	27.92	21.00
	24	65.00	32.00	15.00
	9	59.31	29.30	18.00
	10	49.12	30.40	21.90
	15	29.76	26.60	15.80
	19	63.05	31.10	20.60
	20	58.81	27.40	12.60
	252	31.50	31.30	07.40
	254	65.93	27.40	19.00
	260	59.93	38.10	27.00
	262	84.18	31.00	26.20
	268	43.31	31.00	12.00

Contd...

caprea, and *Sambucus nigra* in Indonesia. Poor rooting response in some of the clones may be related to the higher physiological age of the plus trees from which these clones derived. Generally, plus trees selected are of older age and hence it is hypothesized that they may inherit higher genetic load. In other words, the genetic load would

	1	2	3	4	5
Nepal :	114	38.31	31.40	14.20	
(26°20' -	121	57.42	30.30	22.40	
30°27'N	123	65.78	32.40	22.40	
lat.)	129	29.11	26.60	20.00	
Rajasthan	79	25.92	28.80	19.20	
(23°4' -	80	75.21	30.30	15.80	
30°55'N	81	50.75	27.70	10.00	
lat.)	82	55.50	31.92	25.00	
	86	55.97	29.50	22.80	
	87	42.41	30.80	23.20	
	91	77.43	27.90	20.60	
	92	65.48	28.12	17.00	
	106	65.68	30.20	20.40	
	107	93.18	32.80	28.20	
Haryana	55	27.87	28.40	29.00	
(27°33' -	62	74.18	29.40	29.60	
32°32' N	64	21.67	27.25	18.60	
lat.)	66	91.93	32.20	23.20	
Punjab	136	75.06	30.60	15.60	
(29°33' -					
32°-32'					
Nlat.)					
Mean		58.70	29.77	19.66	
SE	3.73	2.92	4.69		
CD	7.40	5.72	9.19		

SE : Standard Error

CD : Critical Difference

increase with the age of the plus tree which would pass on to the plants produced through vegetative propagation (Mathew and Vasudeva, 2003).

The selection of genotypes with good rooting responses can serve as useful tool in increasing the productivity of man made

plantations. The rooting ability can be incorporated as one of the quantitative traits during selection of plus trees of *Dalbergia sissoo* for further use and multiplication for better results. The information generated here is also important in the establishment of

vegetative multiplication garden (VMG) of the species from where superior propagation material with maximum rooting percentages would be obtained for large-scale production of quality planting stock used in various plantation programs of the country.

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SUMMARY

Clonal variation in rooting ability of branch cuttings of *Dalbergia sissoo* was studied. Significant variation in rooting percentage, root length and number of adventitious roots was observed in 41 clones of the species. The rooting ability should be included as one of the traits in plus tree selection of the species, which ease the commercial production of superior planting stock of *Dalbergia sissoo*.

डलबर्गिया सिस्सु राक्स. की शाखा-कलमों की जड़ें निकालने की योग्यता में मिली
कृन्तकीय विभिन्नता
ओमबीर सिंह
सारांश

डलबर्गिया सिस्सु की शाखा-कलमों की जड़ें निकालने की योग्यता में पाई जाने वाली कृन्तकीय विभिन्नता का अध्ययन किया गया। इस पादपजाति के 41 कृन्तकों में उनके जड़ें निकालने के प्रतिशत, जड़ों की लंबाई और आगन्तुक जड़ों की संख्या में काफी अन्तर रहता देखा गया। इस जाति के श्रेष्ठतर वृक्षों का चुनाव करने में उनकी जड़ें निकालने के लक्षण को भी एक गण की तरह शामिल किया जाना चाहिए जिससे डलबर्गिया सिस्सु की बढ़िया रोपण सामग्री का व्यापारिक उत्पादन कराने में आसानी हो जाएगी।

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