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Studies on Fifteen Seed Source Variation in seed Traits of *Dalbergia Sissoo* (Roxb)

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Abstract: ***The present investigation entitled "Studies on fifteen Seed source variation in seed traits of Dalbergia Sissoo (Roxb)"was carried out in the Department of Forestry. The aim of this investigation was to measure the variability in seed of Dalbergia Sissoo. Seed was collected from Allahabad, Bhopal, Buxar, Faizabad, Lucknow, Maihar, Mirzapur, Patna, Kanpur, Pratapgarh, Varanasi, Sultanpur, Sidhi, Satna and Rewa. Seed traits viz. Length of seed ranged between (6.61-8.79mm), Width of seed (4.36-6.38mm), Thickness of seed (0.44-0.66mm), Wt. of 100 of seed (1.88-2.84g) and viability of seed (83.65-89.65 g) was recorded. The present studies was suggests Kanpur and Rewa is the Best Seed Source. These trees may be used for further selection to maintain broad genetic base in any tree selection programme. Seed source screening provides a great opportunity for tree breeder to screen and capture natural variation for success of afforestation, besides providing information on the raw material for breeding and evolving improved planting stock within a seed source. Such an investigation may help in selection of most suitable seed source for a given site for conservation, breeding and improvement in this species.***

Keywords: *Dalbergia Sissoo*, variability, heritability, GCV, PCV, Genetic Advance Genetic Gain, Correlation

1. Introduction

Dalbergia Sissoo known as sisu, shisham, at different parts of India. It is native to the India, Pakistan, Burma, Sri Lanka and Mauritius. In India it is grown at central Himalaya's hill side. The northern rang of India, in state of Punjab at India and Pakistan both. It grows along the hilly area, beds of river banks with rich alluvium soil. It grows as elevation of 3000ft.The vast physiological and genetic variations existing in forest tree populations are associated with location or source of seed as trees cover a wide range of environmental conditions. The breeding approach generally depends on the extent of variability present on the economically desirable traits in the base populations. It is not possible to operate a breeding programme for forest tree improvement until and unless the sufficient variations exist in that species. It is used to forestry as application of afforestation and reforestation. The tree is planted on roadsides and shade tree for tea plantations. Its morphology had great variation to leaf, pods flowers.

Genetic variability estimation within a species is a prerequisite for developing effective tree improvement/breeding programms. The significance of genetic variation studies and provenance testing in forest tree breeding is very well recorded (Pryor, 1963; Callaham, 1964; Wright, 1976). Variation in several seed and seedling traits and its significance in seed source studies have been documented in a number of tree species such as Pinusbanksiana Lamb. (Yeatman 1966), Pinuscaribaea Mor. (Venator, 1974) and Eucalyptus Globulus Labill (Kirkpatrick, 1975 In Dalbergia Sissoo heritability estimates for height, diameter and stem form have been reported by Vidakovic and Siddiqui (1968) and Vidakovic and Ahsan (1970). However, genetic diversity associated with geographical factors of the seed source have not been worked out.

Provenance testing is a useful approach to genetic improvement of forest tree species (FAO, 1975). The purpose of provenance test is to measure the pattern of genetic variation and to aid in selection of well adapted and highly productive seed source for silvicultural practices (Khullar *et al*., 1991). The concept of provenance testing has been well established and demonstrated through nationally and internationally conducted coordinated "provenance" trials (Subramanium *et al*., 1992).

2. Material and Methods

The present investigations was carried out to Studies on **Fifteen Seed source variation in seed traits of *Dalbergia Sissoo* (Roxb)** in the Department of Forestry, Awadhesh Pratap Singh University, Rewa. The experimental site of Madhya Pradesh with an elevation of 304 m above mean sea level with $24^0$53'86'' N latitude and $81^0$03'53'' E longitude.

Morphological studies: Hundred randomly selected fruits (5 replicates of 20 fruits of each) from each composite sample of each source were subjected to morphological study. Similarly seed dimensions were measured for 100 randomly selected seeds (5 replicates of 20 undamaged seed each) for each provenance. Observations were recorded with respect to following parameters:

Length of Seed size (mm): length of seed was measured up to two decimal points separately for each seed source with the help of digital caliper.

Breadth of Seed size (mm): Breadth of seed was measured up to two decimal points separately for each seed source with the help of digital caliper to study the seed Breadth variation.

Thickness of seed (mm): Thickness of seed was measured up to two decimal points separately for each seed source with the help of digital caliper to study the seed Thickness variation

Seed weight (g): Hundred seeds weight of five replicates (each of 100 randomly selected seeds) for each source was

recorded up to two decimal points as per ISTA (1996) rules using electrical pan balance.

Seed viability (%): Seed viability was determined using Tetrazolium (TZ) salt test as prescribed by Kittock and Law (1968).

Table 1: Geographical location of pod/seed collection sites of *D.sissoo*

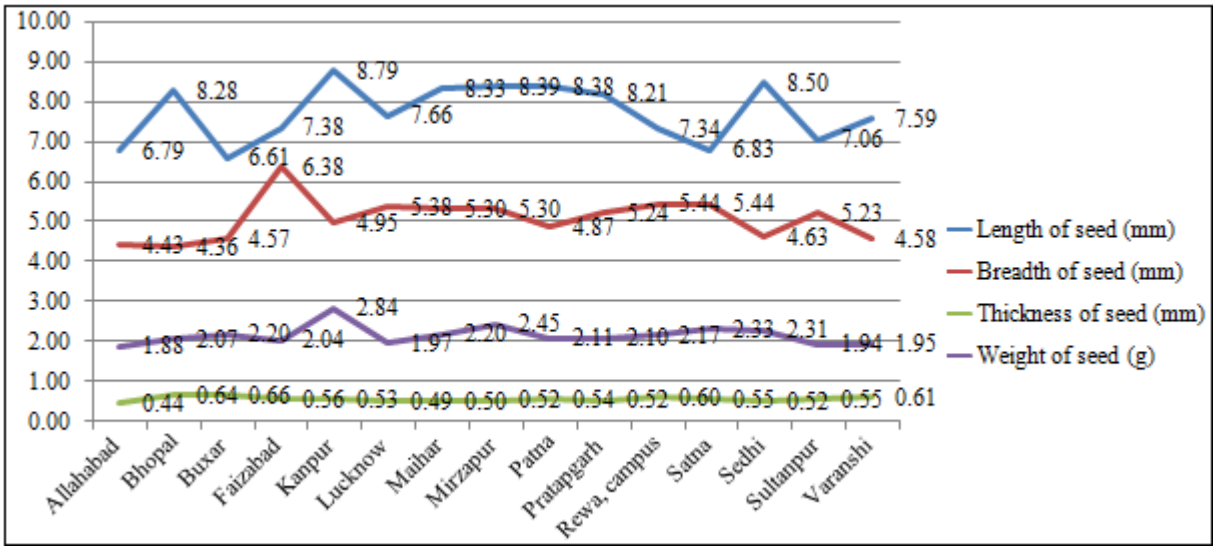
No.	Name of the Provenance	District/ State	Latitude (N)	Longitude (E)	Altitude (m)
1.	Allahabad	Allahabad, Uttar Pradesh	25° 45 ° 11.6'' N	82° 05° 36.9' E	98.31
2.	Bhopal	Bhopal, Madhya Pradesh	23° 15 ° 19.26'' N	77° 25° 18.9' E	527.45
3.	Buxar	Buxar, Bihar	25° 56° 2.6'' N	83° 97° 35.9' E	51.25
4.	Faizabad	Faizabad, Uttar Pradesh	26° 77.3 ° 25.6'' N	82° 146° 66.7' E	97.30
5.	Kanpur	Kanpur, Uttar Pradesh	26° 44° 99.23'' N	80° 33° 18.74' E	126.87
6.	Lucknow	Lucknow, Uttar Pradesh	26° 08 ° 29.6'' N	80° 09° 66.9' E	124.21
7.	Maihar	Maihar, Madhya Pradesh	24° 26 ° 51.6'' N	80° 76° 16.9' E	367.52
8.	Mirzapur	Mirzapur, Uttar Pradesh	25° 15 ° 29.6'' N	82° 60° 15.5' E	80.24
9.	Patna	Patna, Bihar	25° 06° 11.6'' N	85° 01° 32.9' E	53.51
10.	Pratapgarh	Pratapgarh, Uttar Pradesh	25° 93° 28.6'' N	81° 98.6° 26.1' E	102.33
11	Rewa	Rewa, Madhya Pradesh	24° 31° 21.2'' N	81° 17° 06.9' E	304.31
12	Satna	Satna, Madhya Pradesh	24° 16 ° 19.26'' N	80° 83° 26.9' E	415.66
13	Sidhi	Sidhi, Madhya Pradesh	24° 41° 44.6'' N	81° 88° 6.2' E	480.33
14.	Sultanpur	Sultanpur, Uttar Pradesh	26° 27 ° 19.6'' N	82° 07° 34.9' E	95.21
15.	Varanasi	Varanasi, Uttar Pradesh	25° 28 ° 9.6'' N	82° 96° 16.9' E	82.56

3. Result and Discussion

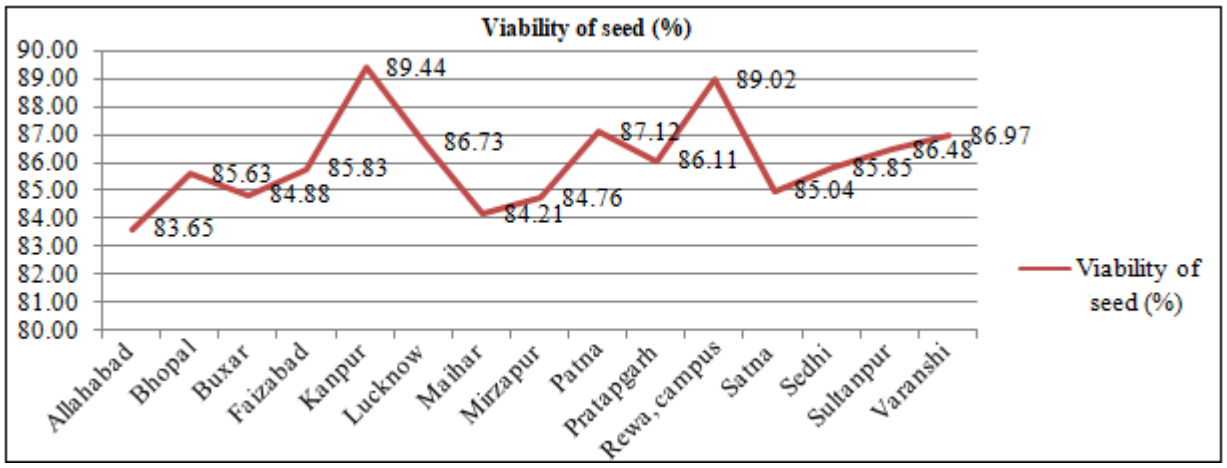
Seed morphology (length, thickness breadth, and weight): Wide variation in seed length, breadth, weight and thickness were observed among different Seed source (graph-1). The seed length varied from 6.79 mm to 8.79 mm among 15Seed source with the mean value of 7.74 mm. The highest seed length (8.79 mm) was recorded in Kanpur Seed source which was closely followed by Sidhi (8.50 mm) and Patna (8.38) And Mirzapur (8.38 mm) Seed source, respectively and the least seed length (6.61 mm) was found in Buxar Seed source which is followed by Allahabad (6.79 mm). The seed breadth varied from 4.36 mm (Bhopal) to 6.38 mm (Faizabad) and mean value was recorded 5.07 mm. Maximum seed breadth was Recorded Faizabad (6.38 mm) which is followed by Satna Seed source (5.44 mm). On the other hand seed weight varied between (1.81-2.84 g/100 seeds and mean value 2.17 g/ seed recorded. Seed weight (g/100 seed) was maximum Kanpur (2.84 g/100 seed) at followed by Mirzapur (2.45 g/100 seed) and Satna (2.33 g/100 seed) and minimum seed weight was recorded (1.81 g/100 seed) in Allahabad (1.88 g) Seed source. Which is followed by of Varansi (1.95 g/ 100 seeds) and Lucknow (1.97 g/ 100 fruits) and Sultanpur (1.94 g/ 100 seeds) were statistically, in case of Thickness of seed was varied between 0.44- 0.66 mm with the mean value of 0.55 mm,highest seed weight was recorded Buxar (0.66 mm) which is closely followed by Bhopal (0.64 mm) and Varanasi (0.61 mm) and minimum thickness of seed was recorded Allahabad (0.44 mm) which is followed by Lucknow (0.49 mm) . Results of ANOVA that the differences among the different Seed source were statistically significant (p=0.05) for all seed traits and the interactions between the year and provenances were also varied significantly.

Variation in seed morphological characters between the Seed source of *Dalbergia Sissoo* could be due to the fact that this species grows over a wide range of rainfall, temperature and soil types. Also it might be due to resource availability during fruit and seed development. The differences in seed length and breadth and seed traits can be clearly attributed to the difference in size of seed resulting from the different rate of the development of pulpy mesocarp. Similar types of findings are reported by Hanamashetti (1997) and Divakara (2008) in fruits of tamarind. This in turn could be due to different environments at the geographic origins of each seed and seasonal variables (Murali, 1997; Gutterman, 1992). Marked differences in selection pressure must have affected the fruit-seed development. Since the fruits/seeds were collected from different locations, from trees approximately of the same age therefore, the differences observed in fruit and seed parameters may be attributed to their genetic make up in nature as a result of adaption to diverse environmental conditions prevailing throughout their distributional range (Mathur *et al*., 1984). Apart from the age, vigour, crown structure and genotype of mother tree, soil and climate of the place of seed origin are important factors affecting the seed traits (Salazar and Quesada, 1987). Such variations in relation to habitat have also been reported in *Acacia nilotica* (Bagchi and Dobriyal, 1990); *Dalbergia Sissoo* (Gera *et al*., 2000; Devagiri, 1997); *Acacia catechu* (Ramachandra, 1996); *Pinusbungeana* (Wang *et al*., 1998). Significant differences in seed weight may provide an opportunity for selection of suitable genotypes for initiating further improvement of this important tree species and also to select superior provenance.

Seed viability percent: As seen from graph -2 the seed viability ranged between 83.65 to 89.44%. Among the various Seed source with the mean value 86.11 %. Kanpur showed the highest (89.44%) seed viability, which was very closely followed by Rewa (89.02%). The lowest viability was recorded in Allahabad (83.65%) Seed source.



Graph 1: Seed morphology (length, thickness breadth, and weight) among Seed source of *Dalbergia Sissoo*



Graph 2: Seed viability percent among Seed source *Dalbergia Sissoo*

Table 2: Anova table of among **Seed source** *Dalbergia Sissoo*

Name of the analysis data	Length of seed (mm)	Breadth of seed (mm)	Thickness of seed (mm)	Weight of seed (g)	Viability of seed (%)
Mean value	7.72	5.08	0.55	2.13	86.11
CD	0.551	0.485	N.S	0.390	N.S
SE (d)	0.268	0.235	0.062	0.189	3.827
SE (m)	0.189	0.166	0.044	0.134	2.706
CV	4.234	5.681	13.799	10.711	5.442

Table 3: Mean, range, coefficient of variation, PCV, GCV, heritability (h2), genetic advance and genetic gain for seed characters of *Dalbergia Sissoo*

Characters	Mean	Range	CV%	PCV%	GCV%	ECV%	h^2	Genetic Advance	Genetic Gain
Length of seed (mm)	7.72	6.61-8.79	4.234	9.86	8.90	4.23	81.57	1.67	16.57
Breadth of seed (mm)	5.08	4.36-6.38	5.681	11.38	9.87	5.68	75.12	1.54	17.62
Thickness of seed (mm)	0.55	0.44-0.66	13.799	15.34	6.71	13.79	19.16	0.29	6.05
Weight of seed (g)	2.13	1.88-2.84	10.711	4.82	2.52	5.44	27.46	0.86	2.72
Viability of seed (%)	86.11	83.65-89.65	5.442	14.40	9.30	11.00	41.68	0.56	12.37

Table 6: Genotypic, environmental and phenotypic coefficient correlation between seed characters of *Dalbergia Sissoo*

Character		Breadth of seed (mm)	Thickness of seed (mm)	Viability of seed (%)	Weight of seed (g)
Length of seed (mm)	G P E	-0.106 -0.062 0.097	-0.286 -0.144 -0.081	0.266 0.082 -0.091	0.652 0.344 -0.112
Breadth of seed (mm)	G P E		-0.268 -0.103 -0.003	0.049 0.083 0.108	-0.016 0.091 0.261
Thickness of seed (mm)	G P			0.234 0.074	-0.194 0.092

	E			0.020	0.214
Viability of seed (%)	G P E				0.487 -0.015 -0.209

4. Conclusion of the Study

The present studies was suggests Kanpur and Rewa is the Best Seed Source. These trees may be used for further selection to maintain broad genetic base in any tree selection programme. Seed source screening provides a great opportunity for tree breeder to screen and capture natural variation for success of afforestation, besides providing information on the raw material for breeding and evolving improved planting stock within a seed source. Such an investigation may help in selection of most suitable seed source for a given site for conservation, breeding and improvement in this species.

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References

[1] Bagchi, G.S. and Dobriyal, N.D. 1990.Provenance variation in seed parameters of *Acacia nilotica.Indian Forester*, **116 (12):** 958-961.
[2] Callaham, R.Z., 1964. Provenance research: investigation of genetic diversity associated with geography. Unasylva, **18**: 40-50.
[3] Devagiri, G.M.; Dhiman, R.C.; Thapliyal, R.C.; Patil, C.S.P. and Kumar, N. 2004.genetic analysis of traits related to seed germination and vigour among provenances of Shisham (*Dalbergia Sissoo*Roxb.). *Annals of Forestry*, **12 (2):** 161-174
[4] Divakara, B.N. 2008. Variation and character association for various pod traits in *Tamarindusindica L. Indian Forester*, **134 (5):**687-696.
[5] FAO. 1975. Forest Genetic Resources, Information NO.4, Forestry occasional paper 1975/1, FAO, Rome, Italy.
[6] Gera, M.; Gera, N.andPurohit, M. 2000.Source variation in seed and germination characteristics in *Acacia nilotica*willd.*Ex.Del*. *Seed Research*, **28 (1**): 27.
[7] Gutterman, Y. 1992. Maternal effects on seed during development. In: Fenner, M. (ed), Seeds-The Ecology of Regeneration in Plant Communities, Walligford*CAB International*, pp.27-29.
[8] Hanamashetti, S. I. 1997. Evaluation of promising genotypes of tamarind (*Tamarindusindica* L.).Proc. National Symposium on *Tamarindusindica* L., Tirupati, Andhra Pradesh, India. pp. 59-68.
[9] ISTA (International Seed Testing Association).1996. International rules for seed testing. Rules and annexes.*Seed Science & Technology*, **24**: 3-177. 3
[10] Khullar, P.; Thapliyal, R. C.; Beniwal, B. S.; Vakshasya, R. K. and Sharma, A. 1991.*Forest Seed.* Pp. 267-273
[11] Kirkpatrick, J., 1975. Geographical variation in Eucalyptus globulus. Aust. Govt. Publishing Service, Canberra, *Forestry and Timber Bureau*, Bull. No. **47**, 65 pp
[12] Kittock, D. L., & Law, A. G. (1968). Relationship of Seedling Vigor to Respiration and Tetrazolium Chloride Reduction by Germinating Wheat Seeds 1.*Agronomy Journal*,**60 (3),** 286-288
[13] Mathur.R.S.; Sharma, K.K. and Rawat, M.M.S. 1984. Germination behavior of various provenance of *Acacia nilotica* sub species India. *Indian Forester*, **110**:435-449.
[14] Murali, K. S. 1997. Patterns of seed size, germination and seed viability of tropical tree species in Southern India. *Biotropica*,**29 (3):** 271-279.
[15] Pryor, L.D., 1963. Provenance in tree improvement with particular reference to Eucalyptus.World Consultation on *Forest Genetics and Tree Improvement*, FAO/FORGEN 3/2.
[16] Ramachandra, N. G. 1996. Provenance variation in seed and seedling parameters of *Acacia catechu*. D. Phil. thesis submitted to F.RI- Deemed University, Dehradun
[17] Subramanian, K. N., Mandal, A. K., Govindarai, P., &Sasidhahan, K. R. (1992). Provenance trial in Eucalyptus grandis and its implication to forestry programmes. *Silvaegenetica*, **41 (4-5),** 239-242.
[18] Venator, C.R., 1974. Hypocotyl length in *Pinuscaribaea* seedlings: A quantitative genetic variation parameter. *SilvaeGenetica.*,**23**: 130-132.
[19] Vidakovic, M. and Ahsan, J., 1970. The inheritance of crooked bole in Shisham (*Dalbergia Sissoo*Roxb.). *SilvaeGenetica.*, 19: 94-98
[20] Vidakovic, M. and Siddiqui, K.N., 1968.Heritability ofheight and diameter growth in Shisham (*Dalbergia Sissoo*Roxb.) using one-parent progeny test. Pak. *J. For*., **18**: 75-94
[21] Wang, X.; Liu, J.; Wang, Jiulin; Liu, C.; Wang, X.P.; Liu, J.L.; Wang, J.L. and Liu, C.J.1998. Geographical variation of the morphological characteristics of *Pinusbungeana* seeds and cones.*Journal of Beijing Forestry University*, **20 (3)**: 25-31.
[22] Wright, J.W. (Ed.), 1976. Introduction to *Forest Genetics.Academic*, New York, 463 pp.
[23] Yeatman, C.W., 1966. Germinant size ofjack pine in relation to seed size and geographic origin.Proc. 2nd Gen. Workshop, Soc. Am. Forester, US For. Serv. Res. Pap. NC-6, pp. 28-36.