RESEARCH ARTICLE

EVALUATION OF *DALBERGIA LATIFOLIA* (ROXB.) PROGENIES IN NURSERY

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Received-02.12.2022, Revised-14.12.2022, Accepted-27.12.2022

Abstract: Thirty plus trees have been selected from dominant rosewood growing areas in Kerala based on growth attributes like tree height, girth at breast height, clean bole height and seed yield. Seeds were collected from these identified genetic resources and incorporated in the evaluation program. The evaluation of progenies in the nursery experiment proved once again the superiority of three progenies *viz*., KLTMPLO 4, KLMYKUT 1 and KLSWMEP 7 in terms of all the growth attributes investigated. The superiority of these three progenies due to juvenile superiority indicated that these three progenies are under strong limelight for immediate utilization and incorporation in the further breeding programme. The variability studies on growth attributes indicated that the genotypic co-efficient of variation was higher than the phenotypic co-efficient of variation for most of the characters and expressed that these characters are strongly under genetic control.

Keywords: *Dalbergia latifolia*, Nursery, Tree

INTRODUCTION

Rosewood (*Dalbergia latifolia* Roxb.) majorly found in India (Adema *et al*., 2016) and also distributed in Java, West Nusa Tenggara, South Sumatra, Sulawesi, Timor Island (Yulita *et al*., 2020). However, large trees are hardly found in Java (Dwianto *et al*., 2019). Due to overexploitation, the worldwide rosewood population is presently in risk of going extinct, the tree species has been included in Appendix II of CITES (Convention on International Trade in Endangered Species). In nature, rosewood reproduces by seed or by adventitious shoots growing from roots. Rosewood seeds have a low germination rate, only around 30-40%. This reproductive system would affect the distribution pattern of the genetic diversity of a population.

Identification of the superior genotypes, geographic origin of the trees and the degrees of variation within the species are crucial elements in any tree improvement initiative (Zobel and Talbert, 1984; Kumar and Luna, 2007). In order to achieve the greatest improvement in the shortest amount of time, researchers might take use of the abundance of variety that exists in trees in nature. The heritability of selected traits and the biology of a species contribute to the development of appropriate plus tree selection procedures and breeding plans based on economic importance. Since variability is a prime requisite for a tree genetic resources selection programme, it is necessary to detect the amount of variation existing within and between the populations. The estimation of heritability helps in assessing the heritable portion of variation and would help in selection. Hence, it is worthwhile to determine the heritable components, for which detailed studies are lacking in rosewood.

Genetic diversity is of primary importance not only for species persistence but also for its improvement. It is also important that considerable variability for economic traits exists in the population for profitable exploitation through breeding or selection. Traditionally, the genetic variation of trees is studied following the approaches of progeny testing and provenance trials. A clear understanding of the degree of divergence for economic characters in the species will be an added advantage (Kumaran *et al*., 1991; Kala *et al*., 2012; Prabakaran *et al*., 2019). Studies on the genetic divergence in the species under investigation have not been undertaken, which underscores the need for intensive research.

There are many factors that are intervening in the reproduction and establishment of tree species in their natural habitats, which could be either biotic, abiotic, or both. Furthermore, habitat destruction and deprivation of the necessary ecological conditions for

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species to continue their life cycles frequently result in population decline. Regeneration is one of the processes that allow the vegetation to attain equilibrium, and it is also essential for the survival of the species. Competition is greater among individuals of the same species than among others, as individuals of the same species need similar environmental conditions such as nutrients, moisture, and light. Regeneration is the starting stage of population, which in due course undergoes the process of sylvigenesis and builds up the tree. It leads to an increase in population numbers (Philomina, 2000).

In the present studies, an attempt was made to scale genetic divergence among the thirty progenies of plus trees to find out the potential progenies for further tree improvement in rose wood to meet out the increasing wood demand.

MATERIALS AND METHODS

Seeds were collected from thirty different plus trees of *Dalbergia latifolia* from various parts of Kerala. Plus trees were selected based on the phenotypic characters such as tree height, basal girth, clear pole height, crown height, crown width, volume and seed yield. Thirty progenies were raised in three replications. The statistical design used was a Completely Randomized Block Design. The growth traits studied were shoot length, collar diameter, root length, root shoot ratio, totalbiomass, sturdiness quotient and volume index. Data on biometric observations were taken at an interval of 60 days up to nine months. Biometrical data recorded at 180 DAS alone was taken for genetic divergence studies.

Statistical Tools

The final data were statistically analyzed by ANOVA using of Randomized block design through Aggress software

RESULTS

The progeny evaluation studies at the nursery showed significant variation among the progenies due to growth trait performances and the results are given in Table 1.

Shoot length

Nine progenies viz., KLTMPLO 4 (82.88 cm), KLTRMAC 6 (69.91 cm), KLMYKUT 1 (68.47 cm), KLSWMEP 7 (67.37 cm), KLKNTAL 2 (65.60 cm), KLPKWAL 5 (64.17 cm), KLTRMAC 1 (64.17 cm), KLRAVAD 2 (62.72 cm) and KLSWMEP 4 (62.66 cm) exhibited significantly higher shoot length compared to others at 180 DAS and minimum was observed in KLCHPAL 1 (31.12 cm).

Collar diameter

KLPKWAL 1 (5.09 mm) recorded maximum collar diameter followed by KLTMPLO 4 (4.27 mm), KLPKWAL 5 (4.15 mm) and KLMYKUT 1 (4.14 mm) which recorded significantly superior at 180 DAS compared with general mean (3.37 mm) and KLKNKAN 1 exhibited the least collar diameter among thirty progenies investigated.

Root length

At 180 DAS root length ranged from 14.64 cm to 29.74 cm. Seven progenies viz., KLTMPLO 4 (29.74 cm), KLPKWAL 5 (29.42 cm), KLMUNER 4 (27.38 cm), KLTRMAC 6 (26.92 cm), KLSWMEP 7 (26.06 cm), KLMUADI 2 (25.97 cm) and KLTMPLO 5 (25.97 cm) had registered significantly higher root length compared to the general mean (22.40 cm).

Root to shoot ratio

Among them six progenies viz., KLCHVEL 5 (0.66), KLKNKAN 1 (0.63), KLMUADI 3 (0.61), KLMYKUT 7 (0.60), KLCHPAL 1 (0.59) and KLMUADI 2 (0.58) recorded significantly higher root to shoot ratio at 180 DAS and the lowest value in KLNWBEG 3 (0.35) .

Total biomass

At 180 DAS, KLTMPLO 4 (19.21 g) documented significantly superior biomass followed by KLSWMEP 7 (18.10 g), KLMYKUT 1 (17.26 g), KLSWMEP 4 (16.72 g), KLTRMAC 6 (16.70 g) and KLKNTAL 2 (16.01 g) and minimum by KLMUNER 2 (9.31 g).

Sturdiness quotient

Six progenies *viz.*, KLTRMAC 1 (220.10), KLRAVAD 2 (200.62), KLKNTAL 2 (198.04), KLTMPLO 4 (194.22), KLTRMAC 6 (179.87) and KLKNKAN 1 (174.97) exhibited significantly superior sturdiness quotient over the general mean (148.16) at 180 DAS whereas KLCHVEL 5 (89.14) progeny recorded the lowest sturdiness quotient.

Table 1. Growth performance of Rosewood progenies at 180 DAS in nursery

S. No	Plus trees	Shoot length (cm)	Collar diameter (cm)	Root length (cm)	Root to Shoot ratio	Total biomass (g)	Sturdiness quotient	Volume index
1.	KLPKWAL 1	54.47	5.09*	24.85	0.46	11.98	107.08	14.096*
2.	KLPKWAL 5	64.17*	4.15*	29.42*	0.46	14.83	154.66	11.045*
3.	KLNMNEL 1	40.70	3.53	20.86	0.51	10.20	115.23	5.078
4.	KLNMNEL 3	33.04	2.61	16.30	0.49	10.67	126.52	2.252
5.	KLNMNEL 6	41.66	3.41	20.77	0.50	10.18	122.03	4.855
6.	KLCHPAL 1	31.12	2.78	18.32	0.59*	11.03	111.94	2.405
7.	KLCHPAL 6	50.28	3.70	21.15	0.42	11.52	135.85	6.887
8.	KLCHVEL 5	33.52	3.76	22.19	0.66*	11.08	89.14	4.740
9.	KLMKATP 1	47.41	3.64	19.83	0.42	11.49	130.17	6.288
10.	KLMYKUT 1	68.47*	4.14*	23.99	0.35	17.26*	165.37	11.739*

11.	KLMYKUT 7	33.99	2.67	20.31	0.60	11.26	127.31	2.424
12.	KLKNKAN 1	36.96	2.11	23.13	0.63*	12.34	174.97*	1.650
13.	KLKNTAL 2	65.60*	3.31	24.56	0.37	16.01*	198.04*	7.197
14.	KLMUADI 2	44.53	2.96	25.97*	0.58*	14.37	150.57	3.895
15.	KLMUADI 3	35.44	2.80	21.72	0.61*	10.67	126.70	2.772
16.	KLMUNER 2	39.27	3.41	20.31	0.52	9.31	115.03	4.576
17.	KLMUNER 4	53.63	3.67	27.38*	0.51	13.11	146.23	7.213
18.	KLTRMAC 1	64.17*	2.92	25.50*	0.40	14.61	220.10*	5.453
19.	KLTRMAC 6	69.91*	3.89	26.92*	0.39	16.70*	179.87*	10.563*
20.	KLTMPLO 4	82.88*	4.27*	29.74*	0.36	19.21*	194.22*	15.092*
21.	KLTMPLO 5	54.11	3.58	25.97	0.48	12.32	151.03	6.946
22.	KLKOKON 1	34.95	3.17	19.83	0.57*	14.86	110.30	3.510
23.	KLRAVAD 2	62.72*	3.13	23.13	0.37	13.81	200.62*	6.131
24.	KLRAVAD 5	40.79	2.70	19.26	0.47	10.46	151.34	2.964
25.	KLNLKAR 2	37.83	2.33	17.47	0.46	12.29	162.19	2.057
26.	KLNLKAR 4	56.50	3.41	21.25	0.38	12.93	165.51	6.585
27.	KLSWMEP 4	62.66*	3.63	25.02	0.40	16.72*	172.45	8.272
28.	KLSWMEP 7	67.37*	3.96	26.06*	0.39	18.10*	170.00	10.581*
29.	KLNWBEG 3	46.45	3.23	16.06	0.35	10.21	143.90	4.840
30.	KLNWBEG 7	37.83	2.99	14.64	0.39	9.49	126.45	3.385
Mean		**49.75**	**3.37**	**22.40**	**0.47**	**12.97**	**148.16**	**6.18**
SED		**5.19**	**0.31**	**1.51**	**0.03**	**1.05**	**12.76**	**2.07**
CD (0.05)		**10.31**	**0.62**	**3.02**	**0.07**	**2.11**	**25.52**	**4.14**

Volume Index

KLTMPLO 4 (15.092 cm^3) recorded maximum volume index at 180 DAS, followed by KLPKWAL 1 (14.096 cm^3), KLMYKUT 1 (11.739 cm^3), KLPKWAL 5 (11.045 cm^3), KLSWMEP 7 (10.581 cm^3) and KLTRMAC 6 (10.563 cm^3), the lowest volume index by KLKNKAN 1 (1.650 cm^3). Among the three growth periods studied, KLTMPLO 4, KLPKWAL 1 and KLMYKUT 1 progenies attested their early superiority in terms of volume index.

DISCUSSION

Combined analysis of variance revealed significant differences on morphological growth traits among the evaluated progenies of *Dalbergialatifolia*. Among the 30 progenies evaluated under nursery, three progenies *viz.*,KLTMPLO 4, KLMYKUT 1 and KLSWMEP 7 had consistently expressed superiority for growth characteristics; particularly shoot length, collar diameter, root length, root shoot ratio, total biomass, sturdiness quotient and volume index. A plethora of workers have reported such seed variability due to progenies or seed sources or provenances in several species *Toona ciliate* (Mohan raj *et al*., 2022), *Azadirachtaindica* (Prabakaran *et al*, 2019), *Neolamarckiacadamba* (Krishnakumar *et al*., 2018).

SUMMARY

Combined analysis of variance revealed significant differences on morphological growth traits among the evaluated progenies of *Dalbergialatifolia*. Among the 30 progenies evaluated under nursery, three progenies *viz.*,KLTMPLO 4, KLMYKUT 1 and KLSWMEP 7 had consistently expressed superiority for growth characteristics; particularly shoot length, collar diameter, root length, root shoot ratio, total biomass, sturdiness quotient and volume index.

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