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RESEARCH PAPER

Effect of pre-sowing treatments on germination parameters of *Dalbergia latifolia* Roxb.

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Abstract: *Dalbergia latifolia* belongs to family Fabaceae. The species is slow-growing and it is threatened by overexploitation for its timber and illegal logging. Large plantations in Java and India have been established to meet the demand for Indian rosewood. Therefore the demand for nursery grown seedlings of *D. latifolia* has increased immensely for planting under afforestation programmes. But poor natural regeneration and low germination rate poses a serious threat to its establishment. An experiment was conducted at College of Forestry, Sirsi to know the effect of pre-sowing treatments on the germination parameters of *Dalbergia latifolia* with a total of eight different treatments. Significantly higher germination percentage (70.00%), mean daily germination (3.33), peak value (6.35), germination rate (5.11) and germination value (21.15) were recorded in the seeds treated with tap water for 12 hours. Seedling vigor index (1376) and biomass (1.166 g fresh weight and 0.607 g dry weight) were also maximum in seeds treated with tap water for 12 hours. The results indicated that seeds treated with tap water had profound and significant impact on seed germination parameters.

Key words: Regeneration, Rosewood, Seedling vigor index

Introduction

Dalbergia latifolia (East Indian Rosewood) belongs to family Fabaceae and subfamily Faboideae. It is well known for producing very hard and durable wood with a long straight bole, which makes it highly valued on the international market.

It produces high-quality timber which commands high prices in trade. It is widely traded as veneer and exported from India, often used in the manufacture of guitar sets. Due to its high commercial value for timber, the wild subpopulations are widely overexploited and Considerable pressure continues to be exerted by illegal felling (Groves and Rutherford, 2016). Ultimately this species has been included in the vulnerable category of the IUCN red list of threatened species. Under the Indian Forest Act, 1927 the exportation of lumber products from wild harvested *D. latifolia* is illegal. The species is protected under the Indian Forest Act, the export of logs or sawn timber being banned (Winfield *et al.,* 2016). However, various afforestation programs are carried out by forest departments to restore the population of this species but owing to its slow growth, establishment is difficult. Hence, there is a need to standardize nursery techniques for quality planting material. Keeping in view the increased demand of *D. latifolia* seedlings in various plantation and afforestation programmes, an effort was made to study the effect of pre-sowing treatments on the germination parameters.

Material and methods

The experiment was conducted in a nursery at College of Forestry, Sirsi during the year 2016. It consisted of eight treatments *viz.,* soaking of seeds in tap water for 12 hours (T_2), soaking in 300 ppm GA_3 for 12 hours (T_3), soaking in 500 ppm GA_3 for 12 hours (T_4), soaking in KNO_3 for 12 hours (T_5), soaking in cow dung slurry for 12 hours (T_6), soaking in beejamrutha for 12 hours (T_7), soaking in cow urine (1:2) for 12 hours (T_8) and control is without any treatment (T_1). It was laid out in completely randomized design with three replications. Fresh seeds of *Dalbergia latifolia* were collected from a matured plantation in Vinukonda forest division (Andhra Pradesh). The seeds were removed from pods manually and dried properly before subjecting to various treatments. Nursery beds (10 m ×1 m) were prepared by mixing soil media containing soil, sand and FYM in 2:1:1 ratio. Hundred seeds of *D. latifolia* were sown in each replication. Regular watering and weeding (as and when required) was done throughout the experimental period. The number of seeds germinated daily was noted upto a period of 21 days. The observations on germination parameters *viz.,* per cent germination, mean daily germination, germination rate, germination value and peak value were calculated. Seedling vigor index was calculated at the end of experimental period. After 21 days of germination, shoot length, root length, seedling fresh weight and seedling dry weight were recorded. For dry weight estimation, the seedlings were dried in oven at 60 ± 1ºC temperature for 48 hours. The data relating to each parameter observed was analyzed statistically using MSTAT-C program as applicable to Completely Randomized Design. The level of significance used in F test was P = 0.05.

Results and discussion

The different pre-sowing treatments of *D. latifolia* enhanced the germination parameters of the seeds significantly (Table 1). Maximum germination percentage (70.00%), mean daily germination (3.33), peak value (6.35), germination rate (5.11) and germination value (21.15) were recorded in soaking the seeds of *D. latifolia* in tap water for 12 hours (T_2). All the germination parameters attained least values in soaking the seeds in cow urine for 12 hours (20%, 1.04, 1.43, 1.51 and 1.50, respectively). The values obtained for germination parameters

Table 1. Germination parameters of *D.latifolia* as influenced by different pre-sowing treatments

Treatment	Mean daily germination	Germination rate	Peak value	Germination value	Germination (%)
T_1	1.79	2.19	2.61	4.73	37.50
T_2	3.33	5.11	6.35	21.15	70.00
T_3	2.82	4.24	4.81	13.58	59.17
T_4	2.46	3.78	4.43	10.90	51.67
T_5	2.14	3.10	3.20	6.92	45.00
T_6	2.98	4.65	5.85	17.45	62.50
T_7	1.91	2.66	2.82	5.40	40.83
T_8	1.04	1.51	1.43	1.50	20.00
S.Em±	0.25	0.40	0.34	2.14	5.36
C.D. @ 5%	0.76	1.21	1.04	6.41	16.27

T_1 - Control is without any treatment, T_2 - Soaking of seeds in tap water for 12 hrs, T_3 -Soaking in 300 ppm GA_3 for12 hrs,
T_4 -Soaking in 500 ppm GA_3 for 12 hrs, T_5 -Soaking in KNO_3 (1%) for 12 hrs, T_6 -Soaking in cow dung slurry for 12 hrs,
T_7 -Soaking in beejamrutha for 12 hrs, T_8 -Soaking in cow urine (1:2) for 12 hrs

in cow urine treatment were lower than the control. Perusal of Table 2 shows that seedlings grown in treatment T_2 produced maximum shoot length (13.08 cm), root length (6.58 cm) and total seedling length (19.66 cm) while seedlings grown in cow urine treated seeds had least values for shoot length (7.49 cm), root length (4.15 cm) and total seedling length (11.64 cm). Seedling vigor index (1376) and biomass (1.166 g fresh weight and 0.607 g dry weight) were also maximum in seeds treated with tap water for 12 hours (Table 2). Similar results were observed by various authors *viz.* Das (2015) in seeds of *Shorea robusta,* Swaminathan and Revathy (2013) in seeds of *Sapindus emarginatus and* Trivedi *et al.* (2016) in *Radermarchera xylocarpa* and *Dolicandrone falcata.* The values obtained for different growth parameters in cow urine treatment were lower than the control.

D.latifolia seeds have low germination percentage owing to the seed dormancy which is attributed to the presence of metabolic blocks in the mature embryo or due to the presence of inhibitors in the seed coat (Bisht and Ahlawat, 1999). Significantly better results in treatment T_2 (comprising of seeds treated with tap water for 12 hours) might be due to the removal of chemical inhibitors such as phenols through leaching, which made seed coat to swell and to become soft for the easy passage of water into the cotyledons. Also, soaking the seeds in tap water leads to gradual softening of seed coat which makes it easy for seeds to respire, uptake water and oxygen and helps the radicle to protrude easily into the ground. Thus, imbibition of water leads to higher germination per cent as well as other germination parameters. These results are in line with findings of Vijayalakshmi and Renganayaki (2017) who reported that water soaking for 48 hours resulted in enhanced germination to the tune of 52 per cent from 33 per cent and minimizes the duration for completion of germination with high vigor index. Soaking of seeds in tap water has been reported to be a good measure to enhance germination by various authors *viz.* Yisau *et al.* (2015) in seeds of *Albizia zygia* and Singh *et al.,* 2015 in *Bridelia retusa*, Kumar *(2016) in Terminalia bellirica.*

Better seedling length and higher biomass of seedlings was recorded in soaking the seeds of *D. latifolia* in tap water for 12 hours. Least germination parameters were recorded in seeds treated with cow urine for 12 hours. The reason being, in fresh cow urine, nitrogen is mainly in the form of urea, which converts quickly into ammonia (Ambika and Balakrishnan, 2015). Ammonia present in cow urine penetrates into the seeds and blocks respiration and restricts water imbibitions due to high pH (Martin, 1970).

Table 2. Influence of different pre-sowing treatments on seedling length, seedling vigor index and biomass of *D.latifolia*

Treatment	Shoot length(cm)	Root length(cm)	Seedling length(cm)	Seedling vigor index	Fresh Dry weight (g)
T_1	9.34	4.29	13.63	512	0.716 0.174
T_2	13.08	6.58	19.66	1376	1.166 0.607
T_3	11.40	6.02	17.42	1032	0.993 0.255
T_4	10.32	5.78	16.10	831	0.955 0.245
T_5	10.28	5.76	16.04	721	0.938 0.240
T_6	11.35	6.19	17.54	1098	1.046 0.425
T_7	9.51	4.86	14.37	587	0.785 0.199
T_8	7.49	4.15	11.64	232	0.743 0.168
S.Em±	0.34	0.37	0.54	93.67	0.071 0.013
C.D. @ 5%	1.03	1.14	1.64	283.26	0.215 0.039

T_1 - Control is without any treatment, T_2 - Soaking of seeds in tap water for 12 hrs, T_3 - Soaking in 300 ppm GA_3 for12 hrs,
T_4 - Soaking in 500 ppm GA_3 for 12 hrs, T_5 - Soaking in KNO_3 (1%) for 12 hrs, T_6 - Soaking in cow dung slurry for 12 hrs,
T_7 - Soaking in beejamrutha for 12 hrs, T_8 - Soaking in cow urine (1:2) for 12 hrs

Conclusion

From this study, it could be concluded that seeds are treated with tap water with 12 hours resulted in highest seed germination parameters in *D.latifolia* and tap water treatment is economical as compared to other treatments. Hence, soaking of seeds in tap water for 12 hours could be recommended for getting higher germination of *D. latifolia.*

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