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Effect of Pre-Sowing Treatment on Germination of Red Sanders

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A B S T R A C T

Pterocarpus santalinus (Linn.f) is an important tree species belongs to family Fabaceae which is a good source timber and has medicinal value similarly. The present studies summarize the effect of different treatments on seed germination of plant species suffer from germination. The seeds show dormancy, low germination percentage and longer time taken to germinate. The seeds given different treatments such as dewinged pod, soaking in water for 24h, 48h, 72h and Acid scarification of pods with wing were scarified with conc. H_2SO_4 for 6 and 8 minutes. It is evident from the observation that the pod given soaking in water 48h treatment showed better germination percentage as compared to acid scarification.

Introduction

Pterocarpus santalinus (Linn. f) is an endemic and an endangered species of Seshachalam hills, Tirumala. Red sanders is having high medicinal properties due to which it is being exploited recklessly and which is already included in the endangered category of IUCN red list. *Pterocarpus santalinus L. f* belongs to the family Papilionaceae/Fabaceae, and popularly known as "Red sanders" (Naidu *et al.,* 2001). These are used in treatment of headache, skin diseases, fever, boils, scorpion sting and to improve sight (Chopra *et al.,* 1956). Ethno-botanical reports list several plants used for diabetes. *Pterocarpus santalinus* is one of such plants used for treatment of diabetes. Ethno-botanical reports indicates that *P. santalinus* is being used to treat diabetes mellitus and related symptoms along with use for many other curative properties including bilious affections, skin diseases as antihelmenthic, aphrodisiac, alexiteric and also useful vomiting thirst, eye diseases, ulcers and disease of the blood (Chopra *et al.,* 1956; Kirtikar and Latheef *et al.,* 2008) Infusion of the fruit is used as an astringent tonic in chronic dysentery. The bark of the tree also yields a Kino similar to *Pterocarpus santalinus* (Anonymous, 1969). Indiscriminate and illegal logging, low natural regeneration potential, narrow habitat specificity and micro climatic changes in the habitat resulted in the severe depletion of natural population of *Pterocarpus santalinus* (Madhava Chetty and Rao, 1990; Sanjappa, 2001). Red sanders are conventionally propagated through vegetative methods and

seed is often very difficult because of a hard seed coat coupled with poor viability (Dayanad *et al.*, 1988; Naidu *et al.*, 2001). Earlier studies using conventional vegetative propagation methods like semi hard woodcuttings, cleft grafting and air layering were not successful in producing sufficient numbers of planting material for forestry programs (Kesava reddy *et al.*, 1990).

The objective of this study is to investigate the effects of pre-treatment techniques for seed germination in red sanders.

Materials and Methods

Seed dormancy breaking studies on Red sanders were carried during 2015-16 at Forest College and Research Institute, Mettupalayam, Tamil Nadu, India. Seeds of *Pterocarpus santalinus* were collected during June, 2015 from Chittoor, Andhra Pradesh Latitude 13° 13' N Longitude 79° 08' E

Treatments details

T_0- Control:- Before sowing, the nursery bed was prepared by adding well rotten and pulverized farm yard manure to the soil and firmly leveled. The nursery beds were watered regularly on daily basis.

T_1 - Dewinged pod - The wings were clipped off with help of scissors
T_2- Water soaking 24h - Pods were soaked in water at 24h
T_3- Water soaking 48h - Pods were soaked in water at 48h
T_4- Water soaking 72h - Pods were soaked in water at 72h
T_5- Acid scarification - pods with wing were scarified with conc. H_2SO_4 for 6 minutes and observed for seed germination percentage.
T_6- - Acid scarification - pods with wing were scarified with conc. H_2SO_4 for 8 minutes and observed for seed germination percentage.

Days to initial germination

The nursery bed was observed daily, for seedling emergence. The day on which the first seedling emerged was expressed as days to initial germination.

Days to final germination (Mauromicale and Cavallaro, 1995)

The number of days on which the last seedling emerged was recorded and expressed as days to final germination

Speed of germination (Czabator, 1962)

Speed of germination was calculated by the following formula,

Speed of germination= n1/d1+n2/d2+n3/d3+----------

Where, n = number of germinated seeds; d= number of days

Germination per cent (ISTA, 2003)

The number of normal seedlings produced in each replication (4 replication/25 pods) was counted, and average was expressed in per cent.

Germination percentage =

$$\frac{\text{Number of normal seedlings}}{\text{Total number of seed sown}} \times 100$$

Seedling length

All normal seedlings of each treatment were measured for length from root tip to shoot tip and the average was expressed in cm.

Dry weight

All normal seedlings were dried under shade for 24 h and then dried in hot air oven

maintained at 85 ± 1°C for 48 h. It was cooled in a desiccator for 30 minutes and weighed. The values were expressed as 'g seedlings^{-1}'.

Vigour Index (Abdul-Baki and Anderson, 1973)

Vigour index (VI) was computed using the following formula and expressed as whole number.

VI = Germination percentage x dry weight (g/seedling)

Statistical analysis

Result data (in per cent) were transformed to arcsine values before statistical analysis in order to unify the variance of the data (Ansari *et al.*, 2012). The data were then analyzed by the 'F' test for significance at 0.05 level by using statistical software AGRESS.

Results and Discussion

Among the observed parameter for the influence of dewinged pod on seed germination and seedling characters, only the speed of germination and germination percentage exhibited significant difference for treatmental effect; vigour index.

Water soaking (T_3) though initiated the germination later than control and acid scarification but could able to germinate, early completed by 27.50 days with a highest speed of germination (0.53) and germination percentage of 53, seedling length (16.50), dry weight (0.21g), vigour index (11.13) and survival percentage of (91.25). Other durations of 24 and 72 also recorded higher values for all the parameters than control and acid scarification 6 and 8 minutes. For all the above characters next to T_2, T_1 and least was T_5 than T_6 (Tables 1 and 2).

Dormancy, is a common factor in most of the tree species and in the family Fabaceae, seed possessed with physical dormancy due to hard seed coat as in the case of *Delonix regia* (Aminu, 2012 and Shuaibu *et al.*, 2015), or hard pod in the case of *Pterocarpus marsupium* (Khan, 2015) or due to presence of chemical inhibitors (Sayed *et al.*, 2011), or combination of both (Baskin and Baskin, 2013).

Pod was hard, with highly reticulated veins, make seed extraction difficult, the seed was completely enclosed inside the pod. The thick brown pod may be the reason to prevent germination either through arresting imbibitions or providing mechanical obstacle for radicle protrusion. Such inhibitory mechanism due to hard seed/pod coat was reported in numerous tree species by number of authors (Goor and Barney, 1976 in *Tectona grandis* and *Pterocarpus angolensis*)

The pods were dewinged, to make a point for entry of water, resulted in little enhanced germination, but results are not satisfactory, since germination percentage was very low when compared to presence of viable seeds in TZ test (96 %), The enhancement in germination percentage might be due to entry of little higher quantity of water during germination process through the dewinged pod. The results find support from Boaler *et al.*, (1966) and Laurie *et al.*, (1974) in *Pterocarpus angolensis.*

Mechanical damage was able to improve the germination percentage though not fully but to a certain extent, as it seems that the water absorption and pressure developed by the protruding radicle are not enough to rupture the seed coat. Duration of germination, speed of germination, seedling length, dry weight and survival percentage were not influenced by dewinged pod.

Table.1 Effect of treatment of pod on seed germination characteristics

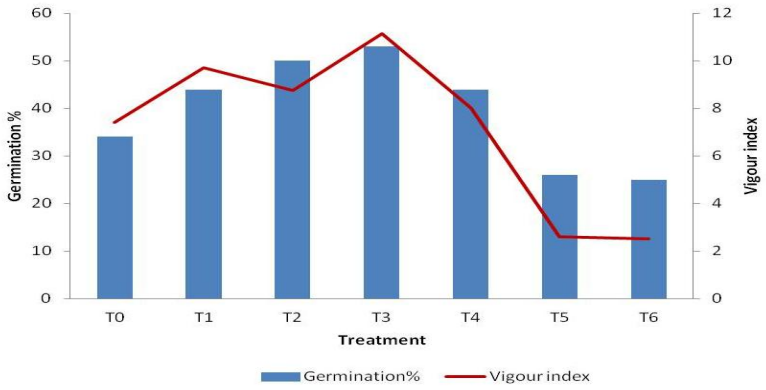
Treatments	Days to initiate germination	Days to final germination	Speed of germination	Germination %
T_0	14.00	53.00	0.22	34(35.66)
T_1	13.50	52.75	00.23	44(41.25)
T_2	08.75	32.75	00.47	50(45.00)
T_3	07.25	27.25	00.53	53(40.97)
T_4	08.00	34.25	00.45	44(41.25)
T_5	10.00	32.00	00.23	26(30.65)
T_6	11.00	34.00	00.23	25(30.35.)
Mean	10.36	36.29	0.34	36(33.58)
SE.D	0.82	0.00	0.00	1.59
CD (0.05)	1.67	0.01	0.02	3.23

T_0- Control, **T_1** - Dewinged pod **T_2**- Water soaking 24h **T_3**- Water soaking 48h: Pod were soaked in water at 48h **T_4**- Water soaking 72h:- Pod were soaked in water at 72h **T_5**- Acid scarification for 6 minutes **T_6**- Acid scarification for 8

Table.2 Effect of clipping of pod on seedling characteristics

Treatments	Seedling length (cm)	Dry weight (g)	Vigor index	Survival (%)
T_0	11.22	0.21	07.41	90.00
T_1	11.47	00.22	09.72	91.00
T_2	14.15	00.24	08.75	89.00
T_3	16.50	00.21	11.13	90.00
T_4	14.48	00.10	08.00	89.00
T_5	11.00	00.10	02.60	80.00
T_6	10.95	00.10	02.50	80.00
Mean	12.79	0.17	6.27	87.14
SE.D	0.61	0.73	0.88	0.64
CD (0.05)	1.25	1.49	1.79	1.34

Fig.1 Effect of different treatment on germination percentage and vigour index in Red sanders



However, increase in vigour index might be due to higher germination percentage, since vigour index is the product of germination percentage x dry weight (Boaler, 1966).

Several pre-sowing treatment have been reported to overcome hard seed coat-imposed dormancy (Ferasol *et al.,* 1995; Broncano *et al.,* 1998; Goslan and Gutterman, 1999) to increase the permeability of the seed coat to water. In the present study, water soaking for 48h resulted (Fig. 1) in enhanced germination to the tune of 52 per cent from 33 per cent, minimizes the duration for completion of germination with high vigour index. The reason might be due to gradual softening of seed coat by continuous water soaking, as stated by Lozumi *et al.,* (2012) in *Acacia nilotica;* Pattanath (1982) in *Acacia mearnsii, A. melanoxylon, A. nilotica.*

Again in the present study, it was noted that the seeds /fruits take long time to initiate germination, once initiated, within another 20 days all 100 pods in a replication completed the process of germination. The reason could be the presence of some inhibitors on fruit/pod coat, which might delay initiation germination which once removed the seeds readily germinate. Owing to the black colour of pods the inhibitor probably could be phenols. Such a correlation between fruit/seed colour and presence of phenols and their inhibitory effect was well established in diverse species (Debeaujon *et al.,* 2000). The permeability of seed coats to water is related to the content of phenolic compounds in the seed coat, and to their level of oxidation.

The poor results pertaining to acid scarification treatments is due to entry of acid through the pores of pod and able to reach the embryo, which might have killed the seed. Several authors have reported that the use of concentrated sulphuric acid in the treatment of tropical tree seeds improved seed germination under various conditions. For seeds scarified by sulphuric acid, failure to germinate may also be attributed to the duration spent by the seeds in the concentrated acid, which may have been too short to cause enough weakening of the seed coats or the duration may have been long enough to cause damage to the embryo thereby failing germination (Salisbury and Ross, 1992). Some species of robust seeds were able to tolerate 30 min. and Caspian locust seed for one and half hours of scarification with conc. H_2SO_4.

In conclusion among all the treatment Water soaking 48h resulted higher the germination percentage and seedling characteristics.

References

Abdul Baki, A.A. and J.D. Anderson. 1973. Vigor determination in soybean seed by multiple criteria. *Crop Sci.,* 13: 630-633.

Aminu Magaji Bichi. 2012. Different pre-germination treatments and *delonix regia* seeds jorind. www.transcampus.org./journals, 10(2).

Anonymous. 1969. *Pterocarpus santalinus,* The wealth of India. *Raw materials,* vol 7. CSIR New Delhi, India.

Ansari, O., H.R. Choghazardi, Z.F. Sharif and H. Nazarli. 2012. Seed reserve utilization and seedling growth of treated seeds of mountain ray (*Seecale montanum*) as affected by drought stress. *Cercetări Agronomiceîn Moldova,* 2(150): 43-48.

Baskin, J.M. and C.C. Baskin. 2013. Classification, biogeography, and phylogenetic relationships of seed dormancy. Pritchard, H. (ed.). Seed conservation: turning

Boaler, S.B. 1966. The ecology of *Pterocarpus angolensis* D.C. in Tanzania. Overseas Research Publication No 12. Ministry of Overseas Development, London

Broncano, M.J., M. Riba and J. Retana. 1998. Seed germination and seedling performance of two Mediterranean tree species, holm oak (*Quercus ilex* L.) and Aleppo pine (*Pinus halepensis* Mill): a multifactor experimental approach. *Plant Ecol.,* 138: 17-26.

Chopra, R.N., Nayar, S.L., Chopra, I.C. 1956. Glossory of Indian Medicinal Plants. New Delhi: C.S.I.R. Publications;

Czabator, F.J. 1962. Germination value: An index combining speed and completeness of pine seed germination. *Forest Sci.*¸8: 386 – 395.

Dayanand, T., Lohidas, T. 1998. Effect of

different treatments on pod germination of red sanders (*Pterocarpus santalinus*) *L. Indian J. Forester*, 11: 87-88.

Ferasol, J.L., L. Lovett-Doust, J. Lovett-Doust and M. Biernacki. 1995. Seed germination in *Vallisneria americana*: effects of cold stratification, scarification, seed coat morphology and PCB concentration. *Ecosci.*, 2: 368–376.

Goor, A.Y. and C.W. Barney. 1976. Forest tree planting in arid zones. 2nd ed., Ronald Preso, New York, USA. 504 p.

Goslan, S. and Y. Gutterman. 1999. Dry storage temperatures, duration and salt concentrations effect germination of local and edaphic ecotypes of *Hordeum spontaneum* (Poaceae) from Israel. *Biol. J. Linn. Soc.*, 67: 163-180.

International Seed Testing Association (ISTA), 2003. ISTA Working Sheets on Tetrazolium Testing Vol. I. Agricultural, Vegetable and Horticultural Species. Edited by Leist, N; Kramer, S; Jonitz, A. Basserdorf, CH-Switzerland. 200 pp.

Kesava Reddy, K., Srivasuki, K.P. 1990. Vegetative propagation of red sanders (*Pterocarpus santalinus* Linn.). *Indian Forest* 116: 536-540.

Khan, M.R. 2015. The Effect of Different Treatments on the Seed Germination of *Pterocarpus marsupium* Roxb. *Weekly Sci. Res. J.*, 2(28): 22.

Kirtikar, K.R. and Basu, B.D. 1999. Indian medicinal plants. Vol.1 Scientific Publishers, India.

Latheef, S.A., Prasad, B. Bavaji, M., Subramanyam, G. 2008. A database on endemic plants at Tirumala hills in India *Bio info.*, 2(6): 260-262

Laurie, M.V. 1974. Tree planting practices in African Savannas. Food and Agriculture Organization of the United Nations, Rome. pp. 42-43.

Laurie, M.V. 1974. Tree planting practices in African savannas. food and agriculture organization of the United Nations, Rome. pp. 42-43.

Madhava cetty, K., Rao, K.N. 1990. Endemic plants to Tirumala Hills Chittor district of Andhra Pradesh. *Vegetos*, 3: 12-15.

Mauromicale, G. and V. Cavallaro. 1995. Effects of seed osmo priming on germination of tomato at different water potential. *Seed Sci. Technol.*, 23: 393-403.

Naidu, C.V., Rajendrudu, G. 2001. Influence of kinetin and nitrogenous salts on seed germination of red sanders (*Pterocarpus santalinus* Linn.f.). *Seed Sci. Technol.*, 29: 669-72.

Pattanath, P.G. 1982. Treatments designed to break teak seed dormancy. A Guide to Forest Seed Handling, FAO, Rome.

Salisbury, F.B. and C.W. Ross. 1992. Plant physiology (4th edition). Wadsworth Publishing Co., Belmont

Sanjappa, M. 2001. Leguminosae In: Singh NP, Singh DK (Eds) Floristic diversity and conservation strategies in India, Vol. 4. Botanical survey of India Dehra Dun, pp 1846-1960.

Sayed, M.M, Azazi, E., E. Sourour, A.H. Belal and E.A. Khalifa. 2013. Improving *Acacia nilotica* seed germination in stress conditions. *J. Plant Breeding Crop Sci.*, 3(8): 29-35.

Shuaibu, Y.M., I. Abdul, N. Abubakar and M. Gambo. 2015. Effects of Different Methods of Breaking Seed Dormancy on the Germination of Flamboyant Seed (*Delonix Regia*) in Bauchi State, Nigeria. *The Int. J. Sci. Technol.*, 3(8).

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