IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 14, Issue 2 Ser. I (February. 2020), PP 06-09
www.iosrjournals.org

Influence of Storage Condition and Duration on Germination of Telsur (*Hopea odorata* Roxb.) Seed

M. Mezan Ul Hoque[1], Zahirul Alam[2], Hasina Mariam[1], M. Arifur Rahman[1] and M. A. Taher Hossain[3]

[1] *Seed Orchard Division, Bangladesh Forest Research Institute, Chattogram, Bangladesh*
[2] *Soil Science Division, Bangladesh Forest Research Institute, Chattogram, Bangladesh*
[3] *Forest Economics Division, Bangladesh Forest Research Institute, Chattogram, Bangladesh*

Abstract: *Telsur (Hopea odorata Roxb.) is a large evergreen tree and currently assessed as vulnerable in IUCN Red list of threatened species. As a recalcitrant seed, it is very difficult to prolong the viability of Telsur seed by applying storage method. A nursery trial was conducted at National Forest Seed Centre, Seed Orchard Division, Bangladesh Forest Research Institute, Chattogram to evaluate the effect of storage condition and duration on germination of Telsur seed. Telsur seed were stored at six different storage condition viz. open air (control), sand, chalk powder, normal refrigerator (0~4^{0}C), saw dust and ash for different storage durations viz. 3, 6, 9, 12, 15, 18, 21, 24, 27 and 30 days. Storage condition, duration and their interaction were found significant on germination of Telsur seed. The highest germination rate (97%) was observed at fresh sowing. Among different storage conditions, in open air, refrigerator and ash was observed 90% germination for 3 days. Refrigerator showed best performance after 6 days of storage. It showed 73.33, 66.67 and 50% germination after 6, 9 and 12 days which were best among the storage conditions. It also prolonged 10% viability up to 27 days for Telsur seed.*

Keywords: *Hopea odorata, Telsur, germination, seed, storage condition.*

Date of Submission: 17-01-2020 Date of Acceptance: 05-02-2020

I. Introduction

Telsur *(Hopea odorata* Roxb.) is a large evergreen tree up to 35m tall, straight bole, cylindrical, with a diameter of up to 120 cm. It is a species of the family Dipterocarpaceae. It is available in Bangladesh, India, Myanmar, Thailand and China with its southernmost limit in north Peninsular Malaysia. This is a common tree of the evergreen forests, although it is essentially a riparian species, rarely occurring far from the streams[1]. In Bangladesh it occurs naturally in the forests of Cox's Bazar, Chittagong and Chittagong Hill Tracts and also planted as road-side avenue tree[2]. This tree is one of the hygrophilous of all the dipterocarps and its general silvicultural characters are those of the hygrophilous or sporadic type[3]. Its timber is valued for its durability, resistance to insects and use for weight-bearing construction. So, it is a commercially valuable wood, but now a day it is missing from the natural habitat. Therefore, Telsur is currently assessed as vulnerable in IUCN Red list of threatened species[4]. Natural regeneration occurs where there is shade, suggestion that seedlings are shade tolerant[5] .Young trees become lighter demanding[6]. While shade is considered important for germination and initial establishment within the understorey[7]. It is associated with low rates of growth, rates increasing when light intensities are increased[8]. Continuous shade can compromise survival[9].

Flowering occurs at more or less regular intervals, usually every two years in trees of more than 8-10 years. In some fruiting years, fruits are produced in large quantities, in others it is restricted to a few branches. The small white fragrant flowers appear in March and April and fruits ripen in May and June: the latter are small, the two wings being about 4 cm. long. The seeds are mature and ready for collection when the wings have turned a darker brown and the fruit coat has changed from green to yellow. It is important to time collection well, as seeds that are not fully mature have low viability. The winged fruit is dispersed all around the mother trees and fruit starts germinate as soon as falls on the forest floor. It is propagated mostly by seeds. During good seed years, fruits are produced abundance. Seeds of Telsur are recalcitrant and do not store well for long periods. Germination can be obtained at 75% after 14 days storage at 14° C. with longer storage, viability is often lost and germination percentage decrease even after storage at low temperatures, particularly temperatures below 10° C[10, 11]. Storage at low temperature causes chilling damage.

Generally seedling is regenerated after storing of seed over variable period. Efficient storage of seeds is necessary to ensure continuous and cost effective supply of seedlings, which is a prerequisite for the success of any afforestation programme. Seed storage is also important for conserving the genetic resources which are ravaged by deforestation as well as by catastrophes such as forest fire, draught and floods. However, storage

potential of tree seeds is highly species-specific and large variation has been encountered across the tree species. Based on the inherent storage potential, seeds are grouped into two main categories viz. recalcitrant and orthodox[12]. Recalcitrant (desiccation-sensitive) seeds are metabolically active when shed from the mother plant and possess relatively high moisture content. Even under ambient temperature and low relative humidity their post-harvest life is very short which also depends on the species. Since sensitive to desiccation, these seeds lose viability when their moisture content falls below 20 to 30% [13, 14].

As Telsur seed is recalcitrant, it is imperative to find out a suitable storage method which can prolong its viability to raise seedlings in large scale at nursery. However, there is a scanty literature regarding the storage method of Telsur seed. Therefore, the present study was undertaken to evaluate the effect of storage condition and duration on germination and viability of Telsur seed.

II. Materials and Methods

The study was performed at National Forest Seed Centre, Seed Orchard Division, Bangladesh Forest Research Institute, Chittagong during May to August 2017. Mature fruits of Telsur were collected from the plus trees in the month of May. Soon after collection the wings were removed manually and small, immature fruits and fruits that are infested by insects are discarded.

Fresh seed germination and viability test was conducted with four replications of 100 seeds each. The seeds are sown in sand seedbed and germination was calculated following standard method [15]. For testing the influence of storage conditions and durations a total of 5,400 seeds were taken and divided equally into six seed lots. Each lot has subjected to a specific storage condition as follows: open air/control, sand, chalk powder, refrigerator saw dust and ash. Seeds in all conditions were stored for different durations viz. 3, 6, 9, 12, 15, 18, 21, 24, 27 and 30 days. From stored seed, ten seeds with three replications were taken out after every three days and germination was tested by sowing in moist sand seedbed. Seeds were sown 0.5 cm depth and 4.0 cm distance between seeds in sand beds and then pressed lightly into the sand. Proper shade was provided until germination starts. Routine watering and weeding activities were carried out. Seeds were considered germinated when the cotyledons protruded from the sand surface. Germinated seeds were remarked with small sticks to differentiate them from newly germinated seeds. Germination was observed on alternate days until completion.

The factorial experiment was followed as complete randomized block design with two factors - storage condition and duration. A variation (ANOVA) in germination potential under different conditions was analyzed using statistical package MSTAT.

III. Results and Discussion

Analysis of variance (ANOVA) for germination potential of Telsur seed under different conditions and durations were done and found highly significant within storage conditions, durations and their interaction (Table 1).Viability of Telsur seeds have lost and germination percentage decreased even after storage at low temperature, particularly temperature below 10°C which is in accordance with Tang and Tamari[10] and Yap[11]. Germination of Telsur was epigeous. Both fresh and stored seeds started germination within 7 to 14 days. Similar results were observed for *Aquilaria malaccensis* Lamk. Where seeds germinated within 6 to 12 days[16] *Aquilaria crassna* within 9 to 15 days[17, 18] and for *Gyrinops walla* Garten. within 7 to 14 days[19]. Germination was completed within 24 days which is similar to Beniwal[20], Adelina *et al*.[21] and Hoque *et al.*[16] for *Aquilaria malaccensis* Lamk.

Figure1. A) Seeds and B) Seedling of Telsur

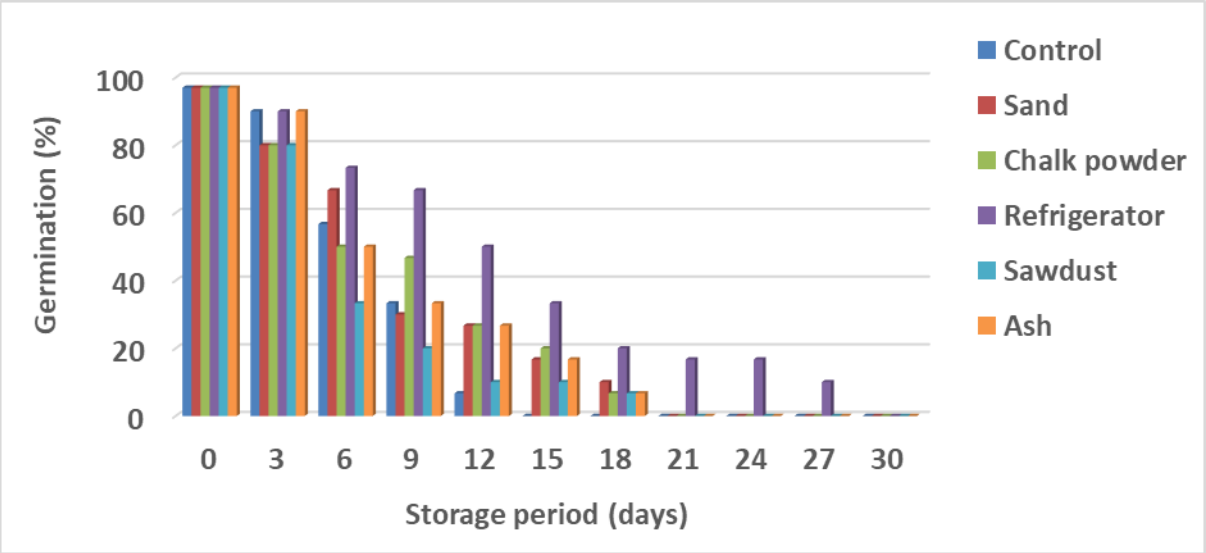
The highest germination (97%) was recorded with fresh seeds sown immediately after harvest. Among storage conditions, refrigerator (0~4^{0}C), ash and control showed highest germination (90%) after 3 days.

Table 1. Two-way ANOVA for seed germination at different storage conditions in relation with storage periods

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Prob
Treatment (T)	5	7495.238	1499.048	41.0609**	0.0000
Duration (D)	6	125304.762	20884.127	572.0435**	0.0000
T X D	30	5904.762	196.825	5.3913**	0.0000
Error	84	3066.667	36.508		
Total	125	141771.429			

**Values are significant at p > 0.01 level

Figure 2. Effect of storage conditions and durations on germination of Telsur seeds



A reduction trend on seed germination percent over the period was evident and significant differences in the germination among the storage conditions and durations used in the experiment. The seeds stored for 3 days in refrigerator, ash and control showed the highest (90%) germination (Fig. 2) followed by the seeds stored in sand, chalk and saw-dust (80%). After a period of 12 days storage, the seeds of refrigerator found 50 % germination followed by the seeds of sand, chalk powder and ash 26.7%, saw-dust 10% and control 6.7%. After the storage period of 24, and 27days, the seeds of refrigerator showed 16.7% and 10% of germinability respectively, while others storage conditions showed no germination at all. Present study revealed that storing seeds in cool conditions such as in a refrigerator (0~4^{0}C) can prolong viability 10% up to 27 days. No more seeds were found alive after 27 days of storage.

Analysis of variance (ANOVA) for viability percentage potential under different media and durations was done and F value was found highly significant (Table 1) within the interaction of media and storage durations. LSD values (9.818 at 5% and 13.024 at 1% level) were for grading the combination more precisely. Germination level in earlier interval period of followed all storage media were found all most same and maximum. But, emphasizing the prolonging period of viability in desired level, seeds stored in refrigerator, germination after 3, 6 and 9 days were found statistically in optimum at 5% & 1% level of significance. Seed viability of Telsur other than those conditions in various interval periods were found poor & below desired level (Table 1).

IV. Conclusion:

Viability of Telsur seeds remains 7 –10 days. The findings of the study indicates that freezing at 0~4^{0}C prolongs seed viability of Telsur up to 27days (10%). But it is not at desired level. The viability of Telsur remains up to 15 days (33.33%) considered at desired level. Seeds stored in refrigerator condition at 0~4^{0}C can be suitable for prolong viability of Telsur seeds.

Acknowledgements

The authors are sincerely acknowledged to Mr. Asadur Rahmam and Jaynal Abedin (Seed Collector, Seed Orchard Division, BFRI, Chattogram) for their cordial cooperation during germination test.

References

[1]. Hossain, M. K. 2015. Silviculture of Plantation Trees of Bangladesh, 193–196 pp
[2]. Das, D. K. and Alam, M. K. 2001. Trees of Bangladesh. Bangladesh Forest Research Institute, Chittagong. 176 pp
[3]. Troup, R. S. 1921. The Silviculture of Indian trees. Vol. 1, London, UK: Oxford University Press. 47 pp
[4]. IUCN 2012. The IUCN Red List of Threatened Species. Version 2012.2. (http://www. iucnredlist. org/details/33006/0). Accessed on 21 February, 2013.
[5]. Sakai A, Visaratana T, Vagharangkura T, Thai-Ngam R, Tanaka N, Ishizuka M & Nakamura S. 2009. Effect of species and spacing of fast-growing nurse trees on growth of an indigenous tree, Hopea odorata Roxb. in northeast Thailand. Forest Ecology and Management 257: 644 – 652
[6]. Thao TT. 1995. Research on Physiological and Ecological Characteristics of Hopea odorata, Dipterocarpus alatus, Michelia mediocris and Ormosia balansae. Forest Science Institute of Vietnam, Hanoi. (In Vietnamese)
[7]. Kettle CJ. 2009. Ecological consideration for using dipterocarps for restoration of lowland rainforest in Southeast Asia. Biodiversity and Conservation 19: 1137–1151
[8]. Appanah, S. and Turnbull JM (Eds). 1998. A Review of Dipterocarps; Taxonomy, Ecology and Silviculture. Center for International Forestry Research, Bogor. 1– 4 pp
[9]. Kamaluddin M & Grace J. 1993. Effects of red: far-red irradiation on Anthocephalus chinesis and Hopea odorata seedlings. Annals of Forestry 1: 119-129
[10]. Tang, H. T. and Tamari, C. 1973. Seed description and storage tests of some Dipterocarps. Malaysian Forester, 36(2): 38 – 53
[11]. Yap, S. K. 1981. Collection, germination and storage of dipterocarp seeds. Malaysian Forester, 44(2&3): 281 – 300
[12]. Berjek, P. and Pammenter, N. W. 2002. Orthodox and recalcitrant seeds. In. Vozzo J. A. (Ed.) Tropical Tree Seed Manual USDA Forest Service, Washington DC.
[13]. Farrant, J.M.; Pammenter, N.W. and Berjek, P.; 1988 Recalcitrance – a current system. Seed Science and Technology 16, 155–166
[14]. Pritchard, H. W. 2004. Classification of seed storage types for ex situ conservation in relation to temperature and moisture. In 'Ex situ plant conservation: supporting species survival in the wild'. (Eds EO Guerrant Jr, K Havens and M Maunder) pp. 139-161. (Island Press: Washington DC)
[15]. ISTA. 1999. International rules for seed testing. Seed Science and Technology 27: 369–380.
[16]. Hoque, M. Mezan Ul; Mariam, Hasina; Rahman, M. Arifur; Azad, A. k. M. and Uddin, S.M. Kamal 2019. Effect of Storage Condition and Duration on Germination of Agar (Aquilaria malaccensis Lamk.) Seed. Bangladesh Journal of Forest Science.Vol. 34No. ( ): pp
[17]. Soehartono, T. and Newton, A. C. 2001. Reproductive ecology of Aquilaria spp. in Indonesia. For. Ecol. Manage., 152: 59–71.
[18]. Shankar, U. 2012. Effect of seed abortion and seed storage on germination and seedling growth in Aquilaria malaccensis Lamk. CURRENT SCIENCE, 102(4): 596-604
[19]. Alwis, De H.N.; Subasinghe, S. M. C. U. P. and Hettiarachchi, D. S. 2016. Effect of Storage Time and Temperature of Gyrinops walla Garten. Seed Germination. Journal of Environmental professionals Sri Lanka, 5(2): 16–24
[20]. Beniwal, B. 1989. Silviculture Characteristics of Aquilaria agallocha Roxb. Indian Forester, 5(1): 17–21
[21]. Adelina, N.; Harum, F.; Schmidt, L. and Joker, D. 2004. Seed Leaflet: Aquilaria malaccensisLamk. Forest & Landscape, Denmark.

M. Mezan Ul Hoque,et.al. "Influence of Storage Condition and Duration on Germination of Telsur (Hopea odorata Roxb.) Seed." *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, 13(2), (2020): pp 06-09.