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EFFECT OF SEED SCARIFICATION ON GERMINATION OF CINNAMOMUM TAMALA SEEDS

Forestry Science

Ankurdeep Preety* Ph.D. Research Scholar, Silviculture & Forest Management Division, Himalayan Forest Research Institute, Conifer Campus, Panthaghati, Shimla -171013, Himachal Pradesh, India * Corresponding Author

Sandeep Sharma Scientist-G, Silviculture & Forest Management Division, Himalayan Forest Research Institute, Conifer Campus, Panthaghati, Shimla -171013, Himachal Pradesh, India.

ABSTRACT

Cinnamomum tamala, commonly known as the Tejpat, Malabar leaf or Indian bay leaf is a promising medicinal tree species of India. Being aromatic and having immense medicinal benefits, its leaves are widely used in culinary preparations as well as ayurvedic medicines. The exhaustive collection methods of this tree for various purposes have imposed a serious threat on the natural occurrence of this species. So, to conserve this species through quality nursery production, the present study was planned with the objective to standardize the method of pre sowing seed treatment in Cinnamomum tamala. The seeds were subjected to different types of scarification treatments and it was observed that scarification with sulphuric acid for 10 minutes resulted in highest per cent germination (76.25%), which was significantly higher than all the other treatments. This was followed by mechanical scarification (68.12 %) and sulphuric acid treatment for 5 minutes (56.25%). The growth parameters such as Root length (10.05 cm), Shoot length (10.38 cm), Collar Diameter (1.95 cm) and plant weight (0.78 g) of the seedlings were also found to be highest in the nursery plants germinated from the seeds treated with sulphuric acid for 10 minutes.

KEYWORDS

Germination, Cinnamomum tamala, scarification, Medicinal tree, pre sowing seed treatment

INTRODUCTION

Cinnamomum tamala, an evergreen monoecious species tree of the Lauraceae family, is a promising medicinal tree species. It is commonly known as the Tejpat, Malabar leaf or Indian bay leaf in India. Its leaves are aromatic and are widely used in culinary preparations throughout the world since ancient times. *Cinnamomum tamala* is used in Indian system of traditional medicines in various Ayurvedic formulations e.g. Sudarshanchoorna and Chandra prabhavati. Its leaves and bark have aromatic, astringent, stimulant and carminative qualities and used in rheumatism, cardiac disorders, colic, diarrhea, nausea and vomiting (Sharma and Nautiyal, 2011). The leaves of this tree have a clove like taste and a faintly pepper like odour and is used extensively as spice in the food industry (Grover *et al*., 2002).The leaf oil obtained by distillation is used for flavoring liquors and confections, and has immense pharmaceutical applications (Rema, 2005). *C. tamala* has been used as a natural food preservative for pineapple juice (Kapoor *et al.*, 2008). The leaves extract are used as clarifiers in dyeing procedures with myrobalans or kamala. Traditionally green dye has been extracted from its leaves (Gaur, 2008).This tree is used as food, fodder, medicine, and timber in Uttarakhand Himalayan region (Nautiyal and Kaechele, 2007).

Cinnamomum tamala is listed as a threatened species as the plant population is declining day by day due to over exploitation and habitat destruction in India (Kumar, 1997). Due to high medicinal value and being a source of different spices, *Cinnamomum tamala* has entered in vulnerable category in entire Himalayan region and endangered in Jammu & Kashmir, India (Ved *et al*, 2003). According to the report by Samant *et al*. (2001), considering the economic potential and dwindling natural populations of *C. tamala* in several ranges Himalayan states of India, this species has been recommended for *in-situ* as well as *ex-situ* conservation. The exhaustive and non-sustainable harvesting practices have posed a serious threat to the survival and availability of this highly useful tree, so, its conservation and propagation has become an immediate need. *Cinnamomum tamala* is generally propagated through seeds (Patel, 2015), however, seed germination in *Cinnamomum tamala* is a critical phenomenon as the seeds are recalcitrant by nature (Deb *et al,* 2014). The seed pulp acts as an inhibiting factor in the germination of its seeds. The de-pulped seeds also experience a decline in germination with time and must be sown immediately after harvesting and depulping (Mayura & Idris 2019; Kuniyal *et al* 2013; Deb *et al* 2012). Proper nursery growing techniques are not available for this species and its cultivation is also not being followed at a large scale by farmers as well as by government agencies.

So, with an objective to produce good quality nursery stock of *Cinnamomum tamala*, the present study was conducted to test the effect of different pre owing seed treatments on germination of its seeds.

MATERIALS AND METHODS

The research experiments were carried out in the Himalayan Forest Research Institute Nursery, Bir Palasi, Nalagarh, Distt Solan (H.P.), India. The seeds of *Cinnamomum tamala* were collected from Jogindernagar, District Mandi, Himachal Pradesh. Healthy mother trees were selected for seed collection and the fruits were collected when ripe, i.e. when the fruit colour changes to blackish purple. De-pulping was done to extract the seeds from the fruits and these extracted seeds (Figure 1) were then sown after carrying out different pre sowing treatments as mentioned below:

T1 - Control i.e. no treatment
T2 – Mechanical scarification
T3 – Sulphuric acid treatment for 5 minutes
T4 – Sulphuric acid treatment for 10 minutes
T5 - Acetic acid treatment for 5 minutes
T6 - Acetic acid treatment for 10 minutes

Figure 1: De-pulped seeds of *Cinnamomum tamala*

In mechanical scarification, the tip of the seed coat was cut off using a nail clipper and seeds coat and the seeds were then sown in seed beds. For acid scarification, concentrated sulphuric acid and acetic acid were used. The seeds were dipped in a beaker containing the acid for a few minutes, as mentioned in the treatments above. These seeds were then removed from the beaker and washed with running water prior to sowing. A control, where no scarification was done, was also maintained. These treated seeds were then sown in Completely Randomized Design with four replications having fifty seeds in each replication.

Under the germination study, the number of days taken from seed sowing to the start of emergence and total percentage of seeds germinated (germination percentage %) was observed. The germination percentage was calculated using the following formula:

$$\text{Germination percentage (\%)} = \frac{\text{(No.of seeds germinated)}}{\text{(No.of seed sown)}} \times 100$$

The number of days taken from sowing to start of emergence in all the treatments was also recorded. In addition to this, observations on other growth parameters of the seedlings such as root length (cm), shoot length (cm), collar diameter (mm), and plant weight (g) were also recorded. These growth performance parameters were studied by taking ten seedlings from each replication of all the treatments after three months of sowing. The data thus obtained were subjected to analysis of variance and the critical difference (CD) was calculated at significance level of P=0.05.

RESULTS

Seed Germination: Maximum germination percent (76.25 %) was observed in T4 i.e. sulphuric acid treatment for ten minutes. The number of days taken by the seeds to start of emergence was also least in T4 (9 days). The results are presented in Table 1.

Table 1: Effect of scarification on germination of *Cinnamomum tamala* seeds

Treatments	Germination percentage (%)	Days to first emergence
T1- Control	42.5	19
T2- Mechanical scarification	68.12	12
T3- Sulphuric acid treatment 5 min	56.25	14
T4- Sulphuric acid treatment 10 min	76.25	9
T5- Acetic acid for 5 min	41.87	17
T6- Acetic acid for 10 min	46.25	16
S/NS*	**S**	**S**
CD (0.05)	10.45	3.33

*** S= Significant, NS= Non significant**

Growth Performance: The mean root length, shoot length, collar diameter and plant weight of the seedlings were found to be maximum in T4 (9.56 cm, 10.38 cm, 1.95 mm and 0.78 g respectively). The detailed data on growth parameters of all the treatments are presented in table 2.

Table 2: Effect of scarification on growth performance of *Cinnamomum tamala* seedlings

Treatments	Root length (cm)	Shoot Length (cm)	Collar diameter(mm)	Plant wt (g)
T1	7.65	8.44	1.66	0.50
T2	10.05	10.38	1.81	0.78
T3	7.72	9.20	1. 77	0.56
T4	9.41	9.27	1. 95	0.72
T5	7.57	7.18	1.67	0.53
T6	7.65	8.65	1.20	0.48
S/NS*	S	S	S	S
CD (0.05)	1.67	1.79	0.30	0.17

* S= Significant, NS= Non significant

DISCUSSION

The present investigation revealed that different treatments to which the seeds were subjected, affected the germination performance of the seeds. The seed germination percent (%) was found to be highest in the treatment T4 i.e. Sulphuric acid treatment for ten minutes, which resulted in 76.25% germination followed by mechanical scarification (68.12%). These treatments were found to be significantly higher than the germination per cent observed in control (42.50 %) as well as all the other treatments. Least germination percent was found to be in the seeds treated with acetic acid for five minutes i.e. T5 (41.87%) and control (42.50%). It was also observed that the number of days taken by the seeds to start of emergence were minimum in T4 (9 days), thus making it the best suitable treatment for fast and higher germination. This may be attributed to the increased permeability of the seed coat due to exposure to the sulphuric acid, which ultimately enhances the germination. The untreated seeds i.e. control (T1) took the longest time (19 days) to the start of emergence. Similar results were obtained by various workers in many species such as *Parkia biglobosa* (Aliero, 2004), *Prunus mahaleb* (Pipinis *et al* 2012,), *Ulex europaeus* (Sixtus, 2003), *Gleditschia triacanthos* (Marzieh *et al*, 2011), *Cassia fistula* (Soliman & Abbas, 2013), where treatment of seeds with sulphuric acid significantly enhanced the germination percent.

The mean root length of the seedlings was found to be maximum in T4 (10.05 cm), followed by T2 (9.41 cm), which were significantly higher than the root length in all other treatments. The shoot length, collar diameter and plant weight were also recorded to be maximum in T4 i.e. sulphuric acid treatment for five minutes among all the treatments, with the values 10.38 cm, 1.95 mm and 0.78 g respectively, which were significantly higher than the control (root length, shoot length, collar diameter and plant weight of 7.65 cm, 8.44 cm 1.66 mm and 0.50 g, respectively). The minimum value for all the growth parameters were recorded in T5 i.e. treatment of seeds with boiling water for five minutes. The better growth performance of the seedling of T4 may be attributed to the early emergence of seed.

CONCLUSIONS

From the current study it can be concluded that treatment of de-pulped *Cinnamomum tamala* seeds with sulphuric acid for ten minutes not only results in faster as well as higher seed germination, but also results in growth of healthy and vigorous seedlings. Apart from this treatment, mechanical scarification also results in good germination percent and growth character. These treatments can thus be recommended for large scale production of good quality nursery stock of *Cinnamomum tamala*, which can ultimately help in conservation of this species.

REFERENCES:

1. Aliero, B.L.(2004). Effects of sulphuric acid, mechanical scarification and wet heat treatments on germination of seeds of African locust bean tree, *Parkia biglobosa*. *African Journal of Biotechnology* ,3(3),179-181.
2. Deb, M.S., Jamir, N.S. & Deb, C.R. (2012). Studies on seed biology of *Cinnamomum tamala* Nees (Lauraceae): a valuable multipurpose tree. *International Journal of Ayurvedic and Herbal Medicine,* 2(5), 817-827.
3. Deb, C.R., Deb, M.S. & Jamir, N.S. (2014). *In-vitro* culture of immature embryos of *Cinnamomum tamala* Nees.- The role of different factors. *Indian Journal of Experimental Biology*, 52, 1003-1010.
4. Gaur, R. D. (2008).Traditional dye yielding plants of Uttarakhand, India. *Natural Products Radiance,* 27(2), 154-165.
5. Grover, J.K., Yadav, S. & Vats, V. (2002). Medicinal plants of India with antidiabetic potential. *Journal of Ethnopharmacology,* 81, 81-100.
6. Hossain, M.A., Arefin, M.K., Khan, B.M. & Rahman, M.A. (2005). Effects of seed treatments on germination and seedling growth attributes of Horitaki (*Terminalia chebula* Retz.) in the nursery. Research *Journal of Agriculture and Biological Sciences*, 1(2), 135-141.
7. Kapoor, I.P.S., Singh, B. & Singh, G. (2008). Essential oil and oleoresins of *Cinnamomum tamala* (tejpat) as natural food preservatives for pineapple fruit juice. *Journal of Food Processing & Preservation,* 32(5), 719-728.
8. Kumar, S., Singh, J., Shah, N.C. & Ranjan, V. (1997). *Indian medicinal and aromatic plants facing genetic erosion.* CIMAP Lucknow (pp 46, 220)
9. Kuniyal, C.P., Purohit, V., Butola, J.S. & Sundriyal, R.C. (2013). Do the seeds pulp and storage time affects seedling emergence in the Indian Bay Leaf (*Cinnamomum tamala*)?. *National Academy Science Letters,* 36(3), 331-334. doi.org/10.1007/s40009-013-0134-2
10. Marzieh, B A., Raana, S., Akram, (2011). Effect of Different Treatments on Seed Germination of Honey Locust (*Gleditschia triacanthos*) *Modern Applied Science*. 5(1), 200-204.
11. Maurya, E. & Idris, H. (2020). Increasing viability of cinnamon (*Cinnamomum burmanii* L.) seed by soaking in rabbit urine. *IOP Conference Series: Earth and Environmental Science*, 497: 012010
12. Nautiyal, S. & Kaechele, H. (2007). Adverse impact of pasture abandonment in Himalayas of India: testing efficiency of a natural resource management plan (NRMP). *Environmental Impact Assessment Review*, 27, 109-125.
13. Patel, D.K. (2015). Aromatic plants diversity showing their propagation by seeds for *ex-situ* conservation in herbal garden. *Journal of Pharmacognosy and Phytochemistry*, 3(5), 152-156.
14. Pipinis, E., Milios, E., Mavrokordopoulou, O., Gkanatsiou, C. ,Aslanidou, M. , Smiris, P. (2012). Effect Of Pretreatments On Seed Germination Of *Prunus Mahaleb* L. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca.* 40(2), 183-189.
15. Rema, J., Leela, N.K., Krishnamoorthy, B. & Mathew, P.A. (2005). Chemical composition of *Cinnamomum tamala* essential oil – a review. *Journal of Medicinal and Aromatic Plant Sciences,* 27, 515-519.
16. Samant, S.S., Dhar, U. & Palini, L.M.S. (2001). *Himalayan medicinal plants: potential and prospects*. Gyanodaya Prakashan, Nainital, India.
17. Sharma, G. & Nautiyal, A.R. (2011). *Cinnamomum tamala*: a valuable tree from Himalayas. *International Journal of Medicinal and Aromatic Plants*, 1(1),1.
18. Sixtus, C.R., Hill, G.D. & Scott, R.R.(2003). The effect of temperature and scarification method on gorse (*Ulex europaeus* L.) seed germination, *New Zealand Plant Protection.* 56, 201-205.
19. Soliman, A.S. & Abbas, M.S. (2013). Effects of Sulfuric Acid and Hot Water Pre-Treatments on Seed Germination and Seedlings Growth of *Cassia fistula* L. *American-Eurasian Journal of Agriculture and Environmental Science*, 13 (1) 07-15.
20. Thakur, A.S., Thakur, P.S. & Mehta, R. (2005). Effect of pre sowing treatments on seed germination in *Berberis aristata*. *Indian Journal of Plant Physiology*, 10(4), 338-343.
21. Travlos, I.S., Economou, G. & Karamanos, A.J. (2007). Seed germination and seedling emergence of *Spartium junceum* L. in response to heat and other pre sowing treatments. *Journal of Agronomy*, 6(1),152-156.
22. Ved, D.K., Kinhal, G.A., Ravikumar, K., Ghate, U., Sankar, R.V. & Indresha, J.H. (2003). Conservation assessment and management prioritization for the medicinalplants of Himachal Pradesh, Jammu & Kashmir and Uttaranchal. In: Proc workshop, Shimla, India, May19-24.