Effect of Presowing Treatment on Seed Germination of *Adenanthera Pavonina*

***Anandhi, S, Lokesh. V, Srinivetha. M, Seetha. P, Gopinath. M, Sanjay. R**
*Assistant Professor (Horticulture), SRM College of Agricultural Sciences
Chengalpattu District - 603 201

Abstract

An experiment was conducted at SRM College of Agricultural Sciences Vendhar Nagar, Baburayanpettai, Chengalpattu District,Tamil Nadu to study the "**"Effect of presowing treatment on seed germination of *Adenanthera pavonina*".** The experiment was laid out in Completely Randomized Design (CRD) with three replications. The experiment involved seed scarification method. There were nine treatments, *viz.,*T1- Conc. Sulphuric acid (5 min.) + 12 hours water soaking, T2 - Conc. Sulphuric acid (5 min.) + 24 hours water soaking, T3 - Conc. Sulphuric acid (10 min.) + 12 hours water soaking, T4 - Conc. Sulphuric acid (10 min.) + 24 hours water soaking, T5 - Hot water + 12 hours water soaking, T6 - Hot water + 24 hours water soaking, T7 - Water soaking (12 hours), T8 - Water soaking (24 hours), T9 - Control (Without treatment).The observations were recorded for the seedling characters like Days for germination (Days), Germination percentage (%), No. of leaves, Root length (cm), Shoot length (cm), Vigour index. Soaking the seeds in water for 24 hrs was the most effective for inducing better seed germination in *Adenanthera pavonina.*

Keywords: Seed dormancy, pre-sowing treatment, hard seed coat, germination

Introduction

Adenanthera pavonina L. is a medium-sized to large deciduous tree. *Adenanthera pavonina* L. is endemic to India and South East China. *Adenanthera pavonina* L. are found scattered in primary and secondary, evergreen to dry deciduous rainforests. The trees have been observed to be flowering and fruiting almost throughout the year. The small leaves break down easily, making the species a good green manure to improve soil fertility. Raw seeds are poisonous. These seeds mostly remain inactive due to seed dormancy. There are a number of ways used to improve germination of seeds. Scarification by sulphuric acid is one of the effective and extensively used ways of germination enhancement (Narbona et al., 2006; Nadjafi et al., 2006). However, there are also artificial ways of breaking seed dormancy. Hot water is used for small to medium sized seeds or large quantities of seeds. This treatment requires dipping seeds into four to five times their volume of hot water (77 to 100°C) (Hossain et al., 2005; Delanoy et al., 2006). Mechanical scarification is a technique for overcoming the effect of an impermeable seed coat. The present study was aimed to evaluate the "Effect of pre sowing treatment on seed germination of *Adenanthera pavonina".*

Materials and methods

Seed collection

The seeds of *Adenanthera pavonina* were collected from different sites at Chengalpattu District from trees grown either naturally or planted. Before seed collection, an extensive survey of the area was made and mature, phenotypically superior or healthy trees of reasonably good form and average growth were marked for seed collection. The times of seed development and maturation were ascertained through consultation of literature and by frequent field visits. Pods were collected either directly from trees, or freshly fallen, from the ground. All pods were disease and insect free. Extraction of seeds was done manually immediately after the

collection of pods. The pods were dried under sunlight (35–38°C) for 2 days, and seeds were extracted by splitting the pods. Extracted seeds were dried in shade, cleaned and packed in polyethylene bags for the detailed study of seed characteristics.

Treatments

Uniform sized seeds of *Adenanthra pavonina* were used for the experiment. The experiment was laid out in Completely Randomized Design (CRD) with three replications. The experiment involved seed scarification method. There were nine treatments, viz.,T1- Conc. Sulphuric acid (5 min.) + 12 hours water soaking, T2 - Conc. Sulphuric acid (5 min.) + 24 hours water soaking, T3 - Conc. Sulphuric acid (10 min.) + 12 hours water soaking, T4 - Conc. Sulphuric acid (10 min.) + 24 hours water soaking, T5 - Hot water + 12 hours water soaking, T6 - Hot water + 24 hours water soaking, T7 - Water soaking (12 hours), T8 - Water soaking (24 hours), T9 - Control (Without treatment).The observations were recorded for the seedling characters like Days for germination (Days), Germination percentage (%), No. of leaves, Root length (cm), Shoot length (cm), Vigour index. The data obtained from the experiments were analysed by the 'F' test for significance following the methods described by Panse and Sukhatme (1985).

Seed Sowing and Weed Control

The pre-treated seeds were sown in polybags filled with sand: soil: FYM in the ratio of (1:2:1). Two seeds were sown for each polythene bag; the sowing depth was 2 cm. There was no serious weed problem as the experiment lasted, however, the few weeds that germinated with the seeds were removed by hand pulling.

Results and discussion

Pre-sowing treatment enhances rapid and uniform germination of seeds. There are several methods of pretreating seeds, but knowledge of a few simple techniques is sufficient to get reasonable germination of almost all species. To determine the optimum pretreatment methods for inducing better seed germination, the present study was conducted. Various dormancy breaking treatments like soaking in hot water, normal water and sulphuric acid were tried.

Seed treatment methods to induce germination percentage

Statistically significant differences were observed among the various dormancy breaking seed treatments for the germination percentage. Soaking the seeds in water (24 hours) (T8) resulted in higher seed germination percentage (83.00 per cent) and was significantly superior to all other treatments. The lowest germination percentage was observed in untreated seeds (T9) (33.00 per cent). As shown in the results section, the non scarified seeds of *Adenanthera pavonina* showed least germination percentage indicating that the seeds have the typical hard, impermeable seed coat of the leguminous species. This is in agreement with the results of Chauhan and Johnson (2009), which reported that non scarified seeds of the leguminous trees did not reveal any imbibition or germination as a result of the hard seed coat. The untreated seeds of *C. fistula* didn't germinate for quite long time (Soliman and Abbas, 2012; Babaloba et al., 2014).

The highest number of compound leaves per seedling (16.33) was observed in the treatment *viz.,* water soaking (24 hours) (T8) as against the lowest number of leaves per seedling (5.33) observed in untreated seeds (T9). The water treatment soaking (24 hours) (T8) recorded the highest shoot length (12.03 cm) as well as root length (12.03 cm). The untreated seeds (T9) recorded the lowest shoot and root length (6.069 and 6.069 cm).The vigour index was maximum for (T8) Water soaking (24 hours) (1997.229), which was significantly superior over other treatments. This was followed by Water soaking (12 hours) (T7), which recorded 1537.128. The lowest vigour index (400.55) was observed in T9 (Control).

The earliest germination (11.22 days) was observed in the seeds soaked in Conc. Sulphuric acid (5 min.) + 12 hours water soaking (T1), followed by soaking in Conc. Sulphuric acid (5 min.) + 24 hours water

soaking (T2) which took 11.40 days. The control (T9) showed the most delayed germination (20.85 days) among all the treatments.

Soaking of seeds in hot water could help in enhancing the seed germination by softening the hard seed coat and facilitating leaching out of the germination inhibitors. According to Alamgir and Hossain (2005), hot water treatment can conquer physical dormancy in leguminous species.

The results are similar to the observation made in *Leucaena glauca*, where the boiling water significantly reduced the percentage of abnormal seedlings and dead seeds (Venkatraman, 1948). Sarker *et al.* (2000) also reported that steeping *Sesbania rostrata* seeds in boiling water for one minute showed the highest percentage of germination (62.63 %). Singh et al., (1984) found that water soaking enhanced the seed germination in *Tephrosia purpurea* and *Abrus precatorius*. Sneh and Verma (1993) concluded that a seeds of *Grewia optiva* when treated with hot water for 24 hours resulted into higher germination (49.66%).

Studies by Ibrahim and Otegbeye (2004) showed that seed immersion in cold water improved the germination of some tropical trees. Owonubi et al. (2005)observed that soaking *Azadirachta indica* seeds in cold water for 1, 12 and 24 hours increased seed germination, implying that the seed coats of different species are differently permeable to water and gas (Owonubi et al., 2005).

Reference

1. Alamgir, M. and Hossain, M..K.. (2005). Effect of pre-sowing treatments on germination and initial seedling development of *Albizia saman* in the nursery. *Journal of Forestry Research,* 16 (3): 200 – 204.
2. Babaloba, S.E., Shonubi, O.O. and Okusanya, O.T. (2014). Seed dormancy in *Cassia fistula* population from Nigeria. *J. Am. Sci.,* 10(10): 85-93.
3. Chauhan B.S. and Johnson D.E. (2009). Seed germination and seedling emergence of giant sensitiveplant (Mimosa invisa). Weed Sci. 56, 244–248.
4. Delanoy, M., van Damme, P., Scheldeman, X. and Belttran. J. (2006). Germination of *Passiflora mollissima* (Kunto) L.H. Bailey, *Passiflora tricuspis*, Mast and *Passifolia nov* species seeds. *Sci. Horticulture*. 110:198 – 203
5. Hossain, M. A., Arefin, M. K., Khan, B. M. and 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.
6. Ibrahim A., and Otegbeye. G.O. (2004). Methods of achieving optimum germination in A*dansonia digitata*. *Bowen Journal of Agriculture*. 1 (1): 53 - 58.
7. Nadjafi, F., Bannayan, M., Tabrizi, T. and Rastogoo, M. (2006). Seed germination and dormancy breaking techniques for Ferula gummosa and *Teucrium polium. J. Arid Environments*, 64: 542 – 547.
8. Narbona, E., Ortiz, P.L. and Arista, M. (2006). Germination variability and the effects of various pre-treatment on germination in the perennial spurge *Euphorbis nicaeensis All. Flora,* 201: 633-641
9. Owonubi, J.J., Otegbeye G.O. and Nwokedi, C. (2005). Development of pre-germination technique for *Azadirachta indica:* preliminary investigation. *In: Sustainable Forest Management in Nigeria: Lessons and Prospects*. Proceedings of the 30th Annual Conference of the Forestry Association of Nigeria, held in Kaduna State. 7-11th November, 2005. p: 29 – 38.
10. Panse, V. G. and Sukhatme, P. V. (1985). Statistical Methods for Agricultural Workers. I.C.A.R., New Delhi.
11. Sarker PC, Hossain, SMA, Bhuija, MSU and Salim, M. (2000). Breaking seed dormancy in Sesbania rostrata. Pakistan J. Biol. Sci., 3(11): 1801–1802.
12. Singh K, Singh, K.P. and Susheel Kumar (1984). Seedling growth and vigour responses of some Indian medicinal plants to certain physical and chemical treatments. Indian J. Plant Physiol., 27(3): 295–299.

13. Sneh, L. and Verma. K.R. (1993). Pre-sowing treatment of bhimal (*Grewia optiva* Drummond) seeds. *Indian Forester,* 119 (2): 135-138.
14. Soliman, A.S. and 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 Agricultural & Environmental Sciences*, *13*(1), pp.7-15.
15. Venkatraman, L (1948). Effect of heat and cold treatment on germination of *Leucaena glauca.* The Madras J.Agril., 35(8): 179–184.

Table 1. Effect of presowing treatment on the seed germination of *Adenanthera pavonina*

Trts.	Seed treatments	Germination percentage (%)	Days for germination (days)	No. of leaves/seedlings	Shoot length (cm)	Root length (cm)	Vigour index
T_1	Conc. Sulphuric acid (5 min.) + 12 hours water soaking	48.333	11.222	11.000	9.768	9.769	944.282
T_2	Conc. Sulphuric acid (5 min.) + 24 hours water soaking	43.667	11.401	13.667	10.543	10.544	920.806
T_3	Conc. Sulphuric acid (10 min.) + 12 hours water soaking	44.000	13.667	12.333	10.523	10.524	926.068
T_4	Conc. Sulphuric acid (10 min.) + 24 hours water soaking	38.333	14.000	13.000	7.960	7.960	610.261
T_5	Hot water + 12 hours water soaking	49.667	12.778	13.000	7.428	7.429	737.903
T_6	Hot water + 24 hours water soaking	49.667	14.778	11.000	9.126	9.127	906.572
T_7	12 hours water soaking	72.000	18.778	15.667	10.674	10.675	1537.128
T_8	24 hours water soaking	83.000	19.889	16.333	12.031	12.032	1997.229
T_9	Control (Without treatment)	33.000	20.851	5.333	6.069	5.069	367.554
SE(d)		13.959	1.967	2.771	1.593	3.324	398.265
CD(0.05)		29.555	4.166	5.867	3.372	7.037	843.207