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EFFECT OF PRE-SOWING TREATMENTS ON SEED GERMINATION SEED QUALITY IN *FLEMINGIASEMIALATAROXB.*

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ABSTRACT *Flemingia semialata* species are naturally distributed and are being utilized as lac host plant. The seeds of the species have hard seed coat and exhibit dormancy, causing delayed and asynchronous germination. Laboratory and poly house experiment were conducted to study the effect of pre-sowing treatment on seed quality of*Flemingia semialata* seeds in College of Forestry, Sirsi, UAS, Dharwad. Both experiments were conducted with twelve pre-sowing treatments. In both the experiment highest germination 76.25 per cent and field emergence 73.00 per cent in poly house were obtained when seeds were scarified in concentrated sulphuric acid for one minute before sowing. Fairly good germination was obtained when seeds were treated with KNO_3 0.2% for 12 hours and soaked in water for 4 days and then overnight soaking in 300 ppm GA_3 solution. Germination was higher in the laboratory condition than the in poly housed. The results obtained from poly house might be better indication of results obtained in field condition. Although sulphuric acid scarification treatment gives early, uniform and highest germination but it is not practicable by Farmers. Therefore soaking in water for four days is recommended.

KEYWORDS : Seed pre-treatment, dormancy, hard seed coat, germination and vigour index

INTRODUCTION

Flemingia semialata (Roxb.) is a genus of flowering plants in the legume Family Fabaceaehaving approximately 42 species, distributed in all over Asia. It is commonly called as "Winged-Stalk Flemingia" and in hindiit is known as "Bara Solpan" and "Ban Chola". It is perennial, erect, quick growing and put responsive lac host, grows up to height of about 2.5-3.5 m depending upon plant management. Leaves are trifoliate, with 2.5-7.5 cm long narrowly winged stalk. Flowers are borne in branched racemes, at the end of branches on leaf axils.Seeds are round, black with sporadic white spots on the outer skin. Seeds have dormancy probably caused by seed coat impermeability to water (Carvalho, 1994).

Many species used for lac production of which *Flemingia emialata* is highly suitable for production of good quality lac. Lac, an important commercial product secreted by tiny gregarious lac insects, *Kerrialacca*, producing three versatile natural product *viz.,* resin, wax and dye, having huge commercial value and scope of cultivation (Singhal *et al*. 2014).

The impermeable seed coat is considered the main problem in establishment. Seed coat- imposed dormancy, known as " hardseedness ", is an ecological mechanism that allows the seed to germinate only when conditions are favourable for supporting seedling growth; however it represents a limitation when prompt and high- level germination is required. This phenomenon generally applies to leguminous plant. Therefore, seeds require pre-sowing treatments before sowing to obtain rapid, uniform and high germination percentage (Tadros *et al.* 2011).

The *Flemingia semialata* is a new to Karnataka region and the seeds which are hard seed coat and dormancy results in low germination. So, it is pre-requisite toachieve good pre-sowing treatment which upsurge the germination. The loss of vigour and viability of seed results in poor field stand and poor performance. Proper seed management practices can improve the seed quality as well as the yield of the plant and produce quality seeds which are locally known adapt to local condition. Pre-sowing seed treatment with water, growth hormone and chemicals is being practiced for reducing the hardness of seed coat for achieving uniform plant stand by minimizing the variation in seed quality within the seed lots and to enhance seed yield and storability. The seeds of this species are hard coated and have physical dormancy. The aim of this study was to evaluate germination within a short period of time. Thus the present investigation was undertaken with the objective to determine the precise optimum pre- sowing treatment for germination.

MATERIALAND METHODS

The fresh seeds of *Flemingia semialata* were obtained from the Indian Institute of Natural Resin and Gums (IINRG) Namkum, Ranchi, Jharkhand. The seeds were subjected to twelve pre-treatment as **T_1:** Control, **T_2:** Seeds soaked in hot water at 70°C for 20 minutes, **T_3:** Seeds immersed in hot water at 90°C for 1 minute and left in water for overnight (7 hrs.), **T_4:** Overnight soaking of the seeds in GA_3 300 ppm solution, **T_5:** Seeds soaked in water for 2 days, **T_6:** Seed soaked in water for 2 days and then overnight (7 hrs.) soaking in GA_3 300 ppm solution, **T_7:** Seeds soaked in water for 4 days **T_8:** Seed soaked in water for 4 days and then overnight (7 hrs.) soaking in $GA_3$300 ppm solution, **T_9:** Seeds soaked in water for 6 days, **T_{10}:** Seed soaked in water for 6 days and then overnight (7 hrs.) soaking in GA_3 300 ppm solution, **T_{11}:** Seeds scarified in conc. H_2SO_4 for 1 minute and **T_{12}:** Seeds soaked in potassium nitrate (KNO_3) 0.2% for 12 hours. For every pre- sowing treatment, 20 g of seeds were used. The acid scarified seeds were thoroughly washed with running tap water carefully. All the treatments were timed in such a way that all of them would end at the same time. The between paper towel germination test and sowing in the beds in poly house were conducted with four replication of 100 seeds each treatment as described by adapting the procedures of ISTA. Seeds were incubated at standing position in wall in germinator room maintained at 25±1°C and relative humidity of 95 percent was maintained during germination test. In poly house, seeds were sown in nursery bed made by fresh top layer soil of length 3.5 m and breadth 1 m for germination of seed. Daily germination counts were taken. The numbers of normal seedlings were counted on the 28th day (final count) of germination. The germination rate, mean daily germination, peak value and seedling vigor index were calculated as per standard procedure.

RESULTS AND DISCUSSION

The problem associated with *F. semialata* seeds that it does not germinate immediately and synchronously due to seed dormancy and hard seed coat. So, it is pre requisite to find good pre-sowing treatment which reduces the thickness of seed coat and remove seed dormancy and ultimately upsurge the germination vigour of the seedling. Standardization of growth and synchrony in development are highly desirable characters for mechanized cultural operations and uniformity of raw materials derived. Production of quality planting material in fast growing tree species will gaining lot of momentum around the world.

A healthy and prosperous germinating seed is commencement of noble establishment. Good seedling stand is significant and primary need for higher yield. This depends largely on seed germination and vigour potential of the seeds used for sowing, which can be improved through various seed germination enhancement techniques. Hence, study on pre-sowing treatments play an important role to produce mature,

healthy and vigorous seeds and the results of which are discussed below. Seeds treated with pre-sowing treatments revealed significant improvement in germination. Maximum seed germination (76.25 per cent) in laboratory and (73.00 per cent) in poly house was observed in seeds scarified with concentrated H2SO4 for one minute followed by the seeds soaked with Potassium nitrate (KNO3) 0.2% for 12 hours (72 per cent) in laboratory and (71 per cent) in poly house. Concentrated H2SO4 scarified the hard coat of seed by dissolving the outer layer of seed coat and makes it perforated which enhance the permeability of seed coat to water and gases, thus initiates germination process. These results are in conformity with that of Asare and Otsyina (1980) observed higher seed germination (89 per cent) in *Flemingia macrophylla* seeds treated with concentrated sulphuric acid for 6 minutes. Gopi kumar (2002) has reported 100 per cent germination in *Prosopis cineraria* seeds treated with concentrated sulphuric acid for 5 minutes and 97 per cent in *Paraserianthus falcotoria* seeds treated for 2 minutes. Salim *et al*. (2010) revealed that, the germination of *Melia azedarach* was significantly increased to 74% in H2SO4 treated seeds as compared to control. Results are in conformity with Khan (2015a) studied on effect of different growth promoters on the seed germination of *Pterocarpus marsupium* Roxb. and their results indicated that, the germination percentage increased significantly when the seeds treated with H2SO4 for 10 to 15 minutes. The germination per cent after treatment was observed 80 per cent as compared to GA3 (250 ppm) and KNO3 (1 %) treatments with the germination of 71 per cent and 68 per cent respectively.

The highest germination per cent result was followed by KNO3 (0.2 %) chemical treatment may be due to it activate the embryo by increasing respiration, recorded higher germination per cent and reduced germination period. Sourour *et al.* (2013) reported that, seeds of *Acacia tortilis* were pre-treated with 0.2 per cent KNO3 for 24 hours and obtained 47 per cent germination. Khan (2013) reported highest germination per cent (79 %) in *Sterculia urens* by soaking seeds in KNO3 (0.5 %) up to 12 hours. Sujatha (2014) reported that, 200 M KNO3 solution has recorded maximum seed germination (84.0%) in *Melia azedarach* seedlings (Table- 1).

Soaking of seeds in water helped in softening the seed coat which improves imbibition of water through the seed and GA3 induced the production of enzymes such as Gibberellins, proteases, lipases which mobilizes storage reserves for seed germination and help to enhance the germination. Those treatments are soaking in water for 2 days and then overnight soaking in 300 ppm GA3 solution, soaking in water for 4 days and then overnight soaking in 300 ppm GA3 solution and soaking in water for 6 days and then overnight soaking in 300 ppm GA3 solution. Treatment involves soaking of seeds in only water for 6 days resulted in low germination due to leaching of the hormones and storage reserve for seed germination. Chaya (2014) studied the effect of pre-sowing treatments on *Lagerstroemia lanceolata* and reported;seeds treated with GA3 100 ppm for 12 hour recorded significantly maximum seed germination (17.33%).

The mean daily germination and peak value in the present value differed significantly over control. The highest mean daily germination (2.72) in laboratory and (2.60) in poly house and highest peak value (16.00) in laboratory and (6.67) in poly house was observed in seeds scarified with conc. H2SO4 for one minute. The shoot length, root length, total seedling length and seedling vigour index in the present value differed significantly over control. The highest shoot length of 13.17 cm in laboratory and 9.86 cm in poly house, highest root length 4.95 cm in laboratory and 5.70 cm in poly house, highest total seedling length 18.12 cm in laboratory and 15.56 cm in poly house and highest seedling vigour index 1380.74 in laboratory and 1135.88 in poly house was observed in seeds scarified with conc. H2SO4 for one minute (Table- 2). The pre-sowing treatment initiated early germination and reduced period of germination by enhancing the permeability of seed coat to water and gases through the pores created due to conc. H2SO4 which facilitates imbibition of water into cotyledons and hastened the bio-chemical reactions; intern increased the mean daily germination and peak value. Thus the liberation of enzyme mobilizes storage reserves and rapidly increase the whole system for higher seed germination with reduced germination period. Ibrahim *et al*. (2011), Yildiztugay *et al*. (2012) and Nawa bahar (2011) obtained similar results while treating seeds of five Acacia species viz. *Acacia asak, Acacia ehrenbergiana, Acacia etbaica, Acacia gerrardii* and *Acacia origena* for 5 and 15 minutes, *Sphaerophysa kotschyana* with conc. H2SO4 for 15 minutes and similar results were also observed with *Cassia glauca.* were pre-treated with 0.2 per cent KNO_3 for 24 hours and obtained 47 per cent germination. Khan (2013) reported highest germination percent (79 %) in *Sterculia urens* by soaking seeds in KNO_3 (0.5 %) up to 12 hours.

It would seem, therefore that the above treatments were likely to give good results in the nursery bed and could be recommended for use by farmers. As sulphuric acid and potassium nitrate may not be readily available to farmers and there are risks involved in its application, especially when farmers are not familiar with the handling of dangerous chemicals. Gibberilic acid is too costly that it is not in the budget of farmers, so the soaking of seeds for 4 days in water would be more suitable for farmers especially when farmers are not familiar with dangerous chemical although it is inferior to acid but is the easiest to use.

Table 1. Effect of pre sowing treatments on seed germination, germination rate, mean daily germination and peak value of Flemingia semialata in laboratory and poly house after 28 days of sowing.

Treatments		Germination %		Germination Rate		Mean Daily Germination		Peak Value	
		Laboratory	Poly house	Laboratory	Poly house	Laboratory	Poly house	Laboratory	Poly house
T_1	Control	53.75	51.00	3.48	1.16	1.92	1.81	9.58	3.64
T_2	Seeds soaked in hot water at 70°C for 20 minutes	58.00	55.00	4.73	1.45	2.06	1.96	11.33	4.03
T_3	Seeds immersed in hot water at 90°C for 1min. and left in water for overnight (7 hrs.)	56.25	53.00	4.24	1.42	2.00	1.89	10.25	3.84
T_4	Overnight soaking of the seeds in 300 ppm GA3 solution.	64.00	61.50	5.25	2.04	2.29	2.19	13.50	4.88
T_5	Seeds soaked in water for 2 days	59.50	57.25	4.88	1.84	2.12	2.04	12.25	4.62
T_6	Seed soaked in water for 2 days and then overnight (7 hrs.) soaking in 300 ppm GA3 solution	65.25	63.00	5.61	2.11	2.32	2.24	14.08	4.95
T_7	Seeds soaked in water for 4 days	67.00	65.00	5.72	2.19	2.38	2.32	14.66	5.12
T_8	Seed soaked in water for 4 days and then overnight (7 hrs.) soaking in 300 ppmGA3 solution	70.25	69.25	6.20	2.35	2.50	2.47	15.33	5.38
T_9	Seeds soaked in water for 6 days	63.75	59.00	4.95	1.94	2.27	2.10	12.33	4.75
T_{10}	Seed soaked in water for 6 days and then overnight (7 hrs.) soaking in 300 ppm GA3 solution	68.00	66.75	6.01	2.33	2.42	2.37	14.92	5.19
T_{11}	Seeds scarified in conc. H2SO4 for 1 minute	76.25	73.00	7.32	2.90	2.72	2.60	16.00	6.67
T_{12}	Seeds soaked in 0.2% potassium nitrate (KNO3) for 12 hours.	72.00	71.00	6.22	2.50	2.60	2.53	15.50	5.93
	Mean	64.5	62.06	5.38	2.01	2.30	2.21	13.31	4.91
	Sem±	0.56	0.64	0.23	0.37	0.29	0.32	0.39	0.48
	CD @ 1%	1.65	1.94	0.69	1.12	0.87	0.98	1.13	1.45

Table 2. Effect of pre sowing treatments on shoot length and root length of Flemingia semialata seedlings in laboratory and poly house after 28 days of sowing.

Treatments		Shoot length (cm)		Root length (cm)		Seedling vigor index		Seedling dry weight (g)	
		Laboratory	Poly house	Laboratory	Poly house	Laboratory	Poly house	Laboratory	Poly house
T_1	Control	10.78	7.67	3.06	4.37	743.20	614.04	0.133	0.043
T_2	Seeds soaked in hot water at 70°C for 20 minutes	11.54	8.16	3.70	4.80	883.92	712.8	0.147	0.053
T_3	Seeds immersed in hot water at 90°C for 1min. and left in water for overnight (7 hrs.)	11.13	7.82	3.44	4.53	833.44	654.55	0.145	0.045
T_4	Overnight soaking of the seeds in 300 ppm GA3 solution.	12.15	8.38	3.88	4.96	1025.90	820.41	0.152	0.059
T_5	Seeds soaked in water for 2 days	12.02	8.23	3.70	4.82	935.34	747.11	0.151	0.056
T_6	Seed soaked in water for 2 days and then overnight (7 hrs.) soaking in 300 ppm GA3 solution	12.22	8.45	3.92	5.10	1053.78	853.65	0.156	0.060
T_7	Seeds soaked in water for 4 days	12.33	8.60	4.24	5.27	1110.19	901.55	0.157	0.061
T_8	Seed soaked in water for 4 days and then overnight (7 hrs.) soaking in 300 ppmGA3 solution	12.42	9.20	4.34	5.34	1176.55	1006.89	0.160	0.065
T_9	Seeds soaked in water for 6 days	12.06	8.30	3.79	4.92	1009.64	779.98	0.152	0.059
T_{10}	Seed soaked in water for 6 days and then overnight (7 hrs.) soaking in 300 ppm GA3 solution	12.72	8.82	4.52	5.30	1172.32	942.51	0.157	0.062
T_{11}	Seeds scarified in conc. H2SO4 for 1 minute	13.17	9.86	4.95	5.70	1380.74	1135.88	0.165	0.074
T_{12}	Seeds soaked in 0.2% potassium nitrate (KNO3) for 12 hours.	12.93	9.43	4.77	5.47	1274.40	1057.90	0.162	0.067
	Mean	12.12	8.57	4.02	5.04	1049.95	852.27	0.153	0.058
	SEm ±	0.32	0.37	0.18	0.23	35.83	42.36	0.005	0.007
	CD @ 1%	0.93	1.06	0.56	0.71	103.19	122.0	NS	NS

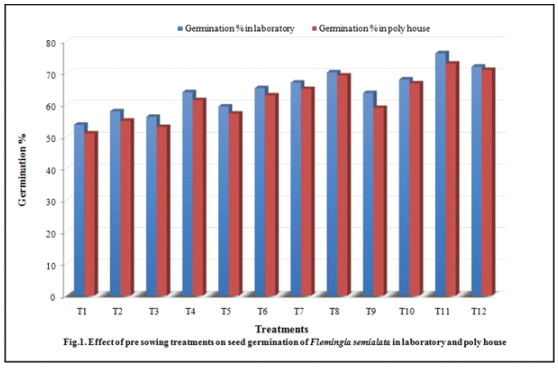
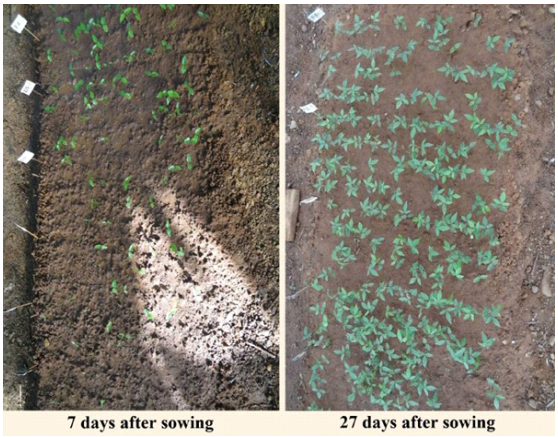


Fig.1. Effect of pre sowing treatments on seed germination of *Flemingia semialata* in laboratory and poly house



7 days after sowing 27 days after sowing

Plate 1. Germination view at polyhouse condition

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