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Research Article

EFFECT OF SEED INVIGORATION TREATMENTS ON AYURVEDIC PLANT *SHIRISHA* (*ALBIZIA LEBBECK* L.) SEED

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ABSTRACT

Shirisha is an important Ayurvedic plant. It is a temperate zone plant that grows well on neutral to slight acidic soil. With optimum agro climatic conditions, use of good quality seed is also required to ensure the establishment of this tree. So it is very much important to maintain the physiological health of seed for the development of healthy seedlings. The physiological quality of the seed is deteriorated mainly due to high temperature, relative humidity and oxygen pressure. In our country availability of good quality seed as a planting material is a major problem for seedling development. *Shirisha* seed generally harvested in pre-monsoon month and absorb lots of moisture during monsoon month with high temperature resulting in rapid decline of vigour and viability of seeds. Hydration-dehydration treatments are effectively control the deterioration of medium vigour seed. During the present study *Shirisha* seeds were hydrated with water as well as 10^{-2}M solution of Salicylic acid, Benzoic acid, KNO_3 and NaCl followed by dehydration. $KNO_3$and NaCl solutions showed better results for the maintenance of germinability of *Shirisha* seed.

Keywords: Seed invigoration, *Shirisha,* Ayurvedic

INTRODUCTION

Shirisha (Albizia lebbeck (L.) Benth seeds are harvested in the month of April-May. Seed storage under ambient conditions is a very problematic due to prevailing high humidity and temperature. If seeds stored under uncontrolled conditions, the viability may go down below ten percent after monsoon. To study the pattern of decline of seed, it stored in cloth bag and glass bottle and conducted germination percentage in 1stweek of every month. *Albizzia lebbeck* seed were treated with water and different solutions for the maintenance of seed viability.

In India, poor to medium quality seeds are used as a planting material in case of field and horticultural crops resulting in substantial yield loss[1]. Seed may undergo certain irreversible changes after attaining physiological maturity that may reduce seed quality leading to loss of vigour and viability and consequently reduction in yield potential of the standing crop. Storing seeds in gunny bags, cloth bags or earthenware vessels absorbs lot of moisture from atmosphere during monsoon months and hastens seed ageing. Mid-storage hydration-dehydration (H-D) treatment helps to maintain vigour, viability and productivity of several leguminous and non-leguminous crop seeds[2]. In addition, hydration-dehydration treatment is ineffective in freshly harvested seeds of many crops due to soaking injury. Our objectives were to standardize suitable treatments for the maintenance of germinability of *Shirisha* seed.

MATERIALS AND METHODS

Medium vigour *Albizzia lebbeck* seeds were cleaned and thoroughly sun dried for 4-5 days to a moisture content of about 8.9% for safe storage and then stored in 100 ml capacity rubber stoppered glass bottles under ambient conditions (Figure 1). Seeds were also stored in cloth bag. Germination test were carried out by taking seed samples after subsequent ageing of seed.

Figure 1: Treated and untreated seeds

Mid-storage seed invigoration treatments were given to five-month-old (medium-vigour) seeds. Hydration-dehydration (Soaking-drying) treatments of seed were given with water and solutions (10^{-2}M) of Salicylic acid, Benzoic acid, and Sodium chloride and Potassium nitrate[3].

METHOD OF TREATMENTS: Seeds were soaked in double volume of water or solutions (as mentioned before) (Figure 2) for 4 hours followed by drying (Figure 3) until the seed reached in a safe moisture label, i.e. 8.5%. After treatment, treated and untreated seeds were kept in glass bottle at room temperature for further studies .

Figure 2: Seed Hydration

Figure 3: Seed Dehydration

After 7 days of treatment, all the treated and untreated seeds were subjected to an accelerated ageing at 98 % RH and 40± 1^0C for 6 days and natural ageing under ambient conditions (average relative humidity 85 ± 3.2% and temperature 30 ± 1.6^0C) for 120 days. For this purpose treated and untreated seeds were stored in perforated paper packets (each packet with equal number of holes and containing equal amount of seeds) and then put into desiccators for accelerated ageing. For natural ageing, treated and untreated seeds were stored in perforated paper packets and put into cloth bag and kept in to the laboratory self under ambient conditions. Germination test of the treated and untreated seeds (minimum 400 seeds for each treatment as specified by ISTA)[7] were carried out immediately after treatment (before ageing), after accelerated ageing and 120 days of natural ageing following the method of Punjabi and Basu[8]. The seeds were sterilized by soaking in 0.05% mercuric chloride solution for 15 min. and then thoroughly washed. The washed seeds were placed on moist blotters spread on glass plates kept in polythene packets containing 10 ml of water. The polythene packet containing glass plates were arranged at 66^0angle and then placed for germination at 28±1^0C. Data on germination percentage and seedling length were recorded after germination for 5 days at 28 ± 1^0C temperature.

Figure 4: Seed Germination

The data obtained from laboratory germination test were analyzed statistically following the method of analysis of variance. Data on germination percentage were transformed to their respective arc-sin angle prior to statistical analysis and seedling length data were analyzed as such.

RESULTS AND DISCUSSION

The germination percentage of *Albizzia lebbeck* seed stored in different containers (cloth bag and glass bottle) from May to April are shown in Table. 1. The germination percentage started decline in the monsoon months (July-August) when the relative humidity started to rise. Seeds kept in cloth bag absorb a lot of moisture from humid atmosphere and showed a sharp decline of germination percentage during monsoon months and onwards. Beside, seeds stored in glass bottle showed comparatively better results to maintain the germination percentage during the storage period.

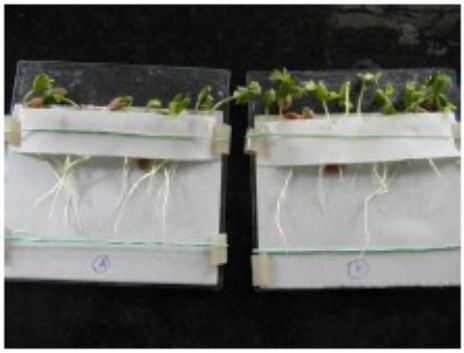

Figure 5: Seedlings developed form untreated and treated seed

Table 1: Pattern of decline in Germination percentage of *Albizzia lebbeck* seed stored in glass bottle and cloth bag under ambient conditions

Months	Glass Bottle	Cloth Bag
	Germination %	Germination %
May	95	95
June	95	85
July	93	69
August	92	50
September	90	40
October	90	32
November	78	15
December	70	5
January	68	0
February	62	0
March	60	0
April	60	0

Germination tests did not show any significant difference on vigour and viability between the treated and untreated seeds (Table 2). But after accelerated ageing at 98% RH and 400 C temperature for 10 days and natural ageing under ambient conditions for 180 days, all the hydration-dehydration treatments significantly improved germination percentage and seedling length over control (Table 3 and 4). Hydration-dehydration treatments with KNO3 10^{-2}M and NaCl, 10^{-2}M solution has shown better results for the maintenance of vigour and viability of *Albizzia lebbeck* seeds over control. Seedling vigour as measured by roots and shoot length and vigour index were also improved by hydration-dehydration treatments.

Table 2: Germinability of *Albizzia lebbeck* seed immediately after treatment i.e. before ageing condition

Treatments	Germination		Mean root length (mm)	Mean shoot length(mm)	Vigour index*
	%	Arc-sin value			
Control	96	78.46	48	51	9900
Soaking-Drying (Water)	96	78.46	48	57	10080
Soaking-Drying (Salicylic acid, 10^{-2}M)	100	90	54	62	11600
Soaking- Drying (Benzoic acid, 10^{-2}M)	98	81.87	51	57	14602
Soaking-Drying (KNO_3 10^{-2}M)	96	78.46	49	59	10368
Soaking-Drying (NaCl, 10^{-2}M)	100	90	42	58	10000
L.S.D. at 0.05P	-	NS	NS	NS	-
L.S.D. at 0.01P	-	NS	NS	NS	-

Data were recorded after germination for 8 days at 28± 1°C temperature
Vigour index* = Seedling length ×Germination %

Table 3: Effect of pre-storage seed invigoration treatment on germination percentage and seedling length of *Albizzia lebbeck* seed after subjecting to accelerated ageing at 98% Rh and 40^0 C temperature for 10 days

Treatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigour index
	%	Arc-sin value			
Control	40	39.23	24	26	2000
Soaking-Drying (Water)	76	60.67	36	44	6080
Soaking-Drying (Salicylic acid, 10^{-2}M)	63	52.53	32	39	4473
Soaking- Drying (Benzoic acid, 10^{-2}M)	78	62.03	38	43	6318
Soaking-Drying (KNO_3 10^{-2}M)	88	69.73	41	49	7920
Soaking-Drying (NaCl, 10^{-2}M)	82	64.90	39	46	6970
L.S.D. at 0.05P	-	8.78	6	7	-
L.S.D. at 0.01P	-	12.47	8	11	-

Table 4: Effect of pre-storage seed invigoration treatment on germination percentage and seedling length of *Albizzia lebbeck* seed after 180 days natural ageing under ambient conditions (average relative humidity 85 ±3.2% and temperature 30 ± 1.6^{0}C)

Treatments	Germination		Mean root length (mm)	Mean shoot length (mm)	Vigour index
	%	Arc-sin value			
Control	34	35.67	20	26	1564
Soaking-Drying (Water)	34	35.67	21	30	1734
Soaking-Drying (Salicylic acid, 10^{-2}M)	54	47.29	26	36	3348
Soaking- Drying (Benzoic acid, 10^{-2}M)	62	51.94	29	35	3968
Soaking-Drying (KNO_3 10^{-2}M)	72	58.05	34	39	5256
Soaking-Drying (NaCl, 10^{-2}M)	68	55.55	33	35	4624
L.S.D. at 0.05P	-	4.63	5	7	-
L.S.D. at 0.01P	-	7.52	9	10	-

Regarding the mode of action of Hydration-Dehydration treatments, there are two main possibilities, viz. the involvement of cellular repair system in correcting age – induced biochemical lesions during seed hydration and free radical and lipid peroxidation reactions in the stored seed[4, 5, and 6] that could be reduced by hydration-dehydration treatments[13]. Some author reported that the possibilities of some seed volatiles may accelerate the loss of seed vigour and because of seed deterioration occurring inevitably in hermitically sealed containers even at sub-zero temperatures[14]. There is a greater level of lipid peroxides and accumulation of more peroxides in the artificially aged peanut seed. The role of iodine in the stabilization of double bonds of unsaturated fatty acid moieties of lipoprotein bio-membranes and controlling free radicals as a possible reason for viability of extension[11.] Chlorine would also be more or less similar to iodine in seed protective action [9, 10].

CONCLUSION

The present study proved that hydration-dehydration treatments with KNO_3 10^{-2}M and NaCl, 10^{-2}M solution has shown better results for the maintenance of vigour and viability of *Shirisha* seeds over control.

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