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2
3 EFFECT OF PRESOWING TREATMENT ON SEED
4 GERMINATION AND SEEDLINGS GROWTH
5 CHARACTERISTICS OF *ALBIZIA PROCERA*
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8 ABSTRACT

9 The present study was carried out at Departmental nursery to examine the effect of pre-
10 sowing treatment on seed germination and seedling growth characteristics of *Albizia procera*.
11 The germination test was conducted in nursery bed, polybags filled with mixture of soil,
12 sand and Farm yard manure decomposed at a ratio of 3:2:2. The seeds were collected from
13 Five provenances namely Bilaspur, Bastar, Korba, Raigarh and Sarguja of Chhattisgarh, India
14 were used in the study. Various pre-treatments were employed to record their effects on seed
15 germination and seedling growth response in the seeds collected from various provenances of
16 *A. procera*. After each treatment seeds of each provenance were tested for their germination.
17 Significant differences were observed due to pre germination treatments like cold water, hot
18 water, hormonal. Germination attributes, vegetative growth, survival percent and vigor index
19 was increased by all treatments over control set of each provenance. Except cold water
20 treatment all the other treatment show an enhancement in the root length shoot length number
21 of leaves and average leaf area as compared to the respective control of each provenance.

22 Keywords- *Albizia procera*, provenance, germination percentage, seedling growth, pre-
23 sowing treatments.

24 Introduction

25 *Albizia procera* commonly called (white siris) is one of the important species belongs to
26 family Fabaceae. It is a large, fast-growing medium to large sized deciduous tree that occurs
27 on many different sites. It is distributed throughout moist and dry deciduous forests of India.
28 In Chhattisgarh, the species found on alluvial grounds along streams and moist swampy
29 places. This species provides wood for a variety of purposes, nutritious fodder for livestock.
30 It is extensively planted in farm lands, agricultural bunds, wasteland, and roadside avenues &
31 is an important reforestation and agro forestry species, Due to its multipurpose use and

32 nitrogen fixing ability it is considered as one of the priority species in plantation programs.
33 To ensure successful plantation of Albizia species it is important to provide better planting
34 stock this can be achieved by seed treatments which can enhance seed germination rate and
35 germination process because the seeds of the species are exogenously dormant due to
36 impermeable seed coat or pericarp to water which impedes proper and complete germination
37 resulting in to low quality uneven stock. So seed treatments can influence seed germination
38 rate and germination process (Azad et al., 2006, 2011, 2012). The effect of pre-sowing treatments
39 on seed germination of some tropical forest tree species have been reported by various
40 authors for Albizia species (Matin and Rashid (1992), *Albizia procera* Ali et al., (1997), Khan
41 et al., *Melia azedarach* (2001), Alamgir and Hossain for *Albizia procera* (2005), Matin
42 et al., *Dalbergia sissoo* (2006), Azad et al. for *Albizia lebbbeck*. Different pre-sowing treatment
43 have been used by different Researchers to enhance seed germination of different species
44 including *Faidherbia albida* Diallo et al. (1996), *Acacia* spp Arefat et al., (2011), *Grewia*
45 *oppositifolia* Uniyal et al. (2000), *Terminalia chebula* Hossain et al. (2005), *Tetrapleura tetrapetra*
46 Ibiang et al. (2012) and *Adonsania digitata* for Falemara et al. (2014). The objective of this
47 study was to identify the most suitable pretreatment method that will increase germination of
48 *Albizia procera*.

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50 **Material and Methods**

51 The present study is carried out in the Departmental nursery and glass house Department of
52 Forestry, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, Bilaspur is a major city of
53 Chhattisgarh State and positioned in north western part of state, GGV is a central university
54 (area around 700 acres). The area is positioned between 21°47' and 23°8' north latitudes and
55 81°14' and 83°15' east latitudes. It has an average altitude of 264 m (866 ft) near the banks of
56 the rain-fed Arpa River with black-sandy soil. The weather of the area is tropical. It is hot and
57 humid, because of its nearness to the Tropic of Cancer and depending on the monsoons for
58 rains. There are average rains in the monsoon season. Its summer is very warm with
59 temperature between 30 and 47°C and between 5 and 25°C in winter. The flora of the area
60 has been classified as tropical deciduous forest.

61 A total of 05 provenances viz., Bilaspur, Bastar, Korba, Raigarh and Sarguja were selected
62 for the present investigation. From each of the provenances pods/seeds were collected from
63 five phenotypically superior trees located about 1000m apart from each other in order to avoid

64 narrowing down of the genetic base due to relatedness or inbreeding. Seeds from all the trees
65 of a provenance were mixed and a composite seed lot was made for each provenance.

66 An extensive survey was carried out for the selection of superior/plus trees for the collection
67 of pod/seeds in each provenance , The Selection was made on visual observations The
68 individuals trees with defective bole, bi forked , diseased, dead branches, or attacked by any
69 pathogen and pests were rejected in the initial stage of selection. The main characteristic
70 considered for the plus tree selection were middle age, cylindrical bole,with well developed
71 crown, straightness non-forking, non-twisting bole, free from buttresses and flutes and
72 minimum form characteristics. The preferred best phenotypically trees were dominating in
73 height and girth compared to its surrounding trees of the same species and age.

74 The germination tests were observed under glass house as well as in polybags in nursery
75 condition (Department of Forestry,GGV,Bilaspur). In Glass House, the experiment was
76 carried out in completely randomized design (CRD) and seeds were placed on sterilized
77 petridishes containing two Whatman germination test papers moistened with distilled water.
78 Observations on seed germination were made every day till the completion of germination.
79 Radicle emergence was taken as an index of germination ((Mackay et al., 1995).). In nursery,
80 the experiment was laid out in randomized block design (RBD) using 25 bags each in four
81 replications for each provenance. Seeds were sown in polythene bags of 30 x 45 cm size
82 filled with soil, sand and FYM in 3:2:2 ratio. Seeds were considered germinated when
83 sprouted plumules just emerged from the soil surface. The bags were regularly watered and
84 weeded in the nursery. Observations were made daily. The experiment was conducted in the
85 first week of May-2015.

86 The observations on morphological growth parameters were recorded *viz.*, plant height, collar
87 diameter, number of leaves and dry weights of root, stem, branch and leaf were made on ten
88 randomly selected seedlings .

89 Three pre-treatment methods were employed, namely, soaking in cold water for 24 hrs, in hot
90 water (50⁰c) for 24 hrs, and Harmonal treatment. These all pretreatments were undertaken
91 separately and compared with control i.e. seeds soaked in tap water for 24 hrs. After each
92 pre-treatment, the seeds were subjected to germination in nursery and the following
93 parameters were recorded. Germination percentage, Germination Energy Index,
94 GerminationValue, Germination Speed, Survival percentage, Seedling height, Number of
95 leaves. Data collected on seed morphology, germination and early seedling growth

96 parameters were subjected to Analysis of Variance (ANOVA). This was done to determine
97 the variation among provenances at a 0.05 significant level. The Duncan multiple range test
98 was used to compare means among provenances.

99 **RESULTS AND DISCUSSION**

100 Various pre-treatments were employed to record their effects on seed germination and
101 seedling growth response in the seeds collected from various provenances of *A. procera*.
102 After each treatment seeds of each provenance were tested for their germination and the data
103 has been depicted in **Table (2)**. On an average germination was (71.6, 71.44, 75.82, 80.02
104 respectively, when seeds were pre-treated with coldwater, hot water and hormonal treatment
105 for 24 hours, irrespective of provenances. In almost all the provenances, seeds pre-treated
106 with cold water had optimum germination as compared to those pre-treated with hot water
107 and hormonal treatment. Seeds pre-treated with hormone IAA had average highest
108 germination among all the provenances. Maximum (90.5%) germination was recorded in
109 Bilaspur provenance followed by (84.3%) Bastar provenance while the minimum (67.2%)
110 was observed in Korba provenance.

111 Effect of various pre treatment (Table 1) on germination value and germination
112 energy index differs significantly across different provenances highest germination value and
113 germination energy index was recorded by hormonal treatment across all the provenances
114 while coldwater recorded a minimum stimulation in germination value and germination
115 energy index respectively .The highest enhancement in germination energy index and
116 germination value where recorded for Bastar provenance after hormonal treatment and these
117 values were lowest for Korba provenance when exposed to coldwater treatment. The speed of
118 germination across all the provenances was enhanced significantly when the seeds were
119 exposed to hot water and hormonal treatment, in contrast the cold water treatment did not
120 recorded a significant difference in germination speed over control for each provenance. It
121 was observed that pre seed treatment with hormones at different concentration can stimulate
122 the germination behaviour of *Albizia procera* for each provenance.

123 The influence of different pre-seed treatments was also observed for different seedling
124 growth attributes of *Albizia procera* among different provenances. Across all the pre-seed
125 treatment the hormonal treatment also proved effective in stimulating different seedling
126 growth attributes for each provenance , it was observed that the coldwater treatment did not

127 significantly changed the shoot length, root length, number of leaves and leaf area than the
 128 control of each provenances. While as hot water treatment and hormonal treatment enhanced
 129 these growth parameters significantly and successively for each provenance.

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131 **Table 2 : Effect of various treatments on growth parameters of various provenances of *Albizia procera*.**

	CONTROL				COLD WATER				HOT WATER (50 ⁰ C)				HARMONAL			
PROVENENCE	SL	RL	NL	LA	SL	RL	NL	LA	SL	RL	NL	LA	SL	RL	NL	LA
BILASPUR	22.7	08.3	8	12.2	21.4	8.3	8	13.5	25.6	10.5	10	14.7	27.8	11.6	12	14.0
BASTER	21.3	11.4	8	10.0	22.7	9.2	8	11.4	23.2	10.0	10	11.6	25.0	10.5	10	12.5
KORBA	15.7	07.0	4	06.8	16.2	8.5	6	08.7	18.4	09.5	6	08.9	20.5	09.0	8	09.5
RAIGARH	17.8	08.8	6	08.4	17.2	7.9	8	08.7	21.5	10.9	8	10.3	23.6	10.0	8	10.6
SARGUJA	17.0	08.0	6	07.9	16.4	8.0	8	08.9	22.6	11.5	8	09.5	23.8	10.7	8	10.0
MEAN	18.9	8.7	6.4	9.06	18.78	8.38	7.6	10.24	22.26	10.48	8.4	11	24.14	10.36	9.2	11.32
SD (±)	2.97	1.65	1.67	2.10	3.04	0.52	0.89	2.15	2.63	0.78	1.67	2.30	2.64	0.96	1.79	1.88

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136 **Table 1: Effect of various treatments on Germination Percentage (GP), Germination Value (GV), Germination**
 137 **Energy Index (GEI) and Germination Speed(GS) of various provenances of *Albizzia procera*.**

	CONTROL				COLD WATER				HOT WATER(50 ⁰ C)				HARMONAL			
PROVENENCE	GP	GV	GEI	GS	GP	GV	GEI	GS	GP	GV	GEI	GS	GP	GV	GEI	GS
BILASPUR	84.0	46.2	44.9	15.2	80.2	40.6	34.6	12.2	86.2	46.6	42.6	16.2	90.5	49.8	44.5	16
BASTER	78.5	49.6	38.3	12.3	76.2	44.6	38.2	13.3	80.5	50.4	46.2	14.5	84.3	54.4	46.8	15.2
KORBA	60.0	18.8	29.8	7.1	62.3	21.2	30.5	8.8	65.4	26.9	32.5	12.7	67.2	29.5	34.6	12.5
RAIGARH	64.0	26.4	34.7	10.2	66.5	29.4	36.5	10.5	72.4	33.2	40.5	13.6	79.6	35.2	42.5	12.9
SARGUJA	71.5	34.3	33.8	10.7	72	37.6	32.7	9.4	74.6	38.9	36.4	14	78.5	40.6	39.9	13.7

MEAN	71.6	35.0	36.3	11.1	71.44	34.68	34.5	10.84	75.82	39.2	39.64	14.2	80.02	41.9	41.66	14.06
SD(±)	9.92	12.99	5.68	2.97	7.21	9.38	3.04	1.89	7.93	9.59	5.34	1.30	8.59	10.23	4.69	1.50

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139 **Discussion**

140 The presowing treatments influence the germination percentage of *A.procera* seeds. The seed
141 problems related to seed dormancy affect the use of species in nurseries for the production of
142 seedlings, it is because seed dormancy can vary from species to species so the pretreatments
143 should be given to that particular species (Amen,1968:Raees 1996) several authors (kobmoo
144 and hellum,1984; Khasa,1992; Yadav1992; Azad etal,2006a,2006b; Airi etal,2009; Azadetal,
145 2010a,2010b ,2011a, 2011b) have discussed different methods of pre-sowing treatments for
146 seed germination in order to break dormancy and enhance the rate of germination and speed
147 up the germination process.the findings of the present study shows that seedgermination of
148 *A.procera* under different pretreatment methods significantly increased ($p>0.05$) over the
149 control. Among the three pretreatments, immersion in coldwater, Hot water and hormonal
150 treatments showed higher germination success. similar studies have been done by sajeev
151 kumar etal (1995) carried out an experiment on seeddormancy and germination of *Albizia*
152 *falcataria* and *Albizia procera* and found that hotwater treatments of 40,60,70,80⁰c
153 significantly increased germination in these two species. Azad et al (2006a) reported that
154 their highest germination in hotwater treatment in *Albizia lebbeck*. The pre-treatment
155 methods by affecting germination also influenced the seedling growth the highest root and
156 shoot length (27.8 &11.6) were recorded with seeds treated with hormone and followed by
157 hot water, coldwater.

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160 Conclusion

161 The present studies revealed that there were difference in seed germination when the seeds
162 were pre-treated, so in order to produce large number of quality seedlings it is necessary for
163 pre-sowing treatments because it plays a vital role to enhance the seed germination.
164 According to our studies the best treatments for *A. procera* is hormonal treatment and hot
165 water treatments.

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