*Original Research Article*

# EFFECT OF PRESOWING TREATMENT ON SEED GERMINATION AND SEEDLINGS GROWTH CHARACTERSTICS OF *ALBIZIA PROCERA*


## ABSTRACT

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


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

## Introduction

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

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

**Material and Methods**

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

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

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

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

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

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

Three pre-treatment methods were employed, namely, soaking in cold water for 24 hrs, in hot water ($50^0$c) for 24 hrs, and Harmonal treatment. These all pretreatments were undertaken separately and compared with control i.e. seeds soaked in tap water for 24 hrs. After each pre-treatment, the seeds were subjected to germination in nursery and the following parameters were recorded. Germination percentage**,** Germination Energy Index**,** GerminationValue**,** Germination Speed**,** Survival percentage**,** Seedling height**,** Number of leaves. Data collected on seed morphology, germination and early seedling growth

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

## RESULTS AND DISCUSSION

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

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

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

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

**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** |

**Table 1: Effect of various treatments on Germination Percentage (GP), Germination Value (GV), Germination 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** |

## Discussion

The presowing treatments influence the germination percentage of A.procera seeds. The seed problems related to seed dormancy affect the use of species in nurseries for the production of seedlings, it is because seed dormancy can vary from species to species so the pretreatments should be given to that particular species (Amen,1968:Raees 1996) several authors (kobmoo and hellum,1984; Khasa,1992; Yadav1992; Azad etal,2006a,2006b; Airi etal,2009; Azadetal, 2010a,2010b ,2011a, 2011b) have discussed different methods of pre-sowing treatments for seed germination in order to break dormancy and enhance the rate of germination and speed up the germination process.the findings of the present study shows that seedgermination of A.procera under different pretreatment methods significantly increased ($p>0.05$) over the control. Among the three pretreatments, immersion in coldwater, Hot water and hormonal treatments showed higher germination success. similar studies have been done by sajeev kumar etal (1995) carried out an experiment on seeddormancy and germination of *Albizia falcataria* and *Albizia procera* and found that hotwater treatments of 40,60,70,80$^0$c significantly increased germination in these two species. Azad et al (2006a) reported that their highest germination in hotwater treatment in Albizia lebbeck. The pre-treatment methods by affecting germination also influenced the seedling growth the highest root and shoot length (27.8 &11.6) were recorded with seeds treated with harmone and followed by hot water, coldwater.

## Conclusion

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

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