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Short Communication

Scarification of Seeds Improves Seedling Growth in *Albizia lebbeck* (L.)

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Albizia lebbeck (L.) has large leaves with fragrant cluster of greenish yellow flowers and long seeded pods. It is known for treating respiratory problems, allergies , eye problem, purify blood and promote dental health. *Albizia lebbeck* (L.) is a fast growing tree, native to tropical Asia, belonging to Fabaceae family. The leaves are bipinnate, 7.5–15cm long with 1 to 4 pairs of pinnae, each pinna with 6–18 leaflets it has a long flat and oblong seed pods, 3-12 seeds per pod, brown and flattened. The leaves are nutritious rich in Protein, calcium, phosphorous, and amnio acid and it is an excellent fuelwood and charcoal species and the wood is used for furniture, veneer and construction purpose. This multi-usage tree has an ability to fix atmospheric nitrogen which improves the chemical structure of the soil. Drought resistant, and provides shade [1]. [2] stated that this tree is adapted to different soil types, from acid soils to alkaline soil and saline soils and it grows best on well-drained, moist soils. [3] reported that the acid scarification is considered as one of the most effective scarification methods used for seed scarification. [4] observed that sulphuric acid was the most popular and effective chemical to reduce hard seed of legume seeds. *Caesalpinia pyramidalis* recorded maximum shoot length in hot water treatment at 80 °C.

[5] determined that the scarification treatments increase the nutrient mineralisation which reduces the pest attack. Soil scarification is one of the main methods for enhancing natural regeneration and it is widely used before seeding and planting as well. Forage legume crops have ability to improve the soil health by fixing atmospheric nitrogen (N)reduce fertilizer cost and produce high quality forages. [6] reported that seed scarification in this technique helps to damage the seed coat to reduce hard seed and keeping the seed viable.

The process of artificially worn or weakened to render the seed coat permeable to gases and water by a process known as Scarification. The *Leucaena leucocephala* seeds were scarified by sandpaper, hot water and concentrated sulphuric acid showed significant germination effect over the control [7].

The seeds of Fabaceae family have impermeable seed coat. The thick hard seed coat is impermeable to water caused the physical dormancy on the seeds, it leads to irregular, slow germination and low germination rate [8-9] observed that acid and sand scarification treatments of species with hard seed coats is known to be highly effective in improving germination and breaking the physical seed dormancy. Mechanical and acid scarifications were effective in reducing hard seededness in alfalfa. The aim of this present investigation was to assess the effect of sand scarification and acid scarification on seed germination and seedling growth characteristics of *Albizia lebbeck (L.)*.

MATERIALS AND METHODS

The experiment was conducted in Seed Science and Technology Laboratory, Kalasalingam School of Agriculture and Horticulture from August 2020 to January 2021with an objective of to assess the effect of sand scarification and acid scarification on seed germination and seedling growth characteristics of *A. lebbeck*.The dried pods were collected directly fromthe standing *Albizia lebbeck (L.)* trees located in Kalasalingam Academy of Research and Education (KARE) campus at Krishnankoil, Virudhunagar, Tamil Nadu, India. Then, seeds were extracted manually by hand from the pods. Diseased, insect infested seeds and abnormal seeds were eliminated (Plate 1A&B).

The three treatments were taken as control (T1), scarification with concentrated sulphuric acid @100ml/kg for 20 minutes (T2), and sand scarification for 20 minutes (T3)in Completely Randomized Block Design

Plate 1. A. Seed extraction; **B.** Weighing graded seeds

under laboratory conditions and each treatment was replicated five timesto study the effect of scarification inseedling growth characteristics of *A. lebbeck.* The combination treatments were denoted as follows:

T1 : Control(without treatment)

T2 : Acid scarification

T3 : Sand scarification

75g of seeds were extracted and divided equally into three comprising 25g of seeds for each treatment (Plate 1B).25g of seeds were immersed in glass of 2 ml concentrated sulphuric acid and it was stirred for 20 minutes with three minutes interval in between. Then the acid was decanted and seeds were repeatedly rinsed six times in running tap water followed by tap water until considered safe to handle because long time exposure of seeds to acid may have caused damage to the seeds (Plate 2).

In sand scarification, the seeds were mixed with abrasive material sand in a ratio of 1:2. 25g of seeds and 50g of sand were rubbed and the sand scarification process is performed for 20 minutes (Plate 3).Petri plate method was practiced to observe the treatment effects on speed

Plate 2. Acid Scarification

Plate 3. Sand Scarification

of germination up to 15th Days after sowing.Speed of germination was calculated by the using formulagiven by Agrawal [10]

Speed of germination = n1/d1+n2/d2+n3/d3…..

Where, n = number of germinated seeds

d = number of days after sowing

After this, the seeds were allowed to germinate by roll towel method. Paper towels provides excellent medium for germinating seeds and help in the observation of germination of seeds.

The paper towel with 25 seeds was rolled and it was placed out in the buckets with water at room temperature (Plate 4). This was followed for all treatments. During the experimental period, watering process were performed regularly as needed.Germination Percentage

Plate 4. Roll towel method

was calculated by the formula (Number of normal seedlings/ Total number of seeds sown) x100.

Shoot length was measured from the collar region to shoot apex by centimeter scale and it was expressed in centimeter.Root length was measured from the collar region to root tip by centimeter scale and it was expressed in centimeter.The sum of shoot length and root length gives seedling length and expressed in centimeter. Vigour Index was worked out by multiplying Germination Percentage and Seedling Length(cm) [11].

The observed data were statistically analyzed by following the standard procedure of [12] using agres software package.

RESULT AND DISCUSSION

Highly significant results were observed among the treaments. *A. lebbeck* seeds sacrified with concentrated sulphuric acid (100ml/kg of seeds) for 20 minutes recorded maximum germination percentage (53%), shoot length (12.78 cm) and root length (13.86 cm) followed by seeds scarified with sand for 20 minutes. Where as the untreated control recorded zero (Plate 6) due to hard seed coats failed to imbibe water. The control seeds were not able to germinate even after 21 Days After Sowing (DAS). Seed germination percentage recorded by acid scarification was 52.8% increased over the mean germination (25%), where as in sand scarification the germination percentage was 23% and it was considered as second best treatment.The maximum shoot length (12.78 cm) was recorded by acid scarification and which was 22.06% increased over the second best treatment sand scarification (9.96 cm). As far as root length is concerened 13.86 cm was recorded by acid scarification followed by 6.67 cm was recorded by sand scarification (Table 1). Our observation was concurred with the previous findings of [13] showed acid scarification for 15 minutes yielded the highest germination percentage of 82% for [14] reported that the seeds soaked with concentrated sulphuric acid for 5 min with mechanical scarification and hot water soaking at 80°C drastically improved germination in *A. lebbeck,* suggesting that dormancy in these seeds might be due to the hardness of the seed coat.

The result of speed of germination were found to be highly significant among the treatments. The maximum speed of germination was recorded in acid scarification (T2) with an average of 0.89 and the minimum speed of germination was recorded in Control (T1) with the average

Table 1. Effect of scarification treatments on seed germination (%), shoot and root length (cm) of *A. lebbeck*

Treatments	Germination (%)	Shoot length (cm)	Root length (cm)
Control (T1)	0	0	0
Acid Scarification (T2)	53	12.78	13.86
Sand Scarification (T3)	23	9.96	6.67
Mean	25	7.58	6.84
SEd	2.26	0.34	0.55
CD	4.93**	0.74**	1.87**

*Significance at 5% ; **Significance at 1%

of 0 (Plate 5). The mean seedling length recorded by the seedlings developed from acid scarification was significantly maximum (26.64 cm) than the sand scarification (16.63 cm) and which was 37.58% increased over sand scarification and 45.87% increased over the mean seedling length (14.42 cm). About four times increased vigour index was recorded by acid scarified seeds (1406) than sand scarification (384). Where as untreated control recorded nil owing to there was no germination even after 21 DAS (Table 2). [15] observed that the physical dormancy with obtaining best seedling growth parameters, if the seeds pretreated with 37% concentrated of HCl and in this study found that the best pretreatment was obtained by immersion seeds in 37% concentration of HCl acid for 30min in terms of all growth parameters, germination percentage, shoot height (cm),

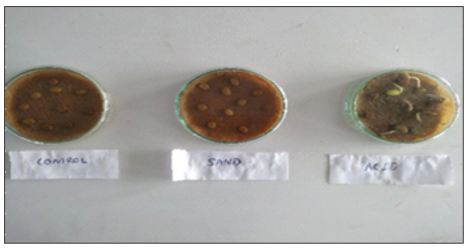

Plate 5. Effect ofscarification treatments on seeds after 8th DAS

Table 2. Effect of scarification treatments on seedling length and vigour index of *Albizia lebbeck*

Treatments	Speed of Germination	Seedling length (cm)	Vigour Index
Control (T1)	0	0	0
Acid Scarification (T2)	0.89	26.64	1406
Sand Scarification (T3)	0	16.63	384
Mean	0.296	14.42	597
SEd	0.07	0.58	54.49
CD	0.16**	1.27**	118.72**

Plate 6. Effect of scarifications on seed germination and seedling growth of *Albizia lebbeck* on 21 DAS

number of leaves and leaves area (cm2).H_2SO_4 plays a vital role to enhance the seed germination and seedling growth. Immersion of *A. lebbeck* seeds in 75 ml H_2SO_4 for 12 hours resulted in maximum germination as well as better seedling growth. Hence, this pre-sowing treatment can be used for breaking the seed dormancy and getting the improved germination and seedling growth [16]. [17] reported that the mechanical scarification and seed immersion in acid solution improved germination of seeds, mechanically scarified seeds had higher germination percentage 92.5 percentage than seeds with acids. Seeds soaked in 10 percentage sulfuric acid for 1-5 minutes exhibits higher germination value than seeds soaked in 20 percentage for 10 minutes in *Schizolobiumparahyba*. [18] found that the prosopis seeds scarified with Conc.H_2SO4, gave the good germination percentage irrespective of seed size.

Maximum shoot length (12.78 cm) was recorded by acid scarification and which was 22.06% increased over the second best treatment sand scarification (9.96 cm). As far as root length is concerened 13.86 cm was recorded by the seedings developed from acid scarification followed by 6.67 cm was recorded by sand scarification. The mean seedling length recorded by the seedlings developed from acid scarification was significantly maximum (26.64 cm) than the sand scarification (16.63 cm) and which was 37.58% increased over sand scarification and 45.87% increased over the mean seedling length (14.42 cm) (Plate 7B). The scarification with sulfuric acid, during 60 minutes of immersion, was efficient in overcoming the integumentary dormancy of [19]. [20] observed that the scarification was found to be an effective tool for reducing physical dormancy in silvery lupine, hairy bigleaf lupine, and silky lupine, thus allowing for a more efficient use of limited seeds. Immersion of *A. lebbeck* seeds in 75 ml H_2SO4 for 12 hours resulted in maximum germination as well as better seedling growth [21]. Hence, the present study revealed that concentrated sulphuric acid 100 ml/kg for 20 minutes can be used as pre-sowing or dormancy breaking treatment in *A. lebbeck* to get fast growth and vigourous seedlings.

CONCLUSION

The present investigationconcludes that the *A. lebbeck* seeds can be treated with concentrated sulphuric acid @ 100 ml/kg for 20 minutesto improve seed germination, speed of germination, seedling length and vigour index. The acid scarification treatment was found to be superior in all seedling parameters observed and sand scarification for 20 minutes was the second best treatment.

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