

## THE EFFECT OF PRETREATMENT METHOD OF SEED GERMINATION ON EARLY GROWTH OF *PARKIA BIGLOBOSA* (African Locust Beans).

Abdurrahman Dunoma & Mohammed Nuhu.

Department of Biological science Yobe State University, 7km, Sir Kashim Road P.M.B 1144. Damaturu, Nigeria.

Correspondent Author: Abdurrahman Dunoma, Email: [ibndunoma@gmail.com](mailto:ibndunoma@gmail.com)

| ARTICLE INFO                                                                                                                     | ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <b>Received:</b> August 15, 2024<br><b>Accepted:</b> September 5, 2024<br><b>Volume:</b> 4<br><b>Issue:</b> 2<br><b>KEYWORDS</b> | <i>The effect of temperature regulation and chemical, mechanical scarification of seed germination of Parkia biglobosa were carried out, after collecting seed of P.biglobosa from the mother tree. The seed treated by using sand paper (scarification), sulphuric acid (chemical), temperature (hot water), cool water and the untreated which is (control) were planting in the botanical garden. The result obtained show that there was a significance difference in daily temperature and the highest percentage of germination recorded was 70% when seeds were scarified by filling around circumference and at the micropyle. The article was devoted for analyzing the effects of different applied pre-treatments to African locust bean seeds on technical efficiency of this design mechanical scarification.</i> |
| Germination                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Treatment                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| P. biglobosa.                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### 1.0 INTRODUCTION

*The Parkia biglobosa*: also known as the locust beans tree, (African locust beans or nare) is a perennial deciduous tree of the family Fabaceae. It's found in a wide range of environment in Africa and is primarily grown for their pods that contain both a sweet pulp and valuable seeds. As a standing trees locust bean may have a positive effect on the yield of other nearby crop. *Parkia biglobosa* is a dicotyledonous angiosperm. It belongs to the family leguminosae-mimosoideae. It often grows to height of 20m. The seed is edible and prepared in many forms, it is made into condiment (iru) used extensively as flavoring and additives to soup and stews (Aliero, 2004). *P. biglobosa* also serves as windbreak and provides shade.

The important of these tree species cannot be over emphasized, because apart from their usefulness as fuel wood and fodder, *Parkia biglobosa* is an important source of food, industrial, and medicinal purpose.

**Medicine:** The bark is used as a mouthwash, vapor inhalant for toothaches, or for ear complaint. It is macerated in baths for leprosy and used for bronchitis, skin infections, pneumonia, sores, bilharzias, ulcers, washes for diarrhea, fever, malaria, violent colic and vomiting, venereal guinea worm, diseases, sterility, rickets, oedema and as a poison antidote. The leaves are used in lotions for burns, sore eyes, toothache and haemorrhoids while Seed is taken for tension, pulp for fevers, as a diuretic and as a mild purgative. Roots where used in a lotion for sore eyes.

**FOOD:** Most of the product from *P. biglobosa* is food. All the food products collected from *P. biglobosa* are important due to the seasonality of fruit maturation and food availability. In February or March, the young green whole pods are roasted and eaten by human. In March and April, the beginnings of 'hunger season' when other foods are becoming scarce, mature pods are collected for food. The seeds are used in preparation of *dawadawa*, a protein and fat rich food (Hall *et al.*, 1997).

**Gum or resin:** The mucilage from the part of fruit is made into a fluid and used for hardening earth floors and give a black glaze in pottery; the gum exudate is proteinaceous and contains the constituent sugars arabinose, galactose, glucuro and 4-0-methylglucuronic acid.

**Alcohol:** The fruit pulp can be fermented into an alcoholic beverage (Booth, 1988).

**Tannin or dyestuff:** The husks of the pods mixed with indigo it improve the lustre of dye products. Ash was prepared from the wood is used in dyeing for fixing the indigo. The Seeds and bark contain tan and bark is used in tanning. An aqueous extract of the husk, sometime with the bark is used to harden laterite beaten floors and sides of indigo pits; on the outside walls of houses it forms as weather proof sealing layer; it also gives a gloss to pottery after firing. The bark contains 12-14 % tannins which makes leather dark brown (FAO, 1988).

**Apiculture:** *Parkia biglobosa* attracts bees and is a popular tree among beekeepers on.

**Fuel:** The branches were also used for firewood.

**Fibre:** The sponges were made by pods and roots, and as strings for musical instruments. There is a tough membrane inner lining to the husk. It is used by people in central Nigeria to rove into twine to fix arrow-heads and to bind the notched end. In northern Ghana, Nankani women wear strings of it dyed black with *Acacia nilotica* (Burkill, 1995).

**Poison:** The bark and pods of locust beans contain pesticides; the alkaloid parkine that occurs in pods and bark may be responsible. The husks are used as fish poison and as a blue dye (FAO, 1988).

**Economic:** Economically *Parkia biglobosa* tree provide income and employment many household members in the savannah region, and particularly women who are more involved in processing and marketing of the tree products. Trading activities in the raw seeds, powered fruit pulp, the fermented food condiment (known as Daddawa), charcoal and firewood among others provide reasonable income and employment. Trading in other small products like knife handles and those of hoes, axes and cutlasses also provide additional income sources (Tee *et al.*, 2009).

### 3.0 MATERIALS AND METHODS

#### 3.1 COLLECTION OF SEED / MATERIAL

This experiment was conducted during the dry season May 2017 at the botanical garden of Biological Science department, Yobe State University Damaturu. The topsoil used was obtained from the Crop Farm in the university. The materials used for the experiment were polypots filled with the top soil in the botanical garden; matured seeds of *P. biglobosa* were collected from the natural forest of Damagum North, Fune Local Government area of Yobe State Nigeria. The seeds were washed, sun dried and stored in Flats for three days in a cool dry place.

The Materials used include the following: Seed of *P. biglobosa*, Sulphuric Acid, Sand paper, Petric dish, Distilled water, Polythene pot, and Test tube, beaker and measurement ruler. The seed were subjected to five different method of breaking seed dormancy.

#### 3.2 METHOD /SEED TREATMENT

##### 3.2.0 TREATMENT OF SULPHURIC ACID $H_2SO_4$

Acid treatment: The seeds were randomly selected and soaked in 100% concentrated  $H_2SO_4$  for 20 minute and immediately air dried before sowing according to Aleiro (2004).

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## **3.2.1 MECHANICAL SCARIFICATION (SAND PAPER)**

The mechanical treatment: The selected seeds were rubbed against the rough surface of the sand paper until slight exposure of the cotyledon of the seed.

## **3.2.2 HOT WATER**

Hot water treatment: The seeds treated were soaked in 100°C hot water for about 15 minutes and air-dried before sowing according to Aleiro (2004).

## **3.2.3 COOL WATER**

Cold water treatment: The seeds were soaked overnight for 24 h in cold water at room temperature and air-dried before sowing.

## **3.2.4 UNTREATED**

The seeds were sown without any treatment (as control)

The experiment was laid out in a completely randomized design and replicated three times. The seeds were watered at 3-5 days interval and weeding was done manually by hand pulling.

## **3.5 DATA COLLECTION**

Data were collected on the following parameters:

Germination rate (%): This was evaluated as the proportion of germinated seed expressed as germination percentage of the total number of seeds sown (ISTA, 1985) at 7, 14, 21, 28, 35, 42 and 49 day after sowing (DAS) that is,  
$$(\text{No of germinated seed} / \text{No of planted seed}) \times 100$$

Seedling assessment was carried out at weekly intervals beginning from the 24 DAS. Parameters assessed include: seedling height (using meter rule), numbers of leaves, numbers of branches were counted manually. The data was collected in percentage were transformed using the arc sin formula and then analyzed using the ANOVA data package and the Duncan Multiple Range Test (DMRT) was used to separate the means found to differ significantly

## **4. Results and Discussion**

The result of the different method of seed germination of *Parkia biglobosa* (locust bean) using various types of treatment weekly.





TABLE 4.1 PERCENTAGE GERMINATION

| TREATMENT                      | 1 <sup>ST</sup> WEEK | 2 <sup>ND</sup> WEEK | 3 <sup>RD</sup> WEEK | 4 <sup>TH</sup> WEEK | 5 <sup>TH</sup> WEEK | 6 <sup>TH</sup> WEEK | 7 <sup>WEEK</sup> |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------------|
| H <sub>2</sub> SO <sub>4</sub> |                      |                      |                      |                      |                      |                      |                   |
| 10M                            | 20.00±0.57c          | 50.00±0.57b          | 60.33±0.88b          | 60.00±0.57b          | 60.00±0.88b          | 60.00±0.00b          | 60.00±0.00b       |
| 15M                            | 21.67±0.88b          | 50.33±0.88b          | 59.67±0.88b          | 60.33±0.88b          | 61.00±0.57b          | 60.67±1.20b          | 61.67±0.88b       |
| 20M                            | 21.67±0.88b          | 51.00±0.57b          | 60.67±1.20b          | 61.00±0.57b          | 62.33±1.20b          | 61.33±0.88b          | 62.33±1.20b       |
| HOT WATER                      |                      |                      |                      |                      |                      |                      |                   |
| 10M                            | 0.00±0.00d           | 0.00±0.00d           | 50.33±0.88c          | 50.00±0.57b          | 49.67±0.33c          | 49.67±0.33c          | 50.00±0.00c       |
| 15M                            | 0.00±0.00d           | 41.00±0.57c          | 50.00±1.15c          | 51.00±0.57c          | 50.33±0.88c          | 50.67±1.20c          | 51.67±0.88c       |
| 20M                            | 0.00±0.00d           | 0.00±0.00d           | 53.33±3.84c          | 50.00±0.57c          | 51.67±0.88c          | 52.33±1.20c          | 52.33±1.20c       |
| COOL WATER                     |                      |                      |                      |                      |                      |                      |                   |
| 6H                             | 0.00±0.00d           | 0.00±0.00d           | 40.33±0.88d          | 40.33±0.88d          | 39.67±0.33e          | 39.67±0.33d          | 41.67±0.88d       |
| 12H                            | 0.00±0.00d           | 0.00±0.00d           | 40.33±0.33d          | 39.67±0.33d          | 41.00±0.57de         | 41.67±0.88d          | 43.00±1.52d       |
| 24H                            | 0.00±0.00d           | 0.00±0.00d           | 41.00±0.57d          | 41.67±0.88d          | 42.33±1.20a          | 42.33±1.20d          | 42.33±1.20d       |
| SCARIFICATION                  | 31.00±0.57a          | 70.33±0.88a          | 70.00±0.57a          | 70.67±1.20a          | 70.67±1.20a          | 71.00±0.57a          | 72.33±1.20a       |
| CONTROL                        | 0.00±0.00d           | 11.00±0.57e          | 10.33±0.88e          | 41.33±0.88d          | 39.67±0.33e          | 42.33±1.20d          | 42.33±1.20d       |
| TOTAL                          | 8.58±2.06            | 26.69±4.44           | 48.76±2.72           | 51.51±1.76           | 51.69±1.80           | 51.97±1.73           | 52.69±1.75        |
| P-VALUE                        | 0.000                | 0.000                | 0.000                | 0.000                | 0.000                | 0.000                | 0.000             |

The percentage germination of *P. biglobosa* showed in table 4.1. The result revealed that at 1<sup>st</sup> week scarification had the highest percentage of (31.00) followed by the H<sub>2</sub>SO<sub>4</sub> for 15m and 20m (20.67) then H<sub>2</sub>SO<sub>4</sub> for 10m (20.00) and the least was cool water, hot water and control with is (0.00) this result showed that there was highly significant difference among the treatment. 2<sup>nd</sup> week in this week the percentage germination also shows that the scarification had the highest percentage at (70.33)follow by H<sub>2</sub>SO<sub>4</sub> 20m (51.00)where H<sub>2</sub>SO<sub>4</sub> for 15m is (50.00)then follow by hot water 15m (41.00) and then follow by cool water 24hrs (20.00) and control had the percentage of (11.00) . And the least was 10m, 20m hot water,and 6hrs, 12hrs cool water. This result showed that there was highly significant difference among the treatment. in 3<sup>rd</sup> week the scarification had the highest percentage germination of (70.00) follow by H<sub>2</sub>SO<sub>4</sub> for 10m, 15m, 20m (60.33, 59.00, 60.67) and hot water for10m, 15m, and 20m ( 50.33, 50.00, 53.33) where cool water follow at 6hrs, 12hrs and 24hrs (40.33, 40.33, 41.00) and the least was control (10.33). Result showed that there was highly significant difference among the treatment. In week 4also scarification had the highest percentage germination of (70.67) followed by H<sub>2</sub>SO<sub>4</sub> for 10m, 15m, 20m (60.00, 60.33, 61.00) and hot water follow at (50.00, 51.00, 50.67) where the least was cool water and

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control (41.67, 41.33, 40.33, 39.67). The result showed that there was highly significant difference among the treatment. In week 5<sup>th</sup> showed that scarification had the highest percentage germination of (70.00) followed by H<sub>2</sub>SO<sub>4</sub> for 10m, 15m, 20m (60.33, 61.00, 62.33) and followed by hot water 10m, 15m, 20m (49.67, 50.33, 51.67) where the percentage germination of cool water followed by 24hrs, 12hrs (42.33, 41.00) and the least was cool water for 6hrs and control (39.67, 39.67). This finding showed that there was highly significant difference among the treatment. In 6<sup>th</sup> week the result revealed that scarification had the highest percentage germination of (71.00) followed by H<sub>2</sub>SO<sub>4</sub> for 20m, 15m, 10m (61.33, 60.67, 60.00) and then followed by hot water 20m, 15m and 10m (52.00, 50.67, 49.67) and the least was control, cool water for 24hrs, 12hrs (42.33, 42.33, 41.67 and 39.67). This result showed that there was highly significant difference among the treatment. Week 7<sup>th</sup> the result revealed that scarification had the highest percentage germination of (72.33) followed by H<sub>2</sub>SO<sub>4</sub> for 20m, 15m, 10m (62.33, 61.67, and 60.00). Where the hot water followed for 20m, 15m, 10m (52.33, 51.67, and 50.00) and the least was cool water and control. The result showed that there was highly significant difference among the treatment at P<0.01.

### 5.0. DISCUSSION

Significant relationship was observed between the germination of the seed treated and the seed that are untreated. In addition, significant and positive relationship was also found in the seed that are treated with sand paper and sulphuric acid are very fast in term of growing than the others that are treated and untreated (Control)

In a similar study, Ailero (2004) discovered that treatment of the seeds of *Parkia biglobosa* with sulphuric acid induced germination of the seeds. This observed significant differences, indicate that acid treatment of seeds stimulated prompt and uniform germination. This finding is similar to prior reports of Dachung and Verinumbe (2006) that acid treatment of the seed removes the waxy layer of the seed coat by chemical decomposition of the seed coat components as that similar to breakdown processes occurring during microbial attack. This observation also supports the findings of Duguma et al. (1998) who noted that acid scarification is the most effective way of improving seed coat permeability in seeds of *Parkia biglobosa* and *Leucaenaleucocephala*. Agbogidi et al. (2007) This observation also supports the findings of Duguma et al. (1998) who noted that scarification is the most effective way of improving seed coat permeability in seeds of *Parkia biglobosa*. Agbogidi et al. (2007) noted that germination period considerably and concluded that it was the best method, though, dangerous to handling.

The Result is also showed that the highest percentage of germination recorded was 70% when seeds were scarified by filling around circumference and at the micropyle. Germination percentages of 70% were recorded by sand papering and cracking respectively. This result agrees with earlier reports by Awodola (1994), Aduradola (1999).

### 5.1 CONCLUSION

The result showed in this study revealed that seeds mechanically scarified improved the seed germination and seedling growth. It is therefore recommended that mechanical scarification of seeds *P. biglobosa* may be effective for breaking dormancy and it improving the seedling vigour which can enhance the domestication and cultivation of these valuable seeds in the environments. The study found

that the treated seed of *Parkia biglobosa* have the highest rate of germination to the untreated one. The control and cool water treatment has least performance of 40% from this study which means that *P. biglobosa* seeds will germinate fairly well, but the percentage germination increased by pre-treating the seeds before planting, so as to reduce germination period and have higher percentage of germination rate.

## 5.2 RECOMMENDATION

Based on the finding of the present study I would recommended the treatment of *Parkia biglobosa* seed with mechanical scarification and sulphuric acid method for the fast germination and efficient seedling growth because considering the important role it plays in socio-economic and environment protection.

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### Conflicts of Interest:

The authors have not declared any conflict of interests.

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