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**PRELIMINARY ASSESSMENT OF GERMINATION AND EARLY GROWTH CHARACTERISTICS OF *ALBIZIA ZYGIA* (DC.) MACBR INFLUENCED BY DIFFERENT GROWTH MEDIA**

**SUMMARY**

*Albizia zygia* is an important multipurpose tree species that has not been domesticated. Thus, the study investigated the effects of different growth media on seed germination and seedling performance in the nursery for the purpose of domestication. The experiment was divided into two; experiment 1 and 2. Experiment 1 investigates the germination response while experiment 2 investigates the early growth response of *Albizia zygia* to different growth media. The experiment was conducted at the Forestry Nursery of the University of Agriculture Makurdi, Benue State, Nigeria. Both experiments were arranged in a completely Randomized Design (CRD) with three replicates. Pretreated seeds were sown into different media namely: Topsoil, sawdust, mixture of topsoil and sawdust and a control (river sand) for the germination studies while seedlings were transplanted into polypots filled with sawdust, mixture of topsoil and sawdust and topsoil (control) for the early growth studies. Data were collected on germination emergence, percentage germination, seedling height, number of leaves and stem diameter. The results revealed that germination emergence and percentage were significant at 5% level of probability ( $p > 0.05$ ), germination emerged earlier in sawdust and mixture of topsoil and sawdust (4th). The highest germination percentage was recorded in sawdust (95%). The growth attributes were influenced significantly by growth media. The highest mean seedling height (9.44cm), number of leaves (12) and stem diameter (0.16cm) were recorded in topsoil. Therefore, from the results topsoil and sawdust are recommended in raising *Albizia zygia* seedlings in the nursery for possible domestication on the field.

**Keywords:** *Albizia zygia*, germination, seedlings growth, domestication

**INTRODUCTION**

*Albizia zygia* (DC.) Macbr, belong to the subfamily of Mimosoideae in the family of Fabaceae. It is a deciduous tree that can attained 9 – 30 cm height with a spreading crown and a graceful architectural form. Its bole is tall and clear having a diameter of about 24 cm, the bark is grey and smooth. It is Native to Cameroon, Democratic republic of Congo, Gabon, Ghana, Kenya, Nigeria,

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Sudan, Tanzania and Uganda (Orwa, et al., 2009). Though *A. zygia* is considered a lesser used species. (Apetorgbor, 2007) or medium wood grade species on the basis of their quality (Ogunwusi, 2012), it produces valuable timber (Zabala, 1997) which has received some level of prominence in the international market (Apetorgbor, 2007). The use of the species in the reclamation of degraded cocoa farm land has been proven to be successful. (Ziblim, et al., 2012). Briquette produced from *A. zygia* sawdust was reported to have high calorific value (Aina, et al., 2009), the fodder are reported to be palatable for animal feeds (Tabuti and Lye 2009), while the leaves are used in preparing soup by the people of cross river state in Nigeria (Orwa et al, 2009). In local medicine different parts of this species is used for the treatments and remedy of diverse ailments and diseases. The bark sap is instilled in the eyes to treat ophthalmia, a bark decoction is administered to treat bronchial diseases, fever, (including malaria) and female sterility, and as a purgative, stomachic, antidote, vermifuge and aphrodisiac (Orwa et al., 2009). The gum produced from the trunk is used as a binding agent in pharmaceutical industry, reported to produce tablets with better mechanical properties and longer disintegration and dissolution times than those containing gelatin BP. (Kwabena, et al., 2009).

Potting media are the most important factors required for the production and survival of seedlings in the nursery. It has been adjudged to be the most critical factor determining seedling quality in the nursery (Baiyeri and Mbah, 2006). Different potting media have significant effect on the growth of plant seedlings (Vendrameet al., 2005). Healthy and vigorous seedlings can be produced from a balanced media with adequate nutrient supply. The presence of organic matter in a potting media is important. Organic matter performs numerous function in soil such as supply of essential nutrients, improves water holding capacity and aggregation, and prevents erosion (Carter 2002; Osaigboo and Orhue 2012; Khan et al., 2012). A suitable potting media is expected to have good physical and chemical properties that will support optimal growth and development of seedlings. (Abad et al., 2002). Tree establishment in the field and productivity of the Orchard and plantation depend on the quality of seedlings obtained from nursery (Baiyeri 2006).

Despite the versatility of the species, little effort has been made towards its domestication, probably because of the general assumption that tropical tree species has long gestation period and dearth of information on its growth requirements. With high demand and pressure on this important multipurpose tree species, if not domesticated and made available to farmers, the generation yet to come may be deprived of the benefits of this important tree species. This called for research on the growth requirements of *A. zygia*. Availability of healthy and vigorous seedlings is one of the important stages towards domestication/plantation establishment of tree species. This research was therefore conducted to assess the effects of different growth media on the germination and early growth characteristics of *A. zygia* in the nursery. This would provide information that will be useful in it domestication.

## MATERIALS AND METHODS

### Study site

The experiment was conducted at the Forestry Nursery of the University of Agriculture, Makurdi. The Nursery is located within the Guinea Savannah zone between latitudes 8o35E and 8o41E and longitudes 7o45N and 7o52N. The mean annual rainfall is between 1000mm-15000m while the mean annual temperature is between 29oc -50oc and relative humidity is between 60%and 80% but decreases in the early months of dry season.

### Seed Collection and Preparation

Matured and ripped pods of *Albizia zygia* were collected under the mother tree at Pila village and within the University Staff Quarters. The pods were broken down, seeds were decarped, cleaned and air dried to prevent microbial and fungal infestation. Seed viability test was carried out through floatation method (Wakawa and Usman 2016). Sawdust was collected from sawmill, topsoil was collected at the depth of 0-15cm and riversand (control) were collected from Forestry nursery. Topsoil and sawdust were mixed in the ratio of 1:1. Germination trays and polypots were filled with different growth media.



**Plate 1:** *Albizia zygia* Pods. **Plate 2:** Decarped Seeds of *Albizia zygia*

### Experiment

The experiment was divided into two; the first experiment was germination studies while the second experiment was early growth characteristics studies.

#### Experiment 1

Three hundred (300) viable seeds obtained by floatation test were pretreated using Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) of 98% concentration for 10 minutes to break the dormancy (Anim-Kwapong and Teklehaimanot 2001). Twenty five (25) seeds were then randomly selected and sown into different germination tray of 21 × 8 cm size filled with different growth media. The growth media were namely; Topsoil, Sawdust, mixture of topsoil and sawdust and a control (Riversand). This was replicated three (3) times and laid in completely randomized design (CRD). Emergence and germination percentage were recorded after the emergence of the plumule. The experiment was terminated at

third week after noticing no new germination. The experiment was laid out in completely randomized design (CRD) having four (4) treatments and replicated three (3) times.

### **Experiment 2**

Ten (10) Seedlings of relatively even growth from the first experiment (Experiment 1) were transplanted into polypots of equal dimension filled with different growth media namely; sawdust, mixture of topsoil and sawdust and topsoil only (control) and replicated three (3) times making thirty (30) seedlings for each treatment. This makes the total number of seedlings used to be ninety (90) in all. Watering was done once in a day during the eight (8) weeks duration of the experiment. The experimental was laid out in completely randomized design (CRD) having three (3) treatments and replicated three (3) times

### **Data Collection and Analysis**

The emergence of seedlings and number of leaves were counted physically, seedling height with a meter rule and stem diameter was obtained with the aid of a veneer caliper. Data collected were subjected to analysis of variance (ANOVA) ( $p < 0.05$ ) using STATISTICA package. The observed means were subjected to Least Significant Difference (LSD) for mean separation.

## **RESULTS**

### **Germination percentage**

The study revealed that sawdust (SD) and the mixture of topsoil and sawdust (TS+SD) emerged earlier on the 4<sup>th</sup> day from the sowing date, topsoil (TS) emerged on the 5<sup>th</sup> day and the control emerged on the 6<sup>th</sup> day from the sowing date (Table 1). The results also indicated that at the end of the experiment the highest germination percentage was recorded in SD (95%) followed by TS+SD (91%) and TS (87%). The least was observed in control RS (35%). (Figure 1).

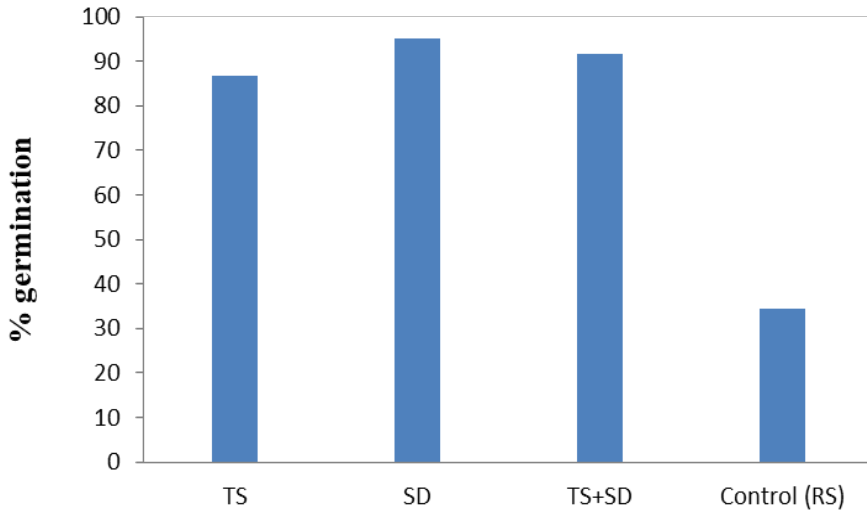
**Table 1.** Effects of growth media on emergence and germination of *A.zygia* seeds

<b>Growth Media</b>	<b>Number of days taken for first emergence</b>	<b>Number of seeds germinated</b>
TS	5	52
SD	4	57
TS+SD	4	55
Control(RS)	5	22

\*Means on the same row with different superscript vary significantly while those having the same superscript did not vary ( $p < 0.05$ ). TS-Topsoil, SD-Sawdust, RS-Riversand

### **Seedlings height (cm)**

Seedling height was influenced by the different growth media though the variation was not significant. The highest mean seedling height was recorded in top soil (Control) (9.47cm), the next was Topsoil +Sawdust (7.80cm) and the least was recorded in Sawdust (7.62cm) (Table 2).



**Figure 1:** Germination percentage of *A. zygia* influenced by growth media

**Table 2:** Effects of growth media on seedling height of *Albizia zygia*

Experimental period (weeks)	TS (Control)	SD	TS + SD	P-Value
Wk 4	6.04±0.55 <sup>a</sup>	5.18±0.61 <sup>a</sup>	5.57±0.55 <sup>a</sup>	<0.01
Wk 5	7.32±0.65 <sup>a</sup>	9.05±3.09 <sup>a</sup>	6.22±0.57 <sup>a</sup>	<0.01
Wk 6	8.24±0.72 <sup>a</sup>	7.24±0.57 <sup>a</sup>	6.89±0.61 <sup>a</sup>	<0.01
Wk 7	8.81±0.77 <sup>a</sup>	7.11±0.69 <sup>a</sup>	7.36±0.64 <sup>a</sup>	<0.01
Wk 8	9.47±0.82 <sup>a</sup>	7.62±0.73 <sup>a</sup>	7.80±0.75 <sup>a</sup>	<0.01

\*Means on the same row with different superscript vary significantly while those having the same superscript did not varies (p<0.05)

### Number of leaves

The results showed that there was an increase in the number of leaves among the different media though the variation was not significant. The highest mean number of leaves was recorded in Topsoil (12) followed by Topsoil +Sawdust (10) and the least was recorded in Sawdust (9) (Table 4).

**Table 3:** Effects of growth media on Number of Leaves of *A. zygia* seedlings

Experimental Period (weeks)	TS (Control)	SD	TS + SD	P-Value
Wk 4	5.00±0.46 <sup>a</sup>	4.30±0.51 <sup>a</sup>	4.20±0.49 <sup>a</sup>	<0.01
Wk 5	6.66±0.60 <sup>a</sup>	5.83±0.65 <sup>a</sup>	5.76±0.61 <sup>a</sup>	<0.01
Wk 6	9.16±0.71 <sup>a</sup>	7.03±0.70 <sup>b</sup>	6.30±0.61 <sup>b</sup>	<0.01
Wk 7	10.46±0.90 <sup>a</sup>	11.80±3.49 <sup>a</sup>	8.70±0.66 <sup>ab</sup>	<0.01
Wk 8	12.23±1.05 <sup>a</sup>	9.63±1.02 <sup>a</sup>	10.36±0.78 <sup>a</sup>	<0.01

\*Means on the same row with different superscript vary significantly while those having the same superscript did not varies (p<0.05)

### Stem diameter (cm)

The results also showed variation in stem diameter varies significantly among the different growth media. The highest mean stem diameter was recorded in Topsoil (0.16cm) followed by Topsoil+Sawdust (0.14cm) and the least was recorded in Sawdust (0.11cm). (Table 4)

**Table 4:** Effects of growth media on Stem Diameter of *A. zygia*

Experimental period (weeks)	TS (Control)	SD	TS + SD	P-Value
Wk 4	0.10±0.00 <sup>a</sup>	0.09±0.00 <sup>a</sup>	0.09±0.00 <sup>a</sup>	<0.01
Wk 5	0.12±0.00 <sup>b</sup>	0.11±0.01 <sup>b</sup>	0.55±0.45 <sup>a</sup>	<0.01
Wk 6	0.13±0.01 <sup>a</sup>	0.12±0.01 <sup>a</sup>	0.10±0.01 <sup>a</sup>	<0.01
Wk 7	0.15±0.01 <sup>a</sup>	0.12±0.01 <sup>a</sup>	0.13±0.01 <sup>a</sup>	<0.01
Wk 8	0.16±0.01 <sup>a</sup>	0.11±0.01 <sup>b</sup>	0.14±0.01 <sup>ab</sup>	<0.01

\*Means on the same row with different superscript vary significantly while those having the same superscript did not varies (p<0.05)

## DISCUSSION

The results obtained from the study indicate that *Albizia zygia* responded significantly to the different growth media. It shows the important role of growth media in the germination and domestication of *A. zygia*. The earlier germination of *A. zygia* seeds is an indication of the role played by germination media in enhancing germination. The highest germination percentage that was recorded in decomposed sawdust agrees with the work of Omokhua *et al.*, (2015) who reported highest germination percentage in sawdust but disagrees with Okunomo (2010) who obtained the highest germination percentage in topsoil with *Parkia bicolor*. This also disagrees with the work of Dickens (2011) who reported the highest germination percentage in river sand with *Irvingia wombulu*. The observed difference in germination response of different species to different media reported by different researchers might be attributed to difference in the type species. Difference in germination and seed viability were observed by Hossain *et al.*, (2014) to vary according to the type of species.

The mean seedling heights are statistically significant among the different media. The highest mean seedling height observed in topsoil supports the work of Egharevba *et al.*, (2005) who obtained highest height in topsoil using African walnut (*Plukenetia nophorum*) and Omokhua *et al.*, (2015) who also obtained highest height of *Terminalia ivorensis* in topsoil. The result also supports the work of Anber (2011) who also obtained the highest seedling height in topsoil with *Bauhinia variegata* and *Delonix regia*. The result is also in conformity with the work of Okunomo *et al.*, (2009) who reported the highest plant height in top soil with *Persea americana*. This could be attributed to the presence of organic matter in topsoil and good aeration and moisture retention ability associated with it. The highest number of leaves recorded in topsoil collaborates with the work of Sabo (2002) and Agbogidiet *et al.*, (2007) who highest number of leaves in topsoil. This contradict the work of Olawuyi *et al* (2002) and Ndor *et al.*, (2012)

who reported highest number of leaves of *Telferia occidentalis* in sawdust. The high number of leaves recorded in topsoil is similar with the findings of Okunomo *et al.*, (2009) which could be related to the high water retention ability and organic matter content of topsoil.

The highest stem diameter recorded in topsoil is an indicative of the top soil to support plant growth. This collaborates with the findings of Sabo (2002) who recorded the highest stem diameter in topsoil. The result disagrees with the work of Ndoret *et al.*, (2012) who obtained highest stem diameter of *Telferia occidentalis* in riversand. The significant differences observed in the performance of seedlings in top soil indicated that topsoil is rich in organic matter, contains good nutrient supply, aeration and water retention. This assertion had been shown to be true from the work of Usman *et al.*, (2013), Akinyele and Wakawa (2017). Darvish *et al.*, (2015) opined that type of growth media influenced the availability of some nutrients such P and N which will influence growth of a plant.

### CONCLUSION

Most nursery practitioners are unable to identify the right soil suitable for growing lesser known species. On the basis of this study, the results have shown that type of growth media significantly influenced the germination and growth performance of *Albizia zygia*. Decomposed sawdust gave the best in germination percentage while topsoil has shown to be the best in terms of increased in seedling height, number of leaves and stem diameter. Therefore, the results suggested that sawdust and topsoil should be recommended for raising seedlings in nursery for possible distribution to local farmers for the establishment and large scale production of *Albizia zygia*.

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