

Full Length Research Paper

Comparative Effect of Different Soil Sources on the Growth and Germination of *Albizia lebbbeck* (L.) Benth

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ABSTRACT: This study investigated the effect of selected soil sources on the germination and growth of *Albizia lebbbeck* (L.) Benth. The seedlings of *Albizia lebbbeck* were transplanted into a 2kg pot filled with different soil sources. Seven treatments were used and these are T₁ -Agric farm soil, T₂ -dumpsite soil, T₃ -plantation soil, T₄ -Agric farm + waste dumpsite soil, T₅ -Agric farm soil + plantation soil, T₆ -Waste dumpsite + plantation soil, and T₇ -Agric farm + waste dump site + plantation soil. Treatments were arranged in Completely Randomized (CRD) with six replicates. Data collection commenced two weeks after the seedling transplant. Parameters assessed were subjected to Analysis of Variance (ANOVA). The result shows that the treatments are significantly different from one another on the growth response of *Albizia lebbbeck*. However T₃ (plantation soil)

gave the best performance with the stem diameter, number of leaves, and leaf area with a value of (3.0mm, 28.8mm, 86.0) respectively while T₂ (dumpsite soil) produced the best performance in plant height with the mean value of 34.9. It is therefore concluded that T₃ (plantation soil) had the best performance on the growth response of *Albizia lebbbeck* seedlings. The study recommends that *Albizia lebbbeck* seedlings should be raised at the nursery stage with plantation soil in order to increase the growth of the plant and have more vigorous seedlings for plantation establishment.

Keywords: Albizia lebbbeck, soil source, germination

INTRODUCTION

Forest is a large area dominated by trees. It constitutes one of the principal renewable natural resources of mankind. They are essential in maintaining environmental stability, provision of raw materials for wood based industries, food and employment for millions of people particularly in the rural area (FAO, 2005). Forest is one of the natural resources which God endowed the human race with. The importance of this lies in the various tree species and non-timber forest produce are extracted from the forest for human use, and it is for this purpose that the aforementioned species are being established (Schilling and Chiang 2011). Forest plantations are generally intended for the production of timber and pulpwood. They can provide ecosystem services such as maintaining soil nutrient, watershed, soil structure regeneration and carbon storage (Armstrong, 2000., Beet, 1999 and Carter et al., 2004). Soil is the unconsolidated mineral material within the layer of earth crust that serves as natural medium for growth of Plants. Soil differs from in mineral content depending on the ability of the species to recycle nutrient (Brady and weil,

2010). The soil thus contributes to tree growth in very fundamental ways. They dictate how best it can be managed to obtain the highest yield as well as the type of tree to grow (Aziz *et al.*, 2008). The different soil sources include plantation soil, forest and actively cultivated forest soil. *Albizia lebbbeck* is a fast growing tree species majorly common in the tropical rainforest zone of Nigeria. It extends to environmental, medicinal value and so on. *Albizia lebbbeck* is a species of Albizia, native of indomalaya, New Guinea and Northern Australia and widely cultivated naturalized in other tropical and subtropical region. It has been noticed that natural forest which has greatly contributed to the economy of Nigeria providing large quantity indigenous timber such as *Albizia lebbbeck* and other produce for both internal and external trade can no longer satisfy both the present and future demand of the daily increasing population (Comerford, 2005; Emery et al., 2001; FAO, 2007). *Albezia lebebeck*; has a variety of vernacular names including Siri's, Koko, Vagai (India), legit (Japanese), Kitoke, tarisi (Sudanese), khago, kese (Ihai), East Indian walnut. *Albizia lebbbeck*

belong to the family mimosaceae and is a genus of about 100 species, very close to acacia but formally distinguished by the stamen being fused at the base. It is worth researching due to its economic importance especially in the area of livestock feed in which leaf is being used. This serves as a source of protein for animals. The wood when matured is used in furniture making due to the ability to hold polish (Ali *et al.*, 2004). In many research works, raising of viable planting stocks is one of the factor to consider by forest manager, therefore special care is needed to raise good planting stock. To achieve this, there is need to determine the different soil sources that will facilitate the growth of the planting stock. The objective of this study is to determine the effect of different soil sources on the germination and growth of *Albizia lebbbeck* (Glanz, 1995; Hackl *et al.*, 2004; Jagadamma and Lal Hoef, 2008; Johnson and Curtis, 2001).

MATERIALS AND METHODS

Collection of materials

The seed of *Albizia lebbbeck* was collected from the mother tree at forestry Research institute of Nigeria, Ibadan). The seed was collected, extracted before broadcasting. This study also involve the use of different soil sources namely; plantation soil, waste dump site soil and agricultural farm soil. Plantation soil was taken from *Gmelina arborea* plantation plot at Federal department of forestry within Federal College of forestry Ibadan. The waste dump site soil was taken from Ajakanga waste dump site and the agricultural farm soil from school farm.

Experimental site

The experiment was carried out within the premises of Federal college of forestry Ibadan located within the Government Reserved Area (GRA) Jericho, Ibadan North West local Government Area of Oyo State. The area lies at latitude 70.2°N and longitude 3.51°N, the climate pattern of this is tropically dominated by annual rainfall ranging from 1,300 - 1,500mm and average temperature is 26°C. The eco climate of the dry season usually commence from November to March while the raining season is usually form April to October (FRIN, 2015).

Material used

The materials are:

- (i) *Albizia lebbbeck* seed
- (ii) Sterilized river sand
- (iii) Germination basket
- (iv) Watering can

(v) Different soils; Plantation soil, Waste dump site soil and agricultural farm soil

(vi) Water

(vii) Ruler

(viii) Venier caliper

Method

The river sand was collected, sterilized and poured into the germination basket; also the seeds were collected, extracted and planted into the three germination baskets by broadcasting method. Germination was noticed 14 days after sowing. As the end of germination period, uniform and vigorous seedlings were selected and transplanted into the different polythene pot filled with different soil type (Table 1).

RESULTS AND DISCUSSION

The result presented in the Table 2 revealed the effect of different soil sources on the height of *Albizia lebbbeck* seedlings. It was observed that seedlings raised with Agric farm soil (T₅) performed best with the mean value of 34.9 cm, followed by seedlings raised with agriculture farm soil + dumpsite soil (T₄) with the mean value 31.8cm. Seedlings raised with dumpsite soil (T₂) had the least height with the mean value of 20.7cm. This was perceived to have happened because dumpsite has least nutrient composition in it. However, the result obtained revealed that height of the seedlings vary as a result of the different soil samples applied to them. Therefore, this work supports the work of Lowry and Seebeck (1997) that discovered that dumpsite soil has less contribution to the growth of *Mansonia altissima*. The result from the Analysis of Variance indicated that there was significant difference among the treatment at 5% level of probability.

The result presented in the table 3 revealed the effect of different soil sources on the stem diameter of *Albizia lebbbeck* seedlings. It was observed that seedlings raised with plantation soil, Agric. Farm soil + plantation soil (T3T5) performed best with the mean value of 3.00mm, followed by seedlings raised with Agric farm soil + waste dumpsite soil (T4) with the mean value of 2.80mm. Seedlings raised with dumpsite soil (T2) performed least with the mean value of 1.96mm. However, the result obtained revealed that the stem diameter of the seedling vary as a result of the different soil samples applied to them. Therefore, this work supports the work of Myers, (2000) who identified that natural forest soil has great influence on the growth of *Azadirachta indica*. The result from the analysis of variance indicated that there was significant difference among the treatments at 5% level of probability.

The result presented in the Table 4 revealed the effect of different soil sources on the number of leaves of

Table 1: Chemical Analysis of different soil sources used for the experiment.

Sample Label	Dumpsite	Agric Farm Soil	Plantation Soil
pH (H2O)	7.69	6.05	6.65
O.C	3.09	0.46	1.78
O.M	5.33	0.79	3.07
TN%	0.27	0.04	0.15
Na Cmol/kg	5.95	0.03	3.2
Ca Cmol/kg	9.58	1.40	1.60
Mg Cmol/kg	0.99	0.13	1.81
K Cmol/kg	1.38	0.10	0.03
Fe mg/kg	1	3	2
Cu mg/kg	2	10	14
Mn mg/kg	22	142	154
Zn mg/kg	6	18	36
P mg/kg	2.52	6.93	1.56
% Clay	15	9	17
Silt	14.5	6.5	6.5
Sand	70.5	84.5	76.5

Source: FRIN Laboratory Result, 2019

Table 2: Effect of Different Soil sources on the Height of *Albizia lebbbeck* Seedlings.

Treatments	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12	Mean
T ₁	7.5	11.5	27	32	43	48	28.2d
T ₂	9.4	12.6	18	24	28	32	20.7e
T ₃	10	15.5	28	32	43	48.5	39.5c
T ₄	9.5	16.5	29.6	33	48	54	31.8b
T ₅	10	15.5	30	35	57	62	34.9a
T ₆	9.5	15.5	24	31.6	43	47	28.4d
T ₇	9	11.5	17.5	22	32	36	21.3e

Means with the same letters are not significantly different at p<0.05

Table 3: Effect of Different Soil sources on the Stem Diameter (mm) of *Albizia lebbbeck* Seedlings.

Treatment	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12	Mean
T ₁	1.13	1.49	2.67	2.86	2.86	2.90	2.30c
T ₂	0.61	1.92	2.05	2.21	2.46	2.51	1.96d
T ₃	0.77	1.67	3.50	3.91	3.97	4.01	3.00a
T ₄	1.21	1.88	3.20	3.46	3.53	3.62	2.80b
T ₅	1.30	2.10	3.36	3.59	3.67	3.72	3.00a
T ₆	1.09	1.91	3.18	3.29	3.42	3.49	2.73b
T ₇	9	11.5	17.5	22	32	36	21.3e

Means with the same letters

Albizia lebbbeck seedlings. It was observed that seedling raised with plantation soil (T3) performed best with the mean value of 28.8cm, followed by seedling raised with agriculture and dumpsite soil (T4) with the mean value of 28.3cm. Seedlings raised with dumpsite soil (T2) had the least with the mean value of 22.8cm. However, the result obtained revealed that height of the seedlings vary as a result of the different soil samples applied to them. Therefore, this work supports the work of Maku and Gbadamosi (2004) that discovered that natural forest soil and plantation soil has great influence on the growth of *Mansonia altissima*. The result from the analysis of variance indicated that there was significant difference among the treatment at 5% level of probability.

The result presented in the table above revealed the effect of different soil sources on the leaf area of *Albizia lebbbeck* seedlings. It was observed that seedlings raised with plantation soil (T3) performed best with the mean value of 86.0cm² followed by seedlings raised with plantation + dumpsite soil (T6) with the mean value of 77.1cm² while seedlings raised with dumpsite soil (T2) performed least with the mean value of 61.3cm². However, the result obtained revealed that height of the seedlings vary as a result of the different soil samples applied to them. Therefore, this work supported the work of Miller (2001) who identified that natural forest soil and plantation soil has great influence on the growth of *Mansonia altissima*. The result from the analysis of

Table 4: Effect of Different Soil sources on the Number of Leaves of *Albizia lebbek* seedlings.

Treatment	WK 2	WK4	WK6	WK8	WK10	WK 12	Mean
T1	9.0	15.0	23.0	30.0	34.0	38.0	24.8c
T2	11.0	15.0	21.0	26.0	30.0	34.0	22.8d
T3	9.0	15.0	27.0	32.0	42.0	48.0	28.8A
T4	11.0	16.0	27.0	32.0	40.0	44.0	28.3A
T5	10.0	13.0	19.0	26.0	33.0	38.0	23.3D
T6	9.0	16.0	24.0	30.0	38.0	43.0	26.7B
T7	11.0	15.0	19.0	24.0	33.0	36.0	23.0D

Means with the same letters are not significantly different at $p < 0.05$

Table 5: Effect of Different Soil sources on the Number of Leaves of *Albizia lebbek* seedlings.

Treatment	WK 2	WK4	WK6	WK8	WK10	WK 12	Mean
T1	22.0	38.0	64.0	95.0	93.0	105.0	69.5
T2	24.0	38.5	60.0	90.0	72.5	83.0	61.3
T3	24.9	36.5	88.0	107.0	124.5	135.0	86.0
T4	24.0	38.2	60.0	108.0	88.5	97.5	69.0
T5	24.0	32.0	62.0	91.0	80.0	93.0	71.1
T6	22.0	39.2	72.0	104.5	108.0	117.0	77.1
T7	20.6	75.0	63.0	84.0	100.0	112.0	75.8

Means with the same letters are not significantly different at $p < 0.05$

variance indicated that there was significant difference among the treatments at 5% level of probability.

Conclusion

Considering the economic importance of the species, the need for its optimum growth is very important for improving the quality of species and for environmental control. The result obtained from this study showed that plantation soil (T3) gave the best performance with the stem diameter, number of leaves, leaf area with the mean values of (3.0mm, 28.8mm, 86.0cm²) respectively while plantation + dumpsite soil had the best performance with plant height with the mean value of 34.9cm. it was also observed that *Albizia lebbek* seedlings had poor performance in dumpsite soil in all parameters assessed.

Recommendation

Based on the result obtained, I therefore recommend the use of plantation soil for raising of *Albizia lebbek* seedlings since it produced a better growth rate in the aforementioned parameters considered.

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