



THE INFLUENCE OF SOWING MEDIA ON THE GROWTH PERFORMANCE OF *Piliostigma thonningii* (Schum) MILNE-REDH.

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ABSTRACT

A study was conducted to evaluate the Influence of sowing media on the growth performance of P. thonningii in a nursery. 90 seedlings of P. thonningii were subjected to top soil, saw dust and river sand respectively. The experiment was laid in a Completely Randomized Design (CRD) with 3 treatments and replicated 30 times. The following variables were measured for a period of 12 weeks: plant height, stem girth and number of leaves. The results revealed that there were significant differences ($p \leq 0.05$) among the growth media on the height, collar diameter and number of leaves. Top soil had the highest mean values of height (7.12 ± 0.65), collar diameter (1.89 ± 0.15) and number of leaves (5.13 ± 0.35). This was followed by sawdust with 3.88 ± 0.40 cm for the height, 1.40 ± 0.15 cm for the collar diameter and 3.31 ± 0.22 for the number of leaves. River sand had the lowest mean values of height (0.24 ± 0.22), collar diameter (0.06 ± 0.05) and number of leaves (0.17 ± 0.15). It is therefore recommended that top soil should be used for optimum growth and development of P. thonningii improved quality seedlings in the nursery for successful afforestation programme.

Key words: *Piliostigma thonningii*, Seedlings, Ecologically, Species and nursery

INTRODUCTION

Indigenous trees are ecologically valuable as they conserve biodiversity and ecosystems as well as the beauty of landscapes. Native trees are more adaptive to local climatic conditions and soil, need less water, and help to maintain natural balance (DeFries *et al.*, 2007). *Piliostigma thonningii* (Schum) Milne-Redh is a leguminous plant belonging to the family Fabaceae and sub-family caesalpinioideae (Lock and Simpson, 1999). In Nigeria, the plant is locally called kalgo in Hausa, Abafe in Yoruba and okpoatu in Igbo. The common names include camel foot and monkey bread (Jimoh, and Oladiji, 2005). The deciduous tree with a single stem. The tree is highly utilized by the local people. It flowers from December – February. An interesting feature of camel's foot is that the male and female flowers occur on different trees in most cases. If on the same tree, male flowers occur first

and then female flowers later so that self-pollination is not possible. Flowers followed by large, thick, reddish brown, non-splitting pods about 30 to 70mm long (Neuwinger, 2000). *P. thonningii* is native to tropical Africa. In Nigeria, it is found growing abundantly as a wild weed in many parts of Nigeria such as Abeokuta, Bauchi, Ilorin, Plateau and Zaria (Jimoh and Oladiji, 2005).

P. thonningii is widely used in African traditional medicine or healing. Tender leaves are chewed and the juice swallowed to treat stomach ache, coughs, and snake bite. The ash obtained from burnt leaves is robbed into snakebite wounds after scarification in order to hasten healing (Neuwinger, 2000). Root preparations are applied on wounds and ulcers as a haemostatic and to promote healing. They are also used as a diuretic and for the treatment of diarrhoea, dysentery,

worms and other intestinal problems (Aderogba, 2004). *P. thonningii* is an agroforestry tree, suitable for intercropping with crops. It provides good shade and serves as shelterbelt in homesteads when in full foliage (Orwa and Simons, 2009). It is used in live fences around fields and as a live support for vines of weaker plants. Honeybees forage for abundant pollen and nectar in dry land areas and the tree is recommended for planting to increase honey production (Bekele-Tesemma, 2007).

Nigeria only research on timber species and their utilization are recognized among the foresters. This may be as a result of less preferential treatment given to non-timber species. *P. thonningii* stands out as one of the most vital shrub of savanna tropical ecosystem as well as a multipurpose indigenous species which is widely used locally and industrially. Hence, it is necessary to carry out experiment on growth performance of *P. thonningii* as an example of non-timber species which is generally known throughout the Savannah region. This is to alleviate to a large extent the imminent utilization of the species and mass production for afforestation program.

MATERIALS AND METHODS

The experiment was carried out at forestry Research Institute of Nigeria Ibadan, Oyo State, Nigeria. The area climate is tropically dominated by rainfall patterns ranging between 1400 mm-1500mm. The mean maximum temperature is 31.9 °C, minimum 24.2 °C while the mean daily relative humidity is about 71.9 %. The eco-climate of the area is rainfall with two distinct seasons which are dry season (usually commencing from November to March) and wet season (usually from April to October). (FRIN Annual Meteorological Report, 2016).

The river sand used was collected from a stream close to ornamental nursery of Forestry Research Institute of Nigeria (FRIN) where it was thoroughly washed. The germination boxes were gotten from the

Estate Department of FRIN. Three sowing media, namely: River sand, Top soil and Sawdust were used for the experiment. The top soil was collected from central nursery of FRIN, Ibadan while sawdust was collected from the Forest Product Development and Utilisation (FPD&U) Department of FRIN. Each sowing medium was filled into 30 polythene pots each. Seeds of *Piliostigma thonningii* were raised in germination box filled with river sand and after germination, seedlings of uniform height were picked and transplanted into polythene pots. Each treatment (sowing medium) thereby comprised of 30 seedlings each. Soil and sawdust analysis were carried out to determine the availability of the nutrient status of each of the element in both medium.

The seeds of *Piliostigma thonningii* were sown into germination boxes filled with river sand and watering was done once a day in the morning. After germination, ninety healthy seedlings of uniform height were selected from the boxes and then transplanted into polythene pots already filled with two kilogram (2kg) of top soil, sawdust and river sand respectively and these were left for two weeks, so as to adapt to the new environment before commencement of the readings. The experimental design used for this experiment was Completely Randomized Design (CRD). It consisted of three treatments replicated 30 times making total of ninety seedlings.

The parameter assessed included shoot height, collar diameter and leaf count weekly for the period of 12 weeks. Data generated from growth parameters measurement was subjected to Analysis of Variance (ANOVA) and means separation with Duncan Multiple Range Test (DMRT) at 5% probability level of significance.

RESULTS

This study showed that *P. thonningii* seedlings are difficult to raise if sown in unsuitable media because they possess hard seed coat which can only be overcome by pre-treatment or if planted in a favorable

medium., In this study different growth responses were observed for the various sowing media. Treatment T₁ (topsoil) had the highest growth rate in plant height, collar diameter and leaf number (Table 1) Mean values showed that height growth of the seedlings grown with topsoil was the highest with 7.21 cm ,leaf production had 5.00 cm

while the collar diameter had 1.85 while the height growth of the seedlings grown with river sand gave the lowest with 0.24 cm., leaf production had 0.00 while the collar diameter had 0.06 . Moreover, the height growth of the seedlings grown with sawdust gave 3.88 cm, leaf production had 3.00 while the collar diameter 1.4

Table 1: Analysis for influence of Sowing media on the Growth Performance of *P. thonningii* Seedlings

Parameter	SV	df	SS	MS	F	Sig.
Height (cm)	Treatment	2	712.78	356.39	55.54	0.00*
	Error	87	558.23	6.42		
	Total	89	1271.01			
Collar Diameter (mm)	Treatment	2	54.17	27.09	56.00	0.00*
	Error	87	42.08	0.48		
	Total	89	96.25			
Number of leaves	Treatment	2	377.93	188.97	98.22	0.00*
	Error	87	167.39	1.92		
	Total	89	545.32			

*significant at ($p \leq 0.05$)

Analysis of Variance (ANOVA) in table 1 revealed that there were significant difference ($p \leq 0.05$) in the influence of different media on the height, collar diameter and leave number of *P. thonningii* seedlings .Table 2 showed mean separation result that the height, collar diameter, leaf number of *P. thonningii* seedlings in the different media significantly different from each other. .

Table 2: Mean separation (LSD) for the Effect of Growth Media on the Growth Performance of *P. thonningii* Seedlings

Parameter	Height (cm)	Collar diameter (mm)	Number of leaves
Topsoil	7.12 ± 0.65 ^a	1.89 ± 0.15 ^a	5.13 ± 0.35 ^a
Sawdust	3.88 ± 0.40 ^b	1.40 ± 0.15 ^b	3.31 ± 0.22 ^b
River Sand	0.24 ± 0.22 ^c	0.06 ± 0.05 ^c	0.17 ± 0.15 ^c

Means±SE with different alphabet in columns are significantly different from each other ($p \leq 0.05$)

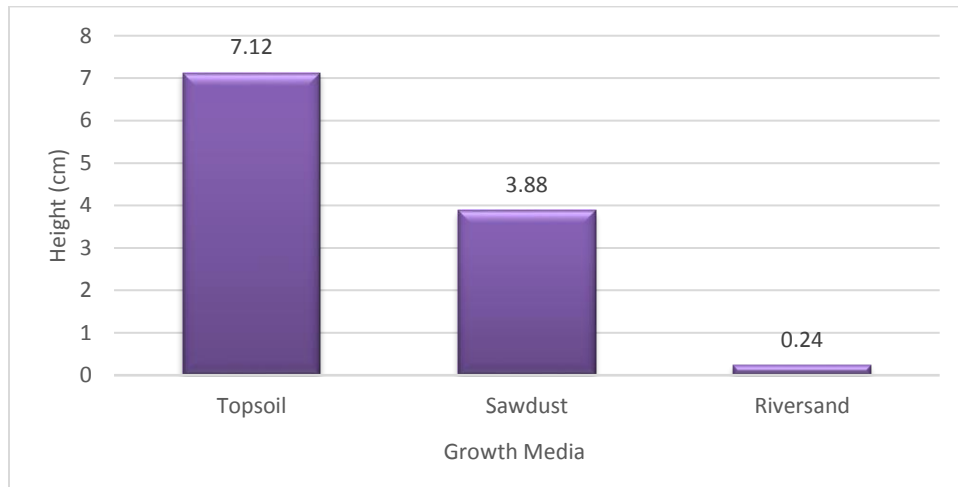


Figure 1: Mean Height of *P. thonningii* Seedlings

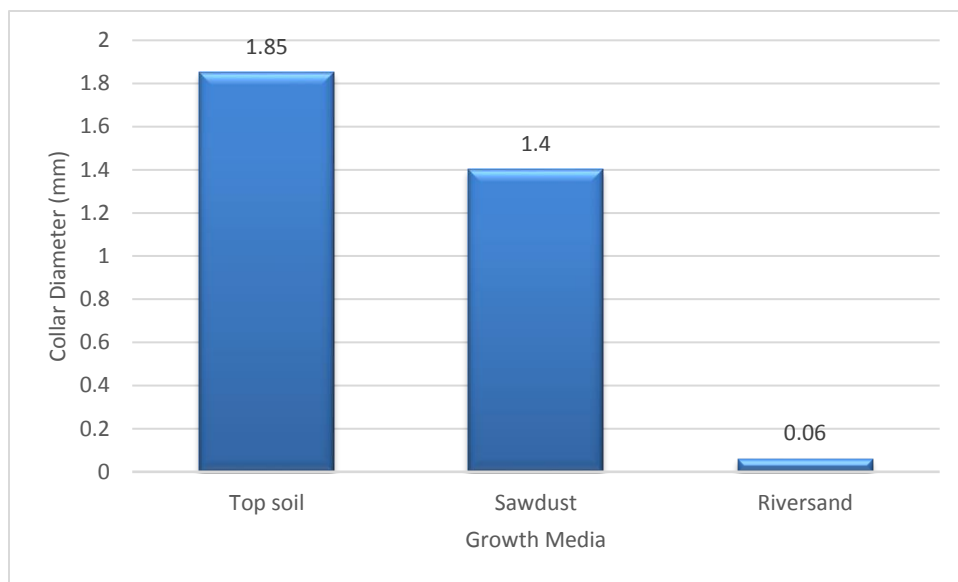


Figure 2: Mean Collar Diameter of *P. thonningii* Seedlings

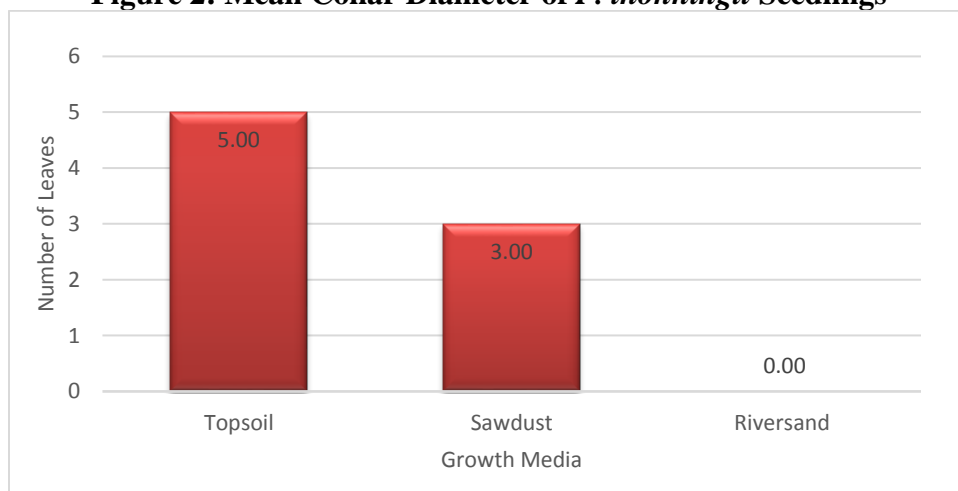


Figure 3: Mean Leaf Production of *P. thonningii* seedlings.

DISCUSSION

This study showed different growth responses were observed for the various

sowing media. Treatment T₁ (topsoil) had the highest growth rate in plant height, collar diameter and leaf number, this result agreed

with the findings of Okunomo (2000; 2004) who obtained a higher percentage in topsoil. Okunomo (2010) recorded a higher growth potential in plant height in topsoil with *Parkia bicolor*. (Agboola and Adedire, 2002) also reported the highest growth in plant height, collar diameter raised with in topsoil with *Terminalia ivorensis* A. Chev. The result this study disagreed with the work of Dickens (2011) who reported apparent high growth in plant height in river sand with *Irvingia wonbulu*. Similarly, Anber (2010) obtained highest growth in plant height and leaves number in sand medium (sharp river sand) with *Bauhinia variegata* L. and *Delonix regia* (Hook.) Raf.

This study has contributed some knowledge to the silvicultural techniques of *P. thonningii*. The seedling growth patterns revealed in this study are relevant in the development of growth models for the species. Also, Table 2 showed mean separation result that the height, collar diameter, leaf number of *P. thonningii* seedlings in the different media significantly

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different from each other. This finding is supported by Yakubu *et al.* (2012) on study on seed and seedling growth of *P. thonningii*.

CONCLUSION

The result obtained in the study showed that seedlings has highest mean value in Treatment T₁ (Top soil) with respect to plant height, collar diameter and leaf number because of the availability of phosphorus present in the soil which aids in optimum growth of plant. It is evident to deduced from the result that *P. thonningii* growth exhibited significant differently in growth by sowing media especially with the top soil., this will play an important role in ensuring uniform and maximum growth of the species in the nursery and subsequent afforestation programme using the species

Recommendation

Based on the result of the study, it is hereby recommended that Top soil should be adopted for raising *P. thonningii* seedlings in the nursery.

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APPENDIX

Table 3: Laboratory analysis of sawdust

Wood Species	Moisture, %	Ash, %	OCH ₃ , %	Cellulose, %	Lignin, %	Extractives %, Soluble in	
						Hot Water	Organic Mixture
Pine	4.8	0.21	5.1	58.2	28.4	1.8	3.2
Gmelina	5.1	0.18	4.9	57.6	28.1	1.5	2.1
Teak	4.9	0.23	5.6	51.7	20.2	1.4	1.6
<i>Milicia excels</i>	5.0	0.33	5.2	52.1	21.4	1.1	1.5

*ethyl alcohol: benzene is close to 1:2

Table 4: Laboratory analysis of topsoil

Constituents	Quality
PH (in Water)	6.50
O.C%	1.08
H%	0.35
O.M%	1.86
T.N%	0.093
Avail. P (mg/kg)	8.11
Sand%	87.1
Clay%	6.5
Silt%	6.4
Na	0.57
K	0.23
Ca	4.94
Mg	7.81
Mn	77
Fe	64
Cu	1.2
Zn	155