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SEED GERMINATION AND SEEDLING GROWTH OF *Ceiba Pentandra* (L) AS INFLUENCED BY DIFFERENT SOIL TYPES IN IBADAN, SOUTHWEST NIGERIA

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ABSTRACT

Ceiba pentandra is a fast growing multipurpose tree with great socio-economic potentials. It is known to be used majorly for timber and its fibre. Lately, it has been documented to have medicinal properties as it has been used to treat leprosy, conjunctivitis, fever, trypanosomiasis among others. Its high value in plywood manufacturing has caused its increased rate harvesting. Natural regeneration efforts have been found to be insufficient and minimal information is available on its nursery requirements. This study was conducted to evaluate the effort of sowing media on its germination and early seedling development. Viable C. Pentandra seeds were sown in polythene bags filled with 5kg each of topsoil (TS), Clay soil, Humus Soil (HS) and Sterilized river sand (RS). The sterilized river sand (RS) served as control. Four weeks after sowing (4WAS), thinning was done and data taken up to a period of 6 months. Pots filled with sterilized River Sand (RS) showed the first radical emergence 3 days after sowing (DAS) followed by the topsoil (TS) which emerged on the 4th day. The first 1radical emergence occurred in clay soil (CS) 7 days after sowing (DAS) while it occurred in humus soil (HS) on the eighth day. All the sowing media gave 100% germination at the end of 14 days. This study showed that both humus and top soils are the best media to use in the nursery establishment of C. pentandra.

Keywords: seed germination, sowing media, effect, nursery,

INTRODUCTION

Ceiba pentandra is a deciduous, gigantic, fast-growing tree, it can grow up to 25-70m in height with a diameter of 100-300 cm; it was reported to be among the largest trees in the world.The most used common name for the tree is Kapok or white silk-Cotton tree. In Nigeria it is called *Araba* in Yoruba, *Rimi* in Hausa and *Akpu-ogwu* in Igbo language (Mojica *et al*., 2002; Chaiarrekij *et al.*, 2011).

Ceiba pentandra has two main uses, being an important source of fibre and of timber. Formerly, it was best known for the fibre produced by its fruit. The floss derived from the inner fruit wall is used for stuffing cushions, pillows and mattresses, and for insulation, absorbent material and tinder (Bates 2004; Orwa*et al*., 2009; Chairrekij*et al*., 2011). The use of kapok fibre declined in the late 20th century after the introduction of synthetic substitutes. However, there is a renewed interest in the potential of kapok. Currently, the main use of *Ceiba pentandra* is as a source of timber. The wood trade name is *fuma ceiba* and is mostly used in plywood manufacturing, but also for making boxes and crates, and for lightweight joinery.(Orwa*et al*., 2009). *Ceiba pentandra* finds wide application in African traditional medicine, The root forms part of preparations to treat leprosy, Stem bark decoctions are used in mouth washes for treating toothache and mouth problems, A decoction of the leaves is applied to treat conjunctivitis and wounds in the eye, and is used for bathing and massaging to treat fever, In veterinary medicine a decoction of the leaves is given to treat trypanosomiasis among others (Friday *et al.*, 2011). *C. pentandra* has a place in folktale, it is considered to be a sacred plant and its image is used as the national emblem of Guatemala, Puerto-Rico and Equatorial Guinea. It appears on the coat of arms and flag of Equatorial Guinea**.**

Ceiba pentandra has high value in plywood manufacturing which caused increased rates of harvesting and the use of the tree will probably intensify in the near future. Natural regeneration may be insufficient to sustain its increased use as a source of timber, while minimal efforts have been undertaken to develop plantations in tropical Africa. Young plants can be grown in a nursery and be transplanted into the field when they are 4–10 months old. However, there is dearth of information on its requirement in the nursery. Therefore an experiment was carried to evaluate the effects of sowing media on germination and early seedling development of *Ceiba petandra.*

Plate 1: *Ceiba pentandra* Seeds and Fruits

MATERIALS AND METHODS

Processed seeds of *Ceiba petandra* obtained from the Seed Store of Forestry Research Institute of Nigeria were used for the experiment. Floatation method was used to determine the viability of the seed before sowing (Pleters, 1954). Five kilogram capacity polythene bags were filled with 5 kg each of different sowing media of topsoil (TS), clay soil (CL) and humus soil (HS) while sterilized river sand (RS) served as the control. The experiment was laid in a Completely Randomized Design (CRD) and it was replicated four times.

Media were watered to field capacity and five seeds were sown per pot. The experimental set up was monitored daily and number of days to first seedling emergence, interval between first and last emergence and percentage germination were recorded and /or calculated .At four weeks after sowing (WAS), seedlings in polypots were thinned to one seedling per pot leaving the most vigorous seedling in the pot. Growth parameters assessed included: stem height, number of leaves, stem circumference were hence forth accessed for six months. All data obtained were analysed and significant means were separated using Duncan multiple range test (DMRT) at 5% level of probability.

RESULTS

Seedling Emergence: Result showed that first seedling emergence was observed in river sand on the 3rd day after sowing and the interval between 1st and last emergence of seedling emergence was 7days with 100% germination count. Emergence was observed in top soil on the 4th day after sowing; seedling emergence lasted for 9 days also with 100% germination count. At 7 days after sowing, emergence was observed on clay soil. The internal between the 1st and last emergence was 13 days with 100% germination count. Emergence on humus soil was on the 8th day after sowing and lasted for 11 days with 100% germination count (Table 1).

Growth parameters

Stem Height: The greatest height was recorded for top soil in the first month of observation (23.95cm) but without significant difference compared to height observed in other treatments (Table 2).-A similar trend was observed in the 2nd month of observation in which topsoil had the greatest height (29.28cm) but with a significant difference between the heights obtained from other treatments. In the third month of observation, plant height was still highest in top soil (47.05 cm) but without significant differences between the heights observed in humus soil (29.10 cm) and that of river sand (26.30 cm). Height observed in river sand and humus were also not significantly taller than—those observed in seedlings planted on top soil and river sand which were similar at 4th month of observation. The least height was observed in seedlings raised on clay soil and river sand. This trend was observed on the 5th and 6th month of observation (Table 2).

Number of Leaves: The highest mean number of leaves was produced from seedlings raised on top soil (7.50) and the least number of leaves was recorded from seedlings raised on clay soil (2.75). The leaf count from seedlings raised on river sand and top soil were not significantly different from each other but significantly differed and were lower than that of top soil and higher than clay soil. A similar trend was observed in the 2nd month of observation but without significant difference in leaf count of seedlings from river sand and clay soil. By the 6th month of observation, the highest leaf count was observed from seedlings raised on top soil (22.25) followed by humus soil (18.50). The least leaf count was from seedlings raised on clay soil (Table 3).

Stem Circumference: The result obtained on stem circumference showed that top soil produced plant with the largest stem circumference (1.13cm) which was significantly higher than other treatments (Table 4).A similar trend was observed in the 2nd month. By the 3rd month of observation, seedlings grown in river sand and humus soils had also increased in their circumference significantly but this was lower than seedlings from top soil and higher than clay soil. At 4 months after sowing, seedlings grown in top soil and humus had the highest stem circumference while those in river sand and clay soil had the least with significant difference at 5% probability level (Table 4).

Table 1: Effect of sowing media on germination of *Ceiba petandra*

Treatment	Number of days to first seedling emergence	Interval between first and last germination	Percentage germination (%)
RS	3	7	100
CS	7	13	100
HS	8	11	100
TS	4	9	100

Means with the same alphabet are not significantly different from each other at 5% probability level
CS= Clay soil RS= River Sand HS= Humus soil TS= Top soil

Table 2: Effect of sowing media on stem height of *Ceiba petandra*

Treatment	Months of Assessment					
	1	2	3	4	5	6
CL	13.47a	18.30a	21.08a	26.75a	26.55a	28.63a
RS	17.70a	20.90a	26.30ab	30.25a	35.70a	40.45a
HS	17.70a	21.13a	29.10ab	49.25b	66.76b	75.00b
TS	23.95b	29.28b	47.05b	57.00b	70.63b	84.00b

Means with the same alphabet are not significantly different from each other at 5% probability level
CL= Clay soil RS= River Sand HS= Humus soil TS= Top soil

Table 3: Effect of sowing media on number of leaves *Ceiba petandra*

TRT	Months of Assessment					
	1	**2**	**3**	**4**	**5**	**6**
CL	2.75a	5.25a	7.50a	9.75a	11.50a	12.25a
RS	4.50b	6.75ab	9.75ab	10.00a	12.50a	14.00a
HS	4.50b	7.25b	11.75bc	13.75b	16.50b	18.50b
TS	7.50c	10.00c	13.75c	17.75c	20.75c	22.25b

Means with the same alphabet are not significantly different from each other at 5% probability level
CL= Clay soil RS= River Sand HS= Humus soil TS= Top soil

Table 4: Effect of sowing media on stem circumference (cm) of *Ceiba petandra*

Treatment	Months of Assessment					
	1	**2**	**3**	**4**	**5**	**6**
CL	0.73a	0.95a	1.43a	1.90a	2.18a	2.30a
RS	0.75a	1.05a	1.60ab	2.18a	2.38a	2.65a
HS	0.88a	1.13a	1.93b	3.13b	4.10b	4.50b
TS	1.13b	1.75b	3.05c	3.40b	4.18b	4.65b

Means with the same alphabet are not significantly different from each other at 5% probability level
CL= Clay soil RS= River Sand HS= Humus soil TS= Top soil

DISCUSSION

The earliest seeds emergence observed on river sand may be attributed to the fact that river sand which is a sandy soil are loose in nature which permits easy penetration of water and easy of emergence of plumule. (Jawayria *et al.*, 2018). The relatively late emergence and longest interval between germination observed on clay soil may be attributed to the compact nature of clay and humus soil used for the experiment.

The greatest height was observed in top soil and humus maybe due to the fact that fertilised soil significantly promote growth of plant compared to soil with less fertility This was corroborated by Fashina *et al*. (2002) and Roy *et al*., (2010) who reported that fertilised plants performed better than unfertilised ones. The increase in number of leaves observed from seedlings raised on top soil and humus may be been due to the nutrients availability to the plants. As stated by Garg and Kumar (2012), favourable soil environmental conditions increased the nutrient availability and water holding capacity of the soil resulting in enhanced plant growth.

CONCLUSION

The study revealed that 100 percent germination was recorded for all soil types used in the experiment. Earliest seeds emergence was on river sand and shortest interval between germination was also on river sand. *Ceiba petandra* sown in topsoil displayed the best performance in seedling growth.

Recommendations

It is therefore recommended based on this study that for optimum performance, the seeds of *Ceiba petandra* should be sown in either

i. topsoil and/or
ii. humus , because these soil types displayed the best performance in seedling growth and can be adopted for *Ceiba petandra production* in the nursery

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