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INFLUENCE OF ORGANIC MANURE ON THE GROWTH OF *Kigelia africana* (Lam.) Benth. SEEDLINGS

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ABSTRACT

Kigelia africana (Lam) Benth is generally considered to be a highly variable mono specific genus of the family Bignoniaceae and sacred to many African communities (e.g. Kenya). This study is aimed to investigate the seedling growth performance of *Kigelia africana* in different growing media so as to determine the best growing medium in raising *Kigelia africana* seedlings for the establishment of healthy vigorous plantation. The fresh seeds of *K. africana* were sown into sterilized river sand to avoid pre-emergence damping off and the germination percentage was calculated using standard formula. And then transplanted into the polythene pots filled with river sand, poultry manure, cow dung and top soil, respectively. The experiment was laid down in a Completely Randomized Design (CRD), each treatment was replicated 1o times making 40 polythene pots. The parameters assessed to monitor the growth performance of *K. africana* seedlings are; germination percentage, plant height**,** stem diameter and leaf production count.

The results of this study established that organic manure had an influence on the height, leaf count and stem girth of *Kigelia africana*. Also, the organic manure that best suit the growth of *Kigelia africana* is poultry manure. The results from ANOVA) indicated that there are significant differences in all the treatments at 5% level of probability. Conclusively, the best organic manure should be applied to soil few weeks before transplanting so as to enhance the growth of *Kigelia africana* seedlings in order to prevent the tree from going into extinction.

Keywords: *Kigelia africana*, Bignoniaceae, pre-emergence damping off, germination percentage, organic manure

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1. INTRODUCTION

Kigelia africana (Lam) Benth belongs to the family Bignoniaceae. It is commonly called sausage tree due to its long sausage-like fruit and locally known as Pandoro (West Nigeria) [2]. *Kigelia* is generally considered to be a highly variable mono specific genus of the family Bignoniaceae [14]. Grace *et al.* (2002) elucidated that, the previous thought on the species was that there were ten different species of *Kigelia*, but only one is presently recognized by botanists. In East Africa two subspecies are recognized, *K. africana* subsp. *africana* growing in grasslands and woodlands and *K. africana* subsp. *moosa* in tropical forests [8].

K. africana is a semi-deciduous to deciduous tree that grows up to 25 meters tall. It is native to Africa and widely distributed throughout the savannah areas of tropical Africa [8]. It can be found growing in open woodlands and moist places such as riverbanks on alluvial soils including river banks/ floodplains of Nigeria, Cameroon, Kenya, Guinea, and Senegal. *K. africana* can also be found in open woodland from KwaZulu-Natal (South Africa) to Tanzania, Chad, and Namibia [6].

The tree is widely grown as an ornamental plant in the tropical regions for its decorative flowers and unusual fruit. *Kigelia africana* is a suitable tree which stabilizes riverbanks when planted, while its broad canopy makes it a good shade tree in the open savannah. Depending on the climate, the sausage tree is remarkably fast-growing and reaches maturity in 4 to 5 years. With its fast growth rate, spreading canopy, interesting flowers and fruit, *Kigelia* is a popular street tree in South Africa and is grown to provide shade in Australia [9].

The sausage tree is considered sacred to many African communities (e.g. Kenya) and has a wide variety of uses in traditional as well as Western medicine, including commercially available skin lotions [12]. *Kigelia africana* is an important tree for many people and has a wide range of uses. Both ripe and unripe fruits are poisonous to humans but the fruits can be dried and fermented, and used along with the bark to enhance the flavour of traditional beers [12]. The seeds are sometimes roasted and eaten in times of food shortage. The wood makes good quality timber for fences, planking, boxes and canoes [5].

Kigelia africana is widely used throughout Africa for a variety of purposes, particularly in local medicine, and more recently in commercial applications to treat various skin complaints [4]. The diversity of complaints against which the plant is used includes fainting, anaemia, sickle-cell anemia, epilepsy, respiratory ailments, hepatic and cardiac disorders, and nutritional illnesses such as kwashiorkor, rickets, wasting and weakness. The leaves are sometimes used to prepare a general tonic for improved health and growth [7]. Aqueous fruit preparations are applied as a wash or rub to promote weight gain in infants. The roots, bark, leaves, stems, twigs and fruits are

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used to treat digestive disorders. Administration is typically by oral ingestion or as an enema. The root, bark and ripe or unripe fruits are taken as a laxative or emetic, to treat chronic and acute digestive disorders and against gastric infections [3].

Despite the importance of *K. africana*, its plantation and the tree is scarce to get in the environment, which makes its establishment very important in order to prevent the species from extinction. However, organic manure is a silvicultural tool which helps to improve the vigour and stimulate the growth of *K. africana* seedlings so as to meet its demand for plantation establishment. Hence, this research is in right order to harness the best growing medium for raising *K. africana* seedlings.

2. MATERIALS AND METHODS

2.1 Experimental Design

The fresh fruits of *K. africana* were harvested from its mother tree at Iwo, Osun state in April, 2015, after which the fresh seeds were extracted from them with the aid of knife. The river sand, Poultry manure, Cow dung and Top soil were obtained within the Federal College of Forestry, Ibadan.

The seeds extracted were sowed directly into the basket filled with sterilized river sand to avoid pre-emergence damping off. The germination was noticed on the fifth day of sowing and the germination percentage was calculated. The growth was monitored for three weeks before being transplanted into the polythene pots. The polythene pots were filled with the mixture of top soil and organic manure (poultry manure and cow dung) that had been air dried and then ground into powder for easy mixing and fast decomposition in the soil. The mixtures were watered for a period of three (3) weeks in order to hasten decomposition and mineralization as well as to avoid reduction in the concentration of organic manure before the seedlings were transplanted. There are four treatments replicated ten times making a total of forty polythene pots. The experiment was laid down in a Completely Randomized Design (CRD). The seedlings of *K. africana* were then transplanted into polythene pots and watered immediately. The initial measurements (ranged between 2.00 and 2.01) were taken and weekly observations were recorded accurately.

The four treatments are as follow:

T_1- 2 kg of top soil + 0.025 kg of poultry manure

T_2- 2 kg of top soil + 0.025 kg of cow dung

T_3- 2 kg of top soil + 0.0125 kg of poultry manure + 0.0125 kg of cow dung

T_4- Control (2 kg of top soil).

2.2 Parameters Assessed

The parameters assessed to monitor the growth performance of *K. africana* seedlings are:

Germination percentage (%): The percentage of germination was derived by dividing the total number of seed germinated by the total number of seeds sown multiply by 100.

Number of seeds germinated/ total number of seed sown × 100

Plant height: The height of each plant was measured from the root collar to the tip of the terminal for each bud with the aid of a graduated ruler in (cm).

Stem diameter: The stem diameter of each seedling was measured with the aid of a vernier caliper.

Number of leaves: The total number of leaves on plant seedlings was recorded for each treatment.

The data collected were subjected to Analysis of variance (ANOVA), while the mean of the results were later differentiated using DMRT (Duncan Multiple Range Test) at 5% level of probability.

3. RESULTS AND DISCUSSION

$$\text{Germination percentage (\%)} = \frac{\text{Number of seeds germinated}}{\text{Total number of seed sown}} \times 100$$

$$= \frac{230}{300} \times 100 = 0.77 \times 100 = 77\%.$$

The result of germination percentage revealed that *Kigelia africana* can be raised at nursery stage without the application of any pre-treatment measure and the seedlings will be vigorous and healthy. However, more research should be done to increase its germination percentage potential. The result (Figure 1) revealed that seedlings of *Kigelia africana* responded well to poultry manure from the first week of transplanting. All the organic manure used had better growth height than the topsoil but poultry manure had the best performance than the others. Furthermore, the result from the analysis of variance (ANOVA) indicated that there are significant differences in the treatments at 5% level of probability and this led to further differentiation of mean using Duncan Multiple Range Test (DMRT). This corroborates with the

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work of Adekiya and Agbede (2016), which established that application of poultry manure showed significant difference in plant height, leaf area, number of fruits per plant and fruit weight on *Lycopersicon esculentum* Mill [1]. The result from Figure 2 also indicated that seedlings treated with manure had better performance in stem girth better than the control, with the mean values ranging from 2.46 mm – 2.84 mm, while the least performance in plant girth was observed in topsoil. The result from the analysis of variance (ANOVA) revealed that there are significant differences in the treatments at 5% level of probability.

The organic manure favored the leaf production count but cow dung had best leaf production count. The Analysis of variance (ANOVA) revealed significant differences among the treatments used at 5% level of probability. The result is in line with assertions of Mader *et al*. (2002), that organic nutrients increase the abundance of soil organism by providing organic matter and micronutrients for organisms which aid plants in absorbing nutrients [11].

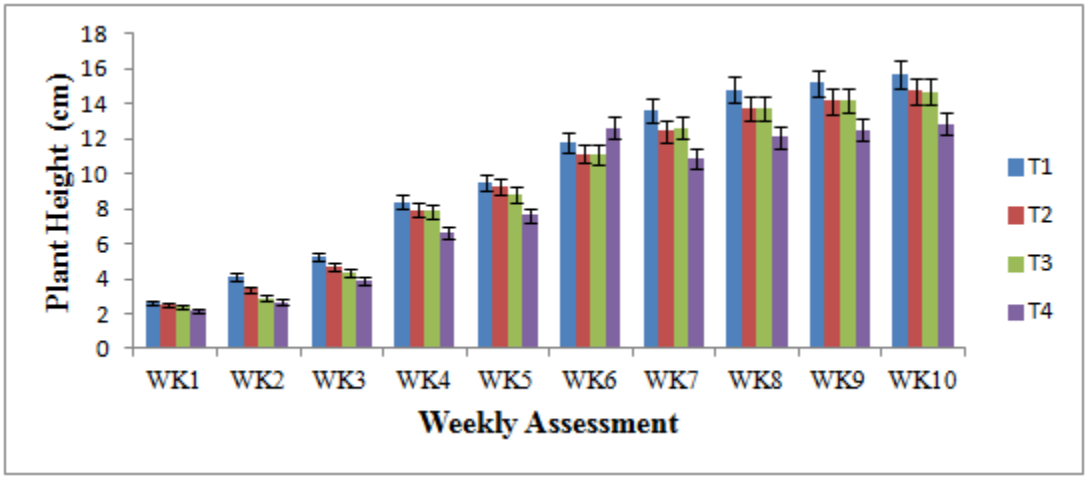

Figure 1: Effect of Organic Manure on Plant Height (cm) of *Kigelia africana* Seedlings

It is observed that the treatments are week dependent on the plant height. As the organic manure decomposes and mineralizes, the plant height increases. Also, at the end of this study poultry manure showed outstanding performance.

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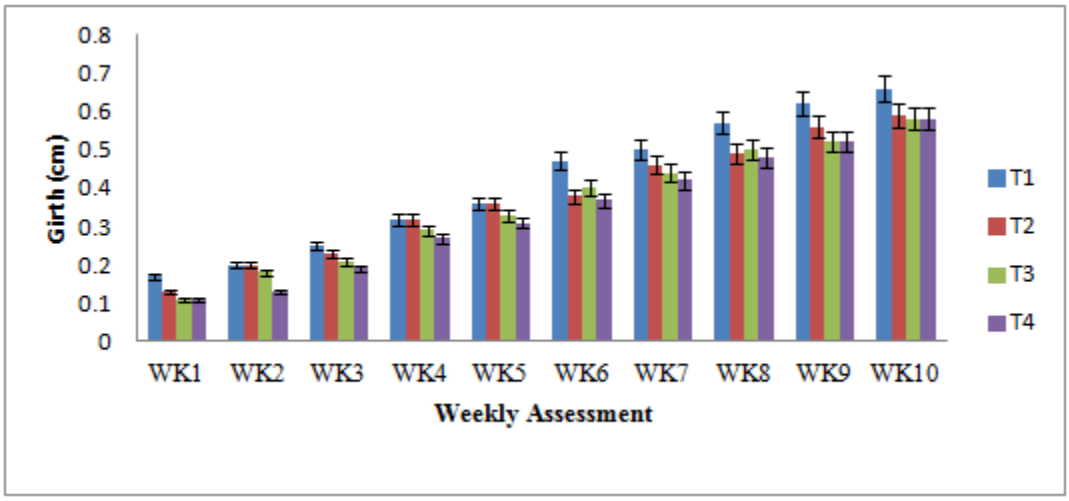

Figure 2: Effect of Organic Manure on Girth (mm) of *Kigelia africana* Seedlings

The result of the effect of organic manure on the stem girth (mm) revealed appreciable increase in the stem girth weekly with poultry manure having the best influence than the other treatments. However, at the tenth week control tends to compete with the combination of poultry manure and cow dung. This indicated that it is not normal to combine the organic manure used to form a single treatment on *K. aficana* seedlings.

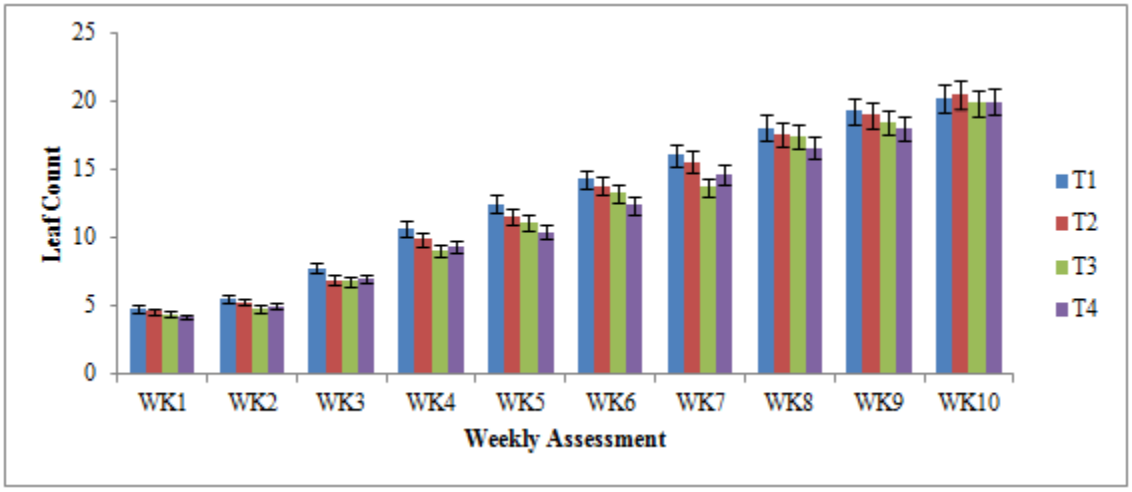

Figure 3: Effect of Organic Manure on the Leaf Production Count of *Kigelia africana* Seedlings

This result revealed that the organic manure had better influence on the production of leaves of *K. africana* seedlings. But at tenth week, the performance of cow dung slightly outstand poultry

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manure this indicated that if production of leaves is the paramount objective of managing *K. africana* plantation, cow dung can be the best organic manure to be used.

4. CONCLUSION AND RECOMMENDATION

The result obtained from this study established that organic manure had an influence on the height, leaf count and stem girth of *Kigelia africana*. Also, the organic manure that best suit the growth of *Kigelia africana* is poultry manure. In view of this, it is recommended that poultry manure at 0.025 kg level should be applied to soil few weeks before transplanting to enhance the growth of *Kigelia africana* seedlings for vigorous and healthy plantation establishment in order to prevent the tree from going into extinction.

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