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

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### ABSTRACT

*Kigelia africana* is renowned for so many medicinal properties, despite the high medicinal uses by most people in Nigeria and to other nation of the world at large, it only exist as protected and semi domesticated species. This study investigated the effect of different levels of poultry manure and cow dung on the growth of *Kigelia africana* seedlings. The experiment was laid in Completely Randomized Design (CRD) replicated four times. The top soil used was amended with the following treatments: T1 (7.5g cow dung), T2 (5g cow dung), T3 (2.5g cow dung), T4 (7.5g poultry manure), T5 (5g poultry manure), T6 (2.5g poultry manure) and T7 (no treatment – control). Four weeks old healthy seedlings were transplanted into polypot containing the treatment combinations. After two weeks, growth data were collected weekly for 8 weeks on plant height, collar diameter and number of leaves. The data collected was subjected to Analysis of Variance (ANOVA) in CRD at 5% probability level. The results obtained shows that there were no significant differences in all the treatments for all variables assessed. However, the growth variables were significantly improved as the highest height was observed when poultry manure (2.5g) was applied with mean value of 4.19cm, cow dung applied at 7.5g had the highest number of leaves with mean value of 7.10 while the highest collar diameter was recorded when 7.5g of cow dung was applied with mean value of 2.38 mm. The least number of leaves and collar diameter was obtained when the soil was amended with 7.5g of poultry manure with mean value of 6.41 and 2.10mm respectively and was significantly lower compared to other treatments. It is therefore recommended that the seedlings of *Kigelia africana* can successfully be raised on any of the two media used even at early stage.

**Keywords:** *Kigelia africana*, poultry manure, cow dung, growth variables, seedlings



## Introduction

*Kigelia* is a genus of flowering plants in the family of Bignoniaceae comprising of only one species *Kigelia africana* which occur throughout tropical Africa (Saini *et al.*, 2009). It is an evergreen tree, native to warm, wet grasslands of tropical West Africa. It is a popular garden ornamental with attractive flowers and unique fruits commonly known as Sausage tree or Cucumber tree due to the shape of its fruit. It may be found at altitude as high as 1830m. It is typically 4.5m to 7.5m tall, but may attain height of 15m. The fruits are not edible, but they are used in traditional African folk medicine to treat many ailments (Akunyii *et al.*, 1991). An alcoholic beverage similar to beer is also made from the fruit. The fresh fruit is poisonous and strongly purgative (Welford and Le Breton, 2008), hence are prepared for consumption by drying, roasting or fermenting (Houghton, 2002). The fruit take a year to ripen, have a hard rind and is pulpy with many seeds (Grace *et al.*, 2002). The powder of the mature fruit is applied as a treatment in the dressing of wound, abscesses, and ulcers (Alam *et al.*, 2011). Young men and women use the fruit also to enhance the growth of their genital and breasts respectively (Oyelami *et al.*, 2012). *K.africana* ground bark and fruit is also taken internally to treat conditions such as dysentery, ringworm, malaria, diabetes and pneumonia (inflammatory of both lungs), stomach problems in children (Picerno *et al.*, 2005). *K. africana* leaf compares favourably with many other commonly-consumed green leafy vegetables such as spinach and provides a rational basis for promoting the conservation and propagation of the plant and encouraging its wider use in the diets of populations in sub-Saharan Africa (Tanveer *et al.*, 2010). The leaf, stem bark and root extracts of *K. africana* exhibits antimicrobial, antioxidant, and enhanced wound healing properties and these may justify the medicinal uses of the plants for treatment of microbial infections and wounds (Agyare *et al.*, 2013). The uses stated above shows the importance of *K. africana* to human and health. There is need therefore to improve on its production especially at nursery stage in a way to establishing plantations and thereby maximizing the use of the tree. The use of organic manure will lead to a more efficient way of its production without any adverse effect on the environment.

The application of organic manure to the soil has been observed to play important roles in the determination and supply of nutrient that are mostly needed for plant growth and survival (Omidire *et al.*, 2015) The maintenance of proper organic manure level is of fundamental importance to the production of soil (Haynes and Naidu 1998). To achieve a good soil medium for plant growth, a continual supply of organic manure must be added to the soil to balance and maintain appropriate levels of organic manure, especially in the active fraction. Organic manure application is lightly appreciated as it has become necessary to meet the demands of plantation establishment (Omidire *et al.*, 2015) Organic manure that are used to fertilized land, usually consist of the faeces and urine of domestic livestock. Most animals manure is faeces. Common forms of animal manure include farmyard manure (FYM) or farm



slurry (liquid manure). FYM also contains plant material (often straw), which has been used as bedding for animal and has absorbed the faeces and urine. Agricultural manure in liquid form, known as slurry is by more intensive livestock rearing system where concrete or slates are used, instead of straw bedding. Cow dung is the undigested residue of plant matter which has passed through the animal's gut and rich in minerals. If not recycled into the soil by species such as earthworms and dung beetle, cow dung can dry out and remain on the pasture (Stolton, 1997)

### **MATERIALS AND METHOD**

This study was carried out at the screen house of Federal College of Forestry, Ibadan, North West Local Government of Oyo State. The fruits of *Kigelia africana* were obtained from Oranyan, Ibadan. The bulk soil samples (0 – 15cm depth) used for the planting was collected from the College arboretum. Poultry manure and cow dung were collected from the poultry farm and cow farm of the Federal College of Forestry Ibadan, Oyo State. *Kigelia africana* seedlings were raised in a nursery tray for 2 weeks, vigorous and healthy seedlings were selected. Soil was mixed with treatments at different level at two weeks before transplanting and seedlings were transplanted into the pots at a rate of one (1) seedling per pot, seedling was selected from the wooden box at random since they had relatively uniform growth as a result of uniform treatment provided in the nursery bed. The treatment used (Poultry manure and cow dung) were subjected to proximate analysis before used to determine their nutritional compositions. Control experiment for each *Kigelia africana* plant was also set up in such a way that no organic manure was applied to the soil prior to planting. Treatments used were: T1 (7.5g cow dung), T2 (5g cow dung), T3 (2.5g cow dung), T4 (7.5g poultry manure), T5 (5g poultry manure), T6 (2.5g poultry manure) and T7 (no treatment – control). It was laid in a completely randomized design with 4 replicates. The following variables were assessed: Plants height (cm) using meter rule, collar diameter (cm) using venier caliper and numbers of leaves. The data collected was subjected to Analysis of Variance (ANOVA) and means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level.



## RESULTS AND DISCUSSION

Table1: NUTRIENTS COMPOSITION OF COW DUNG AND POULTRY MANURE

CONSTITUENT	COW DUNG	POULTRY MANURE
pH(1:1)	7.60	7.75
Ec (u/cm)	853	706
%P	0.060	0.299
%Ca	0.927	5.287
%Mg	0.293	0.963
%K	0.580	1.490
mg/g Na	1112.52	2310.02
%OM	85.63	102.28
%N	2.022	2.216

The proximate analysis of the nutrient composition of the manure used (Table 1) revealed that pH is slightly alkaline for both manure and the composition of Na (Sodium) is higher in poultry manure than in cow dung with 2310.02mg/g and 1112.52mg/g respectively. Percentage composition of Phosphorous (P), Calcium (Ca), Magnesium (Mg), Potassium (K) and Nitrogen (N) are also higher in poultry manure than in cow dung. Ec (exchangeable cations) (u/cm) is more in cow dung than poultry manure with 853 and 706 respectively while composition of P in cow dung is higher than poultry manure.

Table 2: NUTRIENT ANALYSIS OF SOIL

ELEMENTS	VALUES
%N	0.051
mg/g Available P	11.90
cmol/kg Ca	1.26
cmol/kg Mg	1.07
cmol/kg K	0.47

The nutrient analysis of pre planting soil (Table 2) showed that Nitrogen presents in the pre cropping soil is deficient since it is lower than the critical level of 1.5g/kg as recommended by Adeoye and Agboola (1985). Soil was moderately furnished in P since the critical level is



8-20mg/kg (Sobulo *et al.*, 1987). The K content is also moderately higher in the soil than the critical value range of 0.20-0.40 Cmol/kg (Adeoye and Sobulo 1985).

Table 3: Effects of varying levels of organic manure on the height of *Kigelia africana* seedlings

TRT	2WAT	3WAT	3WAT	4WAT	5WAT	6WAT	7WAT	8WAT	Mean
T <sub>1</sub>	2.33	2.78	2.93	3.15	3.20	4.20	5.00	5.68	3.66
T <sub>2</sub>	2.08	2.48	3.08	3.20	2.68	3.88	4.70	5.68	3.47
T <sub>3</sub>	3.18	3.18	3.60	4.00	3.48	4.60	5.38	5.88	4.16
T <sub>4</sub>	2.50	2.58	2.95	3.35	2.95	3.83	4.68	5.30	3.52
T <sub>5</sub>	2.95	3.40	3.60	3.80	3.58	4.70	5.43	6.05	4.19
T <sub>6</sub>	2.83	3.30	3.53	3.88	3.55	4.38	5.08	5.75	4.04
T <sub>7</sub>	2.95	3.10	3.33	3.58	3.63	4.75	5.53	6.23	4.14
GM	2.69	2.97	3.29	3.56	3.29	4.33	5.11	5.79	3.88
%CV	17.0	17.9	15.1	16.1	18.7	15.6	13.8	13.2	14.0

Table 4: Analysis of variance for height development of *Kigelia africana* seedlings

SV	DF	SS	MS	F	F-tab
Treatment	6	2.46570	0.41095	1.3901 <sup>ns</sup>	2.57
Error	21	6.20810	0.29562		
Total	27	8.67380			

ns- Not significant at 5% level of probability.

The result in Table 3 above reveals the effects of varying levels of organic manure on the plant height of *Kigelia africana* seedlings. The result shows that seedlings raised with 2.5g of poultry manure performed very well with an average of 4.19 cm compared with seedlings raised with 2.5g of cow dung which gave the least plants height with an average of 3.47cm, Plant height was markedly influenced by all plots receiving treatments that support the observation of Haynes and Naidu (1998) that organic manure materials is important in the maintenance of soil moisture and increased the height of plants. The rapid growth and increase in height might be as a result of nitrogen content of the waste (poultry manure and cow dung). Meanwhile, ANOVA (Table 4) result revealed that there is no significant difference among the treatments at 5% level of probability which indicates that any of the treatments can be employed for raising *Kigelia africana* seedlings.



Table 5: Effects of varying levels of organic manure on the stem girth of *Kigelia africana* seedlings.

TRT	2WAT	3WAT	3WAT	4WAT	5WAT	6WAT	7WAT	8WAT	Mean
T <sub>1</sub>	1.17	1.47	1.95	2.18	2.43	2.96	3.26	3.64	2.83
T <sub>2</sub>	0.97	1.43	1.82	2.11	2.05	2.83	3.12	3.46	2.23
T <sub>3</sub>	0.81	1.24	1.78	2.03	2.19	2.85	3.22	3.51	2.21
T <sub>4</sub>	0.84	1.19	1.71	1.95	2.05	2.73	3.03	3.27	2.10
T <sub>5</sub>	1.18	1.32	1.74	1.98	2.18	2.75	3.28	3.54	2.25
T <sub>6</sub>	1.15	1.45	1.78	1.98	2.29	2.87	3.31	3.53	2.27
T <sub>7</sub>	0.82	1.59	1.78	1.98	2.29	2.87	3.31	3.53	2.27
GM	0.99	1.38	1.79	2.04	2.21	2.84	3.20	3.48	2.24
%CV	35.3	18.7	15.2	13.8	8.9	9.23	9.09	8.39	6.87

Table 6: Analysis of variance for stem diameter development of *Kigelia africana* seedlings

SV	DF	SS	MS	F	F-tab
Treatment	6	0.17899	0.02983	1.2548 <sup>ns</sup>	2.57
Error	21	0.49925	0.02377		
Total	27	0.67824			

ns- Not significant at 5% level of probability.

The result in Table 5 reveals that seedlings raised with 7.5g of Cow dung had the best performance in stem diameter with an average of 2.83m, while seedlings raised with 7.5g of poultry manure had the least performance with an average of 2.10cm. The result agrees with Schonoh and Hebert (1986) that when organic manure is correctly applied, it increases the productivity of crops. The increase in stem diameter could be as a result of phosphorus content. Table 6 shows that there is no significant difference among the treatments at 5% level of probability. This indicates that the use of organic manure at varying quantities shows no significant difference on stem diameter development *Kigelia africana* seedlings therefore, any of the treatments can be employed in raising the seedlings.



Table 7: Effects of varying levels of organic manure on the leaf production of *Kigelia africana* seedlings

TRT	2WAT	3WAT	3WAT	4WAT	5WAT	6WAT	7WAT	8WAT	Mean
T <sub>1</sub>	3.50	3.75	5.50	5.75	7.75	7.75	10.8	12	7.10
T <sub>2</sub>	3.50	4.50	6.00	5.50	6.50	7.75	9.0	11	6.72
T <sub>3</sub>	2.00	4.00	5.00	5.50	6.50	8.00	10.3	11.5	6.60
T <sub>4</sub>	2.50	4.00	4.75	5.75	6.25	7.25	9.25	11.5	6.41
T <sub>5</sub>	3.00	3.75	5.25	6.00	7.50	8.50	10.0	11.5	6.94
T <sub>6</sub>	2.50	4.50	4.75	6.00	7.00	8.00	9.25	10.8	6.60
T <sub>7</sub>	2.50	4.00	5.75	6.00	6.75	7.50	10	11	6.69
GM	2.79	4.07	5.29	5.17	6.81	7.82	9.79	11.32	6.72
%CV	30.3	14.7	14.3	10.3	13.2	8.01	11.6	10.5	5.68

Table 8: Analysis of variance for leaf production of *Kigelia africana* seedlings

SV	DF	SS	MS	F	F-tab
Treatment	6	0.1331	0.0222	0.8952 <sup>ns</sup>	2.57
Error	21	0.5217	0.0248		
Total	27	0.6548			

ns- Not significant at 5% level of probability.

Table 7 reveals the effects of varying levels of organic manure on number of leaves of *Kigelia africana* seedlings. The result shows that seedlings raised with 7.5g of Cow dung performed very well with an average of 7.10 mm compared with seedlings raised with 7.5g of poultry manure which gave the least number of leaves with an average of 6.41mm, and this findings support the observation of Aluko, (1989) who noted that the application of cow dung was observed to encourage over ground vegetative growth and influence the deep green



colour of plants. It also agrees with that of Schonoh and Hebert (1983) who from their finding observed that manures can be used for the improvement of leaves of plant by improving their growths and supplying them with nutrient needed from the soil. Table 8 shows that there is no significant difference among the treatments at 5% level of probability. This indicates that the use of organic manure at varying quantities shows no significant difference on leaf production of *Kigelia africana* seedlings therefore, any of the treatments can be employed in raising the seedlings.

## CONCLUSION

Result obtained from the experiment show that 2.5g of poultry manure had the best performance in height with a mean of 4.19cm and 2.5g of Cow dung had the least performance in height with a mean of 3.47cm. Highest stem diameter was recorded when 7.5g of Cow dung was used as amendment with a mean of 2.38mm while 7.5g of poultry manure had the least performance with a mean of 2.10. Soil amended with 7.5g of Cow dung had the highest leaves number with value of 7.10mm and 7.5g of poultry manure had the least performance with a value of 6.41mm. Improved cultivation and availability of this species will allow its sustainable use in curing diseases thus improving human health status and generation of income through sale of its produces. The domestication and cultivation of *K.africana* can therefore be enhanced in nurseries using cow dung and poultry manure based on this study.

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