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EFFECT OF COMPOST PRODUCED WITH COW DUNG ON THE EARLY GROWTH OF *Adansonia Digitata L.*

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ABSTRACT

This experiment was carried out to determine the effect of different levels of compost produced with Cow dung on the early growth performance of *Adansonia digitata*. *A. digitata* seeds were planted in a seed box and transplanted into poly pots after germination with the application of compost produced with Cow dung at a rate of 1kg, 2kg and 3kg per treatment and a control experiment. This experiment was carried out in a Completely Randomized Block Design. Data on plant height, number of leaves, leave area, leave width and collar diameter were recorded. The data were collected weekly for eleven weeks starting from the second week after planting. The data collected were subjected to statistical analysis using ANOVA. Result of the experiment revealed the highest mean height (137.63±19.46) was obtained in the control experiment, highest number of leaves (17.67±2.52) was recorded at treatment 4 (3kg), The widest leaf area was recorded at treatment 3 (2kg) (77.98±2.45) and the highest mean collar diameter was recorded is obtained in the control experiment (7.25±2.05). It is deduced that, the compost from cow-dung indicates no significant improvement in the early growth performance of *A. digitata;* also, different rates of application have different influence on the growth of the plant. In order to obtain optimum growth and yield of *A. digitata*, proper soil management techniques (such as application of organic manure) should be adopted and to maintain stable soil fertility; application of compost is advisable.

Keywords: Compost, *Adansonia digitata*, seeds, cow dung, early growth

INTRODUCTION

Adansonia digitata (African baobab) is a very long-lived tree with multipurpose uses; commonly found in the thorn woodlands of African savannahs. It tends to grow as solitary individuals, though it can be found in small groups depending on the soil type. It is not found in areas where sand is deep. It is sensitive to water logging and frost. All locations where the tree is found are arid or semi-arid (Salim *et al*., 2012).

The tree species belong to the family of Malvaceae and the genus Adansonia. The African baobab (*A. digitata*) occurs naturally in most countries of Sahara as a scattered tree in the savannah, and is also present in human habitation. The tree has been introduced in many countries used as an ornamental plant. It is also known as the dead-rat tree (from the appearance of the fruits), monkey-bread tree (the dry fruit as food for monkeys), upside-down tree (the bare branches looked like roots) and cream of tartar tree (the acidic taste of the fruits) (Sidibe and Williams, 2002).

Adansonia digitata is a majestic tree revered in Africa for its medicinal and nutritional value. The plant parts are used to treat various ailments such as diarrhea, malaria and microbial infections (Kamatou *et al*., 2011). Several plant parts have interesting anti-oxidant and anti-inflammatory properties, and baobab has been used extensively since ancient times in traditional medicine (De Caluwé, 2010). The seeds, leaves, roots, flowers, fruit pulp and bark of baobab are edible. Baobab leaves are used in the preparation of soup. Seeds are used as a thickening agent in soups, but they can be fermented and used as a flavoring agent or roasted and eaten as snacks (Kabore *et al*., 2011).

Baobab trees are indigenous to Africa. The trees are tolerant to high temperatures and long spans of drought, and are grown for their sour fruit and leaves. The fruit consists of pulp and large seeds embedded in the dry acidic pulp and shell. The leaves are used to make soup, and the pulp is used to make beverage and for food preparation (Rahul *et al*., 2015).

In order to fully ensure the survival, optimum production and the sustainability of *Adansonia digitata*, this study emphasizes on the use of compost manure to determine its effects on the early growth of this species. Compost directly affects the soil such that it supplies the soil with abundant nutrients. During the early stages of growth, trees are very well dependent on soil nutrient supply, therefore, failure to manage nursery soil adequately can result in depletion of site quality and a reduction of seedling growth (Hoque *et al.*, 2004).

Compost is an organic fertilizer that can be made on the farm at very low cost. The most important input is the farmer's labour. Compost is decomposed organic matter such as crop residues and animal manure.

The seedling of *Adansonia digitata* takes two years to reach a height of 2m (Bosch *et al*., 2004). This specie can also live as long as 1000 years under ideal growing conditions. Considering its extremely long life cycle relative to that of man, it is necessary that planters and cultivators of this plant species obtain optimum yield of products during their lifetime. Since man will not live that long, means in which these products will be gotten at a faster and quicker pace has to be ascertained. Thus, this study aim at evaluation and determination of the effects of compost produced with cow dung mixed with water hyacinth on the early growth that is,s the post germination and early seedling stage of *A. digitata*.

MATERIALS AND METHODS

Study Area

The study was carried out in the nursery unit of the College of Forestry and Fisheries, University of Agriculture Makurdi, Benue State, Makurdi, the capital of Benue State in Nigeria. The state is bounded by Taraba State in the East, Nassarawa State in the North, Kogi State to the West, Enugu State to the Southeast and Cross River State to the South. This area lies between E. ^{0}N and 8.5391^0 latitude and longitude 7.7322^0.

Seed Sample Collection and Pre-Treatment

The seeds were procured from Kanke Local Government, Plateau State. The area is characterized with a tropical savanna climate with an annual rainfall of 1400 millimeters and an average annual temperature of 22.8ºC (ClimateData.org).The fruit pulps were mainly harvested directly from the mother tree. The fruits were broken to access the seeds with each fruit pulp containing an unspecified number of seeds. The seeds were collected, soaked and washed with water to remove the pulp powder before pre-treatment. The seeds were soaked in Sulphur acid for 1 hour after which the seeds were air dried for 30 minutes before sowing into the seed box.

Preparation of Compost and Treatments

Following the recommendations of FAO (2010), a compost pit was dug in the forestry nursery measuring 1.5m wide and 50cm deep. A thin layer of twigs was spread on the bottom of the pit, cow dung which serves as animal manure in this experiment was layered on it. Water hyacinth sourced from the River Benue was also added to aid the decomposition of the compost. All these materials were sealed with a layer of grass fibers to prevent water loss. The contents of the pit were periodically turned over to enable simultaneous decomposition throughout the pit. A total of 12 weeks was allowed for the compost to mature.

In the nursery, black polythene bags which serve as planting medium were filled with sandy soil (Falemara, 2014). A 50kg bag of Sandy soil was sourced and heated in a pan in order to kill harmful microbial organisms in the sand that might affect the seeds germination. The polythene bags were arranged in a Randomized Complete Block Design (RCBD) on a flat bed. Five (5) kg oftop soil was used across all treatments including control. Different rate of compost produced with Cow dung was mixed with top soil as treatments (T1 = Control experiment, T2 = 1kg of compost, T3 = 2kg of compost, T4 = 3kg of compost).

Data Collection and Analysis

Data was collected on the growth performance of the seedlings of *Adansonia digitata* sown in poly pots in the nursery. This growth performance includes several variables (seedling height, stem diameter, number of leaves). The plant height was taken with the aid of a meter rule; measured from the ground level of the plant to the tip of the seedlings, in centimeters at pre-determined time intervals after germination. The collar diameter was determined using Venier caliper, calibrated in centimeters (cm).The number of leaves was determined by visual counting. The data collected from this experiment was subjected to analysis of variance (ANOVA) using Genstat software.

RESULTS

Effect of Different Levels of Compost Produced with Cow Dung on the Early Growth of *Adansonia digitata*

The growth performance *Adansonia digitata* in response to different compost manure is presented in tables below. Parameters measured in this experiment were plant height, number of leaves, leave diameters and collar diameters.

The plant height as affected by the different manure type application in this experiment is presented in table 4.1. Significant difference (P≤0.05) was observed at different weeks of height measurements across the different treatments. Height measurement was done for a period of eleven weeks starting from the second week of manure application. The highest mean height (137.63±19.46) was obtained in the control experiment followed by 115.20±19.95 recorded in treatment 3 (2kg of compost). Lowest mean height was recorded in treatment 4 (3kg of compost) all at 12 weeks after planting.

Table 1: Effect of Different Levels Compost Produced with Cow Dung on Height of *Adansonia digitata L.*

Number of weeks	Control Mean/SD	T2 (1kg) Mean/SD	T3 (2kg) Mean/SD	T4 (3kg) Mean/SD	Sig. Lev.
2WAP	10.77±1.15	10.60±1.04	11.40±1.99	9.50±4.28	.822
3 WAP	15.10±1.35	11.97±.40	11.73±2.80	12.70±.70	.02
4 WAP	20.47±0.45	13.77±0.87	13.80±3.02	13.13±0.68	.002
5 WAP	20.87±3.14	15.17±0.23	14.80±0.44	14.30±0.82	.017
6 WAP	21.67±1.17	16.47±0.68	15.37±0.66	15.50±1.40	.000
7 WAP	25.73±2.51	19.17±1.27	18.70±2.10	19.67±2.10	.008
8 WAP	31.70±7.97	22.70±0.72	22.87±1.48	21.43±1.40	.054
9 WAP	53.20±4.71	26.57±.84	28.30±1.51	25.43±.57	.348
10 WAP	90.37±7.35	39.70±7.96	65.40±4.02	29.80±1.11	.360
11 WAP	113.43±9.90	70.47±6.04	100.03±6.76	60.37±6.35	.397
12 WAP	137.63±19.46	107.00±14.33	115.20±19.95	103.73±6.62	.604
Total	**540.94**	**353.59**	**417.6**	**325.56**	

Survey Data, 2020

Mean in the same column differ significantly (P≤0.05); WAP= weeks after planting
T1 = Control experiment; T2 = 1kg of Compost; T3 = 2kg of compost; T4 = 3kg of Compost.

Number of Leave

The number of plant leaves in response to the different treatments is presented in table 2. The number of leaves showed no significant difference (P≥0.05). However numerical variations in the number of leaves were recorded across the different treatments. The highest number of leave (17.67±2.52) was recorded at treatment 4 (3kg) followed by treatment 2 (1kg) (17.00±1.73). the lowest mean leave number was obtained in treatment 3 (2kg) (15.67±2.08).

Table 2: Effect of Different Levels of Compost Produced with Cow Dung on Number of Leaves of *Adansonia digitata L.*

Number of weeks	Control Mean/SD	T2 (1kg) Mean/SD	T3 (2kg) Mean/SD	T4 (3kg) Mean/SD	Sig. Lev.
2WAP	5.00±1.00	4.67±1.15	4.33±1.53	5.00±.00	.851
3 WAP	7.67±2.30	6.33±0.57	5.00±1.00	4.33±.58	.050
4 WAP	10.00±1.00	6.67±1.53	6.00±1.00	4.67±1.53	.006
5 WAP	6.67±2.082	6.33±1.53	6.33±2.31	6.00±0.00	.972
6 WAP	8.00±2.646	7.67±1.53	6.67±1.155	7.33±1.528	.825
7 WAP	9.67±2.89	9.33±2.08	9.33±1.53	10.67±0.58	.817
8 WAP	11.00±3.51	11.33±1.16	10.67±1.16	12.33±1.53	.780
9 WAP	12.00±2.65	13.67±1.53	13.00±2.00	13.33±.58	.721
10 WAP	15.33±3.22	15.00±1.52	14.33±2.00	16.67±1.52	.628
11 WAP	15.33±3.51	16.00±2.00	14.00±1.00	16.00±2.65	.732
12 WAP	16.25±3.40	17.00±1.73	15.67±2.08	17.67±2.52	.799
Total	**106.92**	**114**	**105.33**	**114**	

Survey Data, 2020

Mean in the same column differ significantly (P≤0.05); WAP= weeks after planting; T1 = Control experiment; T2 = 1kg of Compost; T3 = 2kg of Compost; T4 = 3kg of Compost

Leave Area

The results in table 3 showed the leave area of the plants as affected by the different treatments in this experiment. The results showed significant difference across the treatments a some weeks. However, at the end of the experiment (week 12) there were no significant differences recorded. The widest leave area was recorded at treatment 3 (2kg) (77.98±2.45) followed by the control experiment (71.45±3.03) while the lowest leave area was recorded at treatment 2 (1kg) (68.61±2.36) all at 12 weeks after planting.

Table 3: Effect of Different Levels of Compost Produced with Cow Dung on Leave Area of *Adansonia digitata L.*

Number of weeks	Control Mean/SD	T2 (1kg) Mean/SD	T3 (2kg) Mean/SD	T4 (3kg) Mean/SD	Sig. Lev.
2WAP	12.10±6.03	12.15±1.79	13.34±1.13	12.67±6.16	.978
3 WAP	14.78±5.03	12.93±5.74	13.66±2.46	15.48±2.51	.050
4 WAP	16.93±5.24	15.65±4.08	15.29±7.81	16.67±3.04	.022
5 WAP	18.73±1.16	20.22±1.01	17.80±2.44	21.89±4.51	.925
6 WAP	21.30±1.93	16.67±3.55	18.72±3.55	14.22±2.43	.059
7 WAP	35.19±8.18	31.37±5.31	28.06±6.46	28.72±7.29	.018
8 WAP	45.56±1.60	28.37±5.08	31.50±8.61	32.54±2.093	.029
9 WAP	52.32±1.06	42.71±8.43	41.73±2.29	42.24±2.55	.231
10 WAP	59.82±2.73	52.95±7.64	49.15±0.29	48.81±3.55	.083
11 WAP	68.47±2.42	49.46±7.96	53.25±6.52	55.11±4.38	.180
12 WAP	71.45±3.03	68.61±2.36	77.98±2.45	63.97±1.45	.553
Total	**529.51**	**350.95**	**394.14**	**352.42**	

Survey Data, 2020

Mean in the same column do not differ significantly (P≥0.05); WAP= weeks after planting; T1 = Control experiment; T2 = 1kg of Compost; T3 = 2kg of Compost; T4 = 3kg of Compost.

Collar Diameter

Collar diameter was also measured in this experiment, the results are presented table 4. The highest mean collar diameter was recorded is obtained in the control experiment (7.25±2.05) followed by treatment 4 (3kg) (6.00±1.000). The lowest collar diameter was recorded in treatment 3 (2kg) (5.33±1.155) all at 12 weeks after planting. Significant difference (P≤0.05) was observed across the different treatment.

Table 4: Effect of Different Levels of Compost Produced with Cow Dung on Collar Diameter of *A. digitata L.*

Number of weeks	Control Mean/SD	T2 (1kg) Mean/SD	T3 (2kg) Mean/SD	T4 (3kg) Mean/SD	Sig. Lev.
2WAP	1.00±0. 00	1.00±0. 00	1.00±0. 00	1.00±0.00	-
3 WAP	8.00±2.60	9.40±0.75	9.37±1.72	9.10±1.32	.630
4 WAP	3.33±0.14	2.33±.577	2.33±.58	2.00±0.000	.052
5 WAP	4.00±0.22	2.67±0.07	2.33±0.58	2.33±0. 58	.059
6 WAP	3.67±0.52	2.67±0.51	3.33±01.155	3.33±0. 58	.480
7 WAP	4.67±1.12	3.00±0. 00	3.00±1. 00	3.67±0.512	.060
8 WAP	5.33±1.53	3.00±0. 00	4.00±1.00	3.67±0. 58	.086
9 WAP	5.33±1.34	3.67±3.44	4.33±0. 58	3.67±0. 58	.162
10 WAP	5.67±2.02	3.67±0.49	5.00±1. 00	4.67±0. 58	.315
11 WAP	6.67±2.03	4.67±0.22	5.33±1. 16	5.00±1.00	.334
12 WAP	7.25±2.05	5.45±0.11	5.33±1.16	6.00±1.00	.288
Total	**54.92**	**41.53**	**45.35**	**47.77**	

Survey Data, 2020

Mean in the same column do not differ significantly (P≥0.05); WAP= weeks after planting
T1 = Control experiment; T2 = 1kg of Compost; T3 = 2kg of Compost; T4 = 3kg of Compost.

DISCUSSION

This experiment was carried out to determine the effect of different rates of compost produced with Cow dung on the early growth performance of *Adansonia digitata*. The results of this experiment are as presented in the tables above. The results showed that different growth performance occurred in response the different rate of the compost in the soil. The application of the compost had no significant change in the growth and early performance of the plant.

Plant height was significantly higher in the control experiment; however this was closely followed by the application of the compost at the rate of 3kg (T2). This relatively high plant height recorded with compost manure application could be as the result of the fact that is probably due to release of nutrients which promoted vigorous plant growth through efficient photosynthesis (Iqtidar *et al.,* 2006). Plant height is an important component that helps to determine plant growth. Findings of the present study show that this particular species will grow normally under favorable conditions with the right agroforestry techniques. This study shows that *A. digitata* as a deciduous plant with a lifespan reaching 1500 years, does not require compost application in the seedling stage of the plant, although manure application enhances other properties in the soil. Studies conducted on other crops reported that organic fertilizers such as (. farm yard manure that enhance plant growth (Ismael *et al.*, 2012).

The positive effect of organic fertilizer on plant height in this study could be due to improved soil fertility. Organic fertilizer contain large amounts of nutrients and positively affect plant growth and yield by improving the chemical, physical and biological properties of soil. It is also possible that the application of organic fertilizer activated the soil microbial biomass, hence improved soil fertility.

A higher number of leave was recorded with the application of the compost as compared to the control experiment. The highest number of plant leaves in the present study was recorded in plants amended with 3kg of organic fertilizer which was significantly ($p<0.05$) higher than the control. This result is in agreement with the findings of (Masarirambi *et al.,* 2012) who recorded the highest number of leaves in lettuce plants amended with 60 t ha−1 chicken manure compared to the control. Increased soil fertility following organic fertilizer application might have increased the number of leaves as observed in other crops (Eltun *et al.,* 2002). Organic fertilizers releases nutrients more slowly but store them longer in the soil, thereby ensure a long residual effect. The nutrients from organic fertilizer support rapid root development which might have enhanced leaf growth towards the end of the study.

Leave area and collar diameter were not significantly influenced by the application of the compost. This implies that the compost is not a compulsory component in the seedling stage of this particular species.

CONCLUSION

Based on the result of this finding,the compost produced with cow dung indicates no significant improvement in the early growth performance of *A. digitata.* Thevaried rates of application have different influence on the growth variables of the plant. Thus, compost had shown no significanteffect on theseedlings species at different stages. For optimum growth and yield of *A. digitata*, proper agroforestry practice(s) and techniques must be adopted. In order to maintain stable soil fertility, application of compost manure is recommended.

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