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Effects of Poultry Manure on Growth and Yield of Bambara Nut, (*Vigna subterranea*) in Maiduguri, Borno State

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***Abstract**: An experiment was conducted to determine the effects of poultry manure rates on growth and yield of Bambara nut in Maiduguri. The research was conducted at Ramat Polytechnic Integrated Teaching and Research Farm during the 2024 raining season. The treatments consisted of four rates of poultry manure; T_1 (0kg/ha poultry manure), T_2 (54kg/ha poultry manure), T_3 (108kg/ha poultry manure), T_4 (162kg/ha poultry manure), laid out in randomized completed block design (RCBD) replicated tree times. Data on Growth parameters collected were: include Plant height, Number of Leave/plant, Leave Area/plant at 4, 8 and 12 weeks after sowing (WAS) while data on yield parameter: seed weight kg/ha was determined. The results showed that 164kg/ha poultry manure(T_4) gave the tallest plant height, highest number of leafs/plant, largest leafs area/plant at all the sampling periods and the heaviest seed yield kg/ha of Bambara nut. However treatment 1 (T_1) recorded the shortest plant height, least number of leafs/plant, smallest leafs area/plant at all the sampling periods and least seed yield kg/ha. from the results of the study it was concluded that poultry manure is an effective organic fertilizer for enhancing the productivity of Bambara nut. It is recommended that farmers in Bambara nut-growing regions should be encouraged to use poultry manure as an organic fertilizer to boost yields sustainably*

***Keywords:** Bambara nut, Manure, Growth, Yield.*

INTRODUCTION

Bambara nut, (*Vigna subterranean*) is an indigenous African crop and reported to have originated from North Eastern Nigeria and Northern Cameroon where the wild forms are still found (PROTA, 2015). The crop is grown primarily for its seeds which are eaten fresh when semi-ripe and as a Pulse when dry and mature, or ground into flour. Bambara nut is a major source of vegetable protein in Sub-Saharan Africa, where it constitutes important part of the local diets, cultures and economy. (Williams, 2013). The seeds in regarded as a completely balanced food. Bambara nut seeds, haulm and dry leaves have been used to feed Livestock and Poultry. The plant is wild in isolated Location in the savannah Zone of West Africa and may have been domesticated around the head waters of the Niger River. (Goli, 2017, Heller *et al.*, 2018). Bambara nut is cultivated in many semi-arid African countries such as Ghana, Nigeria and South Africa with a secondary cultivation Centre in South East Asia namely Thailand, Indonesia and parts of Malaysia.

Traditionally, it was cultivated in extreme, tropical environments by small-scale farmers without access to irrigation and/or fertilizers and with little guidance on improved practices (Marahin *et al.,* 2013).
In 2001, FAO published a global mapping report for Bambara nut in which crop modeling was for the first time used to predict potential areas of production and as well as potential yields. The report by Azam-Ali *et al*., (2011) revealed that beyond its two current cultivation Centre's there is a potential for cultivating Bambara nut in many places countries with a Mediterranean climate such as Lebanon and Israel as well as European countries such as Italy, Portugal, Spain and Greece. The report also concluded that when factors such as the seasonal distribution of rainfall, day length and range of temperatures during the growing season are accounted for, the potential yields of Bambara nut within its current areas of cultivation can be significantly increased without high levels of agronomic inputs. Azam-Ali *et al*., (2011).
Cultivation of Bambara nuts on a large scale and pure stand is not very common. The crop is mostly grown by women, intercropped with major commodities such a Maize, Sorghum, Millet, Yam, Cassava, Peanut and Cowpea. Grown in rotation, Bambara nut improve the nitrogen status of the soil. Reliable production figure for the crop are difficult to obtain, because the crop is mainly grown for Home Consumption and Sale at Local Market (Mukurumbira, 2015).The crop is planted extensively in Western Africa where about 333,000 million tonnes of dry seed were produced on 400, 000 ha annually. The major producing areas are Nigeria (100,000 tonnes/annum), Niger (30,000 tonnes/annum) and Ghana (20,000 tonnes/annum) (Rochat and Arthur, 2015), Production outside Africa is negligible. It cultivation seems to have proceeded that of the common groundnuts (*Arachis hypogaea*), of American origin. World annual Production of Bambara nut was estimated at 30,000 Metric tonnes in 1982, with about half being produced in the Savannah region of West Africa. Available estimates in Botswana revealed that the crop is grown on 1500 hectares of Land from which a total yield of 40 Metric tonnes (i.e. 26.6kg/ha) of seed was obtained annually (Karikari, 2010). Most production is carried out at subsistent level or small scale farms which make mechanization impossible or large scale production using Mechanization difficult. The crop is grown widely in Eastern and southern Africa and in Madagascar.

The Main Exporting Counties are Burkina Faso, Chad, Mali, Nigeria and Senegal; they supply Markets in Benin, Ghana, Nigeria and Togo. Nigeria is the major producer of the crop (Mukurumbira, 2015). Nitrogen (N), phosphorus (P), and potassium (K) are essential macronutrients for plant growth and development. Bambara groundnut (Vigna subterranea) is a legume crop that is native to Africa and has a high nutritional value. N, P, and K play important roles in the growth and yield of Bambara groundnut. Nitrogen is essential for the development of vegetative parts of the plant, such as leaves and stems. It also helps with the formation of chlorophyll, which is necessary for photosynthesis. Bambara groundnut requires moderate amounts of nitrogen, typically between 20 and 30 kg/ha. Phosphorus is important for root development, flowering, and fruit set. It also helps with the transfer of energy within the plant. Bambara groundnut requires moderate to high amounts of phosphorus, typically between 30 and 60 kg/ha. The specific requirements for N, P, and K will vary depending on the soil type, climate, and variety of Bambara groundnut being grown.

However, the general guidelines above can provide a starting point for fertilization. Here is a table summarizing the effects of N, P, and K on the growth and yield of Bambara groundnut. In addition to N, P, and K, Bambara groundnut also requires other nutrients, such as calcium, magnesium, sulfur, iron, zinc, copper, manganese, and boron. These nutrients are typically present in sufficient amounts in the soil, but they may need to be supplemented if the soil is deficient. By providing Bambara groundnut with the right nutrients, farmers can optimize the growth and yield of this valuable crop. According to Arthur *et al*., (2013), high carbohydrate (65%) and relatively high protein (18%) content as well as sufficient quantities of fat (6.5%6) make the Bambara nut a complete food. According to research by Ihekoronye and Ngoddy (2015) and validated by Bambara nut seeds have been found to be richer than peanuts (groundnuts) in

essential amino acids each an isoleucine, leucine, lysine, methionine. Phenylalanine, threonine and valine. This is an important trait for the potential of Bambara nut to be used to complement foods lacking in these essential amino acids. The fatty acid content is predominantly linoleic, palmitic and linolenic acids as per reported by Bamashiye *et al.,* (2011). Bambara nut is an important food crop in many developing countries. It is a good source of protein, carbohydrates, and other essential nutrients. Increasing Bambara nut production can help to improve food security and nutrition in these regions. However, farmers often use poultry manure inefficiently, resulting in waste and environmental pollution. Research on Poultry manure management can help farmers to use fertilizer more efficiently and sustainably. The study will provide insights into the mechanisms by which Poultry manure enhances Bambara nut growth and yield. This information can be used to develop new fertilizer formulations and management practices that are more effective and efficient. The study will also contribute to the body of knowledge on sustainable agricultural practices. The research was conducted during the wet season of 2024 at the Integrated Teaching and Research Farm of the Department of Agricultural Technology, Ramat Polytechnic Maiduguri, Borno State of Nigeria. The trial consists of four Poultry Manure rates replicated three times. The aim of this research is to determine/ establish the best poultry manure rates for growth and yield of Bambara nut in Maiduguri.

MATERIAL AND METHOD

The treatment consisted of four rates of poultry manure fertilizer; T_1 (0kg/ha poultry manure), T_2 (54kg/ha poultry manure), T_3 (108kg/ha poultry manure), T_4 (162kg/ha poultry manure), laid out in randomized completed block design (RCBD) replicated tree times. The experiment covers a total land area of 165^2 (15m x 11m). The plots size is $9m^2$ (3m x 3m) and the alley (working space) between sub plot is 1m. The intra and inter row spacing is 20cm x 30cm respectively and data was not collected on plant of outmost row in the sub plot, Therefore, the net plot size was $4.92m^2$**.**

Five plants were randomly selected from the net plot and tagged. Data for growth and yield parameters were measured and recorded from these tagged plants. The parameters measured include: Plant height, Number of Leave/plant, Leave Area/plant at 4, 8 and 12 weeks after sowing (WAS) and seed weight kg/ha.

RESULT AND DISCUSSION

Effects of Poultry Manure on Plant Height of Bambara Nut Plant Height

The table one shows the effects of poultry manure on height of Bambara nut at week 4, 8, and 12 weeks after sowing (WAS). There is a significant difference statistically among the treatments at all the sampling periods. Treatment 4 (which has the highest dose of poultry manure) recorded that the tallest plant, while treatment 1 recorded as the shortest plant, while treatment 4 is the best poultry manure rate for height of Bambara nut in the study area. This result is agreement which founding by Hampson *et al*., (2000), whose recorded as increase in plant weight with increase in rate of poultry manure.

Table 1: Effects of Poultry Manure on Plant Height (cm) of Bambara Nut Plant Height

Treatment	4 WAS	8 WAS	12 WAS
T_1	23.53[d]	34.40[d]	55.63[d]
T_2	27.87[c]	39.23[c]	69.10[c]
T_3	29.13[b]	41.40[b]	72.96[b]
T_4	31.00[a]	42.93[a]	79.03[a]
SC	0.37	0.24	0.26

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability according to LSD test

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T_1 = 0kg/ha poultry manure
T_2 = 54kg/ha poultry manure
T_3 = 108kg/ha poultry manure
T_4 = 162kg/ha poultry manure

Effects of Poultry Manure on Number of Leaves of Bambara Nut

Table two shows the effects of poultry manure on the number of leaves of Bambara nut at week 4, 8, and 12 weeks after sowing (WAS).There is significant difference statistically among the treatments at all the samples periods. Treatment 4 (which has the highest doseof poultry manure) recorded as the highest leaves number, while treatment 4 is the best poultry manure for the number of leaves of Bambara nut in the study area, this was funding by (Redjeki 2007) were also recorded as increase in number of leaves with increase in poultry manure rate.

Table 2: Effects of Poultry Manure on Number of Leaves of Bambara Nut Number of leaves

Treatment	4 WAS	8 WAS	12 WAS
T_1	23.20[d]	41.67[d]	61.00[d]
T_2	29.00[bc]	50.00[c]	72.66[c]
T_3	31.43[b]	53.67[ab]	76.66[b]
T_4	34.27[a]	56.57[a]	83.00[a]
SC	0.43	0.18	0.37

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability according to LSD test.

T_1 = 0kg/ha poultry manure
T_2 = 54kg/ha poultry manure
T_3 = 108kg/ha poultry manure
T_4 = 162kg/ha poultry manure

Effects of Poultry Manure on Leaves area of Bambara Nut

Table three shows the effects of poultry manure on the leaves area of Bambara nut at week 4, 8 and 12 weeks after sowing (WAS). There is a significant difference among the treatments at all the sampling periods. Treatment 4 which has the highest of poultry manure) recorded the largest leave area of Bambaranut compared to treatment 1 which recorded as the smallest leave area at all the sampling periods. Treatment 4 is the best poultry manure rate for leaves are of Bambara nut in the study area. This result is also reported by pengnoo *et al* (2006), who also recorded as the increase in plant leaves area with increase in poultry manure rate.

Table 3: Effects of Poultry Manure on Leaves area of Bambara Nut Plant Height

Treatment	4 WAS	8 WAS	12 WAS
T_1	20.67[b]	39.67[d]	80.67[d]
T_2	22.00[c]	42.67[c]	82.67[c]
T_3	21.00[b]	42.00[b]	84.67[b]
T_4	24.33[a]	50.00[a]	88.00[a]
SC	0.45	3.11	0.23

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability according to LSD test.

T_1 = 0kg/ha poultry manure
T_2 = 54kg/ha poultry manure
T_3 = 108kg/ha poultry manure
T_4 = 162kg/ha poultry manure

Effects of Poultry Manure on Seed Yield of Bambara nut in Maiduguri

Table four shows the effects of poultry seed yield of Bambara nut. There is significant difference among the treatments. Treatment four which has the highest dose of poultry manure recorded the heaviest seed weight while plants which received zero dose of poultry manure gave lightest seed weight. Treatment four which gave heaviest seed weight is the best poultry manure rate for seed weight of Bambara nut in the study area. Azam–Ali *et al*., (2011) report that poultry manure fertilizers provide all of these essential nutrients in a balanced ratio for optimum plant growth and best yield.

Effects of Poultry Manure on Seed Yield of Bambara nut in Maiduguri

Treatment	Seed yield
T1	1.02[c]
T2	1.26[b]
T3	1.38[ab]
T4	1.50[a]
SE	0.04

Mean followed by the same letter(s) within a column are not significantly different at 5% level of probability according to LSD test.

T_1 = 0kg/ha poultry manure
T_2 = 54kg/ha poultry manure
T_3 = 108kg/ha poultry manure
T_4 = 162kg/ha poultry manure

Conclusion

The study highlights the positive effects of poultry manure on the growth and yield of Bambara nut. The application of poultry manure significantly improved plant height, leaf number, leaf area, and seed yield. Among the treatments tested, the highest poultry manure rate produced the most favorable results. These findings demonstrate that poultry manure is an effective organic fertilizer for enhancing the productivity of Bambara nut.

Recommendations

Farmers in Bambara nut-growing regions should be encouraged to use poultry manure as an organic fertilizer to boost yields sustainably. Research is needed to determine optimal application rates for different soil and climate conditions. Training in proper handling and storage should be provided to prevent environmental harm. Governments and agricultural agencies should promote policies supporting organic fertilizers like poultry manure to improve food security and protect the environment.

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