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EFFECT OF POULTRY MANURE AND NPK 15:15:15 FERTILIZER ON THE GROWTH, DEVELOPMENT AND YIELD OF OKRA (*Abelmuschus esculentus L.)*

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Abstract

The study was carried out to investigate the effect of poultry manure on the growth, yield and development of okra (*Abelmuschus esculentus L*). It has been proven that inorganic or commercial fertilizers are not environmentally friendly and expensive. Hence, there is need for this study. The experiment consisted of four treatments: poultry manure at rate of 40 g and 50 g, NPK 15:15:15 at 40 g and control. The experiment was laid out in a completely randomized design and replicated four times. Poultry manure was incorporated into the beds two weeks before sowing and NPK 15:15:15 was applied at two weeks after planting. Parameters assessed were plant height (mm), stem girth (mm) and number of leaves per plant and the results obtained revealed that okra responded well to the application of poultry manure. Based on the finding, T3 (50 g of poultry manure) had the highest plant height of 60.33a, with stem diameter of 3.37a and the number of leaf of 12.33a. Therefore, T3 significantly increase the growth and yield of okra and the control had the least performance with a stem girth of 3.37a. Plant height of 39.53b and number of leaves of 9.33b on the growth and yield of okra. The plants treated with NPK 15:15:15 and poultry manure gave very close results with regards to plant height, stem girth and number of leaves. It is therefore recommended that top soil with the application of 50 kg of poultry manure is optimal for growth and yield of okra in the soil with similar physiochemical properties.

Keywords: Okra (*Abelmoschus esculentus),* Poultry manure, NPK 15:15:15, Yield, Height.

Introduction

Okra *(Abelmoschus esculentus L.)* is an important vegetable crop with a diverse array of nutritional quality and potential health benefits (Aderemi and Sangodoyin, 2019). Okra (*Abelmoschus esculentus* L.) is one of the major vegetables in Africa which is cultivated mainly for consumption (Katung and Kastina, 2005). All parts of the okra plant are useful, its leaves and tender shoots which are equally rich in nutrients can be cooked and eaten. Okra is important because of its nutritive values that are present in the leaves and fruits (Akintoye *et al*., 2011). The pods are either consumed in fresh and dried form. Peasant farmers are not the only ones who grow Okra, unemployed school leavers also grow Okra as a survival strategy when jobs are non-existent (Schippers, 2000). It is widely distributed and grown in the southern parts of Nigeria (Olawuyi *et al.* 2011). Okra commands a high market price in Nigeria markets because it features daily in the diets of most Nigerians.

Well drained fertile soils with an adequate content of inorganic and organic fertilizers and reserve of the major elements are generally suitable for its growth. The present day agriculture requires the supply of additional nutrients for optimum crop performance. Complimentary use of organic with inorganic fertilizer is widely known to be reliable and sustainable soil fertility management strategy. In view of these facts this paper is aimed at investigating the response of Okra to inorganic fertilizer and organic manure for okra yield.

Organic fertilizers are materials added to the soil to supply the essential plant growth development and enhance optimum productivity. Organic manure is wastes and residues of plant or animal life. The best known organic manure is the waste from mixed arable and livestock farming called farmyard manure. Farmyard manure is partially rotted straw containing urine and feaces, other rotting plant remains is usually called composts. Organic wastes from industrial processes, town refuses and sewage sludge are also referred as manures. Common amongst the farm and bi-products at various adaptive trials areas in Nigeria include; poultry droppings, cow dung, goat dung, sheep dung, brewery wastes, cocoa pod husks and ash wastes such as cocoa pod husk ash, wood ash, rice bran ash and sawdust ash. Organic fertilizer materials are cheap, available and consequently environmentally friendly for good production of vegetables (Aderemi and Sangodoyin, 2019). Organic fertilizers are active and important component of soil, it is the nitrogen reservoirs, it furnishes large portion of the soil phosphorous and sulphur.

Inorganic fertilizers are synthetic, chemical, artificial material added to the soil that supplies one or more required materials for plants. They play a vital role in the improvement of soil fertility and enhancement of crop yields. Use of inorganic fertilizer is still a must since the land is limited and the demand for higher production is pressing. Nutrient elements have specific function in crop growth and development but no single nutrient can produce any meaningful plant growth on its own. Chemical fertilizers represent known technology of near-immediate application to solve many of the fertility problems. The bulk of compound fertilizer used in the country were in form of NPK 15:15:15 which is popular with peasant farmers due to lower costs involved in its use. . This study focused mainly on complementary use of NPK 15:15:15 fertilizer and poultry manure to improve soil properties and enhance plant growth (Agbede, 2010; Agbede and Ojeniyi, 2009).

Okra *(Abelmoschus esculentus L)* is a vegetable which is useful to mankind. The leaves and fruits of the plant have medicinal' and good industrial values. The seed germination, early' seedling growth and development of the vegetable are known to the affected by condition of the

growth media. Therefore, there is need to determine the response of the plant to both organic and inorganic fertilizers, thereby selecting an alternative way of enhancing production.

Materials and method

The experimental site was located at the agricultural technology plot of Federal College of Forestry, Jericho hill, Ibadan. The area is situated at Ibadan south west local government, Oyo state, Nigeria. The following materials were used for the experiment; Okra seeds (*Abelmoschus esculentus L.),* Measuring instruments (ruler, vernier caliper), Hoe and cutlass, Inorganic Manure (NPK 15:15:15), Organic Manure (Poultry manure), Watering can, Exercise book, pencil, pen, Labels and tags, Weighing balance, Paper tape, Glove, Polythene Pot, Pen, Cutlass, Sieve, Rain boot, Wheel barrow, Hand navel, Shovel.

Okra seeds were gotten from the seed store of National Horticultural Research Institute, Jericho, Ibadan. Loamy soil were collected and air dried for 3 days and after that it was crushed with mortar and pestle and then was sieve by using sieve to get the smooth and fine soil sample. After the sieving, poultry manure was collected and weighed at 40 g and 50 g and mixed with 3 kg of soil and it was filled into the polythene pots. Three seeds of Okra were sown per polythene pots using drilling method. Watering operations and also weeding operation were carried out to prevent competition of nutrient and water within the plant. The first data collection was taken two weeks after planting.

Table 1: Experimental layout

T1R3	T2R1	T3R2	T4R4
T1R2	T2R3	T3R5	T4R1
T1R5	T2R5	T3R4	T4R5
T1R1	T2R4	T3R3	T4R2
T1R4	T2R2	T3R1	T4R3

Experimental designs

T1 O level of poultry manure/fertilizer (3kg soil)
T2 NPK 15:15:15 (40g) + 3kg of Top soil
T3 Poultry manure (50g) + 3kg of Top soil
T4 Poultry manure (40g) + 3kg of Top soil

Parameters assessed

The following parameters were taken during the experiment.

1. Plant height (cm) — measured from soil surface to plant top.
2. Number of leaves was counted and recorded.
3. Stem girth (mm) — stem girth was measured with the aid of a vernier caliper.
4. Number of fruits was obtained by harvesting matured fruit.

Method of data analysis

The data was subjected to Analysis of Variance (ANOVA) and significant means were separated using Duncan Multiple Range Test (DMRT).

Table 2: Laboratory analysis of physical chemical properties of the loamy soil

Parameter	Soil
ph	6.2
Sand (%)	86.2
Clay (%)	6.3
Silt (%)	7.5
Ca(cmol/kg)	2.30
Mg (cmol/kg)	0.01
Na (cmo/k)	0.47
K(cmol/kg)	0.12
H+Al (cmol/kg)	0.05
Base saturation (%)	99.6
C (%)	1.93
N (%)	0.13
Available P	5.00

Source: FRIN Soil Laboratory, 2020.

Results and discussion

Table 3: Mean and Duncan test for the stem girth of plant for Okra (*Abelmoschus esculentus L.)*

TREATMENT	WK2	WK 4	WK6	WK8
T1	0.93a	1.40c	2.03b	2.30b
T2	1.05a	1.05bc	2.17b	2.83b
T3	1.13a	1.80a	3.13a	3.37a
T4	1.10a	1.70ab	2.43b	2.84b
LSD	0.39	0.24	0.13	0.17

Table 3 shows that at week 2, there was no significant difference amongst the treatment T3 (50 g of poultry manure) had the highest mean value of 3.37 mm. There was a significant difference among the treatments at week 4 to week 8. T3 (Poultry manure) has the best performance on the stem girth with the mean value of 3.37 mm, followed by T4 (40 g of poultry manure) had 2.84 mm and T2 (NPK 15:15:15) had 2.83 mm, while T1 (Control) has the least with mean value of 2.30 mm.

Table 4: Mean and Duncan test for the plant height of plant for Okra (*Abelmoschus esculentus*)

TREATMENT	WK2	WK4	WK6	WK8
T1	9.55b	10.63c	29.77c	39.53b
T2	10.25ab	11.33bc	34.10bc	58.07a
T3	10.93a	12.80a	47.83a	60.33a
T4	10.78a	12.25ab	38.53b	42.70b
LSD	0.86	0.95	0.84	0.80

Table 4 shows that there was significant difference among the treatment at week 2 to week 6, T3 (50g of poultry manure) had the fastest growth, with the mean value of 60.33, followed by T2

(NPK 15:15:15) with the mean value of 58.07, while T1 (control) has the least growth with the value of 39.53. The results obtained agrees with the findings of Aniefiok *et al*. (2013) in okra production in which they reported that organic manure, most especially poultry droppings could increase plant height and number of leaves.

Table 5: Mean and Duncan test for the plant height of plant for Okra (*Abelmoschus esculentus*)

TREATMENT	WK2	WK4	WK6	WK8
T1	2.00a	4.33a	5.67c	9.33b
T2	2.33a	5.00a	6.33bc	10.32b
T3	2.33a	4.00a	7.33a	12.33a
T4	2.67a	4.33a	6.67ab	11.33ab
LSD	1.04	1.57	1.46	Ns

Table 5 shows that there was no significant difference amongst treatment within week 2 and week 4. There is a significant difference among the treatment at week 6 to week 8. T3 (50 g poultry manure) has the best performance on the number of leaves, followed by T4 (40 g of poultry manure) with the mean value of 11.33, while T2 (40 g NPK 15:15:15) had the least performance on the number of leaves with the mean value of 9.33.

Table 6: Mean and Duncan test for the fruit of plant for Okra *(Abelmoschus esculentus)*

TREATMENT	HARVEST 1	HARVEST 2
T1	2.75a	3.25a
T2	2.25a	3.75a
T3	3.25a	4.00a
T4	2.25a	3.50a
LSD	NS	NS

Table 6 shows that there is no significant difference among the treatment, T3 (50 g poultry manure) had the best performance on the fruit of plant with mean value of 4.00, followed by T2 (40 g NPK 15:15:15) with a mean value of 3.75, while T1 (control) has the least performance on the number of leaves with the mean value of 3.25. The results obtained were in agreement with the findings of Onwu *et al*. (2014) which reported that yield of okra can be increased due to organic manure application.

Conclusion

Based on the investigation, 50g of poultry manure (T3) had the best performance on plant height (60.33 cm), stem girth (3.37 mm) and no of leaves (12.33). NPK 15:15:15 (T2) had the best performance on the number of fruit (4.00). This shows that poultry manure were readily available and in the best form for easy absorption by the plant roots, hence there was a boost in the growth of the plant. The results of the study showed that the treatments are capable of improving crop yield. On a long run inorganic fertilizers have been hazardous to human health as a result of chemicals present in them. In many developing countries, farmers have limited financial resources and can rarely afford to purchase sufficient mineral fertilizer. Therefore, it is recommended that farmers adopt the use of poultry manure for planting.

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