



## METHODS OF POULTRY MANURE APPLICATION AND ITS EFFECT ON GROWTH AND YIELD OF OKRA (*Abelmoschus esculentus* L.)

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### ABSTRACT

*This study examined the effect of methods of fertilizer application on growth and yield of okra. The experiment was conducted within the research plot of Crop Production Technology Department, Federal College of Forestry, Ibadan. Poultry manure was applied at varying levels using different methods of fertilizer application (Ring and Broadcasting methods). The experiment was a 2 x 2 factorial laid out in a Randomized Complete Block Design (RCBD) having five (5) treatments which includes T1 – 2 Kg/ha of poultry manure and ring method, T2–2 Kg/ha of poultry manure and broadcasting method, T3– 4kg/ha of poultry manure and ring method, T4 – 4 Kg/ha of poultry manure and broadcasting method, T5 – Control replicated three (3) times. Growth and yield parameters measured were plant height, number of leaves, stem diameter and fruit weight. Data collected were subjected to Analysis of variance (ANOVA) and the means were separated using Duncan Multiple Range Test (DMRT) at 5% level of probability. The result obtained showed that all the treatments favorably influenced the growth parameters of okra although T4(poultry manure and broadcasting) at 4kg/ha performed best while the least performances were recorded in T3(poultry manure and ring method) and T5 (control) plots. In addition, T4(poultry manure and broadcasting) at 2kg/ha had the highest number of fruits recording 242.0 while T5 (control) recorded least with 86.0. Broadcasting method at 4kg/ha and 2kg/ha levels of application performed best at both the vegetative and yield parameters assessed while the control plot recorded the least performance. In conclusion, since T4(Poultry manure and broadcasting)at 2kg produced the highest number of fruits, it is therefore recommended to farmers for optimum growth and yield of okra.*

**Keywords:** Poultry manure, okra, ring and broadcasting methods, growth, yield

### INTRODUCTION

Okra *Abelmoschus esculentus* (L.), a member of the Malvaceae family, is a widely cultivated vegetable crop and very important in the diet of Africans (Omotoso *et al.*, 2008). It is a valuable crop that provides an excellent income and generates other opportunities for small-scale farmers (Adelakun, *et al.*, 2008). Indeed, it is one of the important nutritional vegetable crops cultivated in Nigeria. It is an annual crop grown mainly as fruit and leafy vegetable in both green and dried state in the tropics (Schippers, 2000). Okra as vegetables is an

important protective food for the maintenance of health and prevention of disease. It contains valuable food ingredients, which can be successfully utilized to build up and repair the body (Edet *et al.*, 2007). The nutritional constituents of okra include calcium, protein, oil and carbohydrates; others are iron, magnesium and phosphorus. Most okra is eaten in cooked or processed form. Young fruits may be eaten raw. The oil in the seed could be as high as in poultry eggs and soybean (Omotoso *et al.*, 2007). Okra is recommended for consumption by World Health Organization due to its ability to fight

diseases. Okra has been found to be a rich source of vitamins A and C, calcium, thiamine and riboflavin. It is also rich in iron and is used as a medicine in the treatment of the peptic ulcer (Uka *et al.*, 2013). Okra in Nigeria has often recorded low yield. The low yield experience has been attributed to poor soil fertility and deficiency in important mineral nutrients. Manure provides a source of all necessary macro and micro nutrient in available forms, thereby improving the physical properties of the soil (Abou El- Magd *et al.*, 2006). Poultry manure is an excellent source of nutrients and can be incorporated as fertilizers. Poultry manure can also be used as topdressing and for soil improvement. Its low nutrient value makes it safe to apply unlimited quantities. The form a nutrient is applied in the soil often determines its availability and long-term effect on the soil. During the past decade, there has been a great deal of discussion and debate about the use of organic fertilizer in tropical region to improve soil fertility and thus increase crop yield. In this circumstance, a low-cost management strategy becomes necessary to maximize yield and fruit quality of vegetable crops (Micheal *et al.*, 2010).

Different methods of fertilizer application have been known to influence plant yield (Sweeney *et al.*, 1996). Broadcasting method is the spreading of fertilizer uniformly applied over the soil surface and may be incorporated in the soil or left on the soil surface and may reach the root zone by percolating rainfall or by wetting. (Toews and Soper, 2002). Ring method is a method of applying fertilizer in a round circle from about 30cm from the plant. Ring method also enhance vegetable yield helping farmers to have bountiful harvest. The mode of applying fertilizers to crops has been considered a precious supplement in the application of nutrients to soil system (Fageria *et al.*, 2009).

## MATERIALS AND METHODS

### Study Area

The experiment was carried out behind the screen house of Federal College of Forestry (FCF), Ibadan. The college is situated at Jericho Hill, Ibadan North West area of Oyo State. The area lies between latitude 7<sup>o</sup>23N, and Longitude 3<sup>o</sup>15E. The climatic condition of the area is tropically dominated by rainfall pattern from 1400 mm – 1500 mm. The

average temperature is about 32<sup>o</sup>C, average relative humidity of 80 – 85% and the ecological climatic conditions of the area experiences rainfall with two distinct seasons: dry season from November to March and rainy season from April to October (FRIN, 2017).

### Experimental Design

The experiment was laid out using 2 x 2 factorial in a Randomized Complete Block Design (RCBD) with five (5) treatments replicated three (3) times as follows: T<sub>1</sub> – 2 Kg/ha of poultry manure and Ring method, T<sub>2</sub>–2 Kg/ha of poultry manure and broadcasting method, T<sub>3</sub>– 4kg/ha of poultry manure and Ring method, T<sub>4</sub> – 4 Kg/ha of poultry manure and Broadcasting method, T<sub>5</sub> – Control.

### Sowing of Okra Seeds

Okra seeds were sown on the seed bed made on the field; two seeds were sown per hole at a depth of 1cm and spacing of 45cm x 30cm was used. Seedlings were later thinned to one two weeks after planting. A management practice which includes watering and weeding was done at regular intervals.

### Data collection

Assessment of the following growth parameters was carried out once every week commencing from the second week after sowing; Plant Height (cm), Number of leaves, Stem Diameter and at maturity the number of fruits and fruit Weight were assessed.

### Data Analysis

Data collected was subjected to Analysis of Variance using General Statistical Software Package (GENSTAT) and means was separated using DMRT at 5% level of probability.

## RESULTS

The table below shows the result of the analysis of soil samples from the experimental plot. It clearly shows that the soil used was slightly acidic with pH values of (5.81). Organic carbon content was high having 1.50 while Total nitrogen, Available phosphorus and potassium were low with values (0.13,3.05 and 0.099) compared with the standard critical values.

**Table 1: Typical Physical and Chemical Properties of the Soil Used**

<b>Nutrients</b>	<b>Status</b>
pH	5.81
Organic Carbon (OC)	1.50
Organic Matter (OM)	2.58
Total Nitrogen	0.13
Available Phosphorus	3.05
<b>Exchangeable Bases (Cmol/kg)</b>	
Na (cmol/kg)	4.52
Potassium (K) (cmol/kg)	0.099
Calcium(Ca)	0.10
Magnesium (Mg)	0.07
<b>Exchangeable micro nutrients (mg/kg)</b>	
Mn	130
Iron (Fe)	60
Cu	2.6
Zn	12
Sand%	86.5
Clay%	9.00
Silt%	4.5

The table below shows the result of the chemical properties of the poultry manure used. The result shows that the Total nitrogen in the poultry manure was low with values of 0.55 compared with the contents which ranges between 3-5%, and also

recorded low phosphorus (0.12) compared with 1.5-3.5%. However, organic carbon and potassium appears to be high recording (6.34) and (1.61) when compared with the ranges of 5.8-7.6% and 1.5-3.0% of poultry manure.

**Table 2: chemical properties of poultry manure used**

<b>Nutrients</b>	<b>Contents</b>
Total Nitrogen (%)	0.55
Organic Carbon (%)	6.34
<b>Exchangeable bases(%)</b>	
Mg	0.002
K	1.61
Na	0.11
Available Phosphorus(mg/kg)	0.12
<b>Extractable micronutrients(mg/kg)</b>	
Mn	0.0002
Fe	0.002
Cu	0.000
Zn	0.002

Effect of methods of fertilizer application and rate on the plant height of okra is as presented in table 3. The result shows there was significant difference among the treatments used from the fourth week to

the seventh week after planting. At week seven (7), T4 (PM+B) at 4kg had the highest plant height (63.5) while plot T3 (PM+R) at 4kg had the least performance having the mean value of 32.5.

**Table 3: Effect of Methods of Fertilizer Application on the Plant Height of Okra.**

Method of Fertilizer Application	Rate of Fertilizer Application (Kg)	Weeks After Planting			
		4	5	6	7
Control	0	18.57	26.97	35.2	43.25
Ring	2	14.37	17.95	26.6	32.5
	4	18.75	24.92	39.2	53.4
Broadcasting	2	19.55	28.27	33.5	39.2
	4	25.08	31.23	56.5	63.5
LSD MFA (p<0.05)		3.02**	4.04*	4.55**	4.62ns
LSD RATE (p<0.05)		3.69*	4.94ns	5.58**	5.65**
LSD MFA*RATE (p<0.05)		5.22ns	6.99*	7.89*	8.00**

*Ns* – Not significant

**Table 4: Effect of Methods of Fertilizer Application on Number of Leaves on Okra**

Method of Fertilizer Application	Rate of Fertilizer Application (Kg)	Weeks After Planting			
		4	5	6	7
Control	0	7.00	8.00	8.00	8.00
Ring	2	7.00	8.00	9.00	9.00
	4	8.00	9.00	8.00	9.00
Broadcasting	2	6.00	9.00	8.00	7.00
	4	8.00	11.00	8.00	10.00
LSD MFA (p<0.05)		0.92ns	1.50ns	2.30ns	1.72ns
LSD RATE (p<0.05)		1.12*	1.84ns	2.82ns	2.10ns
		1.54ns	2.60ns	3.99ns	2.98ns

Effect of methods of fertilizer application on number of leaves of okra is as presented in table 4 above. There was no significant difference among the treatments used from 4<sup>th</sup> to 7<sup>th</sup> week after

planting. At week seven, T4 (PM + B) at 4kg had the highest number of leaves having the mean values of (10.00) while the control plot recorded least with the mean values of (8.00).

**Table 5: Effect of Methods of Fertilizer Application on the Stem Diameter of Okra**

Method of Fertilizer Application	Rate of Fertilizer Application (Kg)	Weeks After Planting			
		4	5	6	7
Control	0	0.54	0.59	3.85	4.47
Ring	2	0.27	0.32	3.62	4.82
	4	0.37	0.42	4.78	5.07
Broadcasting	2	0.33	0.40	4.05	4.48
	4	0.43	0.47	5.33	6.10
LSD MFA (p<0.05)		0.13ns	0.14	0.87	0.92ns
LSD RATE (p<0.05)		0.16*	0.17*	1.07	1.13ns
LSD MFA*RATE (p<0.05)		0.23ns	0.23ns	1.51	1.60ns

Effect of methods of fertilizer application and rates on stem diameter of okra is as presented in table 5.

There was no significant difference among the treatments used from 4<sup>th</sup> to 7<sup>th</sup> week after planting.

At week seven, T4 (PM + B) at 4kg had the highest performance (6.10) while T5 (control) recorded least with 4.47.

Effect of fertilizer application on the yield of okra is as presented in table 6. There was significant difference among the treatments used. T3 (PM + B)

at 2 Kg had the highest yield (178kg/ha) while the control plot recorded least having the mean values of 15kg/ha. The increase in fresh pod weight of okra due to poultry manure application could be attributed to easy solubilization effect of released plant nutrient leading to improved nutrient status and water holding capacity of the soil.

**Table 6: Effect of Fertilizer Application on Yield of Okra**

Method of Fertilizer Application	Rate of Fertilizer Application (Kg)	Yield (Kg/ha)
Control	0	15
Ring	2	47
	4	119
Broadcasting	2	178
	4	125
<b>LSD</b>		<b>144.9ns</b>

## DISCUSSION

The result of the study showed that application of organic poultry manure at 2kg using broadcasting method performed best among all the treatments assessed although all the treatments had significant effects on the growth and yield characters of okra. Organic fertilizers are very essential for proper development of plants as they offer rapid growth with superior quality by containing some nutrients that is necessary for better development. It was also reported that poultry manure seems to promote higher growth and yield of okra (Tiamiyu *et al.*, 2012). Oyewole and Oyewole (2011) observed that organic manures are good sources of nitrogen, potassium, calcium, phosphorus which are essential nutrients that increase the growth and yield of crops. However, the mode of applying fertilizer to crops has been considered a precious supplement to the application of nutrients to soil systems (Fageria *et al.*, 2009). Broadcasting requires less labor and helps to evenly cover the field surface before incorporation into soil through ploughing or hand-hoeing. Incorporation generally increases the fertility status of the whole plough layer. When hand applied, it is essential to distribute the fertilizers uniformly and at the recommended rates to avoid over- or under-fertilization (IRRI, 2009).

Broadcast fertilizer should be incorporated after application to enhance effectiveness or to avoid evaporation losses of N. The increase in fresh pod weight of okra due to poultry manure application could be attributed to easy solubilization effect of released plant nutrient leading to improved nutrient status and water holding capacity of the soil. The results obtain were in agreement with the findings of (Premsekhar and Rajashree, 2009) in which they reported that higher yield response of crops due to organic manure application could be attributed to improved physical and biological properties of the soil. It has been reported poultry manure subsequently increase yield attributing characters and yield of okra (Sameera *et al.*, 2005).

## CONCLUSION

This study investigated the Effect of fertilizer application on the growth and yield of okra. The result obtained showed that all treatments favorably influenced the growth and yield of okra. Application of organic manure (poultry) at the different levels in this study had significant effect on the growth characters. Broadcasting method at 4 and 2 Kg/ha levels of application performed best at both the vegetative and yield parameters assessed while the control plot recorded the least

performance. From the result obtained, it showed that broadcasting method at 2Kg/ha (poultry manure) produced the highest number of fruits and

therefore recommended to farmers for the optimum growth and yield of okra.

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