EFFECT OF VARIETY AND NUTRIENT SOURCES ON GROWTH AND YIELD OF OKRA (*Abelmoschus esculentus*)

***[1]Saidu A and [1] A. Mohammed**

[1]Crop Production Department, Federal University of Technology, P.M.B 65, Minna, Niger State Nigeria.
*Correspondence author e- mail: saiduadamu08@ yahoo.com Mobile phone:07036683435

ABSTRACT

A field experiment was conducted at the Teaching and Research Farm of Crop Production Department, Federal University of Technology Minna, Gidan Kwanu compus to determine the effect of poultry dropping and NPK fertilizer on the growth and yield of two okra cultivars(NHAe 47-4 and LD88-1). The experiment was arranged in a randomized complete block design (RCBD) and replicated three times. The treatment consisted of two sources of nutrients (poultry dropping and NPK fertilizer). At 3and 6 WAS highest plant height was observed when poultry dropping was applied to NHAe47-4. However, at 9 WAS highest plant height was observed when NPK was applied to NHAe47-4.There was significant difference ($p<0.05$)in number of fruits, fruit length fruit weight and fruit yield .The application of poultry to NHAe 47- 4 resulted in highest plant height, number of fruits, fruit length, fruit diameter, and fruit yield. It was observed from the result recorded that NHAe47- 4 performed better than LD 88-1. I therefore recommend that NHAe47-4 should be planted to get best fruit yield. In the absent of NPK fertilizer, poultry dropping should be applied to get better yield over where there is no fertilizer application.

Keywords: Okra, Poultry Dropping, NPK, Number of Fruits, and Fruit Yield.

INTRODUCTION

Okra (*Abelmuschus esculentus*) is indigenous to Africa, but it is now grown throughout the tropics Okra is widely cultivated vegetable crop and can be found in almost every market all over Africa. Okra is an annual vegetable crop grown from seed. There is great diversification of okra with the most production regions in Ghana, Burkina Faso and Nigeria (Raemaekers, 2001). Okra grows well in all type of soils, thriving best in all friable well manure soil (Kochhar, 1986) The fruits which contain numerous seeds are long and cylindrical and slimy. Okra contains a mucilaginous substance that thickens soup and stew (Olusola and Osinawe,1996).These authors also stated that okra is one of the of the many vegetables consumed to complement carbohydrate diet. If the yield of okra is to be increased, the low fertility soil will require additional nutrients .Soil productivity maintenance is a major constraint of tropical agriculture. Crop cultivation is usually moved between fields to utilize only fertile soils for many years without use of fertilizers. However, this cannot be sustained to meet increased demand of an increasing population. Continuous use of mineral fertilizer in tropical soils is associated with reduced crop yield, increased soil acidity and nutrient imbalance. A combination of organic materials and mineral fertilizer is better fertilizer management for these soils. Manures provide a source of all necessary macro and micro nutrient in available forms, thereby improving the physical and biological properties of the soil (Abou El Majd *et al.*,2006). Mixing organic and inorganic fertilizer may be sound soil fertility management strategies in many countries. Akande *et al.*, (2003) reported that combined use of ground rock phosphate applied together with poultry manure significantly improved growth and yield of okra. The use of organic manure as a means of maintaining and increasing soil has been advocated (Smil 2002). Manure is usually applied at high rates, relative to inorganic fertilizer. When applied at high rates,

they gives residual effects on the growth and yield of succeeding crops(Makinde and Ayoola 2008). Improvement of environmental condition as well as the need to reduce cost of fertilizing crops are reasons for advocating use of organic materials (Bayu *et al.*,2006).Tropical soils are adversely affected by erosion, causing deterioration of the nutrient status and changes in soil organization population(Economic commission for Africa, 2001).

LITERATURE REVIEW

Soil productivity maintenance is a major constraint of tropical agriculture. Crop cultivation is usually moved between fields to utilize only fertile soil for some years without use fertilizers. However, this cannot be sustained to meet increase demand of an increasing population. Tropical soils are adversely affected with erosion, causing deterioration of nutrient status and changes in soil organization population (Economic commission for Africa, 2001). The use of inorganic fertilizers can improve crop yields, total nutrient availability, but its use is limited due to its scarcity, high cost nutrient, in balance and soil acidity. The use of organic manure as a means of maintaining and increasing soil fertility has been advocated (Smil 2002). Manure is usually applied at high rates, relative to inorganic fertilizer. When applied at high rates, they gives residual effects on the growth of the succeeding crops (Makinde and Ayoola 2008). Improvement of environmental condition as well as the need to reduce cost of fertilizing crops are reasons for advocating of use of organic materials (Bayu *et al.*,2006). Application of organic manures sustains cropping system through better nutrient recycling(El- sharkwar *et al.*, 1998) Organic manure provide a source of all necessary macro and micro nutrient in available forms, thereby improving the physical and biological properties of the soil(Bayu *et al.*,2006). Mixing organic and inorganic fertilizer may be a sound soil fertility management strategy in many countries apart from enhancing crop yields; the practice has greater beneficial residual effect that can be derived from use of either organic or inorganic fertilizer applied alone. Akande *et al.*, (2003) reported that combined use of ground rock phosphate applied together with poultry manure significantly improved growth and yield of okra. Nitrogen as well as phosphorus plays an important in plant and seed quality of okra. NPK fertilizer has been reported to give increase in okra yield (Ayuso *et al.*, 1996) reported that there is increase in both fresh and dry weight of okra plant with increasing NPK fertilizer rates.

MATERIALS AND METHODS

The Study Area

Afield experiment was conducted at Teaching and Research Farm of Crop Production Department, Federal University of Technology, Minna Gidan Kwanu Campus(9^0 S 37, N 6^0S 28 E) located in the Southern Guinea Savanna .

Experimental Design

The experiment was arranged in randomized complete block design and replicated three times. The treatments used were two sources of nutrients (Poultry dropping and NPK fertilizer) and two okra varieties (LD88-1 and NHAe47-4). The ridges were constructed manually using traditional hoe to obtain a well earthen up and a good tilled. Okra seeds were sown three seeds per hole at a spacing of 60cm x20cm.The inorganic fertilizer was applied at the rate of 100kg N, 60kg $p_2 0_5$, and 60kg $k_2 0$ in split application. Firs dose was applied at the rate of 60kg N, 60kg $p_2 o_5$, 60kg $k_2 o$ at 2 weeks

after sowing and later top dressed with 40kg N using urea fertilizer at six weeks after planting.

Method of Data Collection

Four plants were randomly selected from the net plot and tagged, parameters were taken from tagged plants. The parameters taken were plant height, leaf area, number of fruits, fruit length, fruit diameter, fruit weight and fruit yield.

Method of Data Analysis

The analysis of variance (ANOVA) was carried to determine the differences in parameters. Significantly different mean values were compared using Ducan Multiple Range Test (DMRT) at 5% significance level.

RESULTS AND DISCUSSION

(Table 1) shows that the effect of treatment were significant difference ($p< 0.05$) at 3,6, and 9 weeks after sowing respectively. At 3WAS, highest plant height was recorded in NHAe47- 4 plot supplied with poultry dropping . However, at 6and 9 WAS, highest plant height was observed in NHAe47- 4 treated with NPK fertilizer. The result of plant height for LD 88-1 at 3,6 and 9 WAS followed the same trend with that of NHAe47-4, however, LD 88-1 recorded highest plant height. This result agreed with the work of Kochhar (1986) who reported that okra thrived best in all most friable organic manure soil. This was also confirmed that the genetic materials of LD 88-1 were higher in growth habit than that of NHAe47-4 (Abou El Magd *et al.*, 2006). Significant difference ($p<0.05$) was observed on leaf area at 3, 6, and 9 WAS respectively (Table 2). At 3WAS highest leaf area was recorded in both NHAe47-4 and LD 88-1 treated with poultry dropping. However, at 6 and 9WAS, NHAe47-4 and LD 88-1 recorded highest leaf area in plots supplied with NPK fertilizer and lowest leaf area observed where no fertilizer was applied. This conform with the work of Bayu *et al.*, (2001) who reported that okra plants were taller in receiving NPK fertilizer than those that received lower rate of organic manure. There was significant difference ($p<0.05$) in the number of fruits ,fruit length, and fruit diameter (Table 3).There was significant difference($p<0.05$) in number of fruits in NHAe47-4. Highest number of fruits was recorded in plot supplied with poultry dropping. There was no significant difference ($p>0.05$) in number fruits in LD 88-1 that received poultry dropping and NPK fertilizer. Raemaekers *et al.*, (2001) reported that in NHAe47-1, there was more number of fruits than LD88-1 variety especially the one supplied with NPK fertilizer. There was no significant difference ($p>0.05$) in fruit length among the varieties and sources of nutrients. The highest fruit length was recorded in NHAe47-4 plot that was supplied with NPK fertilizer which was not statistically difference ($p>0.05$) from the NHAe47 that was supplied with poultry dropping. This conform with the findings of Awe *et al.*,(2006) who reported that LD88-1 gave highest fruit length when supplied with NPK fertilizer compared to that of organic manure. There was no significant difference ($p> 0.05$) in fruit diameter NHAe47-4 supplied with poultry dropping and NPK fertilizer. However, significant difference ($p<0.05$) in fruit diameter was observed in LD88-1 treated with different sources of nutrients. The highest fruit diameter was recorded in LD88-1 supplied with NPK fertilizer. The difference in the effect of treatment where significant ($p<0.05$) on fruit weight and fruit yield (Table 4).The highest fruit weight was recorded in plot with NHAe47-4 supplied with poultry dropping while the lowest fruit weight was observed in NHAe47-4 without fertilizer. It was not the same with

LD88-1 where the highest fruit weight was recorded in plot supplied with NPK fertilizer and lowest fruit weight was recorded where no fertilizer was applied. The highest fruit yield was recorded in NHAe47-4 treated with NPK fertilizer and lowest fruit yield observed in plot supplied with no fertilizer. Also LD88-1 with NPK fertilizer gave highest fruit yield. This agreed with the findings of Makinde and Ayoola (2008) that organic manure provided long term residual nitrogen than chemical fertilizer during experiment conducted for three years under fed area of ecological zone.

CONCLUSION AND RECOMMEDATIONS

The findings from this study showed that NHAe47-4 responded positively to different sources of nutrients compared to LD88-1.The study also indicated that NPK fertilizer could support the growth and yield of okra. I recommend that NHAe47-4 should be planted to get best fruit yield. In the absent of NPK fertilizer, poultry dropping should be applied to get better yield over where there is no fertilizer application.

REFERENCES

Abou El- Magd, M.M. Hoda, A. Mohammed and Fawzy, Z.F (2006). Relationship, growth and yield of broccoli with increasing NP or K ratio in a mixture of NPK fertilizers. Annual Agriculture Science Moshtohor 43 (2): 791-805.

Akande, M.O, Oluwatoyinbo, F.I. Adediran, J.A., Buhari, K.W. and Yusuf, I.O.(2003). Soil amendments effect on the release of P from rock phosphate and the development and yield of okra. *Journal of Vegetable Production* 9(2): 3-9.

Awe, O.A, R.A. Abdulsalam and O.A. Ogunsola (2006). Effect of NPK 20-10-10 fertilizer on the pod and root growth of okra in humid tropics. Proceeding of the 31st Annual conference Samaru, Zaria, Nov. 13-17, 2006

Ayuso, M.A., Pascal, J.A. Garcia and C. Hermandez (1996).Evaluation of urban waste for Agricultural use. *Soil Science Plant Nutrition* 42: 105-111

Bayu,W., Hammers, P.S and Alemu, G. (2006). Effect of farm yard manure and inorganic fertilizers on sorghum growth, yield and Nitrogen use in a semi arid area .*Ethiopia Journal of plant Nutrition* . 29: 391-407

Economic Commission of Africa (2001). State of the Environment in Africa. Economic Commission of Africa, P.O. Box 3001, Addis Ababa, Ethiopia, ECA/FSSDD/10/06.

El-shakwar, M.H.A.,El- sayed, E.A. and Ewees, M.S.A.(1998). Soil and plant analysis as a guide for interpretation of the improvement efficiency of organic conditioners added to different soil in Egypt. *Communication Soil Science Plant Anl.*, 29: 2067-2088.

Kochhar, S.L.,(1986). Tropical Crops: ATexbook of Economic Botany. 1st Edn; Macmillian Publisher, London, ISBN- 10- 0333392418.

Makinde, E.A.and A.A. Ayola, (2008). Residual influence of early season crop fertilization and cropping system on growth and yield of cassava. *American Journal of Agriculture and Biological Science.* 3(4): 712-715.

Olusola, M. and Osinawe, F.C. (1996). Effect of fertilizer on yield and Nutrient content of okra. Food and Fertilizer Technology case, *Extension Bulletin* No. 311, P. 320.

Raemaekers, R.H.(2001). Crop production in Tropical Africa. 1st Edn, DGIC, Brussels, Belgium, ISSN: 90-806822-1-7, pp. 1-1540.

Smil, V. (2002). Phosphorus in the environment; Natural flows and human interferences. Annual review of energy and environment 25: 53-88

Table1: Effect of Poultry Dropping and NPK Fertilizer on the Growth of Okra (height)

Treatments and Variety	Plant Height(cm)			
	3WAS	6WAS	9WAS	
NHAe47-4				
0kg	18.05b	25.04c	37.5c	
Poultry dropping	23.04a	28.02b	45.20a	
NPK	17.98b	29.50a	47.60a	
LD88-1				
0kg	22.05b	29.72c	55.05c	
Poultry dropping	30.40a	34.07b	67.00b	
NPK	25.02b	38.01a	70.02a	
LSD	*	*		*

Means with different superscript within the column are significantly different ($p<0.05$)
*Indicate significant difference at 5% (DMRT)
DMRT= Ducan Multiple Range Test
WAS=Weeks after sowing
NHAe47-4 = variety 1
LD88-1= variety 2
0kg = no fertilizer

Table 2: Effect of Poultry Dropping and NPK Fertilizer on the Leaf Area of Okra

Treatments and Variety	Leaf area (cm)		
	3 WAS	6 WAS	9 WAS
NHAe47-4			
0kg	104.17b	313.94c	367.22b
Poultry dropping	116.51a	337.77b	407.55a
NPK	106.27b	369.23a	466.35a
LD88-1			
0kg	111.70b	334.20c	403.16b
Poultry dropping	118.50a	359.59b	474.52ab
NPK	114.52ab	384.33a	486.60a
LSD	*	*	*

Means with different superscript within the column are significantly different ($p<0.05$)
*Indicate significant difference at 5%(DMRT)
DMRT= Ducan Multiple Range Test
WAS=Weeks after sowing
NHAe47-4 = variety 1
LD88-1= variety 2
0kg = no fertilizer

Table 3: Effect of Poultry Dropping and NPK Fertilizer on Number of Fruits, Fruit Length and Fruit Diameter of Okra

Treatments and variety	No of fruits	fruit length(cm)	fruit diameter(cm
NHAe47-4			
0kg	8.56c	4.92c	7.16ab
Poultry dropping	13.30a	7.20ab	8.95a
NPK	11.96b	7.21a	8.95a
LD88-1			
0kg	9.40b	7.51a	7.89bc
Poultry dropping	10.13a	6.92c	8.17b
NPK	10.40a	7.20b	8.66a
LSD	*	*	*

Means with different superscript within the column are significantly different ($p<0.05$)
*Indicate significant difference at 5%(DMRT)
DMRT= Ducan Multiple Range Test
WAS= Weeks after sowing
NHAe47-4 = variety 1
LD88-1= variety 2
0kg = no fertilizer

Table 4: Effect of Poultry Dropping and NPK Fertilizer on Fruits, Fruit Weight and Fruit Yield

Treatments and variety	Fruit weight(g)	Fruit yield(kg/ha)
NHAe47-4		
0kg	491.6c	1.45c
Poultry dropping	658.2a	2.57b
NPK	625.7b	2.96a
LD88-1		
0kg	456.8c	1.02c
Poultry dropping	525.2b	2.41b
NPK	593.1a	2.61a
LSD	*	*

Means with different superscript within the column are significantly different ($p<0.05$)
*Indicate significant difference at 5%(DMRT)
DMRT= Ducan Multiple Range Test
WAS- Weeks after sowing
NHAe47-4 = variety 1
LD88-1= variety 2
0kg = no fertilizer