Available online at http://www.ajol.info/index.php/njbas/index
Nigerian Journal of Basic and Applied Science (September, 2012), 20(3): 213-216 ISSN 0794-5698

Full Length Research Article

Effect of Sources of Organic Manure on Growth and Yields of Okra (*Abelmoschus esculentus L.*) in Sokoto, Nigeria

***[1]R.A. Tiamiyu, [1]H.G. Ahmed and [1]A.S. Muhammad**
[1]Department of Crop Science, Faculty of Agriculture Usmanu Danfodiyo University, Sokoto, Nigeria
[*Corresponding Author E-mail: abdultiamiyu@gmail.com; ☎: +234(0)8030770127]

ABSTRACT: Field experiments to investigate the effect of different sources of organic manure (Cow, Sheep and Poultry Manure) on growth and yield of okra was carried out at the Teaching and Research Fadama Farm of Usmanu Danfodiyo University Sokoto, Nigeria during 2007/2008 and 2008/2009 dry seasons. Treatments were laid out in a randomized complete block design (RCBD) with three replications. Data were collected on growth and yield parameters (Plant height, number of leaves per plant, pod length and fresh pod weight). Results obtained indicated that growth and yield of okra was lowest in control treatments which showed that the organic manures used in the study especially poultry manure positively influenced the performance and yield of okra. Poultry manure positively increased okra plant height by 39.4% and number of leaves by 37.8% compared to control treatments. There was no significant effect with respect to number of leaves in 2007/2008. Fresh pod weight was significantly increased by 34.6% with poultry manure compared to control treatments. However, pod length was not significantly affected by the treatments. Based on the findings of the experiments it could be deduced that poultry manure seems to promote higher growth and yield of okra. Thus, it should be recommended for farmers growing okra in this zone.
Keywords: Okra, Growth, Yield, Source, Organic Manure

INTRODUCTION

Okra (*Abelmoschus esculentus L.)* is one of the most important vegetable grown in Nigeria. It is an annual crop grown mainly as fruits and leafy vegetables in both green and dried state in the tropics (Gibbon and Pain, 1984). The crop is used as soup thickener which may also be served with rice and other food types. The fresh fruit is a good source of vitamins, minerals and plant protein (Eke *et al.,* 2008). Rehn and Espig (1991) stated that okra contain about 20% edible oil and protein, while its mucilage is utilized for medicinal purposes. The mature stem contains crude fibre which is used in paper industries and for making ropes. Okra's flower can be very attractive and sometimes used in decorating the room (Schippers, 2000).

Okra is cultivated under rainfed and in irrigated areas on a wide range of soils. The production is seriously affected by the use of local varieties (low yielding), sub-optimal and inappropriate manure doses. The use of inorganic fertilizer has not been helpful under intensive agriculture because it is often associated with reduced crop yield, soil acidity and nutrients imbalance (Kang and Juo, 1980, Obi and Ebo, 1995, Ojeniyi, 2000). Furthermore, the extent to which farmers can depend on this input is constrained by unavailability of the right type of inorganic fertilizers at the right time, high cost, lack of technical know-how and lack of access to credit (Chude, 1999). This has encouraged scientists towards making use of organic materials (both organic manures as well as organic wastes) for improving the physical properties of soils that allow profitable crop production (Somani and Totawat, 1996). Currently, the utilization of these organic materials in soil fertility management in Africa is not encouraging when compared with the countries in Asia (Agboola and Omueti, 1985). According to Ojeniyi (2000), published works on the organic manure use in Nigeria is rather scanty. The need to use renewable forms of energy and reduce costs of fertilizing crops has revived the use of organic fertilizers worldwide. Improvement of environmental conditions and public health are important reasons for advocating increased use of organic materials (Seifritz, 1992; Maritus and Vlelc, 2001). Farmers in the Northern part of Nigeria grow okra as rainfed and irrigated crop with a wide range of organic materials at sub-optimal levels thereby resulting in the reduction in crop yield. In view of the above, this study was conducted to evaluate the effects of sources of organic manure on the growth performance and yield potentials of okra variety NHAe-47-4 in Sokoto Fadama to replace the low-yielding and local varieties currently used by farmers.

MATERIALS AND METHODS

Field experiments were carried out during the 2007/2008 and 2008/2009 dry seasons at the Usmanu Danfodiyo University Teaching and Research Fadama Farm Kwalkwalawa, Sokoto. Sokoto lies on latitude $13^{0}9'$N and longitude $5^{0}15'$E

and about 350m above sea level (Kowal and Knabe, 1972). Sokoto falls under the Sudan Savanna agro ecological zone of North Western Nigeria. The area has an annual rainfall range of 550 – 700 mm and mean annual temperature ranging from 15^0C to 41^0C (SERC, 2003). The soil of the area is sandy loam.

The treatments consisted of three sources of organic manure (Cow, Sheep and Poultry manure). The experiments were laid out in a randomized complete block design (RCBD) with three replications. After viability test, the seeds were treated with Apron star at the rate of 10kg per 3kg seeds prior to planting to protect the seed against soil pathogens and pests. Planting was done at the spacing of 60cm x 60cm. Four seeds of okra NHAE 47-4 were directly sown per hole at a depth of 2cm. After germination, seedlings were thinned to one plant per stand three weeks after planting. Soil samples from (0 – 30cm) were collected from 12 different spots in the study area and were composited, air-dried and sieved through a 5mm sieve and their physical and chemical characteristics were determined before application of treatment.

Manure was applied by broadcasting and thoroughly worked into the experimental plot. The beds measureing 3 x 3.6m were watered and left for one week before planting the seeds on them. This was to enable carbon-dioxide escape thus preventing burning and scorching on the tender seedlings. Cultural operations such as spraying, weeding were strictly observed.

Five okra plants were sampled in the three inner rows of each treatment and used to record growth and yield attributes such as plant height, number of leaves per plant, pod length and fresh pod weight. Data collected were subjected to statistical analysis of variance (ANOVA) using SAS (2003) package. The treatment means were separated for significant differences using Duncan Multiple Range Test (DMRT) at 5% level of probability (Steel and Torrie, 1980).

RESULT

The physicochemical properties of the soil at the experimental sites are shown in Table 1. Sand constituted the major particle size fraction in the soil followed by silt and clay. The soil therefore has sandy loam texture. The pH of the soil revealed that the soil was lightly alkaline (pH 7.43 and 7.50) in the first and second years respectively.

Results from Table 2 shows the effect of sources of organic manures on plant height and number of leaves of okra during the 2007/2008 and 2008/2009 dry seasons. Plant height was significantly ($P<0.05$) affected by different sources of organic manure in both seasons. The plant height for the different sources of organic manure applied were statistically different ($P<0.05$). Values for cow and sheep manure were statistically at par in both seasons. Okra grown on poultry manure were significantly ($P<0.05$) taller than the other two sources of organic manure. Results further showed that treating okra with cow or sheep manure did not bring about any significant difference in plant height from the control (Table 2). Sources of organic manure also had a significant ($P<0.05$) effect on the number of leaves of okra in 2008/2009 but the values for the control and the varying sources of organic manure were statistically similar in 2007/2008.

In 2008/2009 the results further showed that okra plants supplied with poultry manure significantly out yielded the rest in leave number (Table 2). It recorded an average of 25.54 leaves, which was closely followed by sheep and cow manure with average value of 21.63 and 20.44 of leaves respectively. Cow manure and sheep manure had no significant effect on the number of leaves. The control has significantly the least number of leaves.

Table 1: Pre-planting physicochemical characteristics of the soil (0-30cm) at the experimental sites in 2007/2008 and 2008/2009 dry seasons at Sokoto.

	Year	
Soil properties	**2007/2008**	**2008/2009**
Soil (Texture)	Sandy Loam	Sandy Loam
pH (H_2O)	7.43	7.50
Total N (g/kg)	0.385	0.340
Organic Carbon	6.70	6.20
Available P	0.15	0.23
Exchangeable Bases		
Ca	1.35	1.24
Mg	3.40	4.52
K	0.38	0.48
Na	0.39	0.42

Source: Analyzed at Department of Soil Science UDUS, Sokoto.

Different sources of organic manure has statistically no significant effect ($P>0.05$) on pod length of okra in both seasons (Table 2). Numerically poultry manure produced longer pod than the rest of the sources and the control in the two seasons. The results on fresh

pod weight are also presented in Table 3. Sources of organic manure had significant effect (P<0.05) on fresh pod weight in both seasons. In the two seasons, the control and cow manure produced statistically similar fresh pod weight. Sheep manure and poultry manure were at par in 2007/2008 season while in 2008/2009 season, poultry manure source was found to produce significantly higher fresh pod weight than the sheep manure source.

Table 2: Plant height, number of leaves, Pod length and fresh pod weight of okra as affected by sources of organic manures during 2007/2008 and 2008/2009 dry seasons at Usmanu Danfodiyo University, Teaching and Research Fadama Farm, Sokoto.

Treatment	Plant Height (cm)		Number of Leaves		Pod Length (cm)		Fresh Pod Weight(g)	
	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009
Control	32.33b	31.28b	24.55	18.12c	6.98	6.89	18.45b	17.39c
Type of Manure								
Cow	33.28b	30.86b	24.04	20.44b	7.11	6.91	19.01b	19.01c
Sheep	36.28b	33.54b	25.17	21.63b	7.03	6.98	20.39a	20.76b
Poultry	44.53a	42.24a	28.79	25.54a	7.18	7.12	21.09a	2.55a
SE±	2.412	2.333	2.555	0.864	0.083	0.064	0.521	0.575
Significance	*	*	ns	*	ns	ns	*	*

Means followed by same letter(s) within treatment group are not significantly different at 5% level of significance using Duncan Multiple Range Test (DMRT)

* = significant ns = not significant

DISCUSSION

Plant height of okra is genetically determined (IAR (1985). The height of the okra studied is perhaps more of genetic than an environmental trait. The positive effect of organic manure on plant height could be due to the contribution made by manure to fertility status of the soils as the soils were low in organic carbon content. Manure when decomposed increases both macro and micro nutrients as well as enhances the physico-chemical properties of the soil. This could have led to its high vegetative growth. The non-significant difference observed in the treatments supplied with sheep and cow manure with control treatment could be either there were some nutrients already present in the soil or the plants need were satisfied with that quantity of nutrients present in the soil. Okra grown on poultry manure performed better in terms of the height of the plant than other two sources of organic manure. 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 morphological growth of the plant. The obtained results corroborated the finding of Ajari *et al.,* (2003) in okra production in which they reported that organic manure, especially poultry manure could increase plant height of crops when compared with other sources of manures. The increase in number of leaves per plant with organic fertilizer application stressed its importance during the vegetative growth of crop plants (Tindall, 1992).

The non-significant effect of manure sources on pod length may be due to the effect of these sources of organic manure on enhancing vegetative growth. All the nutrients supplied by the different manure sources might have been diverted to vegetative growth. This may be due to their bulkiness and higher amount of nutrients already present in the soil may contribute to this phenomenon. 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 obtained were in agreement with the findings of Sanwal *et al.,* (2007) in turmeric (*Curcuma longa*) Premsekhar and Rajashree (2009) in okra (*A. esculentus*) 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 resulting in better supply of nutrients to the plants.

CONCLUSION

The application of cow, sheep, and poultry manure had a significant effect on plant height, number of leaves per plant and fresh pod weight of okra grown under irrigation during 2007/2008 and 2008/2009 dry seasons at the Sokoto Rima Fadama. The results obtained revealed that okra responded well to the application of poultry manure compared to other sources of organic manures and control treatment in the study. Based on the finding of this study, it may be recommended that applying cow manure was adequate for maximum growth parameters studied and sheep manure may be applied in the absence of

poultry manure for greater fresh pod weight of okra production.

REFERENCES

Agboola, A.A. and Omueti, J.A.I. (1982). Soil fertility problems and its management in tropical Africa. Paper presented at the International Institute of Tropical Agriculture Ibadan, Nigeria Vol. 2p. 215.

Ajari, O., Tsado, L.E.K., Oladiran, J.A. and Salako, E.A. (2003). Plant height and fruit yield of okra as affected by field application of fertilizer and organic matter in Bida, Nigeria. *The Nigerian Agricultural Journal,* **34:** 74 – 80.

Chude, V.O. (1999). Perspectives on fertilizer use in the 21st century. *Book of abstracts, Soil Science Society of Nigeria Benin,* 1999 25th Annual Conf. Held at Precious Palm Royal Hotel from 21st – 25th Nov. 1999.

Eke, K.A., Essiens, B.A. and Ogbu, J.U. (2008). *Determination of optimum planting time of okra in the derived savannah.* Proc. of the 42nd Conf. of ASN at Abakaliki 17th – 23rd Oct. 2008. Pp. 242 – 245.

Gibbon, D. and Pain, A. (1985). *Crops of the drier regions of the tropics.* International Tropical Agriculture Science. Longman London. Pp. 137.

IAR (1985). *Annual Reports*. Institute of Agric. Research Samaru, ABU, Zaria.

Kang, B.T. and Juo, A.S.R. (1980). Management of low activity clay soils in Tropical Africa for Food Crop Production. In: Terry ER, Oduro, K.A. Cavenes F. (eds). *Tropical Root Crops:* Research Strategies for the 1980s. Ottawa, Ontario, IDRC. Pp. 129 – 133.

Kowal, J.M. and Knabe, D.T. (1972). *An agro ecological Atlas of the Northern Nigeria.* ABU Press, A.B.U. Zaria, P. 128.

Maritus, C.H.T and Vlelc, P.L.G. (2001). *The Management of Organic Matter in Tropical Soils:* What are the priorities? *Nutrients Cycling in Agro Ecosystems,* **61:** 1-16.

Obi, M. E. and Ebo, P.O. (1995). The effect of different management practices on the soil physical properties and maize production in severely degraded soil in southern Nigeria. *Biological Resource Technology,* **51:** 117 – 123.

Ojeniyi, S.O. (2000). Effect of goat manure on soil nutrient and okra yield in a rain forest area of Nigeria. *Applied Tropical Agriculture,* **5:** 20-23.

Omisore, J.K., Kasali, M.Y. and Chuckwu, U.C. (2009). Determination of optimum poultry manure rate for maize production. Proceedings of the 43rd Annual Conference of the Agricultural society of Nigeria (ASN) October 20 -23 Held at the National Universities Commission and Raw Materials Research and Development Council, Abuja Nigeria. Pp 260 – 263.

Premsekhar, M. and Rajashree, V. (2009). Influence of organic manure on growth, yield and quality of okra. *American Eurasian Journal of Sustainable Agriculture,* **3(1):** 6 – 8.

Rehn, S. and Espig, G. (1991). The cultivated plants of the tropics and sub-tropics CTAD 6992. Germany P. 552

Sanwal, S.K., Lakminarayana, K., Yadav, R.K. Rai, N., Yaldav, D.S. and Mousumi, B. (2007). Effect of organic manures on soil fertility, growth, physiology, yield and quality of turmeric. *Indian Journal of Horticulture.* **64(4):** 444 – 449.

SAS (2003). Statistical Analysis System. SAS release 9.1 for Windows, SAS Institute *Indc*. Cary NC., USA.

SERC (2003). Metrological Data of Sokoto. Sokoto Energy Research Centre, Usmanu Danfodiyo University, Sokoto.

Schippers, R.R. (2000). African Indigenous Vegetable: an overview of the Cultivated Species. *Chaltham* U.K. National Resources Institute A.C.D.E.U. Technical Centre for Agro-culture and Rural Crop. Pp. 105 – 117.

Seifritz, W. (1992). *Alternative and Renewable Sources of Energy in Optimizing Yields.* The Role of Fertilizers. In: Proceedings of 12th IPI Congress. Pp. 155 – 163.

Somani, L.L. and Totawat, K.L. (1996). *Soil Conditioners and Amendments.* Agrotech Pub. Academy, Udaipur 1st Edition. Pp. 28 – 160.

Steel, R.G.D. and Torrie I.H. (1980). *Principles and procedures of statistics 2nd ed.* Mcgraw. Hill Book Co., NY, USA.

Tindall, H.D. (1992). *Vegetables in the tropics.* Macmillan Press Ltd, London, P. 533.