Journal of Agriculture and Environment Vol. 10 Nos. 1 and 2, 2014: 27-31
ISSN 1595465X

EFFECT OF DIFFERENT RATES OF ORGANIC MANURE ON THE PERFORMANCE OF OKRA (*Abelmoschus esculentus* L.) IN SOKOTO SUDAN SAVANNA, NIGERIA

R.A. Tiamiyu[1], H.G. Ahmed[1] and A.B. Mustapha[2]

[1] Department of Crop Science, Usmanu Danfodiyo University, Sokoto, Nigeria
[2]Department of Engineering, Ramat Polytechnic, Maiduguri, Borno State, Nigeria

ABSTRACT

Field experiments were conducted during 2007/2008 and 2008/2009 dry seasons at the Usmanu Danfodiyo University Teaching and Research Farm, Kwalkwalawa to study the effect of different rates of organic manure on the performance of okra (*Abelmoschus esculentus* L.) in Sudan Savanna. The treatments consisted of four rates of organic manure (0, 5, 10 and 15 t ha^{-1}) laid out in a randomized complete block design (RCBD) replicated three times. Data were collected on number of branches per plant, leaves/plant, leaf area index and days to 50% flowering. Results showed that all parameters measured increased at all sampling dates and there was significant difference among the rates. Okra plants treated with 15 t ha^{-1} had the highest number of branches and days to 50% flowering, while those treated with no manure had the least values for the parameters measured. The application of organic manure rate of 15 t ha^{-1} to okra seems to have highest mean values for all the parameters measured except in the leaf area index where 10 t ha^{-1} significantly produced higher leaf area index. Thus, application of 15 t ha^{-1} is recommended for farmers growing okra in this zone.

Keywords: Growth; Okra; Rates; Organic manure

INTRODUCTION

Okra (*Abelmoschus esculentus* L.) is an annual crop grown mainly as fruits and leafy vegetable in both green and dried state in the tropics (Gibbon and Pain, 1985). Okra production is predominantly carried out by resource poor farmers, usually in home gardens or in mixture with other cereal crops (Lombin *et al*., 1988). The importance of okra lies in its mucilaginous properties where fresh immature fruits and young leaves are used as a good source of gum and for preparing soups (Martins, 1982).

Cultivation and use of okra as vegetable, particularly in Sudan savanna has been for long. However declining soil fertility is a major production constraint in Africa, especially in Nigeria, and it is becoming increasingly critical to secure sustainable soil productivity. Most of the savanna soils are lateritic and low in cation exchange capacity which makes them prone to nutritional imbalances and deficiency (Jones and Wild, 1973). Intensification

of crop production, deforestation and soil erosion are the main factors involved in declining soil fertility (Sanchez *et al*., 1997). The potentials of organic manure as an important soil amendments and a source of plant nutrient supply is particularly important in today's agriculture especially in areas where chemical fertilizers are no longer available and economically feasible (Lal and Kang, 1982). Little attention has been given to the most efficient and profitable use of animal manure in okra production. Farmers are ignorant of the nutrients requirement of the crops and as a result the yield obtained is invariably low. In view of this reason, the research was carried out in order to determine the optimum rate of organic manure on the growth and performance of okra.

MATERIALS AND METHODS

Study Area

The 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 in North Western Agro ecological zone of Nigeria. Sokoto is situated on latitude $13^0$01'N and longitude $5^0$15'E and 350m above sea level. The climate of the area is semi-arid with annual rainfall range of 550-700 mm (Sokoto Energy Research Centre, 2003). The soil of the experimental area is sandy loam. Soil samples from 0-30cm were collected from different locations of the experimental plots, bulked into a composite sample, air- dried and then, physical and chemical characteristics were determined before the application of the treatments. The field was slashed, ploughed and harrowed using a tractor.

Field Experiment and Data Collection

The experimental design was a randomized complete block design (RCBD) with three replications. Each block consisted of three treatments involving poultry and sheep manure and cowdung each at 5, 10, and 15 t $ha^{-1}$and no manure treatment as control for determining the efficacy of the system. The vegetable beds were marked and beds measuring 3m x 3.6m, with 0.5m between adjacent beds were randomly laid out. A lee-way of one metre was left between replicates. Gross plot size was 3.0m x 3.6m (10. $8m^2$), while the net plot size was 2.4m x 1.8m ($4.32m^2$).

In both years seeds were sown on January 28 and February 2, respectively. Three seeds were planted/hole at a depth of 3cm after viability test. Thinning was done to one seedling/stand 14 days after planting. The seeds were treated with gammalin 20 at the rate of 10g per 4kg seeds prior to planting to protect the seed against soil pathogens and pests. Manure was applied at the appropriate doses and thoroughly worked into experimental plots. Watering was done before and after germination to facilitate optimum growth and development. The plots were manually weeded at 21, 24 and 63 days after planting with occasional spot weeding. Data on number of branches, leaf area index, number of leaves/plant, days to 50% flowering were recorded at 8, 10 and 12 weeks after planting. Five plants were randomly selected per plot from which data were taken.

Data Analysis

Data collected were subjected to analysis of variance (ANOVA) and separation of means was done using Duncan's New Multiple Range Test (DNMRT) (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Number of Branches

Table 1 shows effect of manure on number of branches of Okra. Significant ($P<0.05$) effect of rates of manure applied was observed with respect to number of branches per plant in both years and at all sampling periods except at 6 WAP. Application of 10 and 15 t ha^{-1} were found to produce significantly higher number of branches compared with 5 t ha^{-1} even though application of 5 and 10 t ha^{-1} were statistically similar at 10 and 12 WAP in both cropping seasons. However, at 8 WAP in 2008/2009, 5, 10 and 15 t ha^{-1} were at par with respect to branch production. The control treatment resulted in the least number of branches in both cropping seasons. The increase in number of branches may be attributed to the stage of growth of the crop. At initial stage (6 and 8 WAP) a lower dose of organic manure may be required. However, at the later sampling period (10 and 12 WAP) the need for organic manure increases as most of the parts of the plants are well established. This influenced the need for higher rate of 15 t ha^{-1}. On the other hand the increase in number of branches at the application of 5 t ha^{-1} agrees with Ibeawuchi *et al*. (2006) who reported a significant increase on growth characters of vegetable at the application of 7.5 to 10 t ha^{-1}.

Table 1: Number of branches per okra plant as affected by manure rates

Manure (t ha^{-1})	Average number of branches					
	8WAP		10WAP		12WAP	
	07/08	08/09	07/08	08/09	07/08	08/09
0	1.98	1.68^{b}	2.23^{b}	2.20^{c}	2.68^{c}	2.56^{c}
5	2.13	2.06^{a}	2.62^{b}	2.62^{b}	3.18^{b}	3.22^{b}
10	2.21	2.20^{a}	2.74^{a}	2.82^{ab}	3.32^{ab}	3.51^{ab}
15	2.48	2.42^{a}	2.97^{a}	3.14^{a}	3.73^{a}	3.82^{a}
SE	0.145	0.136	0.124	0.135	0.157	0.126
Sig.	ns	*	*	*	*	*

Within a treatment group, means in a column followed by same letter (s) are not significantly different ($P>0.05$) using DNMRT. ns=not significant, *=significant,--branching not yet due.

Leaf Area Index

Table 2 shows that leaf area index was significantly affected by rate of manure application at 10 and 12 WAP, but there was no significant effect at 8 WAP in both seasons. Application of 10 t ha^{-1} produced the highest leaf area index at 10 and 12 WAP in both cropping seasons while at 10 WAP, 5 and 15 t ha^{-1} recorded similar result with control plots. However, at 12 WAP there was no significant difference between 15 t ha^{-1} and control treatment in terms of leaf application 15 t ha^{-1}. Two reasons could be responsible

for the non significant difference between 15 t ha^{-1} and control treatment either there were some nutrients already present in the soil and the plant needs were satisfied at the lower rate or the capacity (potential) of the plant was such that it could not utilize higher rates. This result contradicts with the findings of Greenwood (2001) who reported that lower application rate of 2.5 t ha^{-1} have been recorded with farm yard manure to have direct response on the provision of plant nutrient for crop growth.

Table 2: Leaf area index of okra as affected by different manure rates

Manure (t ha^{-1})	Leaf area index					
	8WAP		10WAP		12WAP	
	07/08	08/09	07/08	08/09	07/08	08/09
0	0.11	0.10	0.20^{b}	0.17^{b}	0.28^{c}	0.26^{c}
5	0.10	0.10	0.19^{b}	0.18^{b}	0.32^{b}	0.31^{b}
10	0.11	0.11	0.23^{a}	0.22^{a}	0.36^{a}	0.35^{a}
15	0.09	0.10	0.19^{b}	0.19^{b}	0.28^{c}	0.29^{bc}
SE	0.10	0.01	0.012	0.011	0.012	0.012
Sig.	ns	ns	*	*	*	*

Within a treatment group, means in a column followed by same letter (s) are not significantly different (P>0.05) using DNMRT. ns=not significant, *=significant.

Days to 50% Flowering

Day to 50% flowering as affected by different rates of organic manure is shown in Table 3. The results showed significant effect of rates of manure on days to 50% flowering in both cropping seasons. Significantly fewer days to 50% flowering (60 days) was recorded in 2007/2008 and (59 days) in 2008/2009 with the application of 15 t ha^{-1} over others. In 2008/2009 however, there was a progressive decrease in the days to 50% flowering with increasing rate of manure from 5 to 10 t ha^{-1}. The significant reduction of the reproductive period with 15tha^{-1} could be as a result of the bulkiness due to higher dose of organic manure sources since organic manure at 15 t ha^{-1} may hasten the crop maturity and stimulating early pod development. This agreed with Karikari (1996) who reported that application of organic manure hastened crop maturity and stimulated early grain development and grain set of Bambara groundnut in Bostwanna.

Table 3: Days to 50% flowering of Okra as influenced by different manure rates

Manure (t ha^{-1})	Days to 50% flowering	
	2007/2008	2008/2009
0	60.33^{a}	61.16^{a}
5	60.61^{a}	60.55^{ab}
10	60.22^{a}	59.88^{b}
15	59.64^{b}	59.38^{b}
SE	0.161	0.162
Sig.	*	*

Within a treatment group, means in a column followed by same letter (s) are not significantly different (P<0.05) using DNMRT. ns=not significant, *=significant.

CONCLUSION

The result obtained indicated that okra responded well to application of various organic manure rates. The growth characters of the crop were significantly increased with the application of 10 and 15 t ha^{-1} compared with other rate and control treatment in the study. Thus, it should be recommended for farmers growing okra in this zone.

REFERENCES

Gibbon, D. and A. Pain (1985). *Crops of the Drier Regions of the Tropics.* First Edition Longman Publishing Company, Singapore. 155pp.

Greenwood, M. (2001). Fertilizer trials with groundnut in Northern Nigeria, *Empirical of Agric.*, 19:225-241.

Ibeawuchi, I.I., E.U. Onweremadu and N.N. Obi (2006). Effect of poultry manure on garden cress and amaranthus on degraded ultrisols of Owerri, South eastern Nigeria. *J. An. Vet. Adv.*, 5:53-56.

Jones, M.J. and A. Wild (1973). Soil of the West African Savanna. *Technical Communication* No. 55 Commonwealth Bureau of Soils, Hoppenden, England.

Karikari, S.K. (1996). The status of bambara groundnut genetic resources in Bostwanna SACCAR *Newsletter* No. 34, June, 1996.

Lal, R., and B.T. Kang (1982). Management of organic matter in soils of the tropics and subtropics. *International Soil Roc*., 3: 153-178.

Lombin, G, J.J. Owonubi, and J.Y. Yayock (1988). *Crop Science and Production in Warm Climate*. Macmillan intermediate agric. science. 214-216.

Martins, F.N. (1982). Okra potentials: A multipurpose crop for temperate zone and tropics. *Economic Botany*, 36 (3): 340-343.

Sanchez, P.A., K.D. Shapher, M.J. Soul, E.M. Place, A.U. Monwunyea, R.J. Buresh, F.R. Kweisiga, A.M. Izac, C.G. Nderitu and P.L. Woomer (1997). Soil fertility replenishment in Africa: an investment in natural resource capital. *In*: R.J. Buresh and P.A. Sanchez (Eds.), Replenishing Soil Fertility in Africa. *Soil Sci. Soc. of America*, Madison, WI.

SERC 2003 (Sokoto Energy Research Centre, 2003).

Steel, R.G.D and J.H. Torrie (1980). *Principles and Procedure of Statistics*. 2nd edition. Macraw Hill book Co, NY, USA.