Ken Okwal Fenno, Adeoluna, O.O., Ologunodudu, O.M. (Eds) (2019) Scientific Track Proceedings of the 5th West African Organic Conference."Organic Agriculture: Life for All", November 12-16, 2019, University of Ghana, Legon, Accra

pp 89-100

5TH WEST AFRICAN ORGANIC CONFERENCE

WAfrONet

Growth and Yield Response of Okra (*Abelmoschus Esculentus* (L.) Moench) Varieties to the Time of Poultry Manure Application in Minna, Nigeria

[1]Saidu*A., [2]Afolabi, S.G. [1]Adedijl, A. O., [1]Umoh, C.B. and [3]Usman, I.

[1]Department of Crop Production, Federal University of Technology Minna, Nigeria.

[2]Department of Soil Science and Land Management, Federal University of Technology, Minna, Nigeria.

[3]Niger State Agricultural and Mechanisation Development Authority Minna, Nigeria

*Corresponding Author:
E-mail: salduadamu08@yahoo.com
Tel: +2347036683435

Keywords:
Growth response, Okra, Poultry Manure, Time, Varieties, Yield.

Access online at:
www.waoc.bio OR
www.noara.bio

Abstract

Field experiment was conducted in June, 2016 rainy season at the Teaching and Research Farm, Department of Crop Production, Federal University of Technology Minna, to determine the growth and yield response of okra varieties to time of poultry manure application. The experiments were laid out in a 3 x 4 factorial in a randomised complete block design with three replications. The plot size was 3 m x 3 m (12 m^2) and contained four ridges. The total land area used was 53 m x 13 m (689 m^2). Inter-row spacing was 70 cm while intra-row spacing was 50 cm. Three varieties of okra used were NHAE 47-4, EX-BASAWA 2, and SEX-SAMARU 3 and the treatments include four application times of poultry manure namely; control (no application), 4 weeks before sowing (WBS), 2 WBS and at sowing (AS). The cured poultry manure of 5t/ha was applied by band method at the rate of 2.5 kg per ridge. Five stands of okra were randomly selected and tagged from each plot for data collection. Data collected included plant height, number of fruits, fruit length and fruit weight. All data collected were subjected to analysis of variance and means were separated using Duncan Multiple Range Test at 5% level of probability. Results showed that NHAe47-4 and application of poultry manure at 2 WBS produced highest plant height, number of okra fruit, heavier okra fruit weight and total yield. The application of poultry manure at 2 WBS and cultivation of NHAe47-4 okra variety could be recommended for farmers in the study area.

Introduction

Okra (*Abelmoschus esculentus* L Moench) is a commonly cultivated vegetable fruit crop by subsistence farmers of Guinea and Sudan savanna of West Africa (Dauda *et al.*, 2005). The cultivation of okra as vegetable in Nigeria has rapidly rises in recent years. In Nigeria, okra is grown across different ecological zones because it serves as a source of income to farmers as well as a cheap source of protein, vitamins (A and B), and minerals (Ca, P, Fe and I) to many households (Oyewale and Oyewale 2011). Okra is one of the most commonly grown vegetable crops in the tropics and subtropics. Okra cultivation and production has been widely practiced because of its importance to the economic development and it can be found in almost every market in Africa (Arapitas, 2008).

Published by NOARA

Increase in soil acidity due to the use of inorganic fertilizer has resulted into nutrient imbalance, reduced crop yield and low fertility status of the soil. Organic manure when efficiently and effectively use, it will ensure crops sustainability, productivity by immobilizing nutrients that are susceptible to leaching (Dilruba *et al.*, 2009).

Poultry manure is an efficient organic fertilizer and also an important source of plant nutrient, its addition improves the physical properties of the soil, it average nutrient content is 3.03 % N, 2.63 % P_2O_5 and 1.4 % K_2O. It has been reported that 30% of nitrogen from poultry litter is in nitrate or ammonium form and hence readily available. Poultry manure is a good source of major mineral elements that are capable of enhancing soil fertility (Kahlon *et al.*, 2009). The fertility of the soil could be sustained with the addition of poultry manure; its application in the soil may contribute to combat soil organic matter decline and soil erosion. Nweke *et al.*, (2013) compared the effect of different animal manures (goat manure, poultry manure and pig manure) on the growth and yield of okra and found that poultry manure has the highest nutrient and was able to release these nutrients for okra plant competitively faster than goat and pig manure. Okra requires nutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), sodium (Na) and Sulphur (S) for fertility maintenance and crop production. Poultry manure is an excellent organic fertilizer, as it contains high nitrogen, phosphorus, potassium and other essential nutrients (Oyewole and Oyewole, 2011). The objectives of the study were to evaluate the effect of poultry manure on growth and yield of okra and to determine the most appropriate time to which poultry manure should be applied to okra.

Materials and Methods

Field experiment was conducted in June, 2016 rainy season at Teaching and Research Farm, Federal University of Technology Minna, Gidan Kwano located in longitude 6° 33' E and Latitude 9° 37' N in the Southern Guinea Savanna of Nigeria. The average rainfall ranges between 750 mm-1250 mm. Soil samples were collected at the experimental site using auger at the depth of 0-15cm along diagonal transect. The samples were collected together to form a composite sample which was used to characterise the field. The soil samples collected were air-dried, crushed gently and pass through 2 mm sieve for analysis using a method described by Agbenin (1995). The plot size was 3 m x 3 m (12 m^2) and contained four ridges. The total land area used was 53 m x 13 m (689 m^2). Inter-row spacing was 70 cm while intra-row spacing was 50 cm. The experiment consisted of four application times of poultry manure at 5 t/ha; control (no application),4 weeks before sowing (4 WBS), 2 weeks before sowing (2 WBS) and at sowing (AS). Three varieties of okra (NHAe 47-4, EX-BASAWA 2 and 5 EX-SAMARU 3) were used. Weeding was done manually at 3,6 and 9 weeks after sowing (WAS). Five stands of okra were randomly selected and tagged from each plot for data collection. Data collected included plant height, number of fruits, fruit length and fruit weight. All data collected were subjected to analysis of variance (ANOVA) and means were separated using Duncan Multiple Range Test (DMRT) at 5% level of probability.

Results

Some physical and chemical properties of the soil are shown in Table 1. The textural class of the soil is sandy loam, slightly acidic, low in organic carbon, total nitrogen and available phosphorus (Esu, 1991).

Table 1: Some Physical and Chemical Properties of the Soil Experimental Site Before Sowing

Parameters	Value
Sand (g/kg)	766
Silt (g/kg)	94
Clay (g/kg)	140
Textural class	Sandy loam
pH (H_2O)	6.3
Organic Carbon (g/kg)	7.2
Total Nitrogen(g/kg)	0.2
Available Phosphorus (mg/kg)	6
Exchangeable bases (cmol/kg)	
Calcium	2.16
Magnesium	1.03
Potassium	0.14
Sodium	0.21
Exchangeable acidity	0.01
ECEC	3.55

The results (Table 2) revealed that there was no significant difference ($p>0.05$) in the plant height at 3 WAS. However, significant difference ($p<0.05$) was observed in the plant height at 6 WAS in which highest plant height was recorded where poultry manure was applied at 2 and 4 WBS. Significant difference ($p<0.05$) was also observed in plant height among the varieties, 5 EX-SAMARU 3 recorded highest plant height at 6 WAS while lowest was observed in NHAe47-4.

Table 2: Response of Okra Varieties to Time of Poultry Manure Application on Okra Plant Height (cm)

Treatment	Plant Height (cm)		
	3WAS	6WAS	9WAS
Time of application (T)			
Control	17.0^a	51.0^c	54.7^c
4WBS	15.8^a	59.4^a	68.5^a
2WBS	18.0^a	60.4^a	65.3^a
AS	16.4^a	55.0^b	60.5^b
SE ±	1.2	1.4	2.0
Variety (V)			
NHA_e 47-4	15.5^a	52.5^c	58.41^b
EX-BASAWA 2	17.1^a	56.8^b	68.58^a
5 EX-SAMARU 3	17.8^a	60.0^a	59.91^b
SE±	1.0	1.3	1.7
Interaction			
T×V	NS	*	NS

Means with the same letter(s) in a column are not significantly difference using DMRT at $p \geq 0.05$, WAS=weeks after sowing, WBS=weeks before sowing, AS= at sowing, SE±=standard Error, NS=not Significant, *=significant at $p<0.05$).

Results (Table 3) indicated that there was significant difference ($p<0.05$) in number of fruits and fruit length. The application of poultry manure at 2 and 4 WBS recorded highest number of fruits while highest fruit length was observed where poultry manure was applied 2 WBS. However, NHAe 47-4 recorded highest number of fruits and fruit length while lowest was observed in EX-BASWA 2 and 5 EX-SAMARU 3.

Table 3: Response of Okra Varieties to Time of Poultry Manure Application on Number of Okra Fruits and Okra Fruit Length (cm)

Treatment	Number of Fruits	Fruit Length (cm)
Time of application (T)		
Control	5^{b}	6.44^{bc}
4WBS	6^{a}	7.11^{ab}
2WBS	6^{a}	7.95^{a}
AS	5^{b}	5.79^{c}
SE±	0.3	0.4
Variety (V)		
NHA_e 47-4	6^{a}	7.62^{a}
EX-BASAWA 2	5^{b}	6.40^{b}
5 EX-SAMARU 3	5^{b}	6.44^{b}
SE±	0.2	0.3
Interaction		
T×V	*	ns

Means with the same letter(s) in a column are not significantly difference using DMRT at $p \geq 0.05$, WAS=weeks after sowing, WBS=weeks before sowing, AS= at sowing, SE±=standard Error, NS=not Significant, *=significant at $p<0.05$).

There was interaction effect between time of application and okra varieties. Application of poultry manure at 2 WBS and NHAe 47-4 produced highest number of fruits which was significantly higher than EX-BASWA 2 and 5 EX-SAMARU 3 irrespective of time of application (Table 4).

Table 4: Interaction Effect on Number of Okra Fruits to Time of Poultry Manure Application on Okra Varieties

Varieties	Time of Application			
	Control	4 WBS	2 WBS	AS
NHA_e 47-4	6^{bc}	7^{b}	8^{a}	5^{d}
EX-BASAWA 2	5^{d}	5^{cd}	5^{cd}	5^{d}
5 EX-SAMARU 3	5^{d}	5^{d}	5^{d}	5^{d}
SE±		0.3		

Means with the same letter(s) in a row or column are not significantly difference using DMRT at $p \geq 0.05$, WBS=weeks before sowing, AS=at sowing, SE±=standard Error.

The results in Table 5 showed that there was significant difference ($p<0.05$) in fruit weight and yield. The result indicated that highest fruit weight and yield were recorded where poultry manure was applied 2 WBS. However, NHAe 47-4 recorded highest fruit weight and yield.

Table 5: Response of Okra Varieties To Time of Poultry Manure Application on Okra Fruits Weight (g) and Total Yield of Okra Fruits (kg/ha).

Treatment	Fruits Weight (g)	Total Yield (kg/ha)
Time of application (T)		
Control	57.00^{c}	3682.8^{c}
4WBS	77.22^{b}	5004.1^{b}
2WBS	83.04^{a}	5381.1^{a}
AS	60.83^{c}	3942.4^{c}
SE±	1.7	110
Variety (V)		
NHA_e 47-4	73.14^{a}	4735.5^{a}
EX-BASAWA 2	68.39^{b}	4427.7^{b}
5 EX-SAMARU 3	67.04^{b}	4344.5^{b}
SE±	3.5	227.9
Interaction		
T×V	ns	ns

Means with the same letter(s) in a column are not significantly difference using DMRT at $p\geq0.05$, WAS=weeks after sowing, WBS=weeks before sowing, AS= at sowing, SE±=standard Error, NS=not significant.

Discussion

The application of poultry manure in okra production is capable of increasing okra plant height, this agreed with the work of Ajari *et al.*(2003), who studied plant height and fruit yield of okra as affected by field application of fertilizer and organic matter. This is also in agreement in the findings of John *et al* (2004) who reported that poultry manure contains essential nutrients which are associated with high photosynthetic activities that promote root and vegetative growth. This is also in agreement with work of Dauda *et al.*, 2005 who discovered that there was increase in growth of okra with the application of poultry manure at two weeks before sowing.

There was no significant difference observed in plant height at three weeks after sowing which was in line with the findings of (Nweke *et al.*, 2013) who revealed that application of poultry manure at two and four weeks before planting increased okra vegetative growth. This is because poultry manure was readily available in forms that were easy for absorption by okra plant root. Anburani and Manivannan (2002) reported that application of poultry manure helps in plant metabolic activity through the supply of some important micro nutrients in the early vigorous stage of okra growth, which in turn increases the fruit yield of okra plant.

The significant difference observed on the fruit yield of okra where poultry manure was applied two weeks before planting also conformed with the result of Aliyu (2000) who stated that poultry manure was capable of increasing the yield of okra as a result of easy solubilisation of nutrients elements that are released to improve the nutrient status of the soil.

Conclusion

From the results of this study, application of poultry manure at 2 WBS and cultivation of NHAe47-4 okra variety performed better in most of the parameter measured and hereby recommended for farmer in the study area.

References

Agbenin, J.O. (1995). Laboratory manual for soil and plant analysis.(selected method and data analysis).Published by the author.140 pp.

Ajani, O. T, Sado, 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.

Aliyu, L. (2000). The effect of organic and mineral fertilizer growth, yield and composition of pepper (*Capsicum annum* L). *Biological Agriculture and Horticulture*. 18: 29-38.

Anburani, A.and Manivannan, K. (2002). Effect of integrated nutrient management on growth in brinjal(*Solanum melongena* L.) cv. Annamalai. *South Indian Horticulture*. 50(4-6): 377-386.

Arapitas P. (2008). Identification arid quantification of polyphenolic compounds from okra seeds and skins. *Food Chemistry* 110: 1041-1045.

Dauda , S N., Aliyu, L., and Chiezey ,U . F (2005). Effect of seedling age at transplant and poultry manure on fruit yield and nutrients of garden egg (S. gilo L) varieties. *Journal of Tropical Science*. 5: 38-48.

Dilruba, HasanuzzamanMi- Karim R, Nahar K.(2009). Yield response of okra to different sowing time and application of growth hormones. *Journal Horticultural Science Ornamental Plants* 1:10-14.

Esu, I.E (1991).Detailed soil survey of NIHORT farms at Bunkure, Kano State, Nigeria Institute for Agricultural Research, Ahmadu Bello University, Zaria, Nigeria. 72 pp

John, L.W, Jamer ., D.B., Samuel.L.T., and Warner L.W., (2004).Soil fertility and fertilizer. An introduction of nutrient management, pearson education India pp: 106-153

Kahlon , T. S, Chapman M.H, and Smith G. E. (2009).In vitro binding of bile acids by okra beetsasparagues eggplant turnips green beans carrots and cauliflower. Food Chem. 103.676-680.

Nweke, I. A., Ijearu, S. I. and Igili, D. N. (2013). Effect of Different Sources of Animal Manure on The Growth and Yield of Okra (*Abelmoschus esculentus* L. Moench). *International Journal of Scientific and Technology Research* 3(2).pp23-28.

Oyewole, C. I., and Oyewole, A. N. (2011). Crop production and the livestock industry, the interplay: A case study of poultry manure and crop production. *Proceeding of the 16th Annual Conference of ASAN*, (pp. 124-127).

Published by

NOARA

Network of Organic Agriculture Researchers in Africa

شبكة الباحثين في الزراعة العضوية بإفريقيا