Effects Of Different Levels Of Poultry Manure On The Growth And Yield Of Okra (*Abelmoschus Esculentus* Monech) In Ikorodu Agro-Ecological Zone Of Nigeria

[1*]Sanni, K. O., [1]Godonu, K. G. and [1]Animashaun, M. O.

[1] Department of Crop Production and Horticulture, Lagos State Polytechnic, Ikorodu, Lagos State, Nigeria.
*sannikehinde2002@gmail.com

Abstract: A field experiment was carried out to determine the effects of different levels of poultry manure on the vegetative development and yield of okra (*Abelmoschus esculentus* Monech). The study was laid out in randomized complete block design with four treatments replicated three times. The treatments were applied at 0 t/ha^{-1}, 15 ha^{-1}, 20 ha^{-1} and 25 ha^{-1}. Data were collected on both growth and yield parameters, the data collected includes: plant height, number of leaves, stem girth, number of days to 50% flowering number of days to 50% fruiting, number of harvested pod/fruits, length of harvested fruits and weight of harvested fruits. Results indicated that plot amended with 25 ha^{-1} poultry manure significantly influenced okra growth and yield; and hereby recommended for the cultivation of okra in Ikorodu agro-ecological zone as a substitute for synthetic fertilizer.
[Sanni, K. O., Godonu, K. G. and Animashaun, M. O. **Effects Of Different Levels Of Poultry Manure On The Growth And Yield Of Okra (*Abelmoschus Esculentus* Monech) In Ikorodu Agro-Ecological Zone Of Nigeria.** *Researcher* 2015;7(4):55-59]. (ISSN: 1553-9865). http://www.sciencepub.net/researcher. 8

Keywords: different levels, harvested fruits, synthetic fertilizer, yield parameters

Introduction

Okra (*Abelmoschus esculentus* L. Moench) is an important vegetable crop widely grown primarily for its soft immature fruits or pods and the third most important fruit vegetable crop after tomato in Nigeria. The pods contain a glutinous, sticky substance that is used to thicken soups and stews. They are boiled or fried and eaten as vegetable. They can also be cut into pieces, dried and/or powdered and stored for use in soups during the dry season when fresh Okra fruits are scarce. Despite its nutritional value, its optimum yield (2-3t/ha) in the tropical countries is low partly because of continuous decline in soil fertility (Abdul-El-kader et al., 2010).

Donahue *et al.* (1990) reported that NPK fertilizer increases soil fertility and yield of okra. However, NPK fertilizer is very expensive and therefore increases cost of production. It is also not environmentally friendly (Ullysses, 1982). Alternative sources of fertilizer are therefore sought to increase yield of okra. Ikpe and Powel (2002) reported that manure applied in correct proportion not just improves soil porosity but it also contribute to good plants growth, development and yield (Ijoya and Sophie, 2009). According to Ewulo (2005) and Awodun (2007), Poultry manure contains high amount of nutrients especially nitrogen that are easily taken up by plants for fast growth however, Quinton (2006) reported that manure application should be limited to amount needed to make a difference between crop needs and the existing soil fertility levels, any manure application more or less will result into defect in production, However, there is lack of information on the recommended level of poultry manure required for economical production of Okra in the study area. It is based on this and lack of information on use of appropriate level of poultry manure on okra production to farmers in the area that this experiment was carried out to study the effect of different levels of poultry manure on the performance of Okra in Ikorodu Agro-ecological zone of Lagos, Nigeria.

Materials and Methods

The study was conducted at Teaching and Research Farms of Lagos State Polytechnic, Ikorodu, Lagos, Nigeria (Latitude 5° 10' N and longitude 3° 16' E) during 2013 late season. Poultry manure was obtained from the livestock unit of the Teaching and Research Farms of Lagos State Polytechnic, Ikorodu, Lagos, Nigeria. The manure was air dried and allowed to decompose for four weeks. Four (4) treatments made up of 0 t/ha^{-1}, 15 t/ha^{-1}, 20 t/ha^{-1} and 25 t/ha^{-1}.

The land was ploughed and harrowed after which the beds were prepared and the different levels of poultry manure were worked into the soil at a depth of 15cm two (2) weeks before sowing of okra seeds. The treatments were laid out in a Randomized Complete Block Design (RCBD) with plots measuring 25m x 10m (250m^2) with four treatments and replicated three times resulting in 12 experimental plots.

NHAE-47-4 okra variety was sourced from National Horticultural Research Institute, Ibadan, Nigeria. Floatation method was used to test the seed viability and the seeds were planted at two seeds per hole and later thinned to one plant per stand. The planting distances of okra were 60cm between rows

and 50cm within rows with thirty two (32) stands per plot and total plant population of 348 stands. All agronomic practices such as supplying, weeding and insect pest control were carried out when necessary.

Surface soil samples (0-15cm) were taken prior to the application of treatments. The pre-treatment samples comprised of a composite sample made up of 10 cores per experimental site. Another set of soil samples were taken at harvest. The samples comprised of a composite samples of two cores per plot. The soil samples were air-dried sieved to pass through a 2-mm mesh prior to analysis. Particle size as determined by hydrometer method (Bouyocus 1981), while soil pH was determined in a 1:1 soil to water suspension using a pH meter. Organic carbon was determined by wet oxidation method (Nelson., and Sommers, 1982). While total Nitrogen was done by Macro-kjeldahl method and available P by Bray-1 method (Bray, and Kurtz, 1945). Exchange bases were extracted with neutral IM NH4OAc at a soil solution ratio of 1:10 and measured by flame photometry. Magnesium was determined with an atomic absorption spectrophotometer. Exchange acidity was determined by titration method (Mclean, 1982).

Data were collected on growth parameters: plant height, stem girth, number of leaves at 6 weeks after planting. Yield parameters were computed after four (4) harvests included, number of fruits per plant, fruit length, and fresh fruit yield. Results were analyzed using the Analysis of Variance (ANOVA) by means of Statistical Analysis System (SAS) (SAS, 1999). Duncan Multiple Range Test (LSD) at 5% was used to separate the means of treatments.

Results and discussion

The data on initial properties of soil at the sites of experiment and the poultry manure used are present in Table 1. The data indicated the soils were loamy sand with high sand particle. The soils pH (6.54) fall within the range that were adequate for producing most crops in the tropics, low in organic matter (OM), available phosphorus (P), cation exchange capacity (CEC), exchangeable calcium (Ca), potassium (K) and Magnesium (Mg). Poultry manure had higher values of N, P, K, Ca and Mg (Table 1) required for the growth of vegetable crop such as okra.

The low level of organic matter (OM), available phosphorus (P), cation exchange capacity (CEC), exchangeable calcium (Ca), potassium (K) and Magnesium (Mg) observed from the soil analysis could be attributed to continuous cultivation on the soil without any soil management practices adopted and this shows clearly that application of poultry manure will tremendously improve the growth and yield of okra.

Table 1: Chemical composition of experimental soil and poultry manure used

Composition	pre soil	post soil	poultry manure
pH (H_2O)	6.54	5.15	
E.C (us/cm)	130.00	2.00	
Organic carbon (%)	0.46	0.43	
Total N (%)	0.11	0.11	3.04
Available P (mg/kg)	33.58	11.69	0.35
Ca (cmol/kg)	7.34	1.54	7.28
Mg (cmol/kg)	0.73	0.66	0.57
Na (cmol/kg)	0.28	0.25	0.21
K (cmol/kg)	0.23	0.18	1.11
Mn	2.4	6.60	0.26
Fe	6.8	8.10	0.84
Cu	9.0	1.30	0.44
Zn	9.0	8.60	0.71
Exc. A (cmol/kg)	0.20	0.20	
CEC (cmol/kg)	8.35	2.85	
Sand (%)	73.2	71.2	
Silt (%)	17.4	13.4	
Clay	9.4	15.4	
Textural class	Loamy sand		

Plant height

Figure 1 shows that there was gradual increase in plant height in all the poultry manure levels as the plant grow older. There was significant increase in height as the rate of poultry manure application increases. The significant increase in plant height with increase in poultry manure could be attributed to increased available nutrients supplied by the manure which are in available form for easy absorption by plant roots throughout the growing stages of the crop; hence there was a boost in the morphological growth of the plant. The observation from this study was in agreement with the findings of Ewulo *et al* 2008 and Iyagba *et al* (2013) who reported that plant height increases as the rate of poultry manure and fertilizer application increases. The control plots had stunted growth as they had to rely solely on the inherent soil nutrients which is low due to continuous farming on the land hence the its nutrient might have been depleted.

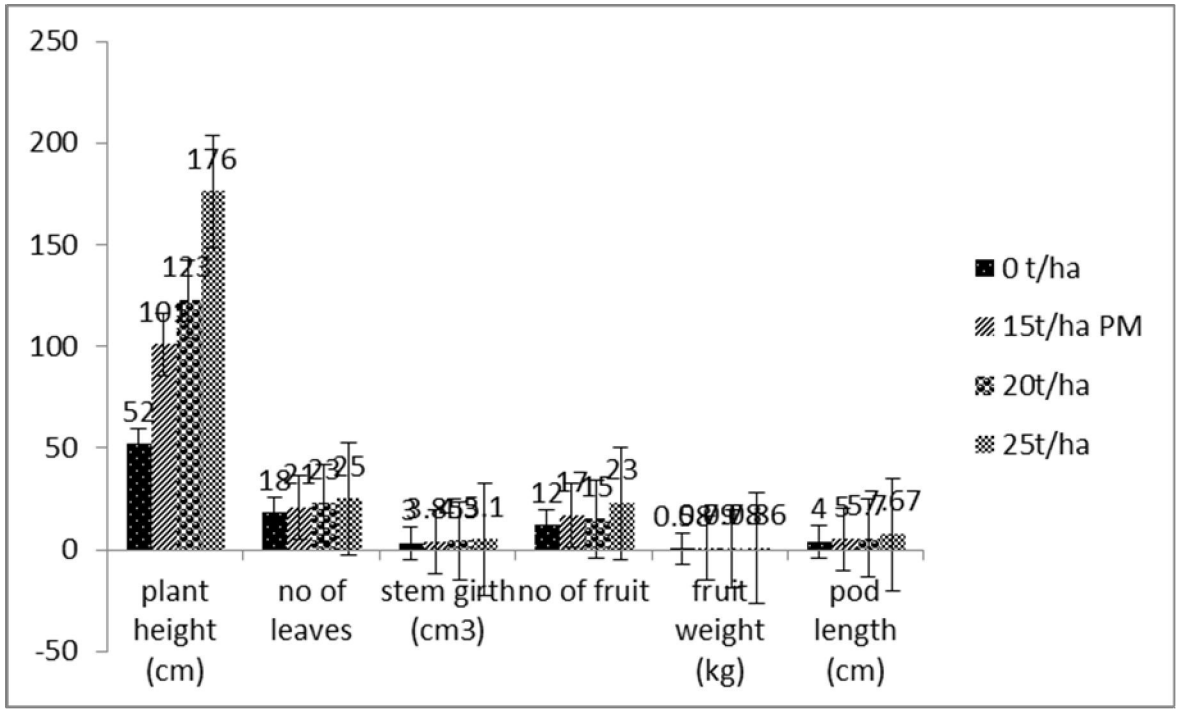
Number of leaves

Number okra leaves were significantly influenced by different levels of poultry manure applied with 25t/ha having the highest number of leaves (Figure 1). The positive influence of poultry manure on the growth of the crop might be due to the release of the balanced nutrient contained in the organic matter (Cooperband, 2002). The increase in the number of leaves per plant will lead to increase in the plant photosynthetic rate which may ultimately leads to yield increase. This confirms the findings of Nweke *et al* (2013) and Adesina *et al* (2014) who reported increase in pepper leaves number due to increase in levels of poultry manure application.

Stem girth

The okra stem girth increase with increase in poultry manure application. There was statistical significant effect among the treatment means, which shows that increase in level of application has appreciable effect on the stem girth (Figure 1). This is in line with the findings of Kolawole *et al* (2008) who reported that increasing level of fertilizer application increased the growth and yield of okra.

Frank (2000) observed that a general increase in vegetative growth was obtained when manures are applied to plants in increasing rates. Moreover, poultry manure is known to rich in N, P and K, which when decomposed add nutrients to the soil resulting in better growth and development.



Yield attributes

Results from the study indicated that okra plant that received 25t/ha of poultry manure had the highest number of harvested fruits followed by 15t/ha and the lowest fruit from control plots. From the values obtained it reflected that increase in rate of application of poultry manure increases the number of okra pods produced by the plants (Figure 1). Although 15t/ha plots performed fairly better that 20t/ha plot, however, there is no significant difference between the two treatments. A similar trend was equally observed in terms of fruit weight; which shows that okra yield responded positively to the increase in poultry manure rates. The yield increase with an increase in poultry manure rates suggest that poultry manure supplies nutrients which enhances vigorous growth which are important indices that culminate in increase in fruit yield. This observation was in support of Ogundiran (2013), who reported that as level of poultry manure application increases, number of pod produced by okra also increases. The significant effect due to poultry manure application might be due to easy solubilsation effect and the gradual release of plant nutrients leading to improved nutrient status of the soil

Okra planted on soil amended with 25t/ha rate of poultry manure produced fruit with the longest fruit while control plots produced shortest okra fruit (Figure 1). Generally okra fruits length varies significantly with increase in rate of poultry manure application. The result agreed with Onwu *et al* (2014) who reported that increase in rate of application of poultry manure increases the length of okra pods.

Sharma (2004) observed that organic manure improves pod size fruit weight and fruit yield when manure is correctly applied at the required amount. The observed improvement in the yield of okra could be linked to the ability of the poultry manure to increase soil organic matter content and also the changing of chemical composition of the soil. Leng (2006) attributed yield increase resulting from addition of organic manure to increase in cation exchange capacity (CEC) and to increase in water holding capacity; when organic manure is applied in sufficient quantity to the soil it can supply all the necessary primary and secondary nutrients required for crop growth and yield.

Conclusion

With the results obtained from this study, it is revealed that increasing rate of poultry manure application have profound effect on the overall performances of okra plant. The poultry manure at the rate of 20t/ha was found to affect the growth and yield of okra positively in the assessed parameters and adapted to the nature of soil the environment study. The manure is cheap and easily assessable in the study area unlike the synthetic fertilizer. It is therefore, advisable to use this rate for the production of okra in the agro-ecological area.

References

1. Abdul-El-kader AA, Shaaban SM, Abdul- El-Fattan MS (2010). Effects of irrigation and organic compost on 0kra plants (*Abelmoschus esculentus* I.) grown in sandy cancerous soil. Agricultural Biology Journal of North America. 1(3):225-231.
2. Ajari, 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.
3. Attigah,E. S., Asiedu, E. K., Agyarko, K. and Dapaah, H. K. (2013) Growth and yield of Okra (*Abelmoschus esculentus* L.) as affected by organic and inorganic fertilizers. Journal of Agricultural and Biological Science, 8 (12): 766-769.
4. Awodun, M. A. (2007) Effect of Poultry Manure on the Growth, Yield and Nutrient Content of Fluted Pumpkin (*Telfaria accidentalis* (Hook). F). Asian Journal of Agricultural Research, 1:67-73.
5. Bouyocus, C. J. (1981) Hydrometer method improved for making particles size analysis of Soil Science Society Proceedings, 26 446-465.
6. Bray, R. H. and Kurtz, L. T. (1945) Determination of total Organic and available forms of phosphorus In Soils. Soil Science 59 (1945) 35-45.
7. Cooperband, L. (2002) Building Soil Organic Matter with Organic Amendments. Centre for Integrated Agricultural Systems. University of Winsconsin. Mdison, September, 2002. 13pp.
8. Donahue R.L., R.W. Miller and J.C. Shicklina. 1990. An introduction to soil and plant growth (5th Edition). Prentice-Hall. India Private Ltd. New Delhi. pp. 139-144.
9. Ewulo, B. S. (2005) Effect of Poultry and Cattle Manure on Sandy Clay Loam Soil. Journal of Animal and Veterinary Sciences. 4: 839-841.
10. Ewulo, B. S., Ojeniyi.S. O. and Akanni, D. A. (2008) Effect of poultry manure on selected soil physical and chemical properties, growth, yield and nutrient status of tomato. African Journal of Agricultural Research, 3 (9): 612-61.
11. Frank G.V (2000) The plants needs for and use of Nitrogen in soils. Edited by Bartaacovew, W.C, Francis E.C. American Society of Agronomy M.C USA. pp 508 – 509.
12. Ijoyah, M. O. and V. L. Sophic (2009) Effects of Different Levels of Decomposed Poultry Manure

on Yield of Cabbage (*Brassica clearaceae* L.) at Anse Boileau, Seychelles. Journal of Tropical Agriculture, Food, Environment and Extension, 8 (1):20-23.

13. Ikpe, F. N. and J. M. Powel (2002) Nutrient Cycling Practices and Changes in Soil Properties in the Crop- Livestock Farming Systems of Western Nigeria, West Africa. Nutrient Cycle in Agro- ecosystem. 62:37-45.
14. Iyagba, A. G., Onuegbu, B. A. and Ibe, A. E. (2013) Growth and yield response of okra (*Abelmoschus esulentus* (L.) Monech) to NPK fertilizer rates and weed interference in south-eastern Nigeria. International Research Journal of Agricultural Science and soil Science, 3(9): 328- 335.
15. Kolawole, G. O., Olapede, A. O. Alade, C. R. and Olaniyi, J. O. (2008) Response of okra (*Abelmoschus esulentus* (L.) Monech) varieties to NPK fertilizer in the South Guinea Savanna of Nigeria. Nigerian Journal of Horticultural Science, 13:99-108.
16. Leng, B. (2006) Effect of organic manure on soil temperature, early vegetative development in muskmelon and weed growth. Proceedings, national agricultural plastic congress, 22:19-27.
17. Mclean, E. O. (1982) Soil pH and line requirement. In: Methods of soil Analysis part 2. Agron. 9 (2nd ed.) ASA, SSSA, Madison, Wise (1982) pp 199-224.
18. Nelson, D. W. and Sommers, C. E. (1982) Total carbon, org. Carbon and organic matter. In: Page A.1. et al., (eds)s method of soil Analysis part 2, Agoon, Monogr, 9, 2nd ed. ASA, SSSA. Madison, Wise pp 539-571.
19. Nweke, I. A., Ijearu, S. I. Igili, d. N. (2013) Effect of Different sources of Animal manure on the growth and yield of okra (*Abelmoschus esulentus* (L.) Monech) in Ustoxic dystropeptat Enugu South Eastern, Nigeria. International journal of Scientific and Technology Research, 2(3) 33-38.
20. Ogundiran, A. O. (2013) The effect of combined application of poultry manure and sawdust on the growth and yield of okra. Journal of Agricultural Science, 5(10): 7-11.
21. Quinton, I. (2006) Indigenous Spinach. Go Farming for the Farmers of Tomorrows, Pg. 20-21.
22. Sharma, D. H. (2004) Fundamental of soil science, 7th edition UK Longman.
23. Ullysses S. 1982. Fertilizer and soil fertility. Prentice-Hall. India Private Ltd., India. p. 305.

4/2/2015