http://dx.doi.org/10.22161/ijeab/2.3.30 *ISSN: 2456-1878*

Effect of Poultry Droppings on Growth and Fruit Yield of Okra (*Abelmoschus esculentus*)

Tswanya M.N.[1], Isah K.M.[2], Ahmed M.[1], Yisa P.Z.[1], Lile S.N.[3]

[1]Niger State College of Agriculture, P.M.B. 109, Mokwa. Niger State.
[2]Ibrahim Badamasi Babangida University Lapai, Niger State.
[3]Federal College of Fresh Water Fisheries Technology New-Bussa, Niger State.

Abstract— The effect of poultry droppings on growth and fruit yield of okra was evaluated during 2013 and 2014 cropping seasons at the Ahmadu Bello University Teaching and Research Farm Mokwa Sub- Station ($9^0 18^1$N and $5^0$4E) with altitude of 378.0 m above the sea level of the Southern Guinea Savanna Zone of Nigeria. The trial was conducted using Randomized Complete Block Design which consisted of ten (10) treatment combinations with three replications. Different rates of poultry droppings (t ha^{-1}); 0 (No application), 5 t ha^{-1}, 10 t ha^{-1}, 15 t ha^{-1} and 20 t ha^{-1} with two okra varieties, LD 88- 1 and Kukurasungi Local were used. Data was taken from five sampled plants per plot on parameters such as average plant height per plant (cm), number of leaves per plant, number of flowers per plant, number of fruits per plant, fruit length (cm) and green fruit yield (t ha^{-1}). Results from this study showed that in the two years trial LD 88- 1 variety performed better than Kukurasungi Local and therefore can be used for okra production within the study area. Poultry droppings rate of 15 t ha^{-1} increased the fruit yield. Therefore, this can be applied as part of cultural treatment.

Keywords— Okra, LD 88-1, Kukurasungi Local, poultry droppings, growth, yield.

I. INTRODUCTION

Okra (*Abelmoschus esculentus* [L.] Moench) is one of the major vegetables in Africa which is cultivated mainly for consumption (Katung and Kastina, 2005). In Nigeria, fresh okra fruits are used in vegetable soups with fluted pumpkin (Telfeiria occidentalis) leaves. It can be eaten raw, cooked, sliced and dried to be preserved for a long period. Okra is important because of its nutritive values that are present in the leaves and fruits (Akintoye *et al*., 2011). The fresh fruits are very rich in vitamin A and C, carbohydrate, calcium, potassium, iron, magnesium, zinc and other minerals which are often lacking in the diet of people. As a valuable medicinal plant, it is used in treatment of peptic ulcer and as source of plasma replacement in man's body fluid. Also, both mature pods and stem contain fibre which can be used industrially in manufacture of paper, rope, jute etc. It is widely distributed and grown in the southern parts of Nigeria (Olawuyi *et al*. 2011). In area where okra is cultivated, two main varieties are known: the dwarf early fruiting ones used for commercial purposes and tall type which takes longer period to come into bearing (Schippers, 2000). Okra is sensitive to low temperature and develops poorly below 15^{O}C. Reports by Katung and Kashina (2005) indicated that okra require high temperature of about 32^{O}C and long day length for optimum growth and development. A well – drained sandy loam soil with a pH of 6 - 6.8 is preferred. Okra responds very well to organic manure application. Udoh *et al*., (2007) demonstrated an excellent use of animal dung and plant residues to improve soil fertility, fruit nutrient composition, root growth and fruit weight of okra plant. Poultry manure is a typical source of nutrient for plant growth, used commonly in the tropics due to high nutrient content, lack of weed seeds, cheapness and availability (Aliyu, 2000). According to Adams *et al*., 2004, poultry manure increases plant height. For tropical countries like Nigeria, high cost and scarcity of chemical fertilizers prohibit their use by most small holding farmers. Hence attention has shifted to use and research on organic sources of plant nutrients. Most studies on the use of animal wastes dealt with cattle and poultry droppings and their fertilizing value has been confirmed for many crops. The study was conducted to investigate the effect of poultry droppings on growth and fruit yield of two okra varieties in the Southern Guinea Savanna of Nigeria.

II. MATERIALS AND METHODS

The experiment was conducted during the 2013 and 2014 cropping seasons (June - September) at the Ahmadu Bello University Teaching and Research Farm Mokwa sub – station ($9^0 18^1$N and $5^0$4E) with altitude of 378.0 m above the sea level of Southern Guinea Savanna zone of Nigeria. The treatments consisted of two okra varieties (LD 88-1 and kukurasungi Local) were obtained from the Department of Agricultural Technology, College of Agriculture Mokwa and the sub treatments consisted of five poultry dropping rates: 0 t ha^{-1}, 5 t ha^{-1}, 10 t ha^{-1}, 15 t ha^{-1} and 20 t ha^{-1}. Each plot consisted of four ridges at 60 cm wide and 6 m long (14.4 m^2) separated by 100 cm wide. The land was cleared and ridged manually. Two seeds were planted per hole at 50 cm within row. The seedlings were thinned to one per stand, two weeks after emergence, weeding was done thrice at 3, 6 and 9 weeks after planting (WAP). NPK (15:15:15) fertilizer was applied at the rate of 250 kg ha^{-1}, 4 weeks after planting. Data were collected on average plant height per plant (cm), number of leaves per plant, number flowers per plant, number of fruits per plant, fruit length (cm) and green fruit yield per plot (t ha^{-1}). Data collected were subjected to analysis of variance (ANOVA) using Genstat 4.0 statistical package. Means were separated using least significant difference (LSD) at 5% probability level.

III. RESULTS

Plant height of okra variety was significantly (P≤0.05) influenced in 2013 cropping season. The tallest plant height (85.8 cm) was obtained from Kukurasungi Local and the least mean value (66.9 cm) was observed from LD 88-1. In 2014 cropping season, plant height was not significantly (P≥0.05) affected by poultry droppings (Table 1).

Poultry dropping rates had significant (P≤0.05) effect on plant height in both years. In 2013, plants applied with 15 t ha^{-1} (94.0 cm) was significantly taller than the control, 5 t ha^{-1} and 10 t ha^{-1}. But was not significantly different from 20 t ha^{-1} (88.2 cm) while the least mean value (50.7 cm) was obtained from the control plot. In 2014 cropping season, plants applied with 15 t ha-1 (96.8 cm) was significantly taller than other treatments evaluated and the least mean value (46.2 cm) was obtained from non-applied plot. The interaction of variety and poultry dropping rates was significant in both years (P≥0.05) (Table 1).

The LD 88-1 variety significantly (P≤0.05) had more number of leaves compared with Kukurasungi Local in the two years (Table 1). In 2013 cropping season, LD88-1 (39.5) recorded the highest number of leaves and the least mean value (28.9) was obtained from Kukurasungi Local variety. The same trend was observed in 2014 which LD88-1 had the highest mean value (43.6) while the least mean value (40.90 was obtained from Kukurasungi Local variety.

Poultry droppings significantly (P≤0.05) enhanced more number of leaves in both years. In 2013, the highest number of leaves was obtained from the plants applied with 15 t ha^{-1} (69.0) which was not significantly different from 20 t ha^{-1} (65.8) while the least mean value (18.7) was obtained from the control plot. In 2014 cropping season, the highest mean value (68.9) was observed from the plants applied with 20 t ha^{-1}. This was closely followed by 15 t ha^{-1} (68.2) and the least mean value (20.3) was obtained from non-applied plot. (Table 1). The interaction effect of variety and poultry dropping rates was not significant in both years (P≥0.05).

The variety did not significantly (P≥0.05) influence number of flowers in 2013 cropping season but significantly affected number of flowers in 2014 (Table 2). The highest mean value (30.1) was obtained from LD 88-1 in 2014 and least mean value (23.6) was recorded from Kukurasungi Local.

Poultry dropping rates had significant (P≤0.05) effect on the number of flowers produced in both years. In 2013, the highest mean value (28.5) was obtained from the plants applied with 20 t ha^{-1} which was closely followed by 15 t ha^{-1} (27.6). The plants applied with 10 ha^{-1} was significantly higher than 5 t ha^{-1} while the least mean value (18.6) was obtained from the control plot. In 2014 cropping season, the highest mean value (29.8) was obtained from the plants applied with 15 t ha^{-1} which was not significantly different from that of 20 t ha^{-1} (29.5) and the least mean value (19.3) was observed from non-applied plot. The interaction effect of variety and poultry dropping rates was not significant in both years (P≥0.05).

LD 88-1 okra variety significantly (P≤0.05) had more number of fruits than Kukurasungi Local variety in the two years. In 2013 cropping season, the highest number of fruits with the mean value (23.7) was obtained from LD88-1 and Kukurasungi Local had the least mean value (15.6). The same trend was observed in 2014 cropping season with the highest mean value (28.4) obtained from LD88-1 and the least mean value (20.7) obtained from Kukurasungi Local (Table 3).

Poultry droppings had significant (P≤0.05) influence on the number of fruits in both years. The highest mean value (25.5) was obtained from 15 t ha^{-1} in 2013, closely followed by 20 t ha^{-1} and the least mean value (10.8) was obtained from non-applied plot. In 2014, the same trend was observed which plants applied with 15 t ha^{-1} (26.0) was significantly different from 5 and 10 t ha^{-1} but was not significantly different from that of 20 t ha^{-1} (25.7). The interaction effect of variety and poultry dropping rates was not significant in both years (P≥0.05).

The okra variety significantly (P≤0.05) influenced the fruit length in the two cropping seasons (Table 3). In 2013, LD

88-1 variety significantly had the highest mean value (15.3 cm) while the least mean value (10.0 cm) was obtained from Kukurasungi Local. Also in 2014, LD88-1 with the mean value (18.9 cm) significantly proved its superiority over Kukurasungi Local which had the mean value (11.3 cm).

Fruit length of okra was significantly ($P \leq 0.05$) influenced by poultry droppings in both years. In 2013, plants applied with 20 t ha^{-1} recorded the highest mean value (19.5 cm) which was followed by 15 t ha^{-1} (18.4 cm) and the least mean value (8.6 cm) was obtained from the control plot. Conversely, the highest mean value (23.3 cm) was obtained from the plants applied with 15 t ha^{-1} in 2014 cropping season. This was followed by 20 t ha^{-1} (21.7 cm) while the least mean value (9.2 cm) was observed from the control plot. The interaction of variety and poultry dropping rates was not significant ($P \geq 0.05$) in both years (Table 3).

Okra variety significantly ($P \leq 0.05$) gave better green fruit yield in both years (Table 3). In 2013, LD 88-1 significantly recorded the highest mean value (11.70 t ha^{-1}) while the least mean value (8.00 t ha^{-1}) was obtained from Kukurasungi Local. In 2014, the highest mean value (12.60 t ha^{-1}) was obtained from LD 88-1 and the least mean value (7.70 t ha^{-1}) was received from Kukurasungi Local.

Fruit yield of okra was significantly ($P \leq 0.05$) influenced by poultry dropping rates. In 2013 cropping season, plants applied with 15 t ha^{-1} (14.40 t ha^{-1}) was not significantly different from 20 t ha^{-1} (13.30 t ha^{-1}). But was significantly higher than other treatments while the least mean value (3.20 t ha^{-1}) was obtained from the control plot. In 2014, the highest mean value (14.90 t ha^{-1}) was obtained from the plants applied with 15 t ha^{-1} which was not significantly different from that of 20 t ha^{-1} (12.90 t ha^{-1}) and the least mean value (2.90 t ha^{-1}) was obtained from non-applied plot. The interaction of variety and poultry dropping rates was not significant ($P \geq 0.05$) in both years.

IV. DISCUSSION

The results obtained from this study indicated a positive response of the test crops to increasing rates of poultry droppings. Plant height and number of leaves of okra were significantly influenced by the application of poultry droppings. Growing of okra on poultry droppings performed in terms of the plant height and number of leaves of the plant than the control plot. This shows that poultry droppings were readily available in the best form for easy absorption by the plant roots, hence there was a boost in the morphological growth of the plant. The results obtained agrees with the findings of Aniefiok *et al*. (2013) in okra production in which they reported that organic manure, most especially poultry droppings could increase plant height and number of leaves. Increase in the poultry droppings rate has significant effect on the vegetative growth of the plant. This result corroborated with the findings of Onwu *et al*. (2008) and Paththinige *et al*. (2008) that increase in growth will increase organic manure rates.

The results of the study proved that the treatments evaluated are capable of improving crop yield. The significant effect due to poultry droppings application can be attributed to easy solubilisation effect of released plant nutrient leading to improved nutrient status of the soil. The results obtained were in agreement with the findings of Onwu *et al*. (2014) which reported that yield of okra can be increased due to organic manure application. Similar observation was made by Premsekhar and Rajashree (2009).

V. CONCLUSIONS

The results from this study showed that LD 88-1 okra variety gave a better fruit yield of 11.70 and 12.60 t ha^{-1} in 2013 and 2014 seasons, respectively. Base on the findings, it may be recommended that 15 t ha^{-1} of poultry droppings be used to obtain good and marketable fruit yield. This could also minimize cost of okra production.

REFERENCES

[1] Adams, B.A., Oskabor, B., Akoun, J., Jayeba, O.J., Meduna, O.T. and Samuel, A.A. (2004). Effects of Organic and Inorganic fertilizers on the growth of Ocimum gratissimum, Proceedings of the 22nd Annual Conference of the Horticultural Society of Nigeria at Kano. Pp. 56 – 58.

[2] Akintoye, H. A., Adebayo, A. G., and Aina, O. O. (2011). Growth and yield response of okra intercropped with live mulches. *Asian Journal of Agricultural Research*, 5: 146 – 153.

[3] Aliyu, I. (2000). The effect of organic and mineral fertilizer on growth, yield and composition of pepper. *Biological Agricultural and Horticulture* 18 (1) 29-36

[4] Aniefiok, E.K., Idorenyin, A.U. and John, O.S. (2013). Effect of poultry manure and plant Spacing on the growth and yield of water leaf (Talinum fructicosum (L.) JUSS). *Journal of Agronomy*, 12: 146-152.

[5] Katung, M. D. and Kashina, B. D. (2005). Time of partial defoliation and GA3 effects on growth indices and yield of okra (*Abelmoschus esculentus* (L) Moench). *Proceeding of the 39th Conference of the Agricultural Society of Nigeria,* Benin 2005. Pp. 210 - 213.

http://dx.doi.org/10.22161/ijeab/2.3.30 *ISSN: 2456-1878*

[6] Olasantan F. O. and Salau A. W. (2007). Effect of pruning on growth, leaf yield and pod yield of okra (*Abelmoschus esculentus (L.) Moench.*). *Journal of Agricultural Science,* 146: 93 -102.

[7] Olawuyi, O. J., Ezekiel-Adewoyin, D. T., Odebode, A. C., Aina, D. O., and Esenbamen,.G. (2011). Effect of arbuscular mycorrhizal (*Glomus clarum*) organomineral fertilizer on growth and yield performance of okra (*Abelmoschus esculentus*). *African Journal of Plant Science*, 6(2): 84 - 88.

[8] Onwu, C.A., Ayuba, S.A. and Ali, A. (2008). The effect of organic manure on the and yield of castor plant (Ricinus cumunis). *Journal of Sustainable Development in Agriculture and Environment* 3 (2) 64-70.

[9] Onwu, A.C., Abubakar, J.R. and Unah, P.O. (2014). Effect of poultry manure on growth, yield of okra and Soil properties in Makurdi, North Central Nigeria. *International Journal of Agricultural and Food Sience*.

[10] Paththinige, S. S., Upashantha, P. S. G., Banda, R. M. R., and Fonseka, R. M. (2008). Effect of plant spacing on yield and fruit characteristics of okra (*Abelmoschus esculentus*) *Tropic, Agric. Res*. 28: 336 – 342.

[11] Schipper, R. R. (2000). African Indigenous Vegetables. An overview of the cultivated Species. Chatham, U.K., National Resource Institute / ACP – EU. Technical Centre for Agricultural and Rural Cooperation. Pp. 114 -118.

[12] Udoh, D.J., Ndon, B.A., Asuquo, P.E. and Ndaeyo, N.U. (2005). Crop production Techniques for the Tropics, *Concept publication* Lagos, Nigeria. Pp. 446.

Table.1: The effects of variety and poultry dropping rates on plant height/plant and number of leaves/plant at Mokwa in 2013 and 2014 cropping seasons.

Treatment	Plant height/plant(cm)		Number of leaves/plant	
	2013	2014	2013	2014
Variety(V)				
LD 88-1	66.9	69.5	39.5	43.6
Kukurasungi Local	85.8	73.8	28.9	40.9
LSD (0.05)	6.30NS		4.602.00	
Poultry dropping rates (t ha^{-1})				
0	50.7	46.2	18.7	20.3
5	63.4	58.7	32.4	38.6
10	71.5	68.3	37.8	49.7
15	94.0	96.8	69.0	68.2
20	88.2	84.9	65.8	68.9
LSD (0.05)	10.45	11.90	8.10	7.30
Interaction (V x PD)	ns	ns	ns	ns

V= variety, PD= poultry droppings, NS= not significant, LSD= least significant difference.

http://dx.doi.org/10.22161/ijeab/2.3.30 *ISSN: 2456-1878*

Table.2: The effects of variety and poultry dropping rates on number of flowers/plant and number of fruits/plant at Mokwa in 2013 and 2014 cropping seasons.

Treatment	Number of flowers		Number of fruits	
	2013	2014	2013	2014
Variety(V)				
LD88-1	29.930.1		23.7	28.4
Kukurasungi Local	22.823.6		15.6	20.7
LSD (0.05)	ns	6.10	3.60 4.75	
Poultry dropping rates (t ha^{-1})				
0	18.6	19.3	10.8	12.1
5	23.7	23.9	18.3	17.8
10	25.1	27.4	21.9	23.8
15	27.6	29.8	25.5	26.0
20	28.5	29.5	25.3	25.7
LSD (0.05)	2.04	2.60	2.90	3.25
Interaction (V x PD)	ns	ns	ns	ns

V= variety, PD=poultry droppings, NS= not significant, LSD= least significant difference.

Table.3: The effects of variety and poultry dropping rates on fruit length and green fruit yield at Mokwa in 2013 and 2014 cropping seasons.

Treatment	Fruit length/plant (cm)		Fruit yield (t ha^{-1})	
	2013	2014	2013	2014
Variety(V)				
LD 88-1	15.3	18.9	11.7	12.6
Kukurasungi Local	10.0	11.3	8.0	7.7
LSD (0.05)	4.35	5.20	2.10	3.80
Poultry dropping rates (t ha^{-1})				
0	8.6	9.2	3.2	2.9
5	11.7	13.0	6.7	7.8
10	14.1	17.0	9.4	10.1
15	18.4	23.3	14.4	14.9
20	19.5	21.7	13.3	12.9
LSD (0.05)	3.60	4.80	4.60	4.50
Interaction (V x PD)	ns	ns	ns	ns

V= variety, PD= poultry droppings, NS= not significant, LSD= least significant difference.