



PRODUCTIVITY OF OKRA [*ABELMOSCHUS ESCULENTUS* (L.) MOENCH] AS INFLUENCED BY POULTRY MANURE AND PLANTING PATTERN IN SAMARU, NORTHERN GUINEA SAVANNA OF NIGERIA.

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ABSTRACT

Field trial was conducted in Samaru during the 2018 and 2019 rainy seasons at the Institute for Agricultural Research farm, Ahmadu Bello University, Zaria, to determine optimum poultry manure rate and appropriate planting pattern for Okra production in the Northern Guinea savanna. Treatments comprised of four rates of poultry manure (0, 4, 8 and 12 t ha⁻¹) and four planting patterns [1plant / stand on a ridge (33,333 plants ha⁻¹), 1plant / stand on two sides of a ridge (66,667 plants ha⁻¹), 2plants / stand/ on a ridge (66,667 plants ha⁻¹), 2plants / stand on two sides of a ridge (133,333 plants ha⁻¹)] laid out in a Randomized complete block design with three replications. Data were collected on plant height, number of leaves, finger length, diameter and fruit yield. Results showed that application of poultry manure significantly increased plant height, number of leaves, finger length and yield. The increment was notable with application of 12 t ha⁻¹ of poultry manure on number of leaves and fruit yield. Planting pattern significantly increased only finger length and fruit yield where 1plant / stand on two sides of a ridge and 2 plants / stand on two sides of a ridge resulted to longer fingers and higher yield respectively. Based on this study, poultry manure applied at 12 t ha⁻¹ and planting pattern of 2plants / stands on both side of a ridge could be adopted for okra production.

Key words: Healthy soils, photosynthetic efficiency, planting pattern and poultry manure

INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench], an annual plant belonging to the *Malvaceae* family is also known as Lady's finger because the fruit is long, curved and tapered at the end (Anonymous, 2020, Britannica, 2021). The crop is commonly cultivated in tropical, sub-tropical and warm temperate regions of the world although its geographical origin is disputed to be West Africa, Ethiopia or South Asia (National Research Council (2006), Wikipedia 2021). Okra is especially valued for its tender delicious fruits and is a good source of

essential vitamins (e.g. Vitamin C) and minerals such as calcium, phosphorus, magnesium and iron. Additionally, consumption of okra is good for the eyes, skin, relieves constipation, lowers cholesterol levels, boosts immunity, enhances weight loss and production of red blood cells (Anonymous, 2020). Despite the importance of okra, the fruit yield has remained low especially in developing countries (1.77-8 t/ha) compared to the yield obtained in developed countries that could reach as high as 30 t/ha (Whitehead and Singh, 2000). Low fruit yield had been attributed to use of inadequate amounts of

Table 3: Effect of Poultry manure and planting patterns on number of leaves and plant height at Samaru during 2018 and 2019 rainy season.

Treatments	<u>Number of Leaves/plant at</u> <u>9WAS</u>		<u>Height (cm)/plant at</u> <u>9WAS</u>	
	2018	2019	2018	2019
Poultry Manure (t ha ⁻¹) (PM)				
0	8.3b	9.0b	28.4b	66.8b
4	8.8b	9.7ab	37.3a	94.1a
8	10.6ab	10.7a	40.8a	93.8a
12	11.9a	10.7a	38.8a	90.1a
SE±	0.83	0.47	2.27	5.25
Planting Patterns (PP)				
1/ stand on a ridge	9.5	10.1	35.1	65.6
1/ stand on two sides of ridge	9.7	10.5	35.7	100
2/ stands on one side of ridge	10.6	10.0	35.4	85.5
2/ stands on two sides of ridge	9.7	9.5	39.2	93.7
SE±	0.83	0.47	2.27	5.25
Interactions				
PM x PP	NS	NS	NS	NS

Means followed by the same letter(s) within a treatment group and year are not significantly different at 0.05% level of probability using DMRT. NS= Not significant, WAS= Weeks after sowing

Table 4 shows the effect of poultry manure and planting patterns on finger length and diameter of Okra during 2018 and 2019 rainy seasons. The result showed that application of poultry manure significantly increased finger length and diameter of Okra only in 2019 rainy season where both yield components increased significantly up to 4 t ha⁻¹ of poultry manure applied beyond which were not significantly different.

Likewise, the various planting patterns resulted to significant differences in finger length in 2018 and diameter of Okra in both years. Longer fingers were recorded with 2 plants / stand than 1 plant / stand but comparable to the other two patterns. This trend was observed on fruit diameter in 2018, but in 2019, 2 plants / stand had significantly wider fingers than the

other planting patterns which were all statistically the same. There was no significant interaction between the treatments on the both parameters and years.

The positive increment noticed on finger length and diameter and yield due to applied poultry manure could be attributed their ability to increase in height, produce more leaves, thus increase sunlight interception. The increment in light interception could have resulted to efficient photosynthetic ability of the crop as such enhanced assimilate production. Improvement in quality of the soil as a result of the applied poultry manure, might have assisted in translocation of assimilates produced into reproductive stage as noticed on finger length and diameter.

Table 4: Effect of Poultry manure and planting patterns on Okra finger length and diameter at Samaru during 2018 and 2019 rainy season.

Treatments	Finger Length (cm) at 9WAS		Finger Diameter (cm) at 9WAS	
	2018	2019	2018	2019
Poultry Manure (t ha ⁻¹) (PM)				
0	6.7	9.9b	2.5	3.2b
4	7.4	10.8a	2.5	3.5a
8	7.6	11.0a	2.8	3.6a
12	7.3	11.2a	2.8	3.6a
SE±	0.36	0.24	0.10	0.07
Planting patterns (PP)				
1/ stand on a ridge	7.9	10.3b	2.5b	3.4b
1/ stand on two sides of ridge	7.7	10.9ab	2.6ab	3.4b
2/ stands on one side of ridge	6.8	11.1a	2.8a	3.6a
2/ stands on two sides of ridge	6.7	10.4ab	2.7ab	3.4b
SE±	0.36	0.24	0.10	0.07
Interactions				
PM x PP	NS	NS	NS	NS

Means followed by the same letter(s) within a treatment group and year are not significantly different at 0.05% level of probability using DMRT. NS= Not significant, WAS= Weeks after sowing

Table 5 shows the yield of okra during 2018 and 2019 rainy seasons and combine analysis as influenced by poultry manure application and planting pattern. Results showed that application of poultry manure resulted in corresponding yield increases up to 12 t ha⁻¹ in both years and the combine analysis.

Planting pattern showed that sowing at 1 plant / stand resulted in the lowest yield in 2018 and the combined analysis than the other patterns which were statistically the same. In 2019 however, 2 plants / stand on 2 sides of a ridge gave higher yield than 1 plant / stand on a ridge and 1 plant / stand on 2 sides of a ridge but not statistically different from 2 plants / stand on a ridge.

Increase in yield due to applied poultry manure is attributed to the nutrients supplied by the manure. Similar result was observed by Mubarak, (2014) on the response of okra (*Abelmoschus esculentus* L. moench) varieties to NPK fertilizer and poultry manure in northern guinea savanna.

Planting pattern of 1 plant on 2 sides of the ridge, 2 plants / stand on both sides of a ridge and 2 plants / stand on ridge gave higher yield, which could be due to the higher population. Moniruzzaman *et al.*, 2007, Smith, and Ojo. (2006) and Haile *et al.*, (2016) also reported similar findings.

Additionally, results obtained on crop performance could be attributed to soil of the experimental site being loam (Table 1). This is because loamy soil is ideal for most plants because it has a high moisture holding capacity and also drains well thus allowing adequate soil aeration (Lerner, 2021). The result of soil analysis also indicates low nitrogen and phosphorus which could be attributed to poor soil organic matter content which is characteristic of most savanna soils as reported by Shehu *et al.*, 2016 and Salako *et al.*, 2001. Thus, the low nutrients status of the soil may not adequately support proper crop growth without external nutrients supply. The crop performance

is an indication that applied manure was able to augment needed soil nutrients for crop production. This implies that applied manure could have mineralized and released nutrients for crop use as it was able to increase crop growth and yield in both years. The observed

crop components responded more to applied manure in the second year, this might be as a result of residual effect and/ or higher manure mineralization as the trial was conducted on the same field for the two years.

Table 5: Effect of Poultry manure and planting patterns on yield and combined analysis of Okra at Samaru during 2018 and 2019 rainy season.

Treatments	Yield (kg ha ⁻¹)		Combine analysis(kg ha ⁻¹)
	2018	2019	
Poultry Manure (t ha ⁻¹) (PM)			
0	2699d	3420d	3058d
4	5523c	6921c	6222c
8	8115b	10498b	9306b
12	11122a	13867a	12494a
SE±	110.86	51.68	61.15
Planting patterns (PP)			
1/ stand on a ridge	6534b	8577b	7555b
1/ stand on two sides of ridge	6909a	8647b	7778a
2/ stands on one side of ridge	6922a	8672ab	7797a
2/ stands on two sides of ridge	7092a	8808a	7950a
SE±	110.86	51.68	61.15
Interactions			
PM x PP	NS	NS	NS

Means followed by the same letter(s) within a treatment group and year are not significantly different at 0.05% level of probability using DMRT. NS= Not significant, WAS= Weeks after sowing

Conclusion and Recommendation

Based on the findings of this study, it can be concluded that poultry manure application resulted in increases on the parameters measured with the fruit yield increasing up to 12 t ha⁻¹ while the planting patterns showed better

results at higher densities where highest yield was recorded with 2 plants / stand on both sides of a ridge. Therefore, application of 12 t ha⁻¹ and planting 2 plants / stand on both sides of a ridge can be recommended for okra production in the northern guinea savanna of Nigeria.



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