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Effect of cow dung and variety on the growth and yield of Okra (*Abelmoschus esculentus (L.*)

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ABSTRACT

A trial to investigate the effect of cow dung and inorganic fertilizer on the growth and yield of Okra (Abelmoschus esculentus) was conducted in the Teaching and Research Farm of Ibrahim Badamsi Babangida University during the 2011 and 2012 cropping seasons. The trial was a factorial experiment consisting of two varieties of Okra (NHe47-4 and LD88-1) and four levels of cow dung (0, 5 10 and 15 tha^{-1}). The inorganic fertilizer was applied at rate of 200kg ha^{-1}. The experiment was fitted into randomized complete block design (RCBD). Cow dung applied at 20 t ha^{-1} and inorganic fertilizer significantly produced taller plants, more leaves and more fruits. Non application of fertilizer significantly delayed flowering. In 2011, cow dung at 20 t ha-1 and inorganic fertilizer statistically gave similar fruit weight which was significantly higher than other treatments. The highest fruit weight in 2012 was obtained with cow dung at 20 t ha-1. The varietal difference was not significant in most of the parameters measured

Key words: cow dung, inorganic fertilizer and variety

INTRODUCTION

One of the most important vegetable consumes widely in Nigeria and grown widely in the country is okra. It is also widely cultivated and can be found in almost every market all over Africa [1]. Okra is mostly eaten in cooked or processed form and was reported to contained protein oil, calcium, iron magnesium and phosphorus [2]. Decline in soil nutrient is one of the major constraints of crop production in Nigeria. In the past years, inorganic fertilizer was advocated for crop production to ameliorate low inherent fertility of soils in the tropics [3]. However, high cost and scarcity of inorganic fertilizer as well as possible cause of soil acidity and nutrient imbalance pose a constraint to use of inorganic fertilizer [4, 5]. Nutrient imbalance and soil physical degradation hinder sustainable use of inorganic fertilizers in the tropics [6]. In order to sustain soil fertility over a long period of time the use of organic manure is been advocated. This is because the nutrients contained in organic manures are released more slowly and are stored for a longer time in the soil, thereby ensuring a long residual effect [7]. [8], also reported that manures provide a source of all necessary macro- and micro-nutrients in available forms, thereby improving the physical and biological properties of the soill. There are different types of organic manure including cow dung, compost, green and farm yard manure etc.

MATERIALS AND METHODS

The experiment was conducted during the 2011 and 2012 cropping seasons at the Teaching and Research Farm of Ibrahim Badamasi Babangida University, Lapai, latitude 9^{0}2N and longitude 6^{0}3E, in the Southern Guinea savanna agroecological zone of Nigeria. The pH (H_2O) of the soil was 5.3 (pH meter), 2.4 g kg organic carbon(Walkley and Black), 0.40 g kg total N (Kjeldahl), 12 mg kg P(bray PT) and 0.35 cmol kg K (in NH OAC).

The treatments were two varieties of Okra (NHAe47-4 and LD 88) and five rates of cow dung (0, 5, 10, 15 and 20 t ha^{-1}). An inorganic fertilizer, NPK (15:15:15) was applied at the rate of 120 kg ha-1 which served as a check. It is therefore a two factors factorial experiment fitted into randomized complete block design (RCBD) with three replications. Each plot measured 4 x 3 m ($12m^2$) with 1 and 0.5 m pathways between each replication and plot respectively. Cow dung was applied in to the soil one week before planting while the inorganic fertilizer was split and applied at two and four weeks after sowing. Okra seeds were planted at a spacing of 30 cm by 50 cm and at rate of three seeds which was thinned to one per hole.

The data collected includes plant height, stem girth, number of leaves per plant, number of fruit per plant, fresh fruit weight and fruit length. All the data collected were subjected to analysis of variance and means separated at 5% probability using least significant difference (LSD).

RESULTS AND DISCUSSION

The effects of different rates of cow dung on plant height and stem girth in 2011 and 2012 were significant as shown on Table 1. The tallest plants were obtained in both 2011 and 2012 cropping seasons when treated with cow dung at rate of 20 t ha^{-1} which did not differs significantly with inorganic fertilizer in 2011. In both 2011 and 2012 cropping seasons control plots significantly produced shorter plants. This result is in agreement with the work of [9]. The effects of rates of cow dung on stem girth were also significant ($P \leq 0.05$) with inorganic fertilizer, 15 t ha^{-1} and 20 t ha^{-1} of cow dung statistically producing plants with similar girth which were significantly better than other treatments. The variety effects on plant height and stem girth were not significant. The interaction effects of variety and cow dung were also not significant.

The effects of cow dung and variety on number of leaves per plant was not significant (Table 2). However control plots significantly took more days to 50 % flowering compared to others. This means that fertilizer enhanced the growth of Okra. This work is in agreement with the work of [10] who reported that the earliness to flowering may be traced to relatively inherent nutrient availability which promoted crop performance.

The effects of cow dung on number of Okra fruits were significant ($P \leq 0.05$). In both 2011 and 2012 cropping seasons, inorganic fertilizer and rates of cow dung at 15 and 20 t ha^{-1} statistically produced similar number of fruits (Table 3) while control plots produced the lowest number of fruits. The effect of fertilizer application on fruit weight was also significant (Table 3). In 2011, inorganic fertilizer and cow dung at 20 t ha^{-1} statistically produce similar fruit weight while in 2012 the fruit weight of cow dung at 20 t ha^{-1} was significantly higher than that of inorganic fertilizer. Generally the weights of fruits produced by the 0, 5, 10 and 15 t ha^{-1} of cow dung were statistically the same except in 2011. This means that cow dung at 20 t ha^{-1} had more effect on fruit weight which translated to yield (Table 4).

The effects of rates of cow dung and variety on fruit length and breadth was shown on Table 4. Control plots generally produced shorter fruit length compared to treated plots. This report however contradicted the result of [11] who reported no significantly difference in fruit length and girth and attributed to inherent genetic characteristic.

Table 1: Effects of rates of cow dung and variety on plant height and stem girth of Okra 2011 and 2012 cropping seasons

Treatment	Plant height (cm)		Stem girth (cm)	
	2011	2012	2011	2012
Variety (V)				
NHe-47- 4	49.34a	60.45a	2.89a	3.23a
LD 88- 1	50.45a	58.12a	3.23a	2.96a
Cow dung (F)				
0 t ha^{-1}	45.02d	40.89d	1.78c	1.56c
5 t ha^{-1}	47.12bc	45.45c	2.58b	2.45b
10 t ha^{-1}	48.34bc	47.89bc	2.78b	2.70b
15 t ha^{-1}	56.34b	58.45b	2.99a	2.98a
20 t ha^{-1}	60.56a	62.24a	3.12a	3.00a
Inorganic fertilizer	59.56a	56.09b	3.02a	3.23a
Interaction				
V x F	NS	NS	NS	NS

Means followed by the same letter(s) in the same column for each factor are not significantly different at $P \leq 0.05$

Table 2: Effect of rates of cow dung and variety on number of leaves and days to 50 % flowering of Okra 2011 and 2012 cropping seasons

Treatment	Number of leaves plant^{-1}		Days to 50% flowering	
	2011	2012	2011	2012
Variety (V)				
NHe-47- 4	9a	10a	30.67a	31.45a
LD 88- 1	10a	11a	31.22a	30.00a
Cow dung (t ha^{-1}) (F)				
0 t ha^{-1}	9ab	8b	37.23a	35.28ab
5 t ha^{-1}	8b	9ab	34.37ab	33.12b
10 t ha^{-1}	9ab	10a	32.34b	31.22b
15 t ha^{-1}	10a	10a	30.41b	31.23b
20 t ha^{-1}	10a	11a	32.11b	30.24b
Inorganic fertilizer	11a	9a	30.21b	29.11b
Interaction				
V x F	NS	NS	NS	NS

Means followed by the same letter(s) in the same column for each factor are not significantly different at P≤0.05

Table 3: Effect of rates of cow dung and variety on number of fruits and fresh fruit weight of Okra, 2011 and 2012 cropping seasons

Treatment	Number of fruit plant^{-1}		Fruit weight p[ant^{-1}	
	2011	2012	2011	2012
Variety				
NHe-47- 4	15.33a	13.08a	155.21a	165.30a
LD 88- 1	14.23a	14.21a	156.89a	160.34a
Cow dung (t ha^{-1})				
0 t ha^{-1}	7.34c	8.02c	121.23c	130.23bc
5 t ha^{-1}	8.45c	10.45b	135.34b	143.00b
10 t ha^{-1}	10.23b	12.34b	139.31b	143.98b
15 t ha^{-1}	13.45a	12.89b	144.09b	143.98b
20 t ha^{-1}	14.35a	15.23a	158.45a	159.34a
Inorganic fertilizer	15.12a	14.78a	156.11a	147.23b
Interaction				
V x F	NS	NS	NS	NS

Means followed by the same letter(s) in the same column for each factor are not significantly different at P≤0.05

Table 4: Effect of rates of cow dung and variety on fruit length, girth and fruit yield of Okra 2011 and 2012 cropping seasons

Treatment	Fruit length		Fruit girth		Fruit Yield (t ha^{-1})	
	2011	2012	2011	2012	2011	2012
Variety (V)						
NHe-47- 4	8.91a	9.01a	2.87a	2.56a	13	14
LD 88- 1	9.82a	10.67a	2.76a	2.47a	13	13
Cow dung (t ha^{-1}) (F)						
0 t ha^{-1}	4.56c	4.98c	2.02c	2.12c	10	11
5 t ha^{-1}	5.69b	6.45b	2.34b	2.19c	11	12
10 t ha^{-1}	8.92a	9.34a	2.56b	2.54b	12	12
15 t ha^{-1}	9.02a	10.09a	2.65a	2.89a	12	12
20 t ha^{-1}	10.02a	10.08a	2.45b	2.76a	13	13
Inorganic fertilizer	8.35a	9.45a	2.35b	2.45b	13	12
Interaction						
V x F	NS	NS	NS	NS		

Means followed by the same letter(s) in the same column for each factor are not significantly different at P≤0.05

CONCLUSION

Application of different rates of cow dung to Okra led to significant increase in growth and yield over the control. Use of cow dung at the rate of 15 to 20 t ha-1 will significantly improve the performance of Okra comparable to use of inorganic fertilizer.

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