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Effect of Organic Manure on the Growth and Yield of Okra (*Abelmoschus esculentus* (L) Moench) in Unwana

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Abstract: ***An experiment was conducted at the experimental field of Department of Horticulture and Landscape Technology, Akanu Ibiam Federal Polytechnic Unwana-Afikpo during 2018 cropping season, to determine the effect of Organic Manure on the Growth and Yield of Okra (Abelmoschus esculentus (L) Moench) in Unwana. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The treatments comprised of control plots, cow dung, goat dung and poultry droppings. Parameters assessed were: plant height, number of leaves, number of branches, number of fruits, stem diameter, fruit diameter and fruit yield. The result showed that organic manure significantly influenced plant height, number of branches, number of leaves, and total fruit yield. Poultry dropping gave higher values in all the parameters except stem diameter and fruit diameter. Number of fruits and fruit yield was 10 fruits and 32.50t/ha, respectively at first harvest which differed significantly from other treatments used. Number of fruits recorded at second and third harvests was 7 and 9 fruits, respectively and were statistically the same with other treatments used. The control plot produced least values in all parameters assessed. Poultry manure produced maximum fruit yield of 32.50t/ha, followed by goat dung (29.20t/ha).***

Keywords: Fruits, Fruit yield, Okra, Organic manure

1. Introduction

Okra (*Abelmoschus esculentus* (L) Moench) is a popular vegetable in tropical and subtropical countries of the world (Avapitsus, 2008). It is an important vegetable crop occupying a land area of 277,000 hectares with a population of 2.63t/ha in Nigeria (FAO, 2005). They are valued for many of its properties. Edible okra pods contain 88% water, 2.1% protein, fat 0.2%, carbohydrate 8.0%, fibre 1.7% and ash 0.2% (Oyelade *et al*., 2003). Akinfasoye and Nwanguma (2005) noted that oil content in okra seed could be as high as that of poultry egg and soybean.

The quality of okra in terms of nutrient availability increase mostly when cultivated in good fertile soils rich in N, P, and K (Awodun, 2007). In Nigeria especially in South eastern part, there are widespread problem of soil degradation due to continuous cultivation on the soils which is as a result of pressure from the increasing population of the area where the available land remains static. The use of organic manure as fertilizer have formed a major area of research in recent times. Adeniyan and Ojeniyi (2003) reported the importance of organic manure for soil fertility which influences so many soil properties. Application of organic manure at lower quantity lead to nutrient deficiency and low yield (Allah Bakhsh *et al*., 2013). Senjobi *et al*. (2010) reported that the use of organic manure improves all growth parameters of leafy vegetables. Animal manure provides a source of all necessary macro and micro nutrient in available forms, thereby improving the physical and biological properties of the soil (Abou El-magd *et al*., 2006). Madukwe *et al.* (2008) reported that organic manure especially poultry manure resulted in increase number of nodules and higher yield in cowpea, and that poultry manure was efficient in the amendment of degraded soils. Therefore, this study was set up to determine the effect of organic manure on the growth and yield of Okra (*Abelmoschus esculentus* (L) Moench) in Unwana.

2. Materials and Methods

The experiment was conducted during 2018 cropping season at the Teaching, Demonstration and Research (TDR) farm of the Department of Horticulture and Landscape Technology, Akanu Ibiam Federal Polytechnic Unwana-Afikpo, Ebonyi State. Unwana is located in latitude 06^0 5'N and longitude 08^0 03'E with an elevation of 300m above sea level (NIMET, 2003).Three sources of organic manure (poultry, goat and cow) and a local variety of okra pods purchased from the "Unwana" market were used for the study. Experimental plot measuring 14m × 10m was cleared using conventional tools such as cutlass and hoe. Soil samples were randomly collected from the site at 0 to 20cm depth, bulked and analyzed for physico-chemical properties.

The experimental field was laid out in a Randomized Complete Block Design (RCBD) with three replications. Organic manure was incorporated into the soil at 10kg each on beds allotted to them two weeks prior to planting. Two okra seeds were planted per hole at the depth of 2cm and spacing of 60cm × 45cm. Weeding was done at three (3) weeks after planting and subsequently as the need arose. The experiment was observed and the following parameters were recorded: plant height, number of leaves and branches per plant and stem diameter at two weeks interval starting from the 5WAP, number of fruits, fruit diameter and fruit yield at harvesting. Data collected from the study was subjected to; analysis of variance (ANOVA) and treatment means were

separated using least significant difference (LSD) as described by Obi (2001)

3. Results

Soil Physico-Chemical Properties

Table 1 shows the physico-chemical properties of the experimental soil. The soil is sandy loam soil with 89.50% sand, 7.00% silt and 3.48% clay. The organic carbon content is 1.26% with 2.50% organic matter. The nitrogen, phosphorus, potassium and other cations are very low in the soil used for this study and pH (water) was highly acidic.

Table 1: Soil Physic-Chemical Properties of the Experimental Site

Soil Parameters	Values
pH (H_2O)	5.00
Mg (Cmol/kg)	0.52
Na (Cmol/kg)	0.02
Ca (Cmol/kg)	2.20
K (Cmol/kg)	0.01
P (Cmol/kg)	3.62
% organic C	1.26
% organic N	0.02
Sand	89.50
Silt	7.00
Clay	3.48

The results in Table 2 showed that organic manure had significant effects at P=0.05 on the plant height, number of leaves and branches of Okra produced. Poultry droppings produced tallest plants 20.30cm, 31.42cm, 45.12cm and 64.30cm at 5, 7, 9 and 11 WAP which differed significantly from the control plots that recorded the least values, respectively. An application of organic manure (poultry droppings) produced highest number of leaves of approximately 5, 8, 19 and 22 at 5, 7, 9 and 11 leaves WAP, respectively. At 5th WAP, number of leaves produced were statistically similar. The most profuse branches were recorded at plots with poultry dropping 2.17, 2.33, 4.41 and 4.80 across the weeks counted as presented in Table 2. Application of organic manure had no significant effect on the stem diameter of okra measured.

Poultry droppings produced higher number of fruits 10, 7, and 9 as presented in Table 3 while the control plots recorded the least. Number of fruits produced at 1st, 2nd and 3rd harvest for poultry dropping treated plots was statistically similar apart from 1st harvest where number of fruits (10) differed significantly from control plots (6). Organic manure significantly affected fruit diameter of Okra at 2nd harvest. Widest fruits of 3.67cm were recorded at goat dung at 2nd harvest which differed significantly from others while control gave the least fruit diameter in all harvesting period.

The result in Table 3 revealed that application of organic manure had significant (P=0.05) differences on fruit yield. Application of poultry manure gave the highest fruit yield of 32.50t/ha which differed significantly from other organic manure used. Control plot recorded the least fruit yield of 21.80t/ha

Table 2: Effect of Organic Manure on the Growth of Okra (*Abelmoschus esculentus* L.)

Organic manure	5WAP	7WAP	9WAP	11WAP
Number of Leaves				
Control	3.81a	5.33b	9.20c	13.90c
Poultry dung	4.80a	8.18a	19.25a	22.33a
Cow dung	4.30a	7.25a	13.40b	16.80b
Goat dung	4.77a	7.45a	18.40a	20.18a
F-$LSD_{0.05}$	N.S	2.14	2.98	3.13
Plant Height (cm)				
Control	9.51c	15.34c	22.71d	39.40c
Poultry dung	20.30a	3142a	45.12a	64.30a
Cow dung	12.75b	20.45b	35.46b	55.33b
Goat dung	19.54a	29.73a	31.09c	62.30a
F-$LSD_{0.05}$	2.31	3.31	2.97	4.94
Number of Branches				
Control	1.12a	1.03b	1.98b	2.89b
Poultry dung	2.17a	2.33a	4.41a	4.80a
Cow dung	1.35b	1.78a	2.77a	4.25a
Goat dung	1.99a	2.13a	3.78a	3.71a
F-$LSD_{0.05}$	0.37	1.18	2.18	1.24
Stem Diameter (cm)				
Control	1.443a	1.500a	1.510a	1.514a
Poultry dung	1.500a	1.525a	1.520a	1.610a
Cow dung	1.210a	1.500a	1.510a	1.835a
Goat dung	1.230a	1.510a	1.520a	1.800a
F-$LSD_{0.05}$	N.S	N.S	N.S	N.S

Means in the same column having the same letter(s) are not significantly different at P=0.05 according to LSD. N.S=Non significant

Table 3: Effects of Organic Manure on the Yield of Okra (*Abelmoschus esculentus* L.)

	Number of Fruits Harvesting			Fruit Diameter (cm) Measurement Interval			Fruit Yield (t/ha)
	1	2	3	1	2	3	
Control	6.00b	6.00a	6.00a	2.33a	2.00c	2.00a	21.80d
Poultry dung	10.00a	7.00a	9.00a	2.50a	2.67b	2.25a	32.50a
Cow dung	8.66a	6.00a	7.33a	2.33a	2.67b	3.33a	26.70c
Goat dung	8.33a	6.00a	8.66a	2.67a	3.67a	2.00a	29.20b
F-$LSD_{0.05}$	1.842	N.S	N.S	N.S	0.999	N.S	2.31

Means in the same column having the same letter(s) are not significantly different at P=0.05 according to LSD. N.S=Non-significant

4. Discussion

Effect of Organic Manure of the Vegetative growth of Okra (*Abelmoschus esculentus* (L) Moench)

The tallest plants, highest number of leaves and branches was produced by poultry manure. The control plots recorded the least values in all vegetative parameters assessed and this is because of low nutrient content of the soil. This is in agreement with the work done by Senjobi *et al*. (2010) who reported that the use of organic manure (poultry, cow, goat, pig) improved all the growth parameters of leaf vegetables. They also help in better nutrient recycling (Elshakweer *et al*., 1998).

Effect of Organic Manure of the Yield of Okra (*Abelmoschus esculentus* (L) Moench)

The highest number of fruits and fruit yield were recorded in poultry manure treated plots and the least was observed at control plots. This agrees with Sanwal *et al*. (2007) who reported that organic manure produced higher pods and improve productivity. Animal manure nutrients are released more slowly and are stored for a longer time in the soil, improved root development and high crop yield (Sharma and Mittra, 1991; Abou El Magd *et al*., 2006).

5. Conclusion

From the field experiment, organic manure had a positive effect on the growth and yield of Okra. Especially poultry manure proved to be the organic manure for higher number of fruits per hectare followed by goat dung.

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