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Research Paper

Effects of Organomineral Fertilizer on the Growth and Yield of Okra

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ABSTRACT
The effects of organomineral on the growth and yield of okra under different rates was determined in this study. The experiment was laid out in completely randomized design (CRD) and it contained five (5) treatments with three (3) replicates making a total of fifteen (15) seedlings altogether. The treatment used were Tl; Control, T2; 5kg, T3; 4kg, T4; 2kg, and T5; 1kg of organomineral. The result showed that T1 produced the least number of leaves from weeks 1 to 12. The number of leaves produced was not significantly different from T4. However, the highest number of leaves was produced by T1 at week 7 and 6, at week 12, T5 produced the highest number of leaves and was significantly different from others. The plant height of okra shows that there were no significant differences among the treatments from weeks 8 to 12 while significant difference was recorded in weeks 3, 4, 5 and 7. The result obtained showed that T1 had the least height where significance was recorded and in all other weeks except week 1. The average fruit result showed that there were significant effects of the treatments on the average fruit. The highest was obtained in T4 (0.80mm) and was not significantly different from T3 (0.71), the least average fruit weight was obtained in T1 (0.31mm) and was significantly different from other treatments. It is therefore recommended that farmers should use organomineral fertilizer in the cultivation of okra.
KEYWORDS: *Organomineral, Okra, Significant effect, Number of leaves, Plant height, Farmers.*

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I. INTRODUCTION

Okra (*Abelmoschus esculentus L*), a vegetable crop, is known in many English-speaking countries as lady's fingers. Its solution in water has an intrinsic viscosity value of about 30% and it is white to yellow in colour, strong but rather coarse. In Nigeria, okra is grown in both the wet and dry season but attract a larger profit during the dry season when the demand is often in excess of the limited supplies. Fresh okra fruits are used as vegetable while the roots and stems are used for preparing brown sugar, okra seeds are used for oil extraction. Okra is a high-value crop because it is a source of nutrients that are important to human health, e.g. vitamins, potassium, calcium, carbohydrates and unsaturated fatty acids such as linolenic and oleic acids. In Nigeria, okra is usually boiled in water resulting in slimy soups and sauces, which are relished. The fruits also serve as soup thickeners. Nutrients contained in manures are released more slowly and are stored for a longer time in the soil ensuring longer residual effects, improved root development and higher crop yields [1]. The application of organomineral fertilizer is necessary for enhancing the soil nutrient status and increasing crop yield. Okra requires nutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), sodium (Na) and Sulphur (S) for fertility maintenance and crop production. These nutrients are specific in function and must be supplied to plants at the right time and at the right quantity. Organomineral is high in organic materials and rich in nutrients. It is an important source of nitrogen for crop production and it is very cheap, reliable and easily available for small and large scale production of plants [2]. They are usually applied at higher rates, relative to inorganic fertilizers. When applied at higher rates, they give residual effects on the growth and yield of succeeding crops [3]. Improvements of environmental conditions as well as the need to reduce cost of fertilizing crops are reasons for advocating use of organic materials [4].

Organomineral Fertilizers (or humic fertilizers), is a fertilizers that consist of organic matter and mineral compounds bound to it either chemically or by adsorption. Organomineral fertilizers are produced by treating humic acids or materials containing them (peat, lignite, silts, shales, or humus) with ammonia,

ammoniacal solutions of phosphates or phosphoric acid, and potassium salts. Organomineral fertilizers have various compositions and names: humoammophos, humoammophoska, peat-ammonia fertilizers (PAF), peat-mineral-ammonia fertilizers (PMAF), and humates of sodium and ammonium. Tropical soils are adversely affected by sub-optimal soil fertility and erosion, causing deterioration of the nutrient status and changes in soil organism populations [5]. Therefore, this study is focused on the effect of organomineral fertilizer on the growth and yield of okra under different rates. Studies by [2]; recorded positive responses of maize and pepper to organomineral fertilizers, they also increases the soil organic matter (SOM) value of the soil which is helpful for the plants.

II. MATERIAL AND METHODS

The experiment was carried out within the premises of the Federal College of Forestry Jericho Ibadan, situated at Jericho, Hills under Ibadan North West local government area of Oyo State, The area is situated in the rainforest agro ecological zone of Nigeria and lies on latitude 7'54°N and longitude 3'34° E above sea level. The average annual rainfall ranges from l400 mm - l500 mm. The average temperature is about 32°C, with the average humidity between of 80 and 85% with two distinct seasons of wet (April — October) and dry (November — March, (FRIN, 2018).

The following materials used for this project are; top soil, cutlass, hoe, polythene bag, weighing balance. Organomineral fertilizer, bucket, watering can, measuring ruler, hand glove, hand trowel, paper tape, measuring tape, recording book and pen. The okro seeds were obtained from the National Horticultural Research Institute (NIHORT), Ibadan and the top soil was obtained inside the College. Organomineral fertilizer was bought from Aleshinloye market, polythene bags were bought from FRIN and paper tape, biro and book were obtained from Dugbe market. Other materials used were collected from the College premises.

The top soil was sieved and the polythene bags were filled with it to raise the okra. 15 kg of topsoil was measured into polythene and different rates of the organomineral fertilizer measured into the polythene bags respectively (i.e organomineral fertilizer). The experiment was laid out in completely randomized design (CRD). The experiment contained five (5) treatments with three (3) replicates making a total of fifteen (15) seedlings altogether.

The treatments were as listed below:

TI = control
T2 = 5kg of organomineral fertilizer and 15kg of top soil
T3 = 4kg of organomineral fertilizer and 15kg of top soil
T4 = 2kg of organomineral fertilizer and 15kg of top soil
T5 = 1kg of organomineral fertilizer

The parameters assessed were:

Plant Height (cm): each plant height was measured by the use of measuring rule graduated in centimeters.
Number of Leaves: the number of leaves was taken by counting the leaves.
Fruit weight: fruit weight was obtained using a sensitive scale.
Yield Weight: fruits were harvested per treatment and weighed using weighing balance.

The data collected were subjected to Analysis of Variance (ANOVA) and means were separated using Duncan Multiple Range Test (DMRT). Samples of the top soil and organomineral were taken to the laboratory for analysis. The physiochemical properties of the samples are presented in Table 1 below.

Table 1: Result of physico-chemical analysis of experimental soil and organomineral

NUTRIENT	SOIL (QTY)	ORGANOMINERAL
Organic Carbon(^{O}C)	1.78	23.00
Organic Mineral (M)	3.06)	
Total nitrogen (TN)	0.15	1.20
Potassium (K) (cmol/kg)	0.11	1.78
Sodium (Na) (cmol/kg)	1.270	
Calcium (Ca)	5.19	1.98
Magnesium (Mg)	2.34	0.07
Manganese Mn	46.1	73.37
Copper (Cu)	0.8	10.50
Zinc (Zn)	3.1	53
Iron (Fe)	36	1.08
Potassium (P)	51.92	
Sand %	86.5	
Clay %	9	
Silt %.	4.5	
pH(H_2O)	5.25	

Bio-Chemistry laboratory, Forestry Research Institute of Nigeria (FRIN), Ibadan.

III. RESULTS AND DISCUSSION

Table 2: Effects of organomineral fertilizer on the number of leaves of okra per week

Trt	Weeks after Planting 1	2	3	4	5	6	7	8	9	10	11	12
T1	5.33b	5.33[b]	6.67b	8.00a	7.67a	7.00a	10.00a	4.00a	8.00d	10.00	8.00	9.00c
T2	6. 67a	8.00[a]	9.00a	7.67a	11.00a	6.00a	7.00b	8.00a	10.67cd	15.00b	15.67a	19.00b
T3	7.33a	7.33[a]	10.00a	8.33a	10.33a	6.00a	6.00b	6.00a	8.67cd	14.67c	18.67a	13.67c
T4	7.00a	7.00[a]	9.00a	8.33a	10.33a	6.33a	6.33b	5.00a	13.00b	11.67c	17.00a	9.00c
T5	7.00a	7.67[a]	9.33a	10.00a	10.67a	6.33a	8.00ab	4.33a	17.00a	17.00a	18.00a	27.00a
Sig	*	*	*	*	*	*	*	*	*	*	*	*

NS= Not Significant*

Table 2 shows the analysis of the means number of leaves in okra. The result obtained shows that there were significant effects among the treatment at weeks 1, 2, 3, 5, 7, 9 and 12. The result obtained showed that T1 produced the least number of leaves from weeks 1 to 12 that ranges from 4.00 leaves at weeks 8 to 10.00 leaves at weeks 10. The number of leaves produced was significantly different from T4 having 9.00 leaves at week 12. However the highest number of leaves was produced by TI at week 7 and at week 12, T5 produced the highest number of leaves having 27.00 leaves which was significantly different from others. The higher number of leaves of okra produced could be due to enhancement of decomposition of the organic materials and mineralized of nutrients especially N and P by the present of mineral fertilizer in organomineral. This is supported by the work of [2].

Table 3: Effect of organomineral fertilizer on the plant height per (cm)

Trt	1	2	3	4	5	6	7	8	9	10	11	12
T1	8.67a	9.33b	14.00b	19.00a	23.00b	37.33b	45.00b	46.00a	45.00b	45.67b	46.00a	50.33
T2	7.33a b	12.00a	20.33a	34.33a	42.67a	53.00b	60.00b	66.00a	64.00ab	63.33ab	61.67a	60.33a
T3	6.83a b	10.67ab	20.33a	31.00a	43.00a	53.00b	62.67a b	59.00a	66.00ab	60.67ab	67.33a	62.67a
T4	6.00b	10.00b	20.33a	31.00a	45.00a	59.33a	59.33b	60.00a	83.00a	83.33a	86.00a	80.33
T5	7.33a b	10.00b	21.00a	35.33a	55.00a	67.00a	30.00a	65.00a	74.33ab	68.67ab	78.67a a	72.00a
Sig	*	*	*	*	*	*	*	*	*	*	*	*

NS= Not Significant*

Table 3 shows the analysis of the mean plant height of okra. There were no significantly difference among the treatment from weeks 8 to 12 while significant difference was recorded in weeks 3, 4, 5 and 7. The result obtained showed that T1 had the least height where significance was recorded and in all other weeks except week 1 where it ranged from 8.67cm (week 1) to 50.33cm (week 12). At week 12, T4 had the highest height of 80.33 cm while T2, T3 and T5 had a range of 60.33 cm to 72.00 cm. This result is supported by the finding of [6] who reported that the height of sweet pepper increased in response to increasing in the levels of organomineral fertilizer rate tip to 150 kg N ha^{-1} whereas, the lowest height was recorded for untreated plots.

Table 4: Number of fruits, fruits weight and average fruit weight

Treatment	Number of fruit	Fruit weight (kg)	Average fruit weight (kg)
T1	2.67b	1.10d	0.31b
T2	4.33ab	2.30c	o.47c
T3	4.00ab	3.10b	0.71ab
T4	7.00a	5.10b	0.5ab
T5	4.67ab	3.10	0.59
Sig	NS	*	*

NS= Not Significant* significant at 5% level of probability

3.1 Number of fruits

Table 4 shows the number of fruit harvested, the result obtained shows that there were no significant differences among the treatments. The least number of fruit harvested was not significantly different from T2 (4.33), T3 (4.00) and T5 (4.67). The highest number of fruits harvested was obtained in T4 having 7.00. This supports the report that the significant increase in maize growth due to organomineral and biochar addition was attributed to increase in nutrient content and water retention capacity [7].

3.2 Fruit weight

The fruit weight results obtained shown in table 4 that there were significant difference among the treatment with the least weight obtained in T1 (1.10 kg) while the highest weight was recorded in T4 having 5.10 kg. This result is in consistent with the findings of [8] who reported that organomineral fertilizer significantly increase fruit weight of okra respectively.

3.3 Average fruit weight

Table 4 also shows the average fruit weight results that there were significant effects of the treatment on the average fruit weight. The highest was obtained in T4 (0.80 kg) and was not significantly different from T3 (0.71 kg), the least average fruit weight was obtained in T1 (0.31 kg) and was significantly different from other treatments.

IV. CONCLUSION

This study showed that organomineral T5 produced the highest number of leaves having 27.00 leaves and was significantly different from other. The plant height of okra showed that organomineral T4 produced the highest height having 86.00 cm and was significantly different from others. The average fruit weight result showed that there were significantly effects of the treatment on the average fruit weight. The highest was obtained in T4 (0.80 kg) and was not significantly different from T3 (0.71 kg), the least average fruit weight was obtained in TI (0.31 kg) and was significantly different from other treatments. It is therefore recommended that the use of organomineral fertilizer is good for farmers in the cultivation of okra. The organomineral has best result in yield and weight of okra at rate of 2.5 t/ha.

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