Effect of different levels of organomineral fertilizer on the performance of fluted pumpkin (*Telfairia occidentalis*) in Ikorodu, Nigeria

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ABSTRACT

Many Researchers have shown that neither mineral fertilizers nor organic fertilizers are a panacea for soil fertility management in Nigeria. This has led to the innovation of organomineral fertilizers which combines the attribute of both mineral and organic fertilizers. Field experiments were conducted at the Teaching and Research Farm, Crop Production and Horticulture Department, School of Agriculture, Lagos State Polytechnic within the month of May and August 2018, to study the effect of organomineral fertilizer (OMF) at the rate of 0, 2.5, 5.0, 7.5 and 10t/ha; and NPK 15:15:15 fertilizer (NPK) at the rate of 200kg/ha on the performance of fluted pumpkin. The treatments were laid out in randomized complete Block Design with three replications and with plots size of 2m×2m. All agronomic characters were recorded at 4^{th}, 6^{th} and 8^{th} weeks after planting (WAP) and the yield was taken at 8^{th} and 11^{th} weeks after planting (WAP). Compared with control, Organomineral fertilizer (OMF) and NPK 15:15:15 fertilizer at all rates had no significance ($P < 0.05$) on vine length, number of leaves, number of branches and leaf area at all week of assessment and stem girth at 4^{th} and 8^{th} weeks after planting (WAP), Fresh weight at 8^{th} weeks after planting (WAP), significant on stem girth at 6^{th} (WAP) and fresh weight at 11^{th} (WAP). It was concluded that Organomineral fertilizers even at low level of application could be used to increase the performance of fluted pumpkin in Nigeria. Hence, one of the recommendations was that organomineral fertilizers should be used even at low level of application in Ikorodu Local Government Area of Lagos State.

KEYWORDS: Organomineral fertilizer, *Telfaira occidentalis*, performance, NPK 15:15:15, lkorodu

Introduction

Fluted pumpkin (*Telfairia occidentalis*), is a member of the family *Cucurbitaceae* family and is indigenous to southern Nigeria and they are distributed all over the warm parts of the world (Adala, 2010; Okoli and Mgbeogwu, 2003). Fluted pumpkin is an important leaf and seed vegetable indigenous to southeastern Nigeria, and found throughout the forested areas from Sierra Leone to Angola and up to Uganda in East Africa. *T. occidentalis* is closely related to *Telfairia pedata* (oyster nut) (Dalziel, 2007; Okoli, 2007) which is found in Zanzibar and along the coast of Kenya, Tanzania and Mozambique. Despite being the highest producer in West Africa (FAOSTAT, 2015), shortfalls in fluted pumpkin are still recorded by farmers occasioned by varying techniques and systems as a result of poor soil fertility and soil management practices. A large majority of farmers in South-Western Nigeria who engage in the business experience low returns on investment caused by low yields occasioned the high cost of inorganic fertilizer to provide nutrients for

the growing crop (Okokon *et al*., 2007). Although literature has reported better performance of crops with fertilizer application as one of the method through which plants will display their potential genetically (Olaniyi *et al*., 2010; Aliyu, 2003), however the high cost of inorganic fertilizer limits the usage, therefore there is need to research into more cheap and efficient means that will supply nutrients to the plants for optimum yield and also friendly to the soil. Organomineral has gained a lot of attention due to its soil and eco-friendly nature and ability to supply essential nutrients that supports crop growth and optimum yield. Hence the objective of this study is to evaluate the effect of organomineral and NPK 15:15:15 fertilizer, on performance of *Telfairia occidentalis*

Materials and Methods

Experimental location, land preparation, experimental design and treatments

This study was conducted during the wet season in 2018 at the Teaching and Research Farm, of the Department of Crop Production and Horticulture Department, Lagos State Polytechnic, Ikorodu, Lagos. Land clearing and mapping was done, and this involved ploughing of the site and subsequent harrowing 2 weeks after. Thereafter, tilling and working-up of the soil for sowing was carried out. The experiment was laid out using Randomized Complete Block Design (RCBD) with three replications. Total land area used for this experiment is 190m^2. There will be six (6) treatments consisting, five (5) different levels of organomineral fertilizer (OMF) treatment viz; 0tonnes per hectare of OMF; 2.5tonnes per hectare of OMF; 5.0tonnes per hectare of OMF; 7.5tonnes per hectare of OMF: 10tonnes per hectare of OMF; and 200 kg of NPK 15:15:15 per hectare with three replications.

Crop establishment and maintenance

Seeds were sown manually at one seed per hole. Organomineral was applied at planting as suggested by the manufacturer, while the NPK 15:15:15 was applied 3 weeks after planting (3WAP) at the rate of 200kg.ha. Supplying was at 2WAP after planting, while manual weeding was done at 3 and 6WAP.

Pre-cropping Soil

Composite soil samples were randomly collected with auger from ten (10) different locations in the study area and were composited, air dried and sieved through 5mm sieve and their physiochemical characteristics were determined before application of treatment following standard laboratory procedure (Page *et al*., 1989).

Data collection and Statistical Analysis

A total of four (4) plants per plot were tagged as sample for data collection, data were collected on vegetative growth at 4, 6 and 8 weeks after planting (WAP) while fresh leaf weight was taken at 8 and 11 weeks after planting (WAP) for first and second harvest respectively. The data obtained were subjected to analysis of variance (ANOVA) and Duncan Multiple Range Test (DMRT) was used for mean separation at 5% level of probability using Statistical Analysis software 2018 (SAS).

Results and Discussion

Soil physio-chemical (pre planting and post harvest) and organomineral analysis

The result shows that the pre planting soil had a Sandy Clay Loam texture with high proportion of coarse sand. The pre planting soil analysis also revealed the soil to be low in Organic Carbon (1.02%), Total N (0.08%) and Available P (3.42mg/kg^{-1}) and exchangeable bases. Na (0.74cmol/kg), K (0.01cmol/kg), Ca (0.85cmol/kg) and Mg (1.26cmol/kg). The pre planting soil analysis shows that the pH was 6.47 (slightly acidic), as shown in Table 1. The low N levels observed in the soil can be attributed to continuous cropping and increased land use intensity (Sanni and Adenubi, 2015). The need for application of organic manure cannot be over emphasized as the soil will not be able to produce high crop yield without addition of external input to improve the soil fertility.

The result shows (Table 1) that the post planting soil had a Sandy Clay Loam texture but the application of organomineral fertilizer increased the percentage of clay (1.00) and silt (28.50) but decreased that of sand (70.05). The analysis also shows an increase in organic Carbon (4.05), organic matter (1.99), total nitrogen (1.08), and available phosphorus (3.85), K (0.12), Ca (1.05) and Mg (1.48), but a decrease was observed in Na (0.70). The result shows that soil physiochemical properties was improved by application of organomineral fertilizer which is in line with the findings of Sanni and Adenubi, (2015) that organic fertilizer application improves soil properties. The result is also supported by the findings of Akanbi *et al.,* (2010) that organomineral fertilizer improves soil's physical, chemical and biological conditions, which in turns improve crop growing environment and culminate in the better production of economic plant parts.

The organomineral fertilizer analysis (Table 2) shows that it had organic carbon10.47%, ph 6.08, base saturation 99.84%, electrical conductivity 4.86%, nitrogen 4.49%, phosphorus 1.38%, potassium 0.64%, magnesium 0.17%, sodium 0.02%, calcium 0.97%, copper 4.05 (ppm), lead 10.00 (ppm), cadmium 45.00 (ppm), zinc 119.00 (ppm), nickel 20.00 (ppm), iron 590.00 (ppm), manganese 214.00 (ppm) and cobalt 30.00 (ppm).

Effects of different levels of organomineral fertilizer on vegetative growth of fluted pumpkin

Table 3 shows that different levels of organomineral fertilizer do not significantly ($p \geq 0.05$) affect the vine length of fluted pumpkin at 4, 6, and 8WAP.

The result showed that OMF 0t/ha (53.41cm, 101.74cm, 167.81cm) at 4, 6 and 8WAP respectively gave the maximum means of vine length compared to all other treatments.

Table 3 shows that different levels of organomineral fertilizer do not significantly ($p \geq 0.05$) affect the number of leaves of fluted pumpkin at 4, 6, and 8WAP. OMF 7.5t/ha (58.67) had the highest number of leaves than other treatments at 4WAP while OMF 0t/ha (143, 211.17) compared to other treatments recorded the highest number of leaves at 6 and 8WAP respectively. The result shows that the number of leaves of fluted pumpkin is not influenced by organomineral application, which is hypothesized to be due to low rates of organomineral application, which is in agreement of the findings of Makinde (2007) who observed no significant difference in the average number of leaves of maize in the first trial of maize using organomineral fertilizer but recorded significant increase in the number of leaves the second year.

Table 3 reveals that different levels of organomineral fertilizer do not significantly ($p \geq 0.05$) affect the number of branches of fluted pumpkin at 4, 6, and 8WAP. The result showed that OMF 7.5t/ha (20.5) had the highest number of branches among the treatments at 4WAP followed by OMF 2.5t/ha (18.67), OMF 0t/ha (18.42), NPK 200kg/ha (16.92), OMF 10.0t/ha

(16.42) and OMF 5.0t/ha (15.17) respectively. NPK 200kg/ha (38) recorded the highest number of branches at 6WAP followed by OMF 7.5t/ha (37.92), OMF 2.5t/ha (35.83), OMF 0t/ha (35.08), OMF 5.0t/ha (34.75), OMF 10.0t/ha (31.79) respectively. At 8WAP, OMF 0t/ha (71.58) had the highest number of branches compared to all other treatments while OMF 10.0t/ha (52.17) had the least number of branches.

This result may be due to effect of previous experiment on the experimental plot, the result is in contrast with the findings of Schillers (2000) who asserted that fertilization can induce branching.

Different levels of organomineral fertilizer significantly ($p \leq 0.05$) affect the stem girth of fluted pumpkin at 6WAP, but not significantly ($p \geq 0.05$) at 4 and 8WAP (table4).

Plots treated with OMF 5.0 t/ha (2.58cm) gave the thickest stem girth followed by OMF 2.5t/ha (2.44cm), NPK 200kg/ha (2.32cm), OMF 0 t/ha (2.04cm), OMF 7.5 t/ha (2.01cm) and OMF 10 t/ha (1.86cm) respectively. This might be due to the effect of optimum application of OMF 5.0 t/ha the result is in agreement with the findings of Olaniyi and Akanbi (2007) who reported that using organomineral enhances the growth of fluted pumpkin (*Telfaria occidentalis*).

Table 4 shows that different levels of organomineral fertilizer do not significantly ($p \geq 0.05$) affect the leaf area of fluted pumpkin at 4, 6, and 8WAP. 200kg/ha NPK 15:15:15 (33.8, 37.36, 37.08 cm^2 respectively) had the highest leaf area while OMF 10t/ha (27.71 and 27.67 cm^2 respectively) had lowest leaf area at 4 and 6WAP and OMF 2.5t/ha (28.32 cm^2) had the lowest leaf area at 8WAP. This result might be in the ease of nutrient availability facilitated by 200kg/ha NPK 15:15:15 application, which is in conformity with the findings of (Okonwu and Mensah, 2012) who reported that NPK fertilizer increase the stem diameter, leaf area and fresh weight of pumpkin.

Table 1: Physico-chemical properties of the soil (pre planting and post harvest)

Elements and units	Pre planting	Post harvest
pH	6.47	5.59
Organic Carbon%	1.02	4.85
Organic matter %	1.73	3.85
Total nitrogen %	0.08	2.15
Available phosphorus (mg/kg)	3.42	3.75
Particle sizes (%)		
Sand	72.5	71.52
Silt	27.00	27.22
Clay	0.5	1.20
Textural class	Sandy clay loam	Sandy clay loam
Exchangeable basses (Cmol/kg)		
Na	0.74	0.61
K	0.01	0.02
Ca	0.85	0.95
Mg	1.26	1.29

Table 2: Laboratory analysis of organomineral fertilizer

Parameters	Result
pH %	6.08
Base saturation%	99.84
Electrical conductivity %	4.86
Nitrogen %	4.49
Phosphorus %	1.38
Potassium (%)	0.64
Magnesium (%)	0.17
Sodium (%)	0.02
Calcium (%)	0.97
Organic carbon (%)	10.47
Copper (ppm)	4.05
Lead (ppm)	10.00
Cadmium (ppm)	45.00
Zinc (ppm)	119.00
Nickel (ppm)	20.00
Iron (ppm)	590.00
Mangenese (ppm)	214.00
Cobalt (ppm)	30.00

Table 3: Effects of different levels of organomineral fertilizer on vegetative growth of fluted pumpkin

	Vine length (WAP)			Number of leaves (WAP)			Number of ranches (WAP)		
Treatments	**4**	**6**	**8**	**4**	**6**	**8**	**4**	**6**	**8**
0t/ha OMF	53.41	101.74	167.81	55.08	143.00	211.17	18.42	35.08	71.58
2.5t/ha OMF	46.46	81.32	129.61	54.17	113.92	185.58	18.67	35.83	64.00
5.0t/ha OMF	48.69	73.56	124.66	47.58	106.17	169.25	15.17	34.75	56.17
7.5/ha OMF	53.00	96.07	145.51	58.67	113.74	202.17	20.50	37.92	59.42
10.0t/ha OMF	43.69	85.69	151.78	47.75	96.25	153.67	16.42	31.79	52.17
200kg/haNPK	44.00	81.28	126.00	50.08	114.83	167.63	16.92	38.00	57.00

Table 4: Effects of different levels of organomineral fertilizer on vegetative growth of fluted pumpkin

	Stem girth (WAP)			Leaf area (WAP)		
Treatments	**4**	**6**	**8**	**4**	**6**	**8**
0t/ha OMF	2.35	2.04abc	4.64	31.70	34.01	32.87
2.5t/ha OMF	2.40	2.44ab	4.53	28.03	29.85	28.32
5.0t/ha OMF	2.37	2.58a	4.10	32.25	37.26	45.90
7.5/ha OMF	2.44	2.01bc	4.39	28.40	32.35	32.14
10.0t/ha OMF	2.38	1.86c	3.45	27.71	27.67	29.23
200kg/haNPK	2.33	2.32abc	6.55	33.80	37.36	37.08

Means with similar letter(s) in the same column are not significantly different at 5% D.M.R.T.

Effect of different levels of organomineral fertilizer fresh weight of fluted pumpkin
Table 8 6 reveals that different levels of organomineral fertilizer significantly ($p \leq 0.05$) affect the fresh weight of fluted pumpkin at second harvest (11WAP), but not significant ($p \geq 0.05$) at first harvest (8WAP).

Plots treated with NPK 200kg/ha (0.75 kg) produced the highest fresh weight followed by OMF 2.5t/ha (0.65kg), OMF 5.0t/ha (0.61kg), and OMF 7.5t/ha (0.56 kg) while OMF 10t/ha (0.43) kg had the least fresh weight of fluted pumpkin. The results is hypothesized to be because of the high amount of nutrients available to the crops at during their growth which helps to increase the yield, the result agrees with the findings of Akanbi and Olaniyi (2007) who found that OMF and inorganic fertilizers increased yield of fluted pumpkin (*Telfaria occidentalis*).

Table 5: Effect of different levels of organomineral fertilizer fresh weight of fluted pumpkin

Treatments	**First harvest (8WAP)**	**Second harvest (11WAP)**
0t/ha OMF	1.174	0.483ab
2.5t/ha OMF	1.139	0.652ab
5.0t/ha OMF	0.858	0.613ab
7.5/ha OMF	1.157	0.56ab
10.0t/ha OMF	0.853	0.428b
200kg/haNPK	1.172	0.752a

Means with similar letter(s) in the same column are not significantly different at 5% D.M.R.T.

Conclusion

The results obtained from this study showed that farmers can have good yield without the use of inorganic fertilizers. Organomineral even at low rate can improve the performance of fluted pumpkin and also have positive effect on the soil.

Recommendation

Based on the outcome of the study, it is recommended that further researches are required for better understanding of the effect of different levels of organomineral fertilizer on the performance of fluted pumpkin. Organomineral fertilizers should be used even at low level of application in Ikorodu Local Government Area of Lagos State.

REFERENCES

Alada, A. R. A. (2010). The hematologic effect of *Telfairia occidentalis* in diet preparation. *Africa Journal of Biomedical Research,* 3: 185-186p.

Aliyu, L. (2003). Effect of manure type and rate on the growth, yield and yield Components of pepper. *Sustanenance Agriculture Environment*, 5: 92 –98p.

Dalziel J. M. (2007). *The useful plants of West Tropical Africa*. Crown agents for the colonies.West Ministers, 64-65p.

Food and Agriculture Organization of the United Nations, FAO (2015). Integrated weed management. www.fao.org/ agriculture/crops/core-themes.Accessed on 26 May, 2015.

Makinde, E. A. (2007). Evaluation of organomineral fertilizer on growth and yield and quality of *Amaranthus cruentus* on two soil types in Lagos State, Nigeria. Ph.D. Thesis, Department of Agronomy, University of Ibadan, Nigeria 154p.

Okokon, J. E., A. J. Ekpo. and O. A. Eseyin. (2007). Antiplasmodial activity of ethanolic toot extract of *Telfairia occidentalis. Research Journal of Parasitology*, 2: 94-98p.

Okoli, B. E. (2007). Morphological and cytological studies in *Telfairia* Hook (*Cucurbitaceae) Feddes repertorium* 98: 9-10p.

Okoli, B. E. and Mgbeogu, C. M. (2003).Fluted Pumpkin *Telfairia occidentalis*. *West Africa Vegetable crop Economics Botany*, 37(2): 145-147p.

Olaniyi, J. O., W. B. Akanbi, Olaniran O. A. and Ilupeju O. T. (2010). Effect of organic inorganic and organominerals on growth, fruit yield and nutritional composition of okra (*Abelmoschus esculentus*). *Journal of Animal and Plant Sciences,* 9 (1): 1 1135 – 1140p.

Page, A. L., Miller, R. H. and Kiney, D. R (1989). *Methods of analyses*. Part II, 2nd edition. America society of Agronomy.Inc.

Schillers, R. R. (2000). *African Indigenous Vegetables: An Overview of The Cultivated Species*. Chatham, United Kingdom: Natural resources resources institute/ ACP-EU Technical center for agriculture and rural cooperation 193-202p.