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Effects of Organic Manure and Staking Methods on the Growth and Yield of Fluted Pumpkin (*Telfairia occidentalis*)

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Abstract: ***An experiment was conducted at the experimental field of the Faculty of Agriculture and Natural Resources Management, Ebonyi State University, Abakaliki in southeastern zone of Nigeria, to evaluate the effect of organic manure and staking methods on the growth and yield of fluted pumpkin (Telfairia occidentalis). Four different rates of organic manure (control, poultry, pig dung and compost) and three staking methods (without staking, raised platform and bamboo tip staking) were used. The experiment was conducted as 4x3 factorial laid out in Randomized Complete Block Design (RCBD) with four replications. The parameters assessed were: vine length, number of leaves, number of vines, fresh weight of leaves and leaf yield. Treatment means were separated using least significant difference (LSD = 0.05). The result showed that organic manure had significant effect on the vine length, fresh weight of leaves and leaf yield. Raised platform staking constantly performed better with higher values than the other staking methods except in number of vines. Hence, for maximum production of fluted pumpkin, compost manure and raised platform staking should be adopted.***

Keywords: Organic manure, staking methods, fluted pumpkin and leaf yield.

1. Introduction

Fluted pumpkin (*Telfairia occidentalis*) is one of the most important vegetables grown in south eastern Nigeria for human consumption. It belongs to the family Cucurbitaceae. It is a high climbing perennial crop with partial drought tolerance and penetrating root system [1]. Fluted pumpkin leaves are picked continually as the plant grows and are used in soups and porridges as the vegetative parts of the crop make an excellent vegetable rich in vitamins. These vegetable has 37.3% protein content on a dry weight basis [2]. Fluted pumpkin is one of the most widely cultivated leaf vegetables in Nigeria. The leaves are rich sources of protein, oil, vitamins and minerals [3]. Despite of the increasing relevance and high demand for *Telfairia occidentalis* in Nigeria, there is no standard practice with respect to application of organic manure. The quality of fluted pumpkin in terms of nutrient availability increase mostly when cultivated in good fertile soils rich in nitrogen, phosphorus and potassium [4]. The sole use of inorganic fertilizer is often not a viable option of soil fertility management as it may lead to yield gain in the short term but usually it is uneconomical to resource poor farmers and does not sustain good yields in the long terms. The use of organic manure especially poultry manure increased number of nodules and yield in cowpea and also used as amendment of degraded soils [5]. [4] also noted that poultry manure increased leaf nitrogen, phosphorus, potassium, calcium and magnesium content in fluted pumpkin. [6] reported that poultry manure resulted in higher number of root and shoot than NPK fertilizer treatments on tomato. [7] noted that organic manure influences many different soil properties. [8] stated that cassava peel compost gave the highest growth, shoot and fruit yield. Despite of all these wonderful attributes of fluted pumpkin, the production of watermelon is still in the hands of peasant farmers in Nigeria who lack information in some important cultural practices such as staking for optimum yield of the crop. These farmers allow the vines to trail on the ground with its attendant problems of pest and disease infestation and splash of sand on the marketable yield. Staking is done to increase yield, better exposure of plant to sunlight and ventilation. [9] recommended raised platform staking method for increasing pod yield and enhanced marketable value for cucumber and fluted pumpkin. [10] reported that staking increases fruit yield, reduces the proportion of unmarketable fruit, enhances the production of high quality fruits, prevent diseases of fruit rot, allows better aeration and exposes the foliage to sunlight for photosynthetic activities. [11] noted that staking of tomatoes and other fruit crops for higher yield and good quality fruit with higher market value. [1] recommended staking of *Telfairia occidentalis* for enhanced marketable leaf yield. [12] suggested that the climbing species such as *Telfairia occidentalis* should be supported with bush sticks to enhance crop crops and development. [15, 14, 15, 16] observed that staked treatment gave higher yield than the unstaked treatment for watermelon. This study was carried out to evaluate the effect of different organic manure and various types of staking methods on the growth and yield of fluted pumpkin (*Telfairia occidentalis*).

2. Materials and Methods

Site Description: The experiment was conducted at the experimental field of the Faculty of Agriculture and Natural Resources Management of Ebonyi State University, Abakaliki during 2014 cropping season. Ebonyi State is in the derived savanna zone of Nigeria located at latitude $06^{0}4^{1}$N and longitude $08^{0}65^{1}$E at an attitude of 447.2 meters above mean sea level (Ebonyi State University meterology station).

Land preparation: The experimental field measured 29.5m long by 11m wide, giving a total of 3245m^2 was cleared using cutlass. Tillage was carried out using hoe while plots measuring 2m x 2m (4m^2) were marked out.

Pre-planting soil Analysis: Soil samples were randomly collected from the site between 0 – 20cm deep with soil auger, bulked and analyzed for physio-chemical properties.

Experimental Design: The experiment was conducted as a 4 x 3 factorial laid out in Randomized Complete Block Design (RCBD). Each treatment was replicated four times and the treatment comprised four levels of organic manure (control, poultry, pig dung and compost) and three different staking methods (without staking, raised platform and bamboo tip staking).

Seed collection, planting, manure application and staking: Seeds of *Telfairia occidentalis* were obtained from pods collected from proven varieties among farmers. The seeds were planted two seeds per hole at the depth of 3 to 4cm with spacing of 1m x 1m. Cured organic manure was incorporated into the soil during tilling for rapid decomposition and nutrient release to the crop. Weeding was done at 3weeks after planting and subsequently as the need arose and staking was done at 4 weeks after planting.

Data collection and Analysis: The experiment was observed and the following parameters were recorded: vine length, number of leaves, number of vines, fresh weight of leaves and leaf yield. Leaf yield was calculated thus:

$$\text{Leaf yield (kg/ha)} = \frac{\text{leaf weight/plot x } 10{,}000\text{m}^2}{\text{Area of plot x } 1{,}000\text{kg}}$$

Data collected from the study was subjected to analysis of variance and treatment means were separated using LSD at 5% level of probability [17].

Physio-chemical properties of the experimental site: The physio-chemical properties of the study area are shown in Table 1. The result showed that the soil is sandy loam with 48.00% sand, 11.80% clay and 40.20% silt. The soil is generally acidic with a pH of 5.8. The organic matter and organic carbon content are 3.45% and 2.03% respectively. The exchangeable cations were low in status with values of 1.80cmolkg^{-1} for Ca and 1.30cmolkg^{-1} for Mg. the values obtained for K (0.10cmolkg^{-1}) and Na (0.21cmolkg^{-1}) were low. The total N is 0.70% and available P of 2.15ppm. (Table 1).

Table 1: Soil physio-chemical properties of the experimental site

Soil parameters	**Values**
pH (H_2O)	5.80
Organic matter (%)	3.45
Organic carbon (%)	2.03
Total N (%)	0.70
Available phosphorus (ppm)	2.15
Basic cations (cmolkg^{-1})	
Ca	1.80
Mg	1.30
K	0.10
Na	0.21
ECEC	3.86
Particle size Analysis (%)	
Sand	48.00
Silt	40.20
Clay	11.80
Textural class	sandy loam

3. Results

Table 2: Effects of organic manure and staking methods on the growth and yield parameters of fluted pumpkin.

	Vine length (cm)	Number of leaves	Number of vines	Fresh weight of leaves	Leaf yield (kg/ha)
Organic manure					
Control	230.20^{c}	162.25^{a}	4.25^{a}	136.90^{d}	342.25^{c}
Poultry	265.40^{b}	178.88^{a}	6.50^{a}	237.10^{b}	592.75^{b}
Pig dung	253.30^{b}	167.53^{a}	6.89^{a}	236.20^{c}	590.50^{b}
Compost	315.80^{a}	189.85^{a}	4.20^{a}	265.00^{a}	662.50^{a}
LSD	13.10	____	____	0.51	2.65
Staking methods					
Without staking	153.00^{a}	166.00^{a}	4.30^{a}	232.40^{c}	581.00^{b}
Raised platform	201.00^{a}	168.00^{a}	6.30^{a}	239.10^{a}	597.75^{a}
Bamboo tip staking	178.00^{a}	166.50^{a}	7.10^{a}	234.21^{b}	585.53^{b}
LSD	____	____	____	0.67	5.7
Interaction	NS	NS	NS	NS	NS

Means in the same column having the same letter (s) are not significantly difference at ($p<0.05$); LSD = Least Significant Difference and NS = Not Significant

Vine length: The result shown in Table 2 revealed that organic manure had significant effect on vine length. The longest (315.80cm) was recorded from plots that recorded compost manure application which shown significant different ($P<0.05$) from other treatment plots while the lowest (230.20cm) vine length was recorded from the control plot (table 2). The table shows that vine length was not significantly affected by staking methods. Though, raised platform staking produced the longest vine than the other methods.

Number of leaves and vines: Compost and pig dung treated plots had the highest mean number of leaves (189.85) and number of vines (6.89) respectively which are not significant from the rest of the treatments which the control plot recorded the lowest (162.25) on the number of leaves. The raised platform staking methods gave the highest (168.00) mean number of leaves which was not significantly different ($p<0.05$) from other staking methods.

Fresh weight of leaves and leaf yield: Organic manure and different staking methods also influenced the fresh weight of leaf and leaf yield of fluted pumpkin. The heaviest leaf (265.00g) was recorded from compost manure treated plot. This was significantly different ($p<0.05$) from other sources of organic manure while the lowest weight (139.90g) was

recorded from the control plots (table 2). Compost manure had the highest (2114.8kg/ha) mean leaf yield of fluted pumpkin which was significantly different ($p<0.05$) from the (2002.70kg/ha) recorded from the control plots. Raised platform staking method also gave the highest (2468.01kg/ha and 239.10g) mean values of leaf yield and leaf weight respectively which showed significant different ($p<0.05$) from the values recorded in other staking methods (table 2).

4. Discussion

Results of the study revealed that the organic manure application improves the germinability of the fluted pumpkin seeds. Compost manure was observed to significantly improve the growth and yield performance of fluted pumpkin. It improved the vine length, number of leaves, fresh weight of leaf and leaf yield. The ability of compost manure and raised platform staking to perform better than poultry and pig manure in the study is contrary to the report of [18] who reported that poultry manure is superior to other sources of organic manure. However, the inability of pig dung, poultry manure to perform better than others in this study could be associated with the age of the animals and mode of preparation of the manure. This is in agreement with the report by [1] who observed that the performance of pig manure depends on the age of the pig. The fresh weight of leaves produced by compost manure treated plots with raised platform staking showed significant difference from other treatments. Greater vine length, number of leaves, weight of leaf and leaf yield recorded from the compost treated plots with raised platform staking could be attributed to the inability of the manure source to mineralize. Raised platform staking, increased the yield of fluted pumpkin. This is inconformity with work done by [9, 1]. They observed that raised platform staking method increased marketable leaf yield for fluted pumpkin.

5. Conclusion

Compost manure improved the vegetative growth and yield of fluted pumpkin (*Telfairia occidentalis* Hook F.). The application of compost manure and raised platform staking method were observed as the optimum agronomic practice to harness the highest foliage production and thereby boost fluted pumpkin productivity. It is hereby recommended to farmers in the study area for a more profitable production of fluted pumpkin.

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