Journal of Agriculture, Environmental Resource and Management
ISSN2245-1800(paper) ISSN 2245-2943(online)
4(2)607-613; Dec.2019

www.saerem.com

PERFORMANCE AND YIELD OF FLUTED PUMPKIN (*Telfairia occidentalis* (F.) HOOK) ON AN ULTISOL AMENDED WITH SOYBEAN MEAL

Ekwere, O. J.,Akpan, E. A., and O. R. Akata.

Department of Crop Science, Akwa Ibom State University, Obio Akpa Campus, Oruk Anam , Nigeria.
Corresponding author; dr.okonekwere @ yahoo.com, okonekwere@aksu.edu.ng

Abstract:

Field experiments were conducted during the 2016 and 2017 early cropping seasons at the Teaching and Research Farm of the Akwa Ibom State University, Obio Akpa Campus, to examine the effects of soybean meal (SBM) rates on the growth and yield of Telfairia occidentalis. The study involved soybean meal applied at five rates; 0,2,4,6 & 8 (tons ha^{-1}). The test crop was Telfairia occidentalis. The experiment was laid out in a completely Randomised design (CRD), and replicated three times. Results indicated that SBM application exerted significant positive effects on all the growth and yield parameters of Telfairia occidentalis considered in the experiment. Most of the growth and yield parameters such as Vine length, number of vines, number of leaves, total foliage yield, and pods yield (tons ha^{-1}) continued to increase as the rate of SBM increased. Some reproductive parameters such as number of days to 50% flowering of the male plants, and number of aborted pods/plant decreased with increase in the rate of SBM application. Most of the growth and yield results obtained at SBM application rate of 6.0 tons ha^{-1}; length and number of vines, days to 50% flowering of the male plants, number and yield of pods (tons ha^{-1}) were not significantly different from those obtained at SBM application rate of 8.0 tons ha^{-1}.suggesting that SBM application rate of 6.0 tons ha^{-1} may be adequate for optimum production and yield of Telfairia occidentalis. SBM application rate of 6.0 tons ha^{-1} was therefore recommended for farmers in the study area.

Key words: Soybean meal, *Telfairia occidentalis.*

Introduction:

Fluted pumpkin (*Telfairia occidentalis* Hook F.) is a perennial vine. It belongs to the family *Curcubitaceae*, and is commonly cultivated in the forest zone of West and Central Africa; from Sierra Leone to Angola and up to Uganda in East Africa (Odiaka *et al.,* 2005).

Telfeiria occidentalis originated from South Eastern Nigeria, where it is predominantly cultivated to date (Uwa *et al*.,2016), but in recent times, its area of cultivation has expanded to the Mid-Western and Middle belt regions of the country,(Akoroda,1990). The rapid expansion of the area of cultivation of the vegetable is aided by it's wide acceptability among Nigerian farmers, due mainly, to the increasing awareness of it's nutritional and medicinal values.

Telfairia occidentalis plays important role in human and livestock nutrition. It is also a cheap source of protein, oil and fat (Udoh *et al,* 2005). Grubben and Denton (2004) noted that *T. occidentalis* is very rich in minerals such as Calcium and Iron which are essential for the building of bones and teeth, hence it is recommended for pregnant women and patients suffering from aneamia. The leaves of *T. occidentalis* contain 85% moisture, 11% crude protein, 2.5 % Carbohydrate, 3% oil, 11% ash and as much as 700 ppm Iron (Oyulu, 1980). The immature seeds can be eaten boiled or roasted. The seeds can also be developed to provide edible oil (Horsefall and Spiff, 2005), the leaves and young tender shoots are used to thicken soups and sauce.

The contributions of fluted pumpkin to human nutrition is however limited, due to the presence of anti-nutrients such as phytic acid, tannin and saponin (Ladeji et al., 1995). Akubue *et al.* (1980) reported that extracts of Fluted pumpkin roots contain resins, alkaloids and Saponins, and have been shown to be lethal to rats, mice, fish and humans.

Udoh *et al.* (2015) stated that *T. occidentalis* thrives under warm environment with plenty of sunshine and prolonged rainy season, and that the crop is very sensitive to Nitrogen deficiency, and therefore recommended heavy manure application before planting. The Crop is cultivated predominantly in the tropical rain forest zone of South Eastern Nigeria (Uwah *et al. 2016).* The Soil of the area is acidic (Ibia *et al.*, 1997), have low cation exchange capacity, generally poorly buffered, and rapidly lost fertility on intense cultivation. The soil also have low organic matter contents, and therefore cannot, in the absence of fertilizer, support intense crop production. In order to boost crops yield and reduce soil acidity therefore, farmers in this area apply inorganic fertilizer and lime to the soil.

It has been stated however, that the use of inorganic fertilizer has not been helpful under intensive agriculture because it aggravates soil degradation. Soil degradation is brought about by loss of organic matter which usually result in soil acidity, nutrient imbalance and low crops yields.(Avery, 1995., Ayoola and Makinde, 2007). In Nigeria, inorganic fertilizer is scarce, expensive and unaffordable to the average farmer (Tanimu, *et. al*, 2007). There is therefore the need to search for alternative materials for managing soil fertility challenges, especially in the high rainfall zones characterized by erosion and leaching of nutrients. Such alternative materials however, should be readily available, low cost, easy to manage and environmentally friendly.

Soybean meal (SBM) is a by-product of Soybean oil extraction. It is better known as raw material for the formulation of animal feeds, but it is also an important source of nutrients, rich in Nitrogen and Organic matter. Soybean meal (SBM) has a typical analysis of 7:2:1 (NPK). It is not water-soluble and therefore not subject to leaching. Unlike the artificial fertilizer, it does not leach to pollute the water ways, and like other forms of organic fertilizer, SBM improves the soil structure, nutrient retention and water filtration of the soil, and since it is not subject to leaching, it can be applied only once in year.

This study therefore, was conducted to;

(i) Examine the effect of different rates of soybean meal (SBM) on the growth, foliar and fruit yields of *Telfaira occidentalis.*

(ii) Determine the optimum SBM application rates for the production and yield of *T. occidentalis.*

Materials and Methods

The study was conducted at the Teaching and Research Farm of the Akwa Ibom State University, Obio Akpa Campus in the early cropping seasons of 2016 and 2017. Obio Akpa is located on Latitude 4^0 31’ and 5^0 30N, and Longitude $8^0$30’ and 8,00’ E (SLUS AK,1989). The area receives annual rainfall of about 2500 mm in a bi-model pattern, with a short dry spell in August, usually termed “August break”. The mean annual temperature varies between 22^0C and 32^0C. The Relative humidity is about 85%.

The experiment covered a total land area of $336m^2$ (21m x 16m). The area was divided into three main plots. Each main plot measured 4 x 21m. The main plots were further divided into sub plots. The main plots were separated by alleys measuring 1.5m wide, while the sub plots were separated by paths 1.2m wide.

The experiment was laid out in a Completely randomized design (CRD). It comprised of one treatment, Soybean meal (SBM) administered at five (5) rates; 0, 200, 400, 600 and 800 (kg/ha). The test crop was *Telfairia occidentalis.* there were five sub plots per replicate, and the treatments were randomly assigned to each sub plot. The treatment (SBM) was evenly worked into the soil two weeks before planting. The *Telfairia oocidentalis* seeds were planted in-situ, 2 seeds per hole at a distance of 1m x 1m and buried 5cm deep. The field was later thinned to one seedling per stand corresponding to 10,000 stands/ha. Weeding was done manually with the use of weeding hoe at 4 WAS, and subsequently when necessary.

Data Collection:

Five plants from the inner rows were randomly selected and tagged for the purpose of data collection. Date were collected on establishment percentage, length of longest vine, number of leaves, number of vines, total foliage yield number of days to 50% flowering of the male plants, number of pods per plant and pods yield (tons ha^{-1}). Apart from establishment percentage, other agronomic data were taken at 2,4,6,8, and 12 WAP. The yield data included total foliage yield, number of aborted pods and pods yield (tons ha^{-1}). Days to 50% flowering of male plants.

Data collected were subjected to Analysis of variance and means that showed significant differences were separated using the Duncan Multiple Range Test ($P \leq 0.05$).

Results:

Results of the physical and chemical analysis of the soil of the study area prior to commencement of the experiment in 2016 and 2017 are shown in table 1.

The soil is sandy loam, and slightly acidic. The total Nitrogen was much lower than the 2% recommended by Black (1965) as the critical value for good crop production.

Exchangeable cations of the soil were generally low. This may be attributed to the high leaching effect of the heavy rains prevalent in the study area; it could also be due to the acidic conditions of the soil, which may promote ready solubility and leaching of the basic cations.

Generally, the soil analysis results indicated that the soil was low in fertility, hence the need for amendment with organic manure.

Results also indicated high percentage establishment at all levels of SBM application. (between 98.10% and 98.38% in 2016, and between 97.97% and 98.21% in 2017)

The vine length of fluted pumpkin varied significantly among the different SBM application rates (Table 2). The longest vines (154.99cm) were produced in 2016 at th highest SBM application rate of (8 tons ha^{-1}). This was followed by 135.39cm and 133.37cm long vines produced at SBM application rates of 6 and 4 (tons ha^{-1}) respectively.

In 2017, the longest vines (136.16 cm) were produced at SBM application rate of 6 tons ha^{-1}, this was followed by 128.57cm long vines produced on plots that received 8 tons ha^{-1}.

SBM application rate of 4 tons ha^{-1} produced 116.45cm long vines in 2017. The shortest vines (72.83cm) in 2017, and 103.44 cm in 2016 were however produced on plots that received no SBM treatment (the control plots).

The number of vines produced by *T. occidentalis* increased with increase in the SBM application rate, with application rate of 8 tons ha^{-1} producing the highest number of vines(4.82) in 2017. In 2016, the highest number of vines (4.20) were produced at SBM application rate of 6 tons ha^{-1}. There was no significant difference however between the number of vines produced at SBM application rate of 8 tons ha^{-1} and those produced at 6 tons ha^{-1} in the two cropping seasons. The least number of vines (3.06 in 2016 and 2.21 in 2017) were produced on the control plots that received no SBM treatment.

The highest number of leaves and the highest total foliage yield (tons ha^{-1}) were produced at the highest SBM application rate (8 tons ha^{-1}) during the two cropping seasons. Generally, the total number of leaves and the total foliage yield continued to increase with increase in SBM application rate except in 2017 when the control plot produced higher total foliage yields than plots that received 2 tons $^{-1}$ of SBM. However, there was no significant differences between total foliage yield produced at SBM application rate of 2 tons/ha and those at the control plot.

Flowering of the male pants were significantly influenced by the SBM application rates. Male plants that received no SBM treatment in 2016 initiated flowers in 170.33 days. This was 23.33 days longer than plants than were fertilized with 8.0 tons ha^{-1} of SBM. Similar trends were recorded in 2017, when the male plants initiated flowers in 169.0 days ; 24.67 days later than plots that received 6 tons ha^{-1} of SBM.

The highest rates of aborted pods, (4.07 in 2016 and 4.73 in 2017) were recorded in plots that received no SBM application, while negligible number of aborted pods (0.72 in 2016, and 0.44 in 2017) were recorded in plots that received the highest rate of SBM application (8.0 tons/ha) The number of pods/plant and pods yield (tons ha^{-1}) continued to increase with increase in the SBM application, with the highest pods yields; 27.28 in 2017, and 27.54 in 2016 obtained at the highest rate of SBM application (8.0 tons ha^{-1}).

Discussion: Results from the experiment revealed that SBM treatment, even at the lowest level of applications, exerted significant positive effects on all the growth and yield parameters considered throughout the period of investigation. Increasing the SBM application rates from 0 to 8.0 tons ha^{-1} resulted in associated significant increase in length and number of vines, number of leaves and total foliage yields. The general positive response of *Telfairia occidentalis* to SBM may be attributed to the low level of Nitrogen in the soil prior to the commencement of the experiment. Tisdale and Nelson (1975) noted that crops respond more to fertilizer application in soils with very low nutrient contents than in soils with high nutrient reserve. Similarly Okoro- Robinson *et al*. (2013) reported significant increase in all the growth and reproductive components of *Telfairia occidentalis* due to the application of Nitrogen fertilizer. SBM is reputed to contain high levels Nitrogen (7%). Nitrogen is a characteristic constituent element of protein, and hence the protoplasm of all living cells. It promotes cell division, and enhances the accumulation of dry matter in leaves and other vegetative parts of the plant.

Results from this experiment also indicated that SBM application significantly stimulated the vegetative growth of *Telferia occidentalis*, and since SBM is not subject to leaching, its effects on soil fertility could be sustained for a greater part of the growth life of *T. occidentalis*, resulting in positive effects on the considered reproductive and yield parameters under consideration.

Recommendations:

In this experiment,vegetative growth of *T. occidentalis* increased significantly with increased rate of SBM application up to 6.0 tons/ha. However, for most growth and yield parameters (Vine length, number of vines, days to 50% flowering of the male plants and number of pods ha^{-1}) there was no significant differences between the SBM application rates of 6 tons ha^{-1} and 8.0 tons ha^{-1}, Suggesting that SBM application at the rate of 6.0 tons ha^{-1} may be adequate for the production and yield of *T. occidentalis* and was therefore recommended.

References:

Akoroda, M. O. (1990) Ethnobotany of *Telfeiria occidentalis* (*Curcubitaceae*) among Igbos in Nigeria. Economic Botany 44: 29 – 39.

Akubue, P.J. Kar, A. and Nnacheta, F. N. (1980) Toxicity of extracts of roots and leaves of *Telfairia occidentalis.* Plant Medicine: 38: 339 – 343.

Avery, D. T. (1995) Saving the planet with Pesticides and Plastics; The environmental trium for high yield farming. Hudson Institute: Indianapolis. 44 p.

Ayoola, O. T. and Makinde, E. A. (2007). Complimentary organic and inorganic fertilizer applications influence on growth and yield of cassava/maize/melon with relayed cowpea. Australian journal of basic and applied sciences 3: 187 – 192.

Black, C. A. (1965). Methods of Soil analysis, Chemical and Microbial properties. Madison, Wisconsin. American Society of Agronomy, pp.1578.

Grubben, G. J. H and Denton, O. A. (2004) Plant Resources of Tropical Africa 2. Vegetable foundations. Wageninen PP. 37 – 44.

Horsefall, M.J. and Spiff, I. A, (2005) Equilibrium Sorption Study of Al^{3+}, CO_2^+ and Ag^+ in

ageous solution of Fluted pumpkin.(*Telfairia occidentalis* Hook F.). Waste biome

Acta Chem. : 52: 174 – 181.

Ibia T. O., E. J. Udo and U. Umoti (1997). Evaluation of slag by- products from Delta Steel

plant as liming material. Global journal of Pure and Applied Sciences.

Vol. 3(3): 293 – 303.

Ladeji O., Okoye, Z. and Ojobe, T. (1995) Chemical evaluation of the nutritive value of leaf

of Fluted pumpki (*Telfairia occidentalis*) Food chemistry 53: 353 – 355 pp.

Odiaka, N. I. Akoroda, M. O. and Odiaka, E. C. (2005) Diversity and production methods of Fluted pumpkin (*Telfeiria occidentalis* Hook(F.). Experience with vegetabIe farmers in Makurdi, Nigeria. African journal of Biotechnology, 7 (8) 944 –954.

Okoro- Robinson, M. O. Adetunji, I. A, Bellow, W. B., Adebisi, A. A. Ojegbanji, T. O. and Afolabi, O. O. (2013).Effect of Nitrogen fertilizer on the growth and yield of Fluted pumpkin (*Telfaira occidentalis* HOOK F.) Proceedings of the First National Annual Conference of the Crop Science Society of Nigeria. (Nsukka, 2013). September 15 – 19, 2013.

Oyulu, C. (1980). Relatively unknown vegetables. Fluted pumpkin (*Telfairia occidentalis*) Proceedings of the First Annual Conference of the Hort. Society of Nigeria.NIHORT, Ibadan Nigeria. 166 – 167.

Sharma, A. R. and Miltra, B. N. (1991) Effects of different rates of application of Organic and Nitrogen fertilizers in a rice-based cropping System. Jorunal of Agricultural Science (Cambridge) 117: 313 – 318.

SLUS- AK (1989) Soils and Land Use Survey of Akwa Ibom State. Government Printer, Uyo 603pp.

Tanimu, J., Iwuafor, E. N. O. Odunige, A. C. and Tian, A. (2007) Effect of incorporation of leguminous cover crops on yield and yield components of maize. World journal of Agricultural Science 3 (2). 65 -76,

Tisdale, S. L. and Nelson, W.L. (1975) Soil Ferility and Fertilizers (3rd ed.). Macmillan Publishing Company. New York.

Udoh, D. J. Ndon., B. A., Asuquo, P. E and Ndaeyo, N. U. (2005) Crop Production Techniques for the tropics. Concept Publishers, Lagos.

Uwah, D. F.,Obok, E.E. and Atim S.N. (2016). Growth and edible leaf yield of Fluted pumpkin(*Telfairia Occidentalis* Hook F.) in response to poultry manure and NPK fertilizer in Calabar. Proceedings of the 3rd Annual Conference of the Crop Science Society of Nigeria, Nsukka, Nigeria. 159 – 525.

Table 1: Some Physical and Chemical properties of the soil of the experimental site in 2016 and 2017 cropping seasons before the planting

Soil Properties	2016	2017
Physical properties		

Sand (%)	87.60	87.62
Silt (%)	3.88	3.87
Clay (%)	8.52	8.51
Textural class	Sandy loam	
Chemical properties		
pH	5.80	5.86
Organic matter (%)	1.79	1.90
Total N (%)	0.071	0.072
Available P (mg/kg)	6.93	6.84
Exchangeable bases		
Ca(cmol kg^{-1})	3.20	3.22
Mg(cmol kg^{-1})	1.60	1.64
Na (cmol kg^{-1})	0.05	0.05
K (cmol kg^{-1})	0.10	0.11
Exchangeable acidity (cmol kg^{-1})	1.0	1.10
ECEC	6.78	6.80
Base Saturation (%)	73.01	73.02

Table 2: Effect of SBM on establishment percentage and vine length of Telferia

Rate of SBM (tons/ha)	**Establishment** (%)	**Length of Longest vine (2016) (WAP)**				**Establishment** (%)	**Length of Longest vine (2017) (WAP)**			
		3	6	9	12		3	6	9	12
0	98.10	31.06^{c}	48.32^{d}	70.77^{c}	103.44^{d}	97.97	30.25^{d}	38.98^{a}	51.77^{d}	72.83^{e}
2	98.38	31.57^{c}	58.64^{c}	77.07^{b}	121.39^{c}	98.14	34.35^{cd}	54.57^{c}	70.10^{c}	94.61^{a}
4	98.26	34.39^{b}	61.88^{b}	84.49^{a}	133.37^{b}	98.21	37.20^{bc}	59.61^{b}	83.31^{b}	116.45^{c}
6	98.28	41.38^{a}	62.48^{b}	84.71^{a}	135.39^{b}	98.12	40.70^{ab}	64.12^{a}	87.99^{a}	136.16^{a}
8	98.13	41.59^{a}	64.61^{a}	86.73^{a}	154.99^{a}	98.18	43.98^{a}	64.40^{a}	88.91^{a}	128.57^{b}

Means with the same superscript along the same column are not significantly different (P<0.05)

Table 3: Effect of SBM on number of vines of Telferia

Rate of SBM (tons/ha)	Number Of Vines (2016) (WAP)	Number Of Vines (2017) (WAP)

	3	6	9	12	3	6	9	12
0	138^{d}	1.53^{c}	2.07^{c}	3.06^{c}	1.13^{b}	1.40^{e}	1.69^{d}	2.21^{d}
2	1.46^{c}	2.88^{b}	3.16^{d}	3.58^{b}	1.34^{a}	2.04^{d}	2.26^{c}	3.25^{c}
4	1.54^{b}	3.05^{bc}	3.52^{c}	3.61^{b}	1.31^{a}	2.83^{c}	3.16^{b}	3.94^{b}
6	1.61^{ab}	3.39^{ab}	3.68^{b}	4.20^{a}	1.31^{a}	3.12^{b}	3.97^{a}	4.79^{a}
8	1.62^{a}	3.70^{a}	3.99^{a}	4.03^{a}	1.35^{a}	3.51^{a}	4.06^{a}	4.82^{a}

Means with the same **s**uperscript along the same column are not significantly different .(P< 0.0.05)

Table 4: Effect of SBM On Number of Leaves and Total Foliage Yield of Telfairia (tons ha^{-1})

Rate of SBM	Nunber of Leaves (2016) (WAP)				Total foliage yield (tons/ha)	Number of leaves (2017) (WAP)				Total foliage yield (tons/ha)
(tons/ha)	3	6	9	12		3	6	9	12	
0	5.13^{c}	11.05^{d}	21.27^{d}	25.08^{d}	24.21^{e}	4.62^{d}	9.91^{c}	21.44^{c}	24.07^{d}	28.80^{c}
2	6.36^{b}	15.08^{c}	26.97^{c}	31.73^{c}	29.66^{d}	6.55^{c}	13.85^{d}	21.69^{c}	30.20^{c}	28.14^{cd}
4	7.09^{a}	17.19^{a}	28.12^{b}	32.84^{b}	32.66^{c}	7.69^{b}	17.10^{c}	25.40^{b}	34.27^{b}	31.97^{c}
6	7.16^{a}	18.42^{a}	28.90^{a}	34.73^{a}	34.79^{b}	$8..02^{b}$	18.22^{b}	28.49^{a}	35.59^{a}	34.27^{b}
8	7.31^{a}	18.74^{a}	28.94^{a}	34.98^{a}	35.89^{a}	8.99^{a}	19.34^{a}	28.65^{a}	34.25^{b}	36.10^{a}

Means with the same superscript along the same column are not significantly different (P< 0.05)

Table 5: Effect of SBM on Number of days to flowering of male plants, Number of pods/plant, Number of aborted pods and Pods yield (tons ha^{-1})

	2016				2017			
Rate of SBM (tons/ha)	Nos.of days to 50% flowering of Male plants	Number Of pods/plant	Number of aborted pods	Pods yield (tons/ha)	Number of days to 50% flowering of male plants	Number of pods/plant	Number of aborted pods	Pods yield (tons/ha)
0	170.33^{a}	0.65^{d}	4.07^{a}	18.72^{e}	169.00^{a}	1.53^{c}	4.73^{a}	15.39^{d}
2	169.33^{b}	0.84^{c}	2.51^{b}	22.90^{d}	161.53^{b}	3.15^{b}	2.76^{b}	22.34^{c}
4	148.67^{c}	1.31^{b}	1.31^{c}	24.38^{c}	152.00^{c}	3.84^{a}	1.26^{c}	25.23^{b}
6	146.33^{cd}	2.95^{a}	0.69^{d}	26.66^{b}	144.33^{d}	3.85^{a}	0.72^{cd}	26.89^{ab}
8	144.00^{d}	3.04^{a}	0.72^{d}	27.54^{a}	146.00^{d}	3.91^{a}	0.44^{d}	27.28^{a}

Means with the same superscript along the same column are not significantly different (P<0.05)