VEGETATIVE PERFORMANCE OF FLUTED PUMPKIN (*Telfairia occidentalis* Hook F.) AS INFLUENCED BY ORGANIC FERTILIZER RATE

[1]*Ibrahim H.M., [2]Oyewale, R.O., [3]Olosunde, O.M. and [1]Alabi, P.O.
[1]Department of Horticulture, Federal University of Technology, Minna, Niger State, Nigeria.
[2]Department of Crop Production, Federal University of Technology, Minna, Niger State, Nigeria
[3]Department of Horticulture, Federal University of Agriculture Abeokuta Ogun State, Nigeria
Corresponding author: neneaminu2012@gmail.com; 08038098324

ABSTRACT

Fluted pumpkin (*Telfairia occidentalis*Hook F.) is a leaf vegetable member of the Cucurbitaceae family commonly grown in Africa, especially in the south eastern part of Nigeria where it is popularly grown for its edible seeds and leaf. An experiment was carried out to ascertain the influence of organic fertilizers (Poultry manure and Nnasaf) at different rates, on the growth and yield of fluted pumpkin (*Telfairia occidentalis*) from March to August, 2019 and September 2019 to January 2020 at the Horticultural Nursery of the Department of Crop Production, Federal University of Technology, Gidan Kwano Campus Minna, Niger State. The organic materials investigated were Poultry manure and Nnasaf manure at four rates (0, 100, 200, 300 g/pot) equivalent to 18,670, 37,340, 56,010 kg/ha in a pot of size 70 cm by 40 cm. The experimental design was a 2 x 4 factorial arranged in a Completely Randomized Design, replicated four times. The longest vines (101.83 and 121.50 cm), highest number of leaves (57 and 58), broadest leaves (54.28 and 58.91 cm^2), and highest fresh yields (66.36 and 70.01) g, were from Nnasaf manure applied at 56,010 kg/ha at the first and second trials, respectively while the shortest vines (99 and 50.83 cm), narrowest leaves (49.84 and 115.93 cm^2), smallest number of leaves and the lowest fresh weight were from seedlings fertilized with poultry manure at 18,670 kg/ha. Rates of Poultry manure and Nnasaf manure had significant effect on the growth and yield parameters taken. It is therefore recommended that application of Nnasaf manure at 56,010 kg/ha should be considered optimum for the growth and fresh weight of fluted pumpkin.

Keywords: Telfairia occidentalis, manure, Nnasaf, leaf development, fresh yield

INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis* Hook), is a leaf vegetable with edible seeds commonly grown in Africa, especially in the south-eastern part of Nigeria (Schippers, 2000). It is a member of the Cucurbitaceous family. It is locally called Ugu, (Akoroda, 1990). It is priced for its leaves and seeds that are used as food (Giami, 2004). Although a perennial by nature, it is often cultivated as an annual crop (Okoli, and Mgbeogwu, (1983).

Low soil fertility is identified as a major factor militating against the production of Fluted Pumpkin in many tropical cropping systems where fertilizer use is low and agricultural residues are not returned to the soil for rejuvenation (Eteng, 2015; 2017). Chemical fertilizers have been used to boost crop production in the face of reduced fallow periods, but over time, they become less effective and hazardous to health and eventually leave the land impoverished with some chemicals and the soil also depleted of essential nutrients (Ekop and Eddy, 2007). Organic materials are a good source of plant nutrients and have positive effects on improvement of the soil physical structure. A combined application of animal and plant materials to agricultural fields is a widely used method of increasing soil organic matter and fertility (Eteng, 2015; Ano and Agwu, 2005).

Attention is now shifting to the use of organic manures as soil amendment for crop production (Eteng, 2015). Application of poultry droppings, animal manure, sewage sludge, and municipal waste, to agricultural lands solves the problem of biodegradable waste disposal and also improves agricultural productivity. Use of animal dung in increasing crop yield in recent time is more pronounced than use of synthetic fertilizers, among the Olericulturists.

Continuous use of inorganic fertilizers affects soil structure, and hence, organic manures can serve as an alternative to mineral fertilizers for improving soil structure.

Poultry manure has been noted to be one of the most readily available and commonest of all manures (Ayeni, 2009). Nnasaf is an organic liquid fertilizer fortified with soil conditioner, fungicide and pesticide, useful in improving soil fertility.

Fluted pumpkin is used primarily in preparing soups and herbal medicines. The seeds are high in protein and fat, and therefore contributes to a well-balanced diet food trade of the Igbo tribe. (Akoroda, 1990). Fluted pumpkin prefers a loose, friable soil rich in plant nutrients. These soil conditions are hardly available in southern guinea savanna agro ecological zone where fluted pumpkin is mostly grown (Eteng, 2017).

There are scanty research reports on the use of Nnasaf manure and poultry manure on vegetative growth and yield of fluted pumpkin, hence, this study was conducted to compare the effects of Nnasaf manure and poultry manures on the vegetative growth and yield of *T. occidentalis*, with the objective of determining the potentials of Nnasaf manure as a viable source of nutrients for cultivation of fluted pumpkin.

MATERIALS AND METHODS

This experiment was conducted from March to August, 2019 and repeated between September 2019 and January 2020, at the Horticultural Nursery, Department of Crop Production, Federal University of Technology, Gidan Kwano Campus Minna, Niger State, on latitude 9^0 50' N and longitude 6^0 25' E; altitude of 300 m above the sea level in the southern guinea savannah zone of Nigeria. Matured fluted pumpkin pods sourced from an open market in Minna, Niger State were opened vertically with knife and the seeds carefully extracted and air dried for 24 hours. The air dried seeds were sown in germination trays filled with river sand (sharp sound). Emerged seeds were nurtured for three weeks to attain 4-6 leaves development.

Polyethylene pots of size 70 x 40 cm were filled with 12 kg top soil. Poultry manure and Nnasaf manure were added at varying quantities of 0, 100, 200, and 300 g/pot (0, 18,670, 37,340, 56,010 kg/ha) for each of the manure, respectively for the two trials. Nnasaf organic fertilizer is a liquid fertilizer that contains Ammonium Sulphate, Ammonium Chloride, and Ammonium Nitrate. It is fortified with soil conditioner, fungicide and pesticide; and commonly called "Agric-zyme 3-in-1". It is produced in Minna, Niger State. Poultry manure contains high nutrient component such as Nitrogen, Potassium, Phosphorus, Calcium, Magnesium and appreciable quantities of micronutrients. The pots were left for a period of three weeks to allow nutrient mineralization process before transplanting the seedlings into the polyethylene containers. Routine management carried out include rouging, weeding, watering. Staking was carried out as at when due. Five plants were selected for the dry matter accumulation calculation. Fresh leaf weight from these selected plants was used for the fresh weight value.

Data collected on number of leaves, vine length, leaf area, and leaf fresh weight were subjected to Analysis of Variance (ANOVA) using 2002 statistical package and means were separated using Least Significant Difference (LSD) at 5% level of probability.

RESULTS

Effect of varying rate of Poultry manure and Nnasaf manure significantly influenced the vine length of fluted pumpkin, during the first and second trials of the experiment (Table 1). Seedlings that received Nnasaf manure had the longest vine length (101.83 and 121.50 cm) while seedlings that received poultry manure had the shortest vine length (99.00 and 115.93 cm) in the first and second trials, respectively.

Throughout the period of the experiments, irrespective of the manure used, seedlings that received 56,010 kg/ha of the organic manure had the longest vine length (117.15 and 126.60 cm), closely followed by those that received 18,670 kg/ha (101.80 and 121.90 cm), and 0 g (109.30 and 105 70 cm) while seedlings that received 37,340 kg/ha of the manure had the least (83.40 and 96.60 cm).

The interaction of the organic manure and the rate of application was significant (Table 2). Seedlings that received 56,010 kg/ha of Nnasaf manure had the longest vine (121.52 and 131.86 cm) while those that received poultry manure had the shortest vine (105.56 and 112.54 cm), closely followed by those manured with 37,340 kg/ha Nnasaf (110.52 and 120.45 cm) and poultry manure (92.45 and 99.64 cm) while seedlings that received no manure had the least vine length (81.45 and 88.36 cm) and (77.84 and 82.46 cm) for both Nnasaf and poultry manure respectively.

Organic fertilizer significantly influenced the number of leaves of fluted pumpkin (Table 3). Seedlings matured with Nnasaf had higher number of leaves (47 and 53) while those treated with poultry manure had the least (41 and 46) in both plantings. Seedlings that received 56,010 kg/ha of the manure had the highest numbers of leaves (57 and 58) followed by seedlings manured with 37,340 kg/ha (46 and 46) and 18,670 kg/ha (44 and 44) while the control had the lowest (42 and 40).

The interactive effects of the organic manure and the rate of application followed similar trend with vine length interaction (Table 4). Seedlings treated with Nnasaf manure had the highest number of leaves across the rates while those that received poultry manure had the least number of leaves in both trials.

Leaf area of fluted pumpkin manure with organic fertilizer was similar in both first and second trials (Table 5). Leaf area of seedlings treated with Nnasaf manure were broader than leaves of seedlings treated with poultry manure. Seedlings manured with 56,010 kg/ha had significantly wider leaves (54.28 and 58.91 cm^2) followed by treatment with 37,340 kg/ha (51.97 and 53.82 cm^2), then 18,670 kg/ha (49.84and 50.82 cm^2) and leaves from control seedlings having the least (46.10 and 47.58) at both trials.

The interactive effects of the organic manure and the rate of application followed similar trend with vine length interaction (Table 6). Seedling treated with Nnasaf had the broadest leaves across the rates while those that received poultry manure had lower broad leave in both trials.

Fresh weight of fluted pumpkin leaves that received poultry manure and Nnasaf was statistically similar, although the leave weight of seedlings treated with Nnasaf had weightier leaves than those of poultry manure. Seedling that received 56, 010 kg/ha manure had the highest leaf weight (66.36 and 70.01 g/plant) followed by 37,340 kg/ha (60.87 and 66.35 g/plant), then 18,670 kg/ha (56.83 and 58.25 g) and vegetable manured with 0 kg/ha (control) having the least (53.70 and 50.88 g).

The interaction of organic manure and rate of application on leaf fresh weight of fluted pumpkin showed that seedlings that received Nnasaf had weightier leaves at 56, 010 kg/ha (88.16 and 93.52 g/plant) than poultry manure (76.22 and 71.58 g/plant) while seedlings that did not receive any manure had the least weight (59.23 and 69.12 g) and (57.49 and 62.44 g/plant) respectively (Table 8).

DISCUSSION

The longest vines, highest numbers of leaves, broadest leaves and highest fresh vegetable were obtained from seedlings manured with Nnasaf manure at 56,010 kg/ha. This was in line with the findings of Ogbonna, (2008); Dauda *et al.*, (2008) that Organic manure improves soil chemical and physical properties which enhance crop growth and development. Also, Aderi *et al.*,(2011), Ndor *et al.*, (2013) and Iren *et al.*, (2014) worked on the influence of organic manure rates and inorganic fertilizer formulations on some quantitative parameters of fluted pumpkin and recorded optimum performance at higher rates of application as the growth stage advanced. Applying high rate of organic manure 56,010 kg/ha in this work had recorded optimum performance in all the parameters taken. This was in accordance with Adeniyi and Ojeniyi, (2005) who reported that organic manure made available nutrients such as nitrogen and organic matter in soil as they are essential for plant growth.

Sunassee, (200I), Akanbi *et al.,(*2010) have reported that plants nourished with sufficient amount of nutrients in adequate proportion are expected to have higher number of cells and hence more yield.

CONCLUSION

Based on the findings obtained from this study, it could therefore be concluded that Nnasaf manure applied at 56,010 kg/ha had the optimum growth and yield performance between the two organic manure used.

Table 1: Vine length (cm) of fluted pumpkin raised in containers as influenced by rates of organic fertilizer

	Vine length (cm)									
Nutrient Source	2	4	6	8	10	2	4	6	8	10
	Weeks after Transplanting									
Poultry manure	22.85	32.10	47.28	71.65	99.00	29.78	43.53	56.88	79.83	115.93
Nnasaf	24.30	35.53	51.40	73.98	101.83	36.00	45.23	61.48	89.78	121.50
LSD($p \leq 0.05$)	0.35	0.76	1.82	2.21	2.25	0.09	0.50	0.67	1.15	1.89
Rate (kg/ha)										
0	25.20	47.30	56.80	79.70	109.30	40.00	50.90	67.90	93.50	105.70
18,670	25.30	41.40	50.40	72.20	101.80	37.40	45.10	60.40	85.40	121.90
37,340	26.90	32.60	37.30	58.90	83.40	29.90	36.20	46.10	73.80	96.60
56,010	28.90	52.35	60.35	87.45	117.15	44.25	53.40	71.80	98.95	126.60
LSD($p \leq 0.05$)	2.27	5.97	7.06	7.11	8.75	9.14	3.71	5.14	7.41	8.15

Table 2: Interaction of nutrient source and rate of application on vine length of fluted pumpkin raised in containers

		Vine length (cm)									
			First Trial				Second Trial				
Nutrient source	**Rate (kg/ha)**	2	4	6	8	10	2	4	6	8	10
		Weeks after Transplanting									
Poultry manure	0	21.42	33.17	40.92	51.67	77.84	28.42	40.06	51.68	65.49	82.46
	18,670	22.86	38.28	45.26	57.32	83.44	32.96	45.15	57.88	74.27	92.56
	37,340	25.06	44.22	52.75	66.39	92.45	36.41	48.91	61.57	80.05	99.64
	56,010	28.11	49.01	58.25	75.52	105.56	40.91	52.56	67.62	85.69	112.54
Nnasaf	0	23.77	35.94	47.25	58.99	81.45	32.54	44.21	57.03	69.19	88.36
	18,670	24.48	40.53	52.55	63.87	91.59	37.58	49.17	64.35	78.53	104.23
	37,340	27.65	47.39	59.32	70.89	110.25	41.26	54.28	68.79	85.46	120.45
	56,010	31.72	52.36	65.77	80.56	121.52	45.16	60.07	73.16	90.38	131.86
LSD($p \leq 0.05$)		0.07	0.03	0.09	0.36	0.72	0.52	0.33	0.08	0.44	0.03

Table 3: Number leaf of fluted pumpkin raised in containers as affected by application of organic fertilizer rates

	Number of leaves									
Nutrient Source	2	4	6	8	10	2	4	6	8	10
	Weeks after Transplanting									
Poultry manure	7.00	15.00	26.00	32.00	41.00	11.00	19.00	26.00	35.00	46.00
Nnasaf	9.00	21.00	32.00	38.00	47.00	13.00	25.00	34.00	43.00	53.00
LSD ($p \leq 0.05$)	1.40	3.59	5.77	5.94	6.83	1.80	3.77	5.03	6.82	7.90
Rate (kg/ha)										
0	6.00	14.00	30.00	33.00	42.00	10.00	18.00	23.00	34.00	40.00
18,670	7.00	15.00	33.00	36.00	44.00	12.00	21.00	27.00	39.00	44.00
37,340	8.00	21.00	36.00	39.00	46.00	14.00	27.00	32.00	41.00	46.00
56,010	10.00	25.00	38.00	46.00	57.00	16.00	29.00	36.00	49.00	58.00
LSD ($p \leq 0.05$)	1.99	2.07	2.57	2.95	3.07	1.54	2.16	2.95	3.06	3.18

Table 4: Interaction of nutrient source and rate of application on number of leaf of fluted pumpkin raised in containers

		Number of leaves									
		First Trial					Second Trial				
Nutrient source	**Rate (kg/ha)**	2	4	6	8	10	2	4	6	8	10
		Weeks after Transplanting									
Poultry manure	0	8	17	29	35	44	12	21	30	37	47
	18,670	9	19	31	36	46	13	22	32	38	49
	37,340	10	20	33	37	47	14	23	34	40	51
	56,010	12	21	36	39	49	15	24	36	42	53
Nnasaf	0	11	23	36	43	48	14	26	37	45	51
	18,670	12	24	38	45	50	15	27	37	48	54
	37,340	13	25	41	47	52	16	28	41	50	56
	56,010	14	27	44	49	55	18	30	44	53	59
LSD ($p \leq 0.05$)		1.77	2.12	1.05	0.65	0.38	1.95	2.07	3.48	1.04	0.83

Table 5: Leaf area (cm^2) of fluted pumpkin raised in containers as affected by application of organic fertilizer rates

	Leaf area (cm^2)									
Nutrient Source	2	4	6	8	10	2	4	6	8	10
	Weeks after Transplanting									
Poultry manure	16.12	18.62	31.26	42.92	48.79	18.04	24.28	43.19	46.04	51.43
Nnasaf	17.5	25.14	35.36	47.47	49.37	20.3	27.09	46.81	48.99	55.71
LSD($p \leq 0.05$)	0.65	0.82	0.91	1.03	1.12	0.37	0.62	0.78	0.99	1.33
Rate (kg/ha)										
0	11.34	15.65	23.6	41.91	46.1	12.91	13.77	33.07	39.07	47.58
18,670	14.5	20.14	33.58	47.91	49.84	13.64	16.98	43.26	44.45	50.82
37,340	17.16	25.48	37.49	50.26	51.97	21.09	24.6	45.04	51.34	53.98
56,010	19.55	28.98	38.56	53.5	54.28	25.3	32.17	49.96	53.6	58.91
LSD($p \leq 0.05$)	0.99	1.09	1.64	1.83	1.9	0.94	0.97	1.27	1.39	1.51

Table 6: Interaction of nutrient source and rate of application on number of leaf of fluted pumpkin raised in containers

		Leaf area (cm^2)									
		First Trial					Second Trial				
Nutrient source	**Rate (kg/ha)**	2	4	6	8	10	2	4	6	8	10
		Weeks after Transplanting									
Poultry manure	0	17.63	21.07	33.24	44.45	53.85	19.36	25.88	44.21	48.35	53.66
	18,670	19.28	24.09	35.27	46.23	55.75	21.55	26.85	47.76	49.52	56.17
	37,340	22.72	27.66	37.93	48.19	57.26	22.88	28.13	49.68	52.17	58.22
	56,010	25.04	29.36	39.11	50.99	60.2	24.11	29.88	52.33	53.78	63.22
Nnasaf	0	18.92	27.06	36.89	47.64	55.36	21.73	28.96	47.35	50.58	57.25
	18,670	21.24	30.45	37.77	48.99	57.25	23.25	31.22	49.65	52.22	60.25
	37,340	23.87	36.67	39.28	52.11	58.76	25.17	36.89	54.62	54.03	63.44
	56,010	26.88	39.3	42.15	55.26	60.45	27.48	40.21	59.25	55.96	67.07
LSD($p \leq 0.05$)		0.02	0.03	0.52	0.09	0.84	0.93	0.09	0.02	0.83	0.03

Table 7: Fresh leaf weight of fluted pumpkin raised in containers as influenced by application of organic fertilizer rates

	Leaf fresh weight (g) per plants	
Nutrient Source	First Trial	Second Trial
Poultry manure	55.73	59.22
Nnasaf	61.15	67.35
LSD($p \leq 0.05$)	3.71	4.05
Rate (kg/ha)		
0	53.7	50.88
18,670	56.83	58.25
37,340	60.87	66.35
56,010	66.36	70.01
LSD($p \leq 0.05$)	6.66	5.87

Table 8: Interaction of nutrient source and rate of application on leaf fresh weight (g) of fluted pumpkin raised in containers

			Leaf fresh weight (g) per plant	
Nutrient source	**Rate (kg/ha)**	**Rate (g)**	First trial	Second trial
Poultry manure	0	0	57.49	62.44
	18,670	100	61.41	65.35
	37,340	200	69.38	67.25
	56,010	300	76.22	71.58
Nnasaf	0	0	59.23	69.12
	18,670	100	67.63	78.22
	37,340	200	75.31	86.77
	56,010	300	88.16	93.52
LSD($p \leq 0.05$)			0.05	0.03

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