International Journal of Plant & Soil Science
2(2): 212-221, 2013; Article no. IJPSS.2013.004

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Growth and Yield Performances of Fluted Pumpkin (*Telfairia occidentalis* Hook F.) under Organic and Inorganic Fertilizer on Ultisols of North Central Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author EN designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author SND managed the analyses of the study, performed the spectroscopy analysis and MNG managed the experimental process, literature searches and identified the species of plant. All authors read and approved the final manuscript.

Research Article

Received 19th March 2013
Accepted 5th July 2013
Published 25th July 2013

ABSTRACT

The experiments were conducted during 2010 and 2011 rainy seasons at the research and teaching farm of the college of agriculture, Lafia, Nasarawa state, Nigeria. To determine the effect of urea fertilizer and poultry manure on the performances of fluted pumpkin (*Telfairia occidentalis)* in southern guinea savanna agroecological zone of north central Nigeria. The treatments consisted of three levels of urea fertilizer 0, 40 and 80 kg/ha and three levels of poultry manure: 0, 5 and 10t/ha factorially combined to form nine treatments which were laid in a Randomized Complete Block Design (RCBD) and replicated three times to form twenty seven plots. The result show that, application of urea and poultry manure rates did not significantly (p=0.05) affected vine length and number of leaves at 4 and 5weeks after germination in both cropping season. However, 6 weeks after germination application of urea and poultry manure produced a significant (p=0.05) effect on vine length and number of leaves in both season. 80kg/ha of urea produced the

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longest vine length of 74.80cm; 78.33cm in both years which are statistically comparable to 40kg/ha of urea but significantly higher than the control. 10t/ha of poultry manure generally recorded the best vine length (76.31cm and 79.23cm) in both years which is also comparable with application of 5t/ha of poultry manure; but significantly higher than the control(68.02cm and 68.57cm) in both years. Application of 80 kg/ha of urea fertilizer produced the highest number of leaves 27.46 in 2011cropping season, but was statistically the same with application of 40kg/ha of urea. 10t/ha of poultry manure also recorded the highest number of leaves 27.43 which is statistically the same with 5t/ha of poultry manure in both years. Urea fertilizer showed a significant (p=0.05) effect on the fresh biomass yield in 2010 cropping season. In 2011, urea fertilizer and poultry manure had a significant (p=0.05) response on fresh biomass yield of fluted pumpkin. Application of 80kg/ha of urea fertilizer produced the best biomass yield of 1134.52kg/ha, which is at par with application of 40kg/ha but higher than the control. Also, 10t/ha of poultry manure recorded a higher biomass yield of 1234.42kg/ha; which is also comparable with 5t/ha of poultry manure. Application of 40kg/ha of urea fertilizer and 5t/ha of poultry manure produced the best level of interaction. Therefore, this study recommend application of 40kg/ha of urea fertilizer and 5t/ha of poultry manure for environmentally friendly production of fluted pumpkin in North Central Nigeria.

Keywords: Growth; urea fertilizer; poultry manure; fluted pumpkin; yield.

1. INTRODUCTION

Fluted pumpkin *Telfairia occidentalis* Hook F is one of the most important vegetables grown among the Igbo people in Southeastern Nigeria. It is gaining recognition in other parts of Nigeria especially in the North central states. It is generally regarded as a leaf and seed vegetable. The leaf has a high nutritional, medicinal and industrial values being rich in protein 29%, fat 18%, minerals and vitamins 20% [1]. Apart from the leaves, the seeds can be cooked /roasted and eaten, or ground and added in soup. The vegetable contained 20.5g proteins, 45g fat, 23g carbohydrate, 2.2g fibre and 4.8g total ash [2]. The oil in the seeds is useful in soap making and in cooking [3]. In the recent time, fluted pumpkin had gained medicinal recognition. It has been discovered to be blood purifiers [4] and could therefore be useful in maintenance of good health.

Despite the importance of fluted pumpkins in Nigerian diet, farmers are facing a lot of challenges concerning its production; especially on the soils of guinea savanna agroecological zones. Rapid depletion of soil nutrients and poor physical condition of the savanna soils which constitute a strong limitations to crop production [5]. Also, soil fertility depletion in small holder farm is the fundamental cause of declining per capita food production [6]. Therefore, these soils must be supplemented with adequate macronutrients in other to keep them productive [7]. The shortage and high cost of inorganic fertilizers have limited their use for crop production among the peasant farmers in Nigeria. Also, chemical fertilizers alone generate several deleterious effects to the environment and human health and they should be replenished in every cultivation. This is because; the synthetic fertilizer is rapidly lost by either evaporation or by leaching in drainage water and it causes dangerous environmental pollution [8]. Continuous usage of inorganic fertilizer affects soil structure. Hence, organic manures can serve as alternative to mineral fertilizers for improving soil structure [9]. Therefore, there is the need for increased dependence on the use of organic waste such as farmyard manure, crop residues and poultry manure for crop production. In fact, poultry manure has been adjudged to be the most valuable of all manures produced by

livestock [10]. Moreover, the nutrient contents of poultry manure are among the highest of all animal manures, and the use of it as soil amendment for agricultural crops will provide appreciable quantities of all the major plant nutrients. Poultry manure also improves biological activities, soil tilt and soil chemical properties (Michael and George, 1998 university of Minnesota Agricultural Services. Unpublished article).

Fluted pumpkins prefer a loose, friable soil with ample humus and shade [11]. These conditions are hardly available in southern guinea savanna agroecological zone of north central Nigeria. There is a lot of documented information on the soil nutrients requirement of fluted pumpkin in southeastern and southwestern Nigeria [12,13,14,3,15,16]. In the north central Nigeria, this crop has gained acceptability and currently there is increased in cultivation by small farm holders as a source of income. However, there is a dearth of documented information regarding the soil nutritional requirement of the crop and other agronomic practices that may be of help to these farmers for increasing the yield of the crop in this zone. This research therefore, was aimed to determine optimal levels of both organic and inorganic fertilizer requirement for sustainable production of fluted pumpkin in north central Nigeria.

2. MATERIALS AND METHODS

The study was carried out at the teaching and research farm, College of Agriculture, Lafia, Nasarawa State, Nigeria during the wet seasons of 2010 and 2011. The study area falls within the Guinea savanna zone of North of central Nigeria and is located between Latitude 08.33 N and Longitude 08.32 E. Rainfall usually starts from March – October and the average monthly rainfall ranged from 40mm-350mm. The months of July and August usually records heavy rainfall. The daily maximum temperature ranged from 20.0 ºC – 38.5 ºC and daily minimum ranged between 18.7ºC – 28.2ºC. The months of February to early April are the months that have the highest maximum temperature, while the lowest maximum temperature months were recorded in December and January because of the prevailing cold harmattan wind from the northern part of the country at this period. The relative humidity rises as from April to a maximum of about 75- 90 percent in July (Nigeria Meteorological Agency, Lafia station 2010). The treatments consisted of three levels of Urea fertilizer 0, 40 and 80 kg/ha and three levels of Poultry manure: 0, 5 and 10t/ha factorially combined to form nine treatments which were laid in a Randomized Complete Block Design (RCBD)and replicated three times to form twenty seven plots. Chemical composition of poultry manure is presented in Table 1. Seed bed was well prepared by ploughing and harrowing in each season and plots were marked out into 9 m^2 plot. Fluted pumpkins were planted at the spacing of 75 x 90 cm. Soil samples were taken at a depth of 0-15 cm in each season and were analyzed. The result is presented in Table 2. Poultry manure was incorporated based on treatments two weeks before sowing. Weeds were controlled through manual hoeing and subsequently by hand pulling as the fluted pumpkins vines spread and covered the plots to thus suppress weed growth. Harvesting of total herbage yield was carried out once when the crops were 15weeks after germination.

Three plants were randomly tagged per plot and the following data were taken from them: vine length, number of branches, number of leaves and fresh herbage yield taken. The data collected were subjected to analysis of variance using GENSTAT, and where there is a significant difference; the means were separated using F-LSD at 5% probability level.

Table 1. Chemical composition of the poultry manure used during 2010 and 2011 season

% Chemical properties	2010	2011
N	3.14	3.89
P	0. 48	0.59
K	4.95	5.34
Ca	5.52	5.65
Mg	0.45	0.56
Na	0.32	0.30
OC	45.90	49.23

Table 2. Soil samples at a depth of 0-15cm before planting

Soil properties	2010	2011
Mechanical composition		
Clay (g/kg)	8.64	8.85
Silt	26.21	25.43
Sand	65.22	66.47
Textural classification (USD)	Loamy Sand	Loamy Sand
Chemical composition		
pH(H_2O)	5.59	5.55
pH(0.01MCaCl2)	5.04	5.18
T N%	0.13	0.15
Avail. P(mg/kg)	18.08	19.25
K(mg/kg)	0.16	0.19
C(mg/kg)	0.52	0.61
Mg(mol/kg)	4.49	4.12
Ca(mol/kg)	6.34	4.65
Na(mol/kg)	89.85	85.78
CEC(mol/kg)	2.75	2.90

3. RESULTS

The chemical analysis of the poultry manure used in both cropping season showed that the manure used in 2011 was superior in nutrients compared to the one used in 2010.

The soil was very low in nitrogen, phosphorus, potassium, organic carbon and the same with cation exchange capacity (Table 2). However, the soil was acidic in nature (5.04, 5.18); sodium (89.85, 85.87); and sand fraction (62.22, 66.47) in both seasons.

There was no significant (p=0.05) difference in vine length at 4 and 5weeks after germination when urea and poultry manure rates were applied in both cropping season (Table 3). However 6 weeks after germination, application of urea and poultry manure produced a significant (p=0.05) effect on vine length in both season. 80kg/ha of urea produced the longest vine length of 74.80cm and 78.33cm in both years which are statistically comparable to application of 40kg/ha of urea but significantly higher than the control. 10t/ha of poultry manure generally recorded the best vine length (76.31cm and 79.23cm) in both years which is comparable with application of 5t/ha of poultry manure; but significantly higher than the control(68.02cm and 68.57cm) in both years. Interaction between urea and poultry

manure also showed significant (p=0.05) effects on vine length at 6weeks after germination in both cropping season (Table 4). The longest vine length of 97.24cm and 81.14cm in both years were obtained by application of 40kg/ha of urea and 5t/ha of poultry manure. While, the shortest vine length was obtained in non application of urea or poultry manure (control) in both cropping season.

Table 3. Effect of poultry manure and urea levels on vine length (cm) of fluted pumpkin

Treatment	4 weeks after germination		5 weeks after germination		6 weeks after germination	
Urea(kg/ha)	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
0	51.22	59.73	57.82	68.96	64.71c	62.42c
40	55.41	67.89	61.21	71.25	69.72ab	74.45ab
80	60.13	68.12	71.80	73.24	74.80a	78.33a
PM(t/ha)						
0	52.41	64.45	65.10	67.15	68.02c	68.57c
5	54.82	65.56	66.81	69.22	72.60ab	75.12ab
10	55.53	69.12	68.92	71.23	76.31a	79.23a
LSD(0.05)	NS	NS	NS	NS	6.49	6.25
Interaction						
Urea X PM	NS	NS	NS	NS	*	*

Means in the same column followed by the same letter (s) are not significantly different (p=0.05)
*NS=No significant different at 5%; PM= Poultry manure; * =significant different at 5%.*

Table 4. Interaction between urea and poultry manure on vine length (cm) of fluted pumpkin at 6weeks after germination during 2010 and 2011 cropping season

	2010			2011		
	Poultry manure(t/ha)			Poultry manure(t/ha)		
Treatment						
Urea(kg/ha)	0	5	10	0	5	10
0	55.65i	59.62h	68.32e	58.25i	61.75h	67.32f
40	62.35g	79.24a	76.23b	64.36g	81.14a	76.45c
80	66.74f	73.25c	72.21cd	71.65e	74.11d	79.82ab
LSD(0.05)	3.01			2.25		

There was no significant (p=0.05) difference in application of urea and poultry manure on number of branches produced in both years (Table 5). However, 2011 cropping season produced higher number of branches. Interaction between urea and poultry manure did not produced any significant (p=0.05) effect on number of branches in both years of cropping.

Poultry manure and urea fertilizer did not show any significant effect on number of leaves of fluted pumpkin at 4 and 5weeks after germination in both cropping season (Table 6). However, urea fertilizer and poultry manure had a significant (p=0.05) response on number of leaves of fluted pumpkin cultivated in 2011 cropping season at 6weeks after germination. Application of 80 kg/ha of urea fertilizer produced the highest number of 27.46 leaves in 2011cropping season, but was statistically the same with application of 40kg/ha of urea. 10t/ha of poultry manure also recorded the highest number of 27.43 leaves which is also statistically a par with 5t/ha of poultry manure. Interaction between urea fertilizer and poultry manure (Table 7) show a significant (p=0.05) effect on number of leaves at 6weeks after

germination. Application of 40kg/ha of urea and 5t/ha of poultry manure produced the highest number of 27.23 and 27.98 in both year. This results is statistically at par with application of 80kg/ha of urea and 10t/ha of poultry manure.

Table 5. Effect of poultry manure and urea levels on branches of fluted pumpkin

Treatment	4 weeks after germination		5 weeks after germination		6 weeks after germination	
Urea(kg/ha)	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
0	1.67	1.56	1.76	1.81	2.22	2.42
40	1.78	1.67	1.84	1.88	2.50	2. 61
80	1.87	1.75	1.92	1.98	2.46	2.75
PM(t/ha)						
0	1.78	1.76	1.84	1.85	2.22	2.34
5	1.78	1.81	1.87	1.98	2.34	2.44
10	1.86	1.84	2.00	2.13	2.59	2.62
LSD(0.05)	NS	NS	NS	NS	NS	NS
Interaction						
Urea X PM	NS	NS	NS	NS	NS	NS

NS = No significant difference at 5%; PM= Poultry manure

Table 6. Effect of poultry manure and urea levels on number of leaves of fluted pumpkin

Treatment	4weeks after germination		5weeks after germination		6weeks after germination	
Urea(kg/ha)	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
0	18.53	19.68	22.96	22.45	25.60	24.11c
40	20.63	22.04	22.83	24.01	25.96	26.43ab
80	19.51	23.45	22.77	25.22	26.11	27.46a
PM(t/ha)						
0	19.93	20.43	21.01	21.23	25.00	25.25c
5	19.33	22.87	22.89	23.43	25.23	26.76ab
10	19.41	23.58	22.66	25.34	25.44	27.43a
LSD(0.05)	NS	NS	NS	NS	NS	2.12
Interaction						
Urea X PM	NS	NS	NS	NS	*	*

*Means in the same column followed by the same letter (s) are not significantly different (p=0.05); NS= No significant difference at 5%; PM= Poultry manure; * =significant different at 5%*

Table 7. Interaction between urea and poultry manure on number of leaves of fluted pumpkin at 6 weeks after germination during 2010 and 2011 cropping season

	2010			2011		
	Poultry manure(t/ha)			Poultry manure(t/ha)		
Treatment						
urea(kg/ha)	0	5	10	0	5	10
0	23.26i	26.11g	26.75d	25.24k	26.21f	26.65e
40	25.24h	27.23a	26.85c	25.67j	27.98ab	27.21cd
80	26.53f	26.44e	27.20ab	25.82i	27. 34c	27.94a
LSD(0.05)	0.24			0.53		

Urea fertilizer show a significant (p=0.05) effect on the fresh biomass yield in 2010 and 2011 cropping season (Table 8). Poultry manure only showed response to biomass yield in 2011 cropping season. Application of 80kg/ha of urea fertilizer produced the highest biomass yield of 1033.33kg/ha and 1134.52kg/ha. Which is statistically a par with application of 40kg/ha of urea but higher than control (700kg/ha and 689.45kg/ha) in 2010 and 2011 cropping season. Application of poultry manure did not show any significant effect on biomass yield in 2010 cropping season. However, in 2011 cropping season, 10t/ha of poultry manure recorded significantly higher biomass yield of 1234.42kg/ha, which is statistically the same with application of 5t/ha of poultry manure but higher than the control. The result in (Table 9) showed that interaction between urea fertilizer and poultry manure show a significant (p=0.05) effect on the biomass yield in both years. Application of 40kg/ha of urea fertilizer and 5t/ha of poultry manure produced the highest fresh biomass yield of 1235.75kg/ha and 1310.53kg/ha in both years. This is statistically a par with application of 80kg/ha of urea and 10t/ha of poultry manure.

Table 8. Effect of poultry manure and urea levels on Biomass yield of fluted pumpkin at harvest

Treatment	**Fresh biomass weight(kg/ha)**	
Urea(kg/ha)	**2010**	**2011**
0	700c	689.45c
40	951.11ab	1021.25ab
80	1033.33a	1134.52a
PM(t/ha)		
0	866.65	884.52c
5	877.78	1135.25ab
10	911.11	1234.42a
LSD(0.05)	100	112.23
Interaction		
Urea X PM	*	*

Means in the same column followed by the same letter (s) are not significantly different (p=0.05)
** =significant different at 5%*

Table 9. Interaction between urea fertilizer and poultry manure on biomass yield (kg/ha) of fluted pumpkin at harvest during 2010 and 2011 cropping season

	2010			**2011**		
	Poultry manure(t/ha)			**Poultry manure(t/ha)**		
Treatment						
urea(kg/ha)	0	5	10	0	5	10
0	864.25i	1134.29f	1053.24g	967.56i	1243.65e	1260.21e
40	987.56h	1235.75a	1212.35d	998.45h	1310.53a	1290.76c
80	1194.42e	1225.62c	1234.68ab	1124.25g	1275.59d	1308.97ab
LSD(0.05)	12.05			14.23		

4. DISCUSSIONS

The slow response of fluted pumpkin to application of urea and poultry manure in terms of vine length and number of leaves at 4 and 5weeks after germination may be attributed to the slow release of nutrients by poultry manure and inherent low levels of soil macronutrient in

the experimental site (Table 2) especially nitrogen which promote active vegetative growth. However, when fluted pumpkin was at 6weeks after germination, the effect of additional nutrients was clearly seen in both cropping season. Urea fertilizer improved cell activity, enhanced cell multiplication and development of luxuriant vegetative plant [14].This result is in line with the findings of [16] who work on the influence of chicken manure rates and inorganic fertilizer formulations on some quantitative parameters of fluted pumpkin. Also the non significant effect of urea and poultry manure on the number of branches of fluted pumpkin in both seasons might be because of the morphological characteristics of the plant. The significant effect shown in both urea and poultry manure on biomass yield in 2011 was as a result of the superior quality of the poultry manure used (Table 1) and also, in all the parameters assessed in this study the performances of fluted pumpkin in the second cropping season was better. This is because of complete mineralization of the organic materials into absorbable forms that plants can take in. This agreed with the work of [10] and reconfirmed the report of [17] and [18] that there is a significant influence on the growth and yield of *telfairia* by application of organic fertilizers. The study generally revealed that, there is always a proportional increased in all the parameters assessed when additional nutrients are applied. The mean number of branches, length of vine, number of leaves and biomass yield of t*elfairia* increased as the application of both urea and poultry manure were increased. However, application of 40kg/ha of urea and 5t/ha of poultry manure produced result that is a par with values obtained when 80kg N/ha of urea and 10t/ha of poultry manure was applied. The significant interactions between urea fertilizer and poultry manure, on vine length, number of leaves and biomass yield of fluted pumpkin is an affirmation of the fact that combined applications of both organic and inorganic manure is essential for increased growth and yield [19]. Application of 40kg/ha of urea fertilizer and 5t/ha of poultry manure produced the best level of interaction. This finding, corroborated those of [3,20]; and [21].

5. CONCLUSION

From this study, it can be concluded that 40kg/ha urea fertilizer and 5t/ha of poultry manure could be the optimal fertilizer level for a good growth and environmentally friendly production of fluted pumpkin in North central agroecological zone of central Nigeria. However, further locational trials should be conducted within the zone to confirm this result.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Tindal HD. Vegetables in the Tropics: Macmillan Education Ltd. Houndmills, Hampshire. 1986;533.
2. Badifu GIO, Ogunsua AO. Chemical composition of kernels from some species of cucurbitacea grown in Nigeria. Plant Food Human Nutrition. 1991;41:35-44.
3. Fashina AS, Olatunji KA, Alasiri KO. Effect of different plant populations and poultry manure on the yield of Ugu (*Telfairia occidentalis*) *in* Lagos State, Nigeria. In: Proceedings of the Annual Conference of Horticultural Society of Nigeria (HORTSON), 14th – 17th May, 2002; NIHORT, Ibadan, Nigeria.

4. Aletor O, Oshodi AA, Ipinmoroti K. Chemical composition of common leafy vegetables and functional properties of their leaf protein concentrate. Food Chemistry. 2002;78:63-68.
5. Salako FK. Soil physical conditions in nigerian savannas and biomass production department of soil science and agricultural mechanisation, university of agriculture, abeokuta, nigeria lecture given at the college on soil physics. World Journal of Agricultural Sciences. 2003;3(4):508-5021.
6. Sanchez PA, Izac AM, Valencia I, Pieri C. Soil fertility replenishment in frica: A concept note. In: Breth (ed.). Proceedings of the workshop on achieving greater impact from Research Investments in Africa. 26-30 September, 1996. Addis Ababa, Ethiopia.
7. Ndor E; Dauda NS, Abimuku EO, Azagaku DE, Anzaku H. Effect of phosphorus fertilizer and spacing on growth, nodulation count and yield of cowpea (*Vigna unguiculata* (L) *Walp*) in Southern Guinea Savanna Agroecological Zone, Nigeria. Asian Journal of Agricultural Sciences. 2012**;**4(4):254-257.
8. Aisha AH, Rizk FA, Shaheen AM, Abdel-Mouty MM. Onion plant growth,bulbs yield and its physical and chemical properties as affected by organic and natural fertilization. Research Journal of Agriculture and Biological Sciences. 2007;3(5):380-388.
9. Dauda SN, Ajayi, FA, Ndor E. Growth and yield of water melon (*Citrullus lanatus*) as affected by poultry manure application. Journal of Agriculture and Social Science. 2008;4:121-124.
10. Omisore JK, Kasail MY, Chukwu UC. Determination of optimum poultry manure rate for maize production. Proceedings of the 43rd Annual Conference of the Agricultural Society of Nigeria. Abuja. 2009;260-263.
11. Olaniyi JO, Odedere MP. The effects of mineral N and compost fertilizers on the growth, yield and nutritional values of fluted pumpkin (*Telfairia occidentalis)* in Southwestern Nigeria*.* Journal of Animal & Plant Sciences. 2009;5(1):443 - 449.
12. Ossom EM, Igbokwe JR, Rhykerd CL. Effect of mixed fertilizer levels and harvest intervals on the yield and mineral concentration of fluted pumpkin, *T. occidentalis* Hook. Proc. Indiana Acad. Sci. 1998;105(13-14):169-176*.*
13. Akwaowo EU, Ndon BA, Etuk EU. Minerals and antinutrients in fluted pumpkin (*Telfairia occidentalis* Hook f.). Food Chemistry. 2000;70:235-240.
14. Akanbi WB, Akande MO, Adediran JA. Suitability of composted maize straw and mineral nitrogen fertilizer for tomato production. Journ. Of Vegetable Science. 2005;11(1):57-65.
15. Nwite JC, Ogbodo EN, Obalum SE, Igbo VC, Igwe CA. Short-term response of Soil Physical properties of an Ultisol, and Nutrient composition of Fluted Pumpkin to Organic and Inorganic Fertilizer mixtures. Journal of Biology, Agriculture and Healthcare. 2012;2:10.
16. Aderi OS, Udofia AC, Ndaeyo NU. Influence of chicken manure rates and inorganic fertilizer formulations on some quantitative parameters of fluted pumpkin (*telfairia occidentalis* hook f.). Nigerian journal of Agriculture, Food and Environment. 2011;7(1):9-15.
17. Ndor E, Agbede OO, Dauda SN. Growth and Yield Response of Cotton (*Gossypium spp)* to varying Levels of Nitrogen and Phosphorus Fertilization in Southern Guinea Savanna Zone, Nigeria. Journal of production Agriculture. 2010;6(2):119-125.
18. Schippers RR. African indigenous vegetables: an over view of the cultivated species. Revised edition on CDROM.National Resources International limited, Aylesford, United Kingdom; 2000.

19. Awodun MA. Effect of poultry manure on growth, yield and nutrient content of fluted pumpkin (*Telfairiaoccidentalis* Hook F). Asian Journal of Agricultural Research. 2007;1:67-73.
20. Asiegbu JE, Uzo JO. Yield and Yield component Responses of vegetable crops to farm yard manure rates in the presence of inorganic fertilizer. Journal of Agriculturte of University of Puerto Rico. 1984;LXVIII(3):243-250.
21. Olaniyi JO, Oyerele TA. Growth, Yield and nutritional compositions of fluted pumpkin (*Telfairia Occidentalis*) as Affected by Fertilizer Types in Ogbomoso, South West Nigeria. Bull. Environ. Pharmacol. Life Sci. 2012;1(9):81-88.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=248&id=24&aid=1750