Global Journal of Plant Ecophysiology, 3(1): 7-11, 2013
ISSN 2074-0891
This is a refereed journal and all articles are professionally screened and reviewed

ORIGINAL ARTICLES

Growth and yield performances of fluted pumpkins (*telferia occidentalis* hook f.) Under organic and inorganic fertilizer on ultisols of north central nigeria.

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ABSTRACT

The experiments were conducted during 2010 and 2011 rainy season 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 (Telferia occ*idenatalis)* 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 showed that, there was no significant ($p<0.05$) difference in vine length and number of leaves at 4 and 5weeks after germination in urea and poultry manure treatment 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 longest vine length of 74.80cm; 78.33cm in both years and 27.46 number of leaves in 2011 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 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. Urea fertilizer showed a significant ($p<0.05$) effect on the fresh herbage yield in 2010 cropping season. However, poultry manure did not showed any response to herbage yield in the same season. In 2011, urea fertilizer and poultry manure had a significant ($p<0.05$) response on fresh herbage yield of fluted pumpkin. Application of 80kg/ha of urea fertilizer produced the best herbage yield of 1134.52kg/ha, which is higher than 40kg/ha and control. Also, 10t/ha of poultry manure recorded a higher yield of 1234.42kg/ha of fresh herbage which is also higher than 5t/ha and zero application of poultry manure. Therefore, this study recommend application of 80kg/ha of urea fertilizer and 10t/ha of poultry manure for optimal production fluted pumpkin in north central Nigeria.

Key words: Growth, urea fertilizer, poultry manure, fluted pumpkin, and yield

Introduction

Fluted pumpkins *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% (Tindall, 1986). Apart from the leaves, the seeds can be cooked /roasted and eaten, or ground and added in soup, contained 20.5g proteins, 45g fat, 23g carbohydrate, 2.2g fibre and 4.8g total ash (Badifu and Ogunsua, 1991). The oil in the seeds is useful in soap making and in cooking (Fashina *et al*, 2002). In the recent time, fluted pumpkin had gained medicinal recognition. It has been discovered to be blood purifiers (Aletor *et al*, 2002) 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. Because of the rapid depletion of soil nutrients and poor physical condition of the savanna soils which constitute a strong limitations to crop production (Salako, 2003). Also, according to Sanchez *et al*. (1996), soil fertility depletion in small holder farm is the fundamental cause of declining per capita food production. Therefore, these soils must be supplemented with adequate macronutrients in other to keep them productive (Ndor, 2012). The shortage and high cost of inorganic fertilizers have limited their use for crop production among the peasant farmers in Nigeria

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(Tanimu *et al*., 2007); and also, chemical fertilizers alone generate several deleterious effects to the environment and human health and they should be replenished in every cultivation season because, the synthetic N, P and K fertilizer is rapidly lost by either evaporation or by leaching in drainage water and it causes dangerous environmental pollution (Aisha *et al*., 2007). Continuous usage of inorganic fertilizer affects soil structure. Hence, organic manures can serve as alternative to mineral fertilizers for improving soil structure (Dauda *et al*., 2008). 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 (Omisore *et al*., 2009). 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).

Fluted pumpkins prefer a loose, friable soil with ample humus and shade (Olaniyi and Odedere 2009). These conditions are hardly available in southern guinea savanna agroecological zone of north central Nigeria and unfortunately this crop will grow in conditions that are far less favorable. There are a lot of documented information on the soil nutrients requirement of fluted pumpkin in southeastern and southwestern Nigeria (Ossom *et al* 1998; Akwaowo, *et al*, 2000; Akanbi *et al* 2005;.Fashina *et al*, 2002; Nwite *et al* 2012; Aderi *et al* 2011). However, in the north central Nigeria where this crop has gained acceptability and currently there is increased in cultivation by small farm holders as a source of income; but 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.

Therefore, this research is an attempt to determine optimal levels of both organic and inorganic fertilizer requirement for sustainable production of fluted pumpkin on ultisols in north central Nigeria.

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 figures ranged from 40mm-350mm. The months of July and August usually records heavy rainfall. The daily maximum temperature ranged from 20.0^{0C} – 38.5^{0C} and daily minimum ranged between 18.7^{0C} – 28.2^{0C}. 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 (NIMET Lafia, 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 I. 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.

Data collection and analysis:

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

Result:

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.

Table I: 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

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

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(H2o)	5.59	5.55
pH(0.01MCaCl2)	5.04	5.18
T N%	0.13	0.17
Avail. P	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

There was no significant ($p<0.05$) difference in vine length at 4 and 5weeks after germination in urea and poultry manure treatment in both cropping season (Table3). 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 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.

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

Treatment	4weeks after germination		5weeks after germination		6weeks after germination	
Urea(kg/ha)	2010	2011	2010	2011	2010	2011
0	51.22	59.73	57.82	68.96	64.71	62.42
40	55.41	67.89	61.21	71.25	69.72	74.45
80	60.13	68.12	71.80	73.24	74.80	78.33
Poultry manure(t/ha)						
0	52.41	64.45	65.10	67.15	68.02	68.57
5	54.82	65.56	66.81	69.22	72.60	75.12
10	55.53	69.12	68.92	71.23	76.31	79.23
LSD(0.05)	8.93*	9.74*	8.16*	7.85*	6.49	6.25

*=No significant different at 5% probability

There was no significant ($p<0.05$) difference in the application of urea and poultry manure on number of branches produced in both years (table 4). However, 2011 cropping season produced higher number of branches.

Table 4: effect of poultry manure and urea levels on branches of fluted pumpkin

Treatment	4weeks after germination		5weeks after germination		6weeks 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
Poultry manure(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)	0.56*	0.59*	0.67*	0.82*	0.47*	0.56*

*= No significant difference at 5% probability

Poultry manure and urea fertilizer did not showed any significant effect on number of leaves of fluted pumpkin at 4 and 5weeks after germination in both cropping season (table 5). 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 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.

Table 5: 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	24.67
40	20.63	22.04	22.83	24.01	25.96	26.43
80	19.51	23.45	22.77	25.22	26.11	27.46
Poultry manure(t/ha)						
0	19.93	20.43	21.01	21.23	25.00	25.25
5	19.33	22.87	22.89	23.43	25.23	26.76
10	19.41	23.58	22.66	25.34	25.44	27.43
LSD(0.05)	1.70*	4.53*	1.84*	2.45*	0.61*	2.12

*= No significant difference at 5% probability

Urea fertilizer showed a significant ($p<0.05$) effect on the fresh herbage yield in 2010 cropping season (table 6). However, poultry manure did not showed any response to herbage yield in the same season. In 2011, urea fertilizer and poultry manure had a significant ($p<0.05$) response on fresh herbage yield of fluted pumpkin. Application of 80kg/ha of urea fertilizer produced the best herbage yield of 1134.52kg/ha, which is higher than 40kg/ha and control. Also, 10t/ha of poultry manure recorded a higher yield of 1234.42kg/ha of fresh herbage which is also higher than 5t/ha and zero application of poultry manure.

Table 6: effect of poultry manure and urea levels on herbage yield of fluted pumpkin at harvest

Treatment	Fresh herbage weight(kg/ha)	
Urea(kg/ha)	2010	2011
0	700	689.45
40	911.11	1021.25
80	1033.33	1134.52
Poultry manure(t/ha)		
0	866.65	884.52
5	877.78	1035.25
10	911.11	1234.42
LSD(0.05)	100	112.23

Discussion:

The non significant response of fluted pumpkin to urea and poultry manure fertilizer application observed in terms of vine length and number of leaves at 4 and 5weeks after germination may be attributed to the fact that Poultry manure releases nutrients slowly. But when fluted pumpkin was 6weeks after germination, the effect of additional nutrients was clearly seen in both cropping season. This result is in tandem with the findings of Aderi *et al* 2011 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 may be because of the morphological characteristics of the plant. The significant effect shown in both urea and poultry manure on herbage 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 into their system in the second year of production. This results agreed with the work of (Dauda *et al*, 2008). The study generally revealed that, there is always a proportional increased in the growth parameters (number of leaves, vine length and number of branches) assessed when additional nutrients are applied. This may be as a result of the higher availability of nitrogen in both urea and poultry manure which encouraged higher vegetative growth. This findings agreed with work of(Ndor et al, 2010)

Conclusion:

From this study, it can be concluded that 80 kg/ha urea fertilizer and 10t/ha of poultry manure could be the best fertilizer level for a good growth and herbage yield of fluted pumpkin in southern guinea savanna

agroecological zone of central Nigeria. However, further locational trials should be conducted within the zone to confirm this result.

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