Comparative Evaluation of Different Organic Fertilizers on The Soil Chemical Composition, Growth, Leaf And Fruit Yields Of Fluted Pumpkin (TelfariaOccidentalis L.)

Emmanuel Ibukunoluwa Moyin-Jesu

Agronomy Department, Federal College of Agriculture,
Akure, Ondo State, Nigeria.
E-mail: moyinjesu2004@yahoo.com

Abstract

The efficiency of different organic fertilizers such as wood ash, pig, goat manure, oil palm bunches either in sole or amended forms as sources of fertilizers on the soil chemical composition, growth and fruit yields of fluted pumpkin (Telfaria occidentalis L.) was investigated at Akure in the rainforest zone of Nigeria for 2008 and 2009 respectively.

Seven organic fertilizers treatment were namely: pig manure, wood ash + pig manure, oil palm bunch ash + pig manure, oil palm bunch ash + goat manure, wood ash + goat manure, wood ash + pig manure applied at 6t/ha with a reference treatment NPK 15-15-15 fertilizers application, replicated three times and arranged in a randomized complete block design. The amended were applied at a 50:50% rate of weight (3t/ha each).

The results showed that there were significant increases ($P<0.05$) in the fluted pumpkin growth parameters (vine length, leaf number, fruit number of branches); leaf yield , fruit length, fruit diameter and fruit weight under the different organic fertilizers compared to the control treatment.

For the growth parameters, wood ash + pig manure treatment increased the vine length, leaf population, stem girth and number of branches of fluted pumpkin by 29%, 51%, 50% and 36% respectively compared to the sole pig manure treatment. In addition, when compared with NPK 15-15-15 fertilizers, amended wood ash + pig manure increased the vine length, leaf

population and stem girth by 7%, 17% and 21% respectively except the number of branches where NPK 15-15-15 fertilizers increased the value of 3% compared to the wood ash + pig manure.

For the yield parameters, amended oil palm bunch ash and wood ash with goat and pig manures had higher values of fluted pumpkin leaf yield (t/ha), fruit length, fruit diameter and fruit weight than the sole forms of the fertilizers treatment . Oil palm bunch ash + goat manure increased the leaf yield , fruit length, fruit diameter and fruit weight by 19%, 27%, 31% and 36% respectively compared to the goat manure treatment. When compared to NPK 15-15-15 fertilizers, wood ash,+ pig manure increased the fluted pumpkin leaf yield, fruit length and fruit diameter by 17%, 12% and 2%. However, there was a significant difference ($P<0.05$) between the fruit weight of fluted pumpkin in wood ash + pig manure and NPK 15-15-15 fertilizers.

For the soil chemical composition, oil palm bunch ash + goat manure increase soil pH, O.M, N, P, K, Ca and Mg by 3%, 43%, 30%, 26%, 4%, 17% and 5% compared to the oil palm bunch ash (sole). Wood ash + pig manure increased the soil pH, O.M, N, P, Ca, and Mg by 25%, 88%, 3%, 1%, 99% and 98% respectively compared to NPK 15-15-15 fertilizers except soil K.

The NPK 15-15-15 fertilizers had higher soil K/Ca and K/Mg ratios which led to nutrient imbalance and the reduction of nutrient such as K, Ca and Mg to the crops.

The performance of the wood ash + pig manure and oil palm bunch ash + pig manure in improving soil growth and yield parameters of fluted pumpkin was due to their rich nutrients superiority over others. Wood ash + pig manure applied at 6t/ha gave the best growth, leaf and fruit yields and improvement in soil chemical composition.

Key Words: Fluted pumpkin (Telfaria occidentalis), growth, leaf and fruit yields and soil chemical composition.

{**Citation:** Emmanuel Ibukunoluwa Moyin-Jesu. Comparative Evaluation of Different Organic Fertilizers on The Soil Chemical Composition, Growth, Leaf And Fruit Yields Of Fluted Pumpkin (TelfariaOccidentalis L.). American Journal of Research Communication, 7(3): 1-23} www.usa-journals.com, ISSN: 2325-4076.

Introduction

Fluted Pumpkin (Telfaria occidentalis) belongs to the family curcubitaceae and it is one of the most important leaf and seed vegetable grown for its high nutritional, medicinal and industrial values. The leaf has 29% protein, 18% fat, mineral and vitamin (20%) while seed contains 20.5, 45, 23, 2.2 and 4.8kg/100kg of protein, fat, carbohydrate, fibre and total ash respectively. (Badifu and Ogunsua, 1991)[1].

In addition, the oil in the seeds is useful for soap making and domestic cooking, also, fluted pumpkin had gained medicinal importance to be blood purifiers which enhanced good health among the poor resource farmers in the developing countries (Aletor et al, 2002)[2].

In spite of the nutritional, medicinal and industrial uses of fluted pumpkin (Telfaria occidentalis) in Nigeria, its optimum production has not been attained because the farmers cultivate the same piece of land continually without fertilizers application and this had led to serious decline in soil fertility. (Fashina et al, 2002)[3].

Efforts aimed at improving the level of soil fertility through the use of inorganic fertilizers are limited by high cost of purchase and deterioration of soil properties on continuous use. Therefore, there is a strong need to find 3lternative sources of fertilizers (i.e. organic forms) that are cheap and sustainable for production of fluted pumpkin (Telfaria occidentalis). This is because there is a high and growing demand for the crops by consumers (i.e. restraunts, individuals, caterers and corporate eateries) but the supply is very low.

Hence, this is responsible for low value chain development for fluted pumpkin in Nigeria and other countries which would have enhanced good export trade.

Having reviewed literature critically, except the works of Moyin-Jesu (2006)[4], Obatolu (1995)[5] and Adekiya (2009)[6] on the organic residues to grow okra, coffee and tomato respectively, there were scarcity of research information on the use of wood ash, pig manure, oil palm bunch ash and goat manure to grow fluted pumpkin (Telfaria occidentalis).

The objectives of this research work are (i) to determine the effect of wood ash, pig, goat manure and oil palm bunch ash on the growth, leaf and fruit yield of fluted pumpkin (ii) to determine the effect of these organic fertilizers on the soil chemical composition after the experiment.

Materials and Methods

An experiment was carried out at Akure, in the rainforest zone of Nigeria in 2008 and was repeated in 2009 to validate the results. The soil is sandy loam, skeletal, kaolinitic, isohyperthermic oxic paleustaff (Alfisol). Soil survey staff (1999)[7]. The annual rainfall is between 1100 and 1500mm while the annual temperature is between 26-32^{o}C.

Soil sampling and analysis before planting

30 core soil samples were collected from 0-15cm depth on the site, mixed thoroughly, air-dried, sieved with 2mm sieve and ready for routine analysis.

The soil pH (1:1 soil/water) and 1:2 soil/0.01M $CaCl_2$ was read on pH meter (Crockford and Nowell, 1956)[8] while organic matter was determined using wet oxidation method through chromic acid digestion (Walkley and Black, 1934)[9].

Soil P was extracted by Bray P1 extractant and the extract was developed on Murphy blue colouration and determined on a spectronic 20 (Murphy and Riley, 1962)[10].

The soil K, Ca, Mg and Na were read on the flame photometer (Jackson, 1958)[11] while Mg content was determined using the atomic absorption spectrophotometer.

The %N was determined using the microkjedahl method (Jackson, 1964)[12]. The micronutrients were extracted with 0.1M HCl and read on atomic absorption spectrophotometer (Ojeniyi, 1985)[13] while particle size analysis was done using hydrometer method. Bouycous (1951)[14].

Sources and processing of organic fertilizers used for the experiment

The goat and pig manures were obtained from the livestock section while the wood ash and oil palm bunch ash were also collected from the crop processing unit of Federal College of Agriculture, Akure.

Both the oil palm bunch ash and wood ash were sieved with 2mm sieve to remove pebbles, wood and charcoal remnants while the goat and pig manures were air-dried and stacked under a shade to allow quick mineralization. The fluted pumpkin seeds were purchased from Ondo State Agricultural Development Project, Akure, Nigeria.

Chemical analysis of the organic materials used

Two grammes each of the processed forms of the organic materials were analyzed. The N content was determined by the Kjedahl method (Jackson, 1964)[12] while the determination of other nutrients such as P, K, Ca, Mg was done using the wet digestion method based on 25-5-5ml of HNO_3 – H_2SO_4 – $HClO_4$ acids (AOAC, 1970)[15].

Field Experiment

The site was cleared, ploughed, harrowed and divided into different plots. The size of each plot is 4m x 4m ($16m^2$) with a discard of 1m between each plot to allow carrying out cultural activities.

There were some organic fertilizers treatments namely pig manure, wood ash + pig manure, oil palm bunch ash + pig manure, oil palm bunch ash + goat manure, wood ash oil palm bunch ash, goat manure, wood ash + goat manure and wood ash + pig manure applied at 6t/ha with a reference treatment NPK 15-15-15 fertilizer applied at 300kg/ha and a control treatment (no fertilizer nor manure), replicated three times and arranged in a randomized complete block design. The amended treatments were applied at a 50:50% ratio by weight (3t/ha each).

The treatments were incorporated into the soil using a hand towel and allowed to decompose for one week before planting two seeds of fluted pumpkin (Telfaria Occidentalis L) at a spacing of 1m x 1m on each plot, watered immediately and continued every morning and evening until the rain was steady in order to enhance full establishment. The seeds germinated after 5-7 days of planting. Agronomic practices such as weeding started at two weeks after planting and continued at every three intervals until full establishment. Spraying of Avesthrin (10 EC Cypermethrin) at 10ml per 10L of water to control pests starting from two weeks after planting.

After three weeks of planting, the fluted pumpkin seedlings were staked using a two meter long bamboo pole erected in a rectangular form. This ensured good exposure to sunlight. In each plot, six plants were sampled and used for data` collection on growth parameters starting from four weeks after treatment application till the harvesting period.

The vine length, number of branches, stem girth and leaf yield of fluted pumpkin were measured weekly until senenscence. At 24 weeks, after planting, the fruits matured and measured for fruit length, diameter and weight.

Soil analysis after harvesting

The soil samples were taken from each treatment plot, air-dried, sieved and analyzed for soil pH, O.M., N, P, K, Ca and Mg as described earlier.

Statistical analysis

All the data collected on the growth and fruit parameters (vine length, leaf area, leaf population, leaf yield, fruit length, fruit diameter and fruit weight) were subjected to statistical analysis using ANOVA F – Test and their means were separated using Duncan Multiple Range Test at 5% level. Gomez and Gomez (1984)[16].

RESULT

Soil analysis before planting

Table 1 presents the analysis of the soils before planting pumpkin (Telfaria Occidentalis L). The % O.M was 0.88 which is below 3% recommended for crop production in South West Nigeria (Agboola and Corey, 1973)[17]. The soil P (Mg/Kg) content is 5mg/kg which is lower than 10mg/kg P recommended for crop production in S. West Nigeria.

The percent Nitrogen was 0.07% which is also far below the 0.15% N critical level for crops. Sobulo and Osiname (1981)[18]. The soil pH value was 5.90 which showed that the soil is slightly acidic while the exchangeable bases (K, Ca, Mg and Na) were below 0.2mmol/kg

recommended by Folorunso et al (2000)[19]. The textural class of the soil is sandy loam and the soil bulk density is 1.60mgm^{-3}.

Table 1: Soil fertility before planting Pumpkin (Telfaraia Occidentalis L.)

SOIL PROPERTIES	VALUES
Soil pH (1:1 H_20)	5.90
Soil pH : 2:1 (Soil/0.01M$CaCl_2$)	5.40
N (%)	0.07
Available P (%mg/kg)	5.00
O.M (%)	0.58
Exchangeable bases	
K (mmol/Kg)	0.13
Ca (mmol/Kg)	0.12
Mg (mmol/Kg)	0.09
Na (mmol/Kg)	0.11
Exchangeable acidity	
H^+ (mmol/Kg)	3.80
Al^{3+} (mmol/Kg)	1.49
Micronutrients	
Fe (mg/kg)	8.50
Zn (mg/kg)	3.70
Cu (mg/kg)	1.80
Mn (mg/kg)	2.00
Textual analysis	
% Sand	79.60
% Silt	14.50
% Clay	5.90
Bulk density mgm^{-3}	1.60

Chemical composition of the organic fertilizer materials

The chemical composition of the organic fertilizer materials were presented in Table 2. Pig manure had the highest value of N and P nutrients compared to others while the wood ash treatment had the highest value of K, Ca and Mg followed by oil palm bunch ash, pig manure and goat dung respectively. Wood ash also had the highest values of Fe, Mn, Cu and Zn nutrients compared to other materials used.

Table 2: Chemical analysis of the organic materials used

Treatments	%N	P (mg/kg)	K	Ca	Mg	Fe (mg/kg)	Mn (mg/kg)	Cu (mg/kg)	Zn (mg/kg)
			_____%_____						
Pig manure	3.72	312.0	14.45	3.10	4.8	34.0	1.62	0.17	1.34
Wood ash	1.53	86.00	23.02	40.00	8.52	65.57	11.92	0.66	1.83
Oil palm ash	1.47	69.0	21.04	35.2	6.25	34.0	0.99	0.10	0.70
Goat manure	2.53	167.5	9.97	2.90	4.50	34.05	1.60	1.60	1.30

Effect of organic fertilizers on the growth parameters of fluted pumpkin

There were significant increases ($P<0.05$) in the growth parameters such as vine length, leaf population, stem girth and number of branches of fluted pumpkin under different organic fertilizers treatment compared to the control treatment (Table 3).

Generally, the amended treatments had higher values of vine length, leaf population, stem girth and number of branches of fluted pumpkin than the sole treatment. For instance, wood ash + pig manure treatment increased the fluted pumpkin vine length, leaf population,

stem girth and number of branches by 29%, 51%, 50% and 36% respectively compared to the sole application of pig manure treatment.

In addition, among the amended treatment, wood ash + pig manure had the highest value of the growth parameters of fluted pumpkin compared to other treatments. For instance, wood ash + pig manure treatment increase the vine length, leaf population, stem girth and number of branches of fluted pumpkin by 25%, 26%, 21% and 33% respectively compared to the oil palm bunch ash + pig manure treatments.

When compared to NPK 15-15-15, amended wood ash + pig manure increased the vine length, leaf population and stem girth by 7%, 17% and 21% respectively except the number of branches of fluted pumpkin where NPK 15-15-15 fertilizer increased the value by 3% compared to wood ash + pig manure.

Generally, the NPK 15-15-15 fertilizer increased all the values of vine length, leaf population, stem girth and number of branches of fluted pumpkin compared to the sole application of pig manure, wood ash, goat manure and oil palm bunch ash respectively.

Finally, among the sole treatments used, pig manure had the highest values of leaf population, stem girth and number of branches except vine length of fluted pumpkin where oil palm bunch ash had the highest value compared to others.

Effect of organic fertilizers on the leaf yield and fruit yield parameters of fluted pumpkin (Telfaria occidentalis L.)

There were significant increases ($P<0.05$) in the yield parameters of fluted pumpkin, leaf yield, fruit length, fruit diameters and fruit weight under different organic fertilizers compared to the control treatment (Table 4).

The amended oil palm bunch ash and wood ash with goat and pig manures had higher values of leaf yield (t/ha) fruit diameter, fruit length and fruit weight of fluted pumpkin than

the sole application of oil palm bunch, wood ash, pig manure and goat manure respectively. For example, wood ash + pig manure increased the leaf yield, fruit length, fruit diameter and fruit weight of fluted pumpkin by 34%, 32%, 35% and 55% compared to sole application of pig manure. Also, oil palm bunch ash + goat manure increased above named yield parameters by 19%, 27%, 31% and 26% respectively compared to the sole goat manure application.

Table 3: Effect of different organic fertilizers on the growth parameters of Telfaria occidentals (Fluted Pumpkin)

Treatments	Vine Length (cm)	Leaf Population	Stem girth (cm)	Number of branches
Control	25.15a	16.24a	0.3a	6.31a
NPK 1515 15	69.20h	67.29i	1.10g	29.60i
Pig manure	52.53d	39.82e	0.70e	12.8d
Wood ash	42.09c	36.77c	0.56c	16.80c
Goat manure	32.03b	31.79b	0.60d	16.40c
Oil palm bunch ash + goat manure	53.56de	37.07cd	0.50b	13.60b
Oil palm bunch ash +goat manure	58.25g	58.12g	0.90f	18.94de
Oil palm bunch ash +pig manure	55.98f	60.35h	1.10g	19.26f
Wood ash + goat manure	67.87i	56.19f	1.20h	22.52g
Wood ash + pig manure	74.42j	81.39j	1.40i	28.63h

Treatment means followed by the same letters within each group or columns are not significantly different from each other using Duncan Multiple Range Test at 5% level.

When compared with NPK 15-15-15 fertilizers, only two amended treatments; oil palm bunch ash + pig manure and wood ash + pig manure increased fluted pumpkin leaf yield (t/ha) while there was a significant difference between the fruit yield (t/ha) of fluted pumpkin between wood ash + pig manure and NPK 15-15-15 fertilizer.

For instance, wood ash + pig manure increased the fluted pumpkin leaf yield, fruit length and fruit diameter by 17%, 12% and 2% compared to NPK 15-15-15 fertilizer.

Furthermore, NPK 15-15-15 fertilizer increased all the yield parameters, leaf yield, fruit length, fruit diameter and fruit weight (t/ha) of fluted pumpkin more than the sole application of pig, goat manures, oil palm bunch ash and wood ash respectively. NPK 15-15-15 increased the leaf yield, fruit length, fruit diameter and fruit weight by 32%, 36%, 40% and 61% compared to wood ash sole application.

Among the sole treatments, pig manure had the highest values of pumpkin leaf yield, fruit length, fruit diameter and fruit weight (t/ha) compared to the goat manure, oil palm bunch ash and wood ash treatments respectively. Pig manure increased the leaf yield, fruit length, fruit diameter and fruit weight of fluted pumpkin by 14%, 18%, 9% and 15% respectively compared to the wood ash treatment.

The control treatment had the least values of fluted pumpkin leaf yield, fruit length, fruit diameter and fruit weight.

Effect of organic fertilizers on the soil chemical composition after harvesting fluted pumpkin

The organic fertilizers increased the soil N, P, K, Ca, Mg, pH and O.M significantly ($P<0.05$) relative to the control treatment (Table 5).

Wood ash + pig manure increased the soil pH, O.M, N, P, Ca and Mg by 25%, 88%, 3%, 1%, 99% and 98% respectively compared to NPK 15-15-15 fertilizer treatment except soil K where NPK 15-15-15 fertilizer slightly increased more than the wood ash + pig manure.

Table 4: Effect of organic fertilizers on the leaf and fruit yield of telfaria occidentals (Fluted Pumpkin)

Treatments	Leaf Yield (t/ha)	Fruit Length (cm)	Fruit Diameter (cm)	Fruit Weight (t/ha)
Control	2.00a	6.90a	2.25a	0.65a
NPK 1515 15	29.00g	37.00f	5.30i	57.70i
Pig manure	23.ood	28.70d	3.50e	26.50e
Wood ash	19.70b	23.60c	3.18b	22.50bc
Goat manure	21.30c	28.0d	3.20bc	24.00d
Oil palm bunch ash+goat manure	20.10b	22.00b	3.30d	22.00b
Oil palm bunch ash +goat manure	26.4e	38.50g	4.70f	32.50f
Oil palm bunch ash +pig manure	32h	35.15e	4.80fg	46.0h
Wood ash + goat manure	28f	38.67h	5.10h	38.50g
Wood ash + pig manure	35i	42.15i	5.40j	58.50j

Treatment means followed by the same letters within each group or columns are not significantly different from each other using Duncan Multiple Range Test at 5% level.

The NPK fertilizer treatment decreased the soil pH and O.M contents after harvesting the fluted pumpkin compared to the initial soil nutrient status. The NPK fertilizer treatment had higher ratios of K/Ca, P/Mg and K/Mg were 131:1, 920:1 and 98:1 respectively under NPK 15-15-15 fertilizer treatment compared to K/Ca 2:1, P/Mg 19:1 and K/Mg 2:1 respectively under wood ash + pig manure treatment.

Generally, the amended forms of oil palm bunch ash and wood ash with pig and goat manures increased the values of soil N, P, K, Ca, Mg, pH and O.M more than their sole application (oil palm bunch ash, wood ash, pig and goat manures). For example, oil palm bunch ash + goat manure increased soil pH, O.M, N, P, K, Ca and Mg by 3%, 43%, 20%, 26%, 4%, 17% and 5% respectively compared to the oil palm bunch ash (sole).

Among the sole forms of the treatments, both oil palm bunch ash and wood ash had the highest values of soil pH, K, Ca and Mg while pig manure had the highest values of soil O.M, N and P respectively.

DISCUSSION

The least values of growth, leaf yield and fruit yield parameters of fluted pumpkin and soil N, P, K, Ca, Mg, pH and O.M in the control treatment might be traced to the initial poor nutrient status of the soil and continuous cultivation of the land without fertilizer application. Hence the fluted pumpkin plants were having deficiency symptoms of yellow, purple colorations and the marginal burn of leaves consistent with N, P, K or Mg deficiencies in soils.

This observation agreed with the research findings of Adepetu et al (1978)[20] which reported about 58% drop in soil O.M over seven years of continuously cropping on Iwo soil association in the greenhouse and field conditions. Therefore, this observation also agreed with the fact that application of fertilizers especially organic fertilizers enhanced both soil and crop productivity in the tropics.

Table 5: Soil chemical composition after harvesting telfaria occidentalis

Treatments	Soil pH	O.M (%)	N (%)	P (mg/kg)	K (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)
Control	5.40a	0.32ab	0.0 3a	3.42a	0.04a	0.07ab	0.08ab
NPK 1515 15	5.30a	0.28a	0.37gh	36.80h	3.92j	0.03a	0.04a
Pig manure	6.40c	1.38f	0.26e	22.52d	2.40bc	1.22c	0.74c
Wood ash	6.50c	1.21cd	0.24c	20.90b	3.24d	1.58d	1.29e
Goat manure	6.20b	1.28e	0.25cd	21.65c	2.20b	1.13b	1.04d
Oil palm bunch ash+goat manure	6.70d	1.19c	0.21b	20.57b	3.30de	1.69e	1.48f
Oil palm bunch ash +goat manure	6.90e	2.10g	0.30f	27.80e	3.43f	1.86f	1.53g
Oil palm bunch ash +pig manure	7.20f	2.30h	0.35g	30.56f	3.50g	2.10g	1.67h
Wood ash + goat manure	6.95e	2.20g	0.36h	32.40g	3.58g	2.30h	1.74i
Wood ash + pig manure	7.10f	2.36hi	0.38i	37.10i	3.65i	2.42i	1.90j

Treatment means followed by the same letters within each group or columns are not significantly different from each other using Duncan Multiple Range Test at 5% level.

The effectiveness of oil palm bunch ash and wood ash in improving the soil, growth, leaf and fruit yields of fluted pumpkin when mixed with pig and goat manures can be attributed to enhancement of their degradation rate by the manures with lower C/N ratio. This observation was supported by Moyin-Jesu and Adeofun (2008)[21] who reported that the lower C/N ratio of poultry and turkey manures enhanced the decomposition of spent grain and oil palm bunch ash.

In addition, the processing of the organic fertilizers before application to the soil would have enhanced further their decomposition and rate of nutrient release to the soil.

This findings might be responsible for the exception difference in the performance of the oil palm bunch ash and wood ash amended with pig and goat manures compared to the work of Adebayo and Olayinka (1984)[22] which used the unprocessed forms of oil palm bunch ash and sawdust amended with poultry and turkey manures to grow maize.

The better performance of wood ash + pig manure treatment in increasing the vine length, leaf population stem girth and number of branches of fluted pumpkin compared to the NPK 15-15-15 fertilizer could be traced to their rich nutrients (N, P, K, Ca and Mg) which increased the soil nutrients and consequently improved nutrient and uptake in the plants as observed by Ndor et al, (2013)[23] and Moyin-Jesu (2014)[24]. The same trend of performance was observed for fruit length, fruit diameter and leaf yield respectively. The significant difference ($P<0.05$) in the fruit weight of fluted pumpkin in NPK 15-15-15 fertilizer and wood ash + pig manure also confirmed the balanced nutrient composition of the latter in meeting the nutritional needs of crops by supplying more Ca and Mg to the telfaria crop. Aderi et al (2011)[25].

In addition, the application of NPK 15-15-15 fertilizer at 300kg/ha has led to high soil K/Ca, K/Mg and P/Mg ratio which made difficult the availability of nutrients such as K, Ca, Mg and others to fluted pumpkin. This could be responsible for the lower values of soil Ca,

Mg, O.M and P compared to the oil palm bunch ash and wood ash amended with pig and poultry manure.

The observation was further supported by Agboola (1982)[26] and Moyin-Jesu (2007)[27] who reported that arbitrary use of inorganic fertilizers resulted in signs of toxicities, poor yield responses and rapid deterioration of soil properties.

The striking performances of the amended oil palm bunch ash and wood ash with pig and goat manures over their sole forms, was due to the fact that pig and goat manures have high nutrient contents and their combination with oil palm bunch ash and wood ash fortified their nutrient supplying power.

This observation explained the superiority on the growth, yield parameters and soil chemical composition of fluted pumpkin in the wood ash amended with pig manure compared to the sole application of pig manure.

This was in line with Moyin-Jesu (2012)[28] who reported nutrient superiority of organically amended fertilizers over their sole forms in Kolanut seedlings production.

However, it was observed that the performance of amended oil palm bunch ash with pig manure in increasing the growth, yield and soil parameters of fluted pumpkin was different from the work of Emede et al (2002)[29] which used sawdust amended with poultry manure to grow amaranthus (A. Cruentus NH84/445), also the performance of the wood ash + pig manure in improving growth, leaf and fruit yield parameters of fluted pumpkin was different from the work of Fashina et al (2002)[3] and Dauda et al (2008)[30] which used poultry manure to grow fluted pumpkin and water melon.

These differences might be due to the higher nutrient composition and lower C/N ratio of oil palm bunch ash and wood ash over saw dust as well as faster release of nutrients from the processed pig manure over the unprocessed poultry manure.

The values of leaf yield and fruit weight of fluted pumpkin obtained under wood ash + pig manure were far higher than those obtained by Akanbi et al (2007)[31] under combined use of cassava peels and NPK fertilizer to grow fluted pumpkin. This might be adduced to the nutrients superiority of wood ash and pig manure over the cassava peels compost and NPK 15-15-15 fertilizer used by the researchers, also, the same trend was observed for Ndor et al (2003)[23] work on Telfaria in Nassarawa Nigeria. The increase in soil pH under sole forms of oil palm bunch ash and wood ash or their amended forms with pig and goat manures compared to other treatments could be traced to their high K, Ca and Mg contents which would, in turn, serve as liming materials (Gordon, 1988)[32] unlike the NPK 15-15-15 fertilizer which on continuous use decreased soil pH.

The soil pH had been reported to influence nutrient uptake and availability. Obatolu (1995)[5] reported that oil palm bunch ash, wood ash and cocoa pod husk improved K, Ca and Mg nutrients and corrected soil acidity in an Alfisol grown to coffee and maize.

In terms of nutritional status, the consumption of fluted pumpkin by human beings would supply more protein, mineral and vitamins for body growth and build up of blood system as noted by Badifu and Ogunsua (1991)[1] and Aletor et al (2002)[2]. The implication is that farmers and other people in the society would spend less amount of money in purchasing drugs containing protein, mineral, vitamins and oil.

Hence, the people would become stronger in term of health status and increased productivity to national income of their countries, thereby meeting the attainment of food security and sound health under the Millennium Goal Development of United Nations by 2015.

Conclusions and Recommendation

The sole and amended forms of oil palm bunch ash and wood ash with pig and goat manures applied at 6t/ha increased the soil, leaf and fruit yields of fluted pumpkin and soil N,

P, K, Ca, Mg, pH and O.M. It is recommended that amended wood ash + pig manure (6t/ha) was the most effective fertilizer materials for improving the nutrient availability and ensuring sustainable cultivation of fluted pumpkin on commercial basis and it could replace significantly the 300kg/ha of NPK 15-15-15 fertilizer.

This recommendation agreed with the fact that inorganic fertilizers are becoming very expensive to purchase by small holding farmers of fluted pumpkin, also, these organic materials appear to have beneficial secondary benefits on soil properties as well as being favourable to the environment.

REFERENCES

1. Badifu, G.I. O and Ogunsua, A.O. 1991, Chemical composition of kernels from some species of circibitaceae grown in Nigeria. Plant Food Human Nutrition, 41: 35-44.
2. Aletor, O. Oshodi, A.A, Ipinmoroti K. Chemical composition of common leafy vegetables and functional properties of their leaf protein concentrate. Food Chemistry. 2002; 78:63-68.
3. Fasina, A.S, K.A Olatunji and Alashiri, K.O 2002. Effect of different plant population and poultry manure on the yield of Ugu (Telfaria Occidentahs L). In proceedings of the Annual Conference of Horticultural Society of Nigeria (HORTSON) eds. I.A Ayelagbe, May 14, 2002, NIHORT Ibadan, Nigeria: 20-25.
4. Moyin-Jesu, E.I and S.O. Ojeniyi 2006: Effects of sole and amended plant residues on soil nutrient contents and yield of okra (Abelmoschus esculentum L). Discovery and Innovation Journal. 18 (4): 318-326.
5. Obatolu, C.R. 1995: Nutrient balance sheet of Alfisol grown to coffee and maize using organic fertilizers. In Proceedings of the third annual conference of all African Soil Science Society. "The International Conference on Soil Management and Environmental Protection". University of Ibadan, Nigeria. Pp: 250-256.
6. Adekiya, A.O. and Agbede, T.M 2009: Growth and yield of tomato (Lycopersicon esculentum Mill) as influenced by poultry manure and NPK fertilizer. Emirate Jour. Food and Agric 2009. 21 (1): 10-20.
7. Soil Survey Staff. 1999. Soil Taxonomy. A basic system for soil classification for making and interpreting soil surveys. Agric Handbook No. 435, USDA, Washington, D.C
8. Crockford, L. and R. Newell. 1956. Laboratory manual of Physical Chemistry. Exp. 31 and 32. John Wiley and Sons, New York.

9. Walkley, A and I.A Black. 1934. An examination of degtajaroff method for determining soil organic acid filtration method. Soil Sci. 37: 29-38.

10. Murphy, J. and J.P Riley. 1962. A modified single solution method for determination of phosphate in natural waters. Analytical Chem. Acta 27:31-36.

11. Jackson, M.L 1958. Soil Chemical Analysis. Englewood Cliffs N.J Prentice Hall. 57-69.

12. Jackson, M.L. 1964. Soil Chemical Analysis. Englewood Cliffs N.J Prentice Hall. 86-92.

13. Ojeniyi, S.O. 1985. Effect of replacement of grass and forest with tree crops on soil textural and chemical properties. A paper presented at International Conference on Soil fertility, soil tilth and post clearing land degradation in the humid tropics. University of Ibadan. Pp 20-27.

14. Bouycous, H. 1951. Mechanical analysis of soils using hydrometer method. Analytical Chem. Acta 22:32-34.

15. AOAC. 1970. Official Methods of Analysis 12th ed. Association of Official Analytical Chemists. Arlington, VA.

16. Gomez, K.A and A.A. Gomez. 1984. Statistical procedures for Agricultural Research 2nd edition. John Wiley and Sons. New York.

17. Agboola, A.A and R.B Corey. 1973. Soil testing N, P, K for maize in the soils derived from metamorphic and igneous rocks of Western State of Nigeria. Nigeria Jour. West African Sci. Assoc. 17:93-100.

18. Sobulo, R.A and O.A. Osiname. 1981. Soils and fertilizer use in Western Nigeria. Tech Bull. No. 11 Institute of Agricultural Research and Training, University of Ife, Nigeria.

19. Folorunso, O.O., A.A Agboola and G.O. Adeoye. 2000. Evaluation of three fertilizer models for P and K recommendation in maize (Zea Mays L) Jour of Technical Education. 2: 237-253.

20. Adepetu, J.A, A.A. Adebayo, E.A. Adeayi and C.O. Alofe. 1978. A preliminary survey of the fertility status of soils in Ondo State under traditional cultivation, Ife Jour of Agric. 1: 134-139.

21. Moyin-Jesu E.I and C.O. Adeofun. 2008. Comparative evaluation of different organic fertilizers on the soil fertility, leaf mineral composition and growth performance of Mango seedlings (Magnifera Indica L). Emirate J. Food Agric. 2008: 20 (1): 18-30.

22. Adebayo, A and Olayinka, A. 1984. The effect of methods of application of sawdust on plant growth, nutrient uptake and soil chemical properties. Ife Jour of Agric 2 (1): 36-44.

23. Ndor, E, Dauda S.N and Garba, M.N 2013. Growth and yield performances of fluted pumpkin (Telfaria occidentahs Hook F.) under organic and inorganic fertilizers on Ultisols of North Central Nigeria. International Jour of Plant and Soil Science 2 (2): 212 – 221, 2013.

24. Moyin-Jesu, E.I. 2014. Effect of water extracts of wood ash, leaf and their mixture on the soil fertility, growth and yield of plantain (Musa Sapientum L). American Jour of Experimental Agric.

25. Aderi O.S, Udofia A.C, Ndeayo N.U. Influence of chicken manure rates and inorganic fertilizer formulations on some quantitative parameters of fluted pumpkin (telfaria occidentahs hooks F). Nigerian Journal of Agriculture, Food and Environment 2011. 7 (1): 9-15

26. Agboola, A.A 1982. Soil testing, soil fertility and fertilizer use in Nigeria. A paper presented at the first National Seminar on Agricultural Land Resources, Kaduna, Nigeria pp 6-8.

27. Moyin-jesu, E.I. 2007. Effects of some organic fertilizers on soil and coffee (Coffea Arabica L), leaf chemical composition and growth. University of Khartoum Jour of Agric Sci 15 (1): 52-70.

28. Moyin-jesu, E.I. 2012: Simple and blended organic fertilizers improve the soil fertility of degraded nursery soils for Kolanut seedlings. In Teach Publishers Open Access book.Eds Joaan K. Whalen. ISBN: 978-953-307-945-5: pp 209-306. www.intechweb.org

29. Emede, T.O. Osaigbovo, V.A, Egaharevha, R.K.A and Sideni, P 2002. Effects of poultry manure on the growth and yield of Amaranthus cruentus L. in Proceedings of the 20th Annual Conference of Horticultural Society of Nigeria, Port Harcourt, Nigeria. Pp 23-26.

30. Dauda, S.N, Ajayi, F.A and Ndor, E. Growth and yield of water melon (cirtullus lanatus L) as affected by poultry manure application. Journal of Agric and Social Science. 2008; 4: 121-124.

31. Akanbi, .A.B Adeboye, C.O, Togun, A.O. Ogunrinde J.O and Adeyeye S.A. 2007. Growth, Herbage and seed yield and quality of Telfaria occidentahs as influenced by cassava peels compost and mineral fertilizer. World Journal of Agric Science 3 (4): 508-516 ISSN 1817-3047.

32. Gordon, W. 1988. Coffee Tropical Agricultural Series. In:H. Murray (Eds). Pp 1-20. Macmillan Publishing Ltd. London.