Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol 2, No.10, 2012
www.iiste.org

Short-term response of Soil Physical properties of an Ultisol, and Nutrient composition of Fluted Pumpkin to Organic and Inorganic Fertilizer mixtures.

Nwite J.C[1], E.N Ogbodo[2] , S.E Obalum[3], V.C Igbo[4], and C.A Igwe[3]

[1] Department of Crop Production, Federal College of Agriculture, Ishiagu P.M.B. 7008, Ivo L.G.A, Ebonyi State, Nigeria

[2] Department of Soil Science and Environmental Management, Ebonyi State University, Abakaliki

3 Department of Soil Science, University of Nigeria, Nsukka, Nigeria

[4] National Root Crop Research Institute, Umudike, Abia State

*Corresponding author's name and e-mail address: Ogbodo Emmanuel N.; Email: emmanwaogbodo@yahoo.com . Phone number; +2348037465495

Abstract

A field experiment was conducted at the Research Farm of Federal College of Agriculture, Ishiagu, Ebonyi State to evaluate the influence of sole organo-minerals and inorganic fertilizer and mixed forms on some selected soil physical properties and leaf nutrient composition of fluted pumpkin (*Telfairia Occidentalis* Hook F). The treatments (T_1 = Control; T_2 = 10 t/ha of rice-husk dust; T_3 = 10 t/ha rice husk ash; T_4 = 10 t/ha poultry droppings; T_5 = 0.375 t/ha of NPK fertilizer 15:15:15; T_6 = 5 t/ha of rice husk dust + 5 t/ha of poultry dropping; T_7 = 5 t/ha of rice husk dust + 0.188 t/ha NPK 15: 15: 15; T_8 = 5 t/ha poultry dropping + 5 t/ha of rice husk ash; T_9 = 5 t/ha rice husk ash + 0.38 t/ha of NPK 15:15:15) were built into a randomized complete block design (RCBD) with three replications. Data on soil physical properties and leaf nutrient composition of fluted pumpkin` were collected and subjected to statistical analysis using Genstat 3 7.2 Edition. The results obtained showed that soil bulk density was significantly reduced on soils treated with different amendment combinations of organo-minerals and inorganic fertilizer compared to the control which received no application of amendment. The soils total porosity, saturated hydraulic conductivity and moisture content were improved when treated the soil with different amendment combinations compared to the control .More so, the results equally revealed that treatments application did statistically improve the leaf nutrient compositions.

Key words: Amendments, Soil physical properties, organo-minerals, nutrient composition, fluted pumpkin.

1. Introduction

Vegetable products are of importance in human nutrition and they will continue to remain as primary source of energy, lipids and carbohydrates, including fibres, minerals and vitamins in developing countries (Oyolu, 1980; Lima *et al.,* 2009). *Telfairia occidentalis* (fluted pumpkin), a member of Cucurbitaceous family is one of the commonly consumed leafy and seed vegetables in Nigeria. It is an important leaf and seed vegetable indigenous to Southeastern Nigeria, and found throughout the former forested areas from Sierra Leone to Angola and up to Uganda in East African (Okoli, 1987). 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 the maintenance of good health most especially among poor resource ruralities in developing countries. In Nigeria, the herbal preparation of the plant has been employed in the treatment of anaemia, chronic fatigue and diabetes (Alada, 2000).

The leaf has a high nutritional, medicinal and industrial values being rich in protein (29 %), fat (18 %) and minerals and vitamins (20 %) (Tindall 1986). The oil in the seeds is non-drying and is useful in soap making and in cooking

(Fashina *et al.,* 2002). The seed oil could also of be used for the preparation of margarine and pomade as well as for use as carrier for drugs (Asiegbu, 1987). Also Asigebu (1987) reported that protein and oil content of the seed are 30.1% and 47% respectively. The oily seeds also have lactation promoting properties and are widely consumed by nursing mothers. The composition of the seed per 100g edible portion is water 6.0g; energy 2280kj (543k cal); protein 20.5g; fat 45.0g; carbohydrate 23.5g; fiber 2.2g; calcium(Ca) 84mg and Phosphorus (P) 572mg; (leung, *et al*., 1968). The seeds are high in essential amino acids (except lysine) and can be compared to soya bean meal with 95% biological value. The fruit pulp has a protein content of about 1.0%. The main constituents of the seed oil are oleic acid (37%), steric and palmetic acid (both 21%); and linoleic acid (15%) (FAO, 1988). Variation between samples however is large.

Soil organic matter influence the degree of aggregation and aggregate stability and can reduce bulk density, increase total porosity and hydraulic conductivity of heavy clay soils (Anikwe, 2000). Variations in water retention and available water capacity for different soils amended with organic wastes have been reported by (Mbagwu and Ekwealor, 1990). Leucaena biomass combined with mineral fertilizer gave higher crop yields as compared to sole use of mineral fertilizer or sole leucaena biomass (Mugendi *et al.,* 1999).

Despite the nutritive values obtainable from fluted pumpkin, it is a common observation that the demands far exceed the supply of fluted pumpkin as a vegetable crop resulting in scarcity which increases cost. Nigerian farmers' access to fertilizer in vegetable growing season is limited by fund (Agbede and Kalu 1995), Scarcity and late distribution are the major problems to the optimum production of vegetables. It is therefore necessary to source for locally available, cheap and environmental friendly materials that can be used solely or integrated for vegetable production. Organic materials have advantages of being environmental friendly as reported by Yusoff (1992).

The study aimed at investigating the effect of sole organo-minerals, inorganic fertilizer and their mixtures on the soil physical improvement and leaf nutrient composition of fluted pumpkin.

2. Materials and mathods

Experimental site:

The experiment was conducted in 2011 at the Research Farm of Federal College of Agriculture, Ishiagu. The area lies within latitude 05°56 ´N and longitude 07°41´E in the Derived Savannah Zone of Southeastern Nigeria. The mean annual rainfall for the area is 1350 mm, spread from April to October with average air temperature being 29 °C. The underlying geological material is Shale formation with sand intrusions locally classified as the 'Asu River' group. The soil is hydromorphic and belongs to the order Ultisol. It has been classified as Typic Haplustult (FDALR, 1985). Using a composite sample from the top- (0-20 cm) soil region at the study site, the soil was characterized before land preparation.

The soil amendments comprised partially burnt rice-mill wastes (rice husk ash) and fresh rice-mill wastes (rice husk dust) collected respectively from a rice-mill industry within the vicinity of the study site. Others included poultry droppings sourced from Animal production department of the Federal College of Agriculture, Ishiagu and NPK 15:15:15.

Field study

The experiment was carried out in 2011 cropping season. The treatments were laid into randomized complete block design (RCBD) with three replications. Nine treatments of single and their mixture as soil amendments including the control were used. The soil amendments were different manure sources and their mixtures, applied at different rates and these included:

T_1 = Control; T_2 = 10 t/ha of rice-husk dust; T_3 = 10 t/ha rice husk ash; T_4 = 10 t/ha poultry droppings; T_5 = 0.375 t/ha of NPK fertilizer 15:15:15; T_6 = 5 t/ha of rice husk dust + 5 t/ha of poultry dropping; T_7 = 5 t/ha of rice husk dust + 0.188 t/ha NPK 15: 15: 15; T_8 = 5 t/ha poultry dropping + 5 t/ha of rice husk ash; T_9 = 5 t/ha rice husk ash + 0.38 t/ha of NPK 15:15:15

Field preparation, data collection and analyses

The experimental site was cleared, ploughed, harrowed and made into seed beds. The treatments were allocated into the plots and incorporated into 0-5 cm soil depth before planting except treatment 5 (NPK fertilizer). The rice husk dust and poultry dropping amendments were applied into the soil two weeks before planting, while the rice husk ash was applied two days before planting. Planting of the test crop, fluted pumpkin (*Telfairia*) seeds were done one seed per hole at the depth of 2.5 cm and planting distance of 1 x 1 m apart.

Leaf analysis

Fluted pumpkin (Telfairia) vegetative samples were collected from all the plots at 8th week after planting and subjected to chemical analysis to determine their nutrient composition. Leaf samples were oven dried at 60 ^{0}C to constant weight. Dried samples were ground and passed through 2.00 mm sieve. The ash, crude fibre, moisture content and dry matter content were determined as described by AOAC (1990); while the Calcium, phosphorous and vitamins were determined as described by Okalebo *et al*. (2002).

Soil sample collection and laboratory analyses

Soil samples (0-20 cm) were collected from different representative locations with the aid of soil auger. The soil samples were air-dried and sieved with 2 mm sieve and routine analyses done using the soil fractions less than 2 mm for the determination of particle size distribution.

Duplicate soil cores 5.4 cm diam. 6 cm long was obtained from 1–7 cm depth from each plot at the end of the research work.

The soil cores were used for determination of Soil Bulk density (bd) which was obtained by the use of core method described by (Stolt, 1997). Total porosity (TP) was obtained from bulk density value with assumed particle density (pd) value of 2.65 g cm^{-3} as follows:

$$Tp = 100\,(1 - bd/pd)$$

The same soil cores were also used to determine the following soil physical properties:

Saturated hydraulic conductivity *(*Ksat) which was determined by the constant head permeameter technique (Klute and Dirksen, 1986) as:

$$\frac{QL}{AT.\,H}$$

Where;

Q is volume of water (cm3) that passed through a cross sectional area, A (cm2), T is time

elapsed (sec.), L is length of core (m), A is the cross sectional area of the core (cm2) and H is

hydraulic head difference (cm) and Gravimetric moisture content was determined using the method described by Obi (2000).

Data analyses

Statistical analyses of data was performed using **GENSTAT** 3 7.2 Edition. Significant treatment means were separated and compared using Least Significant Difference (LSD), and all inferences were made at 5 % levels of probability.

3. Results and discussion

Effects of soil amendments on soil properties

The results of bulk density, total porosity, saturated hydraulic conductivity and moisture content were shown on Table 2. There was a significant ($p<0.05$) reduction of bulk density in all amended plots compared to the control plots. The bulk density ranged from 1.073 to 1.42 with the lowest value obtained from plots treated with 5 t/ha RHD + 5 t/ha PD. The results showed that integrated application of the organo-minerals and mineral fertilizer significantly reduced the soil bulk density than the sole application of these amendments. The lower bulk density obtained from the treated plots can be as a result of the improved soil structure, hence increase in the soil granulation and improving the sol porosity. More so, the decreased bulk density could equally be as result of increased microbial activity. The result is in line with the research findings of Hulugalle and Palada (1990) and Mbagwu and Nnabude (2001). Ikpe and Powell (2002) observed that low soil bulk density enhanced access to soil moisture and increased nutrient uptake resulting in higher crop yield. The low soil bulk density obtained was believed to have facilitated root growth and penetration thus leading to improved yield of fluted pumpkin.

The sole and combined application of the organo-minerals and inorganic fertilizer improved the soil structure, reduced compaction and increased soil porosity hence improving the level of soil water intake. Compared to the control, all the treatments increased soil total porosity with the application of 5 t/ha RHA +5 t/ha PD giving the highest total porosity (56.13) while control recorded the lowest value of 46.87. Werner (1997) reported increase in total porosity as a result of low bulk density. The lower total porosity of the control brought about by the non-application of amendments conversely reduced the rate of water infiltration down the profile, Ogbodo (2010).

The result indicated that all the treatments relatively increased the saturated hydraulic conductivity over the control. The saturated hydraulic conductivity values ranged from 13.02 to 28.86 with the highest value (28.86) obtained from plots treated with 5 t/ha RHD + 0.188 t/ha NPK. Increase in saturated hydraulic conductivity could be attributed to increased water infiltration due to soil pulverization brought about by the addition of soil amendments. Martens and Frankenberger (1992) reported significant improvement of soil properties as a result of the addition of organic amendments to soil. Treatment 7 (5 t/ha RHD + 0.188 t/ha NPK) gave the highest value of hydraulic conductivity when compared to other treatments.

The increased infiltration due to soil amendments also increased the water storage capacity of the soil. When compared to the control, all the treatments significantly improved the moisture content of the soil higher except treatments $\mathbf{T_8}$= 5t/ha RHA + 5t/ha PD and $\mathbf{T_9}$ = 5t/ha RHA + 0.38 t/ha NPK. The soil moisture content ranged from 61.11 to 70.53 with the highest value (70.53) obtained at the application of 5t/ha RHD + 5t/ha PD. The reduced moisture content in 5t/ha RHA + 5t/ha PD and $\mathbf{T_9}$ = 5t/ha RHA + 0.38 t/ha NPK could be as a result of the high surface area of rice husk ash in combination with poultry droppings and NPK. Treatment 6 (5 t/ha RHD + 5 t/ha) gave the highest moisture content value of 70.53 when compared with other treatments. This improvement could be due to increase in total porosity and low bulk density in rice husk dust treatment supplemented with poultry droppings.

Effects of soil amendments on leaf nutrient composition

Proximate analysis of *Telfairia* leaves as affected by the soil amendments application is presented in Tables 3 and 4. The result (Table 3) showed that sole poultry droppings (PD) and NPK fertilizer significantly reduced the crude fibre in fluted pumpkin. It was also recorded that the integration of all the amendments (organic and inorganic fertilizers) statistically reduced crude fibre relative to the control. The result is in agreement with the report of Makinde *et al.* (2010) that the integration or combination of kola pod husk or poultry waste with NPK fertilizer significantly reduced crude fibre of amaranthus. More so, the result affirms the findings of Nwite *et al.* (2012) that the sole and combined application of rice husk dust and rice husk dust with poultry droppings and NPK fertilizer significantly reduced crude fibre of fluted pumpkin in a research conducted at the same location. However, inability of rice husk dust to significantly reduce the crude fibre over the control could be attributed to the fact that nutrients in the organic material which could have boosted the protein content of the plant are less easily available since the material takes longer time to decomposed and organic nutrients mineralized.

Generally, the soil amendments in sole form and their mixtures relatively increased the ash contents of the fluted pumpkin leaves, except sole rice husk ash, which its inability to increase the ash content of the plant leaf might be due to the ease with which the nutrients in the material were mineralized and leached.

Table 3 equally indicated that amended plots recorded significant effect on the moisture, dry matter and calcium contents of fluted pumpkin leaves. Generally, the quality and mineral element contents in the leaves and stems of fluted pumpkin were significantly improved with both application of sole inorganic and organic fertilizers and their mixtures. This result equally agreed with the findings of Olaniyi and Akanbi (2007), that the integration of N-fertilizer and organic fertilizer; and their sole application relatively improved moisture, fibre, crude protein, dry matter, fat and Ca contents of fluted pumpkin. It was obtained from the result that the amendments did not significantly increase phosphorous content of the fluted pumpkin leaves.

Effects of soil amendments on some vitamin composition of the fluted pumpkin

The result of Table (4) indicated that vitamin C was significantly improved upon by both the sole amendments and their integrations. It was also recorded that the highest vitamin C content in fluted pumpkin leaf was obtained from sole poultry dropping amendment with 18.60 mg/100g; while rice husk dust mixed with poultry dropping amendment yielded the best improvement on vitamin C content among the amendments mixtures.

It was also obtained that Thiamine, Riboflavin and Niacin were equally increased significantly by the soil amendments including their mixtures.

Conclusion

Results from the study have indicated that the application of organo-minerals and inorganic fertilizer in their both sole and mixtures can adequately improve soil physical properties and nutrient composition of fluted pumpkin. The study revealed that the physical constraints of the study area could be ameliorated considerably with the application of sole and combined application of organo-minerals and inorganic fertilizer.

However, since poultry droppings (PD) may not be much available in large quantities required for application by farmers and NPK fertilizers are scarce and /or costly, farmers are by the results of this study advised to use rice husk dust (RHD) and rice husk ash (RHA) that are so abound in the area with the integration of the PD or NPK. The use of these cheap and available wastes with little mixtures of PD or NPK by the poor resource farmers in the area regarded as food belt of Southeastern Nigeria, will not only improve the soil properties, but enhance vegetable nutrient composition on long term basis.

References

Agbede, O.O. and B.A. Kalu (1995). Constraints of small-scale farmers in increasing crop yield: farm size and fertilizer supply. Nigeria Journal of Soil Science, 11: 139-159.

Alada, A.R.A. (2000). The haematological effects of *Telfairia occidentalis* diet preparation. Afr. J. Biomed. Res. 3:

185 – 186 In: Kayolde, A.A.A and Kayode, O.T. (2011) Some medicinal values of *Telfairia occientalis*: A review. American Journal of Biochemistry and Molecular Biology, 1: 30-38.

Aletor, O., Oshodi, A. A. and Ipinmoroti, K. (2002). Chemical Composition of Common Leafy Vegetables and Functional Properties of their leaf protein concentrates Food Chemistry. 78: 63-68.

Anikwe, M.A.N (2000). Amelioration of a heavy clay loam with rice husk and its effect on soil physical characteristics and maize yield. Bioresource technology, 74, 169-173.

AOAC (1990). Official methods of analysis association of official Analytical Chemists 15th Edition, Washington, D C pp 112-119.

Asiegbu, J.E. (1987). Some biochemical evaluation of fluted pumpkin seed. J. Sci. Food Agric. 40:151 – 155.

Fashina, A.S, Olatunji, K.A., and Alasiri K.O., (2002). 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), 14-17th May 2002; NIHORT, Ibadan, Nigeria.

FAO (1988). Traditional Food Plants. Rome: FAO

FDALR (1985). Reconnaissance soil survey of Anambra State of Nigeria. Soils Report. Federal Department of Agriculture and Land Resources (FDALR), Lagos Nigeria.

Hulugalle, N.R and M.C. Pallada (1990). Effect of Seedbed preparation method and mulch on soil physical properties and yield of cowpea in a rice fallows of an Inland valley swamp. Soil and Tillage research. 1990. 17, 1-2; 101-113.

Ikpe, F.N. and Powell, J.M. 2002. Nutrient cycling practices and changes in soil properties in the crop-livestock farming systems of western Niger Republic of West Africa. Nutrient Cycling Agroecosystems. 62: 37-45.

Klute, A. and Dirksen, C. 1986. Hydraulic conductivity and diffusivity. Laboratory methods. In: A. Klute (ed.), Methods of Soil Analysis. Part 1, 2nd ed, ASASSSA, Madison, WI., pp 687-734.

Lima, G.P.P., Lopez, T.V.C., Roseto, M.R.M. and Vianello, F. (2009). Nutritional composition, Phenolic compounds, nitrate content in eatable vegetables obtained by conventional and certified organic grown culture subject to thermal treatment. International journal of Food Science and Technology 44: 1118-1124.

Leung, W. T. W., Busson, F., and Jardin, C. (1968). *Food Composition ¹able for ;se in Africa*. (DHEWPublication No. (NIH) 79}465). U.S. Government Printing O$ce, Bethesda, MD.

Martens, D. A. and Frankenberger, W. T., Jr. (1992). Modification of infiltration rates in an organic-amended irrigated soil. Agron. J. 84: 707–717.

Mbagwu, J.S.C. and G.C. Ekwealor, 1990. Agronomic potentials of brewer's spent grains. Biologic Wastes, 163: 94-102.

Mbagwu, J.S.C and Nnabude, P.C (2001). Physicochemical properties and productivity of a Nigerian typic-Haplustult amended with fresh and burnt rice mill waste, Bioresource technology, vol. 76: 267 – 272.

Makinde E.A., L.S. Ayeni, S.O. Ojeniyi and J.N. Odedina (2010).). Effect of organic, Organomineral and NPK Fertilizer on Nutritional quality of Amaranthus cruentus (L) in Lagos, Nigeria. Researcher.2010; 2 (2): 91 – 96. ISSN: 1553 – 9865. http://www.sciencepub.net/researcher.

Mugendi, D.N., P.K.R. Nair, J.N. Mugwe, M.K.O'Neill and P.L. Woomer (1999). Calliandra and Leucaena alley cropped with maize. Part 1 Soil fertility changes and maize production in the sub-humid highlands of Kenya. Agrof. Systems, 46: 39-50.

Nwite J.C. C.I. Keke. S.E. Obalum. C.C. Okolo. J.B. Essien. M.U. Anaele and C.A Igwe(2012) . Evaluation of Organo-minerals and Inorganic Fertilizer Soles and their Mixtures on Some Selected Soil Chemical Properties and Leaf Nutrient Composition of Fluted Pumpkin (*Telfairia occidentalis* Hook F.) in an Ultisol of Southeastern Nigeria. Proceedings of International Agricultural Conference, held at Anambra State University, Igbariam Campus, 6th – 9th May 2012. Pp 494 -501

Obi, M. E (2000). In soil physics: a compendium of lectures. Atlanto Publishers Nsukka, Nigeria 111-118pp

Ogbodo EN (2010) Effect of Tillage methods on some soil properties and rice yield on an acid ultisol at Abakaliki, Southeastern Nigeria. Nigerian JOurnl of Soil Sci 21(1):47–57.

Okalebo J.R, K.W. Gathua and P.L. Woomer (2002). Laboratory Methods of Soil and Water Analysis: A Working Manual (2nd eds.) Naairobi, Kenya. SACRED Africa. 128 pp.

Okoli, B.E. (1987). Morphological and cytological studies in Telfairia Hook (Cucurbitaceae) Feddes Repertorium 98: 9-10.

Olaniyi J.O. and W.B. Akanbi (2007). Effect of organo mineral and inorganic fertilizers on the yield quality of fluted pumpkin (*Telfairia occidentalis* hook F.). African Crop Science Conference Proceedings Vol.8. pp 347 – 350. Printed in El – Minia, Egypt.

Oyolu, C., 1980. Maximizing the contribution of okro (*Hibiscus esculentus*) to the national diet. Proceedings of the

3rd Conference Host Soc. Nigeria at University of Ife, 30 November, 3 December.

Stolt, J., (1997). Manual of soil physical measurements.Version 3 Wageningen, D.L.O. Staring Centre Teach Doc., pp: 37.

Tindall, H.D. (1986). Vegetables in the Tropics: Mac-Millan Education Ltd. Houndmills. Hampshire. Pp. 533.

Werner, M.R., (1997). Soil Quality Characteristics during conversion to organic orchard management. *App. Soil Ecol 5*: 151-167

Yusoff, A.R.M, (1992). Cattle rearing under oil palm (Profitability of cattle oil palm) The planter, Jan. 1992, 68(790): 19-24.

Table 1: Some properties of the topsoil (0-20cm) before amendments

Soil property	Value
Soil Texture	
Clay (%)	18.7
Silt (%)	15.1
Total sand (%)	66.2
Textural class	sandy loam
Bulk density	1.73
Total porosity	34.4
Aggregate stability	3.6
Mean weight diameter	0.19
Hydraulic conductivity (Ksat)	3.37

Table 2: Effects of Soil Amendments on Soil Properties

Treatment	BD (mg m^{-3})	Total P (%)	Ksat (cm hr^{-1})	MC (%)
T_1 = Control	1.42	46.87	13.02	63.63
T_2 = 10 t/ha RHD	1.28	51.5	27.2	68.52
T_3 = 10 t/ha RHA	1.32	50.07	27.44	64.76
T_4 = 10 t/ha PD	1.37	48.30	22.77	69.52
T_5 = 0.375 t/ha NPK	1.26	54.47	27.85	65.35
T_6 = 5 t/ha RHD + 5 t/ha PD	1.073	58.73	25.48	70.53
T_7 = 5 t/ha RHD + 0.188 t/ha NPK	1.187	54.97	28.86	70.41
T_8 = 5 t/ha RHA +5 t/ha PD	1.223	56.13	23.54	62.8
T_9 = 5 t/ha RHA + 0.38 t/ha NPK	1.367	48.7	23.91	61.11
Mean	**1.278**	**52.19**	**24.45**	**66.29**
LSD at 0.05	0.0849	NS	3.22	2.421

RHD = Rice Husk Dust, RHA = Rice Husk Ash, PD = Poultry dropping, NPK = Nitrogen. Phosphorus. Potassium fertilizer (15:15:15).

Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol 2, No.10, 2012

Table 3: Effects of soil amendments on leaf Nutrient composition

Treatment	Fibre	Ash	Moisture cont. (MC)	Dry matter (DM)	Phosphorous	Calcium
T_1 = control	14.07	4.74	10.05	88.32	293	165.37
T_2 = 10 t/ha RHD	13.93	5.0	10.69	89.73	483	186.30
T_3 = 10 t/ha RHA	13.83	4.94	11.02	89.17	530	181.27
T_4 = 10 t/ha PD	11.41	5.69	11.15	89.24	501	170.37
T_5 = 0.375 t/ha NPK	12.65	5.97	11.07	89.44	539	178.20
T_6 = 5 t/ha RHD + 5 t/ha PD	12.37	4.98	10.95	89.25	495	180.47
T_7 = 5 t/ha RHD + 0.188 t/ha NPK	12.60	5.77	11.41	89.11	532	189.37
T_8 = 5 t/ha RHA + 5 t/ha PD	12.88	5.47	10.74	89.76	495	178.60
T_9 = 5 t/ha RHA + 0.188 t/ha NPK	12.73	5.74	10.77	89.49	506	178.67
LSD at 0.05	**0.594**	**0.173**	**0.577**	**0.638**	**NS**	**7.241**

RHD = Rice Husk Dust, RHA = Rice Husk Ash, PD = Poultry dropping, NPK = Nitrogen phosphorus potassium

LSD = Least significant difference, NS = Not significant

Table 4: Effects of Soil Amendments on some Vitamin composition of the Fluted Pumpkin

Treatment	Vitamin C	Thiamine	Riboflavin	Niacin
T_1 = control	12.63	0.037	0.020	0.40
T_2 = 10 t/ha RHD	14.17	0.047	0.047	0.48
T_3 = 10 t/ha RHA	15.13	0.057	0.027	0.47
T_4 = 10 t/ha PD	18.60	0.053	0.060	0.59
T_5 = 0.375 t/ha NPK	14.73	0.033	0.057	0.51
T_6 = 5 t/ha RHD + 5 t/ha PD	16.97	0.047	0.047	0.57
T_7 = 5 t/ha RHD + 0.188 t/ha NPK	15.43	0.043	0.053	0.47
T_8 = 5 t/ha RHA + 5 t/ha PD	16.07	0.040	0.063	0.51
T_9 = 5 t/ha RHA + 0.188 t/ha NPK	14.53	0.047	0.060	0.49
LSD at 0.05	**1.102**	**0.0088**	**0.00971**	**0.0425**

RHD = Rice Husk Dust, RHA = Rice Husk Ash, PD = Poultry dropping, NPK = Nitrogen phosphorus potassium

LSD = Least significant difference,

Intake and Growth Performance of West African Dwarf Goats Fed *Moringa oleifera*, *Gliricidia sepium* and *Leucaena leucocephala* Dried Leaves as Supplements to Cassava Peels

Vincent Asaolu[1*], Rachael Binuomote[2], Jelili Akinlade[2], Olusola Aderinola[2], Oyeniyi Oyelami[2]
[1]Department of Animal Nutrition and Biotechnology, Ladoke Akintola University of Technology, Ogbomoso, Nigeria
[2]Department of Animal Production and Health, Ladoke Akintola University of Technology, Ogbomoso, Nigeria
[*]E-mail of the corresponding author: voasaolu@yahoo.com

Abstract

An 84-day feeding trial was employed to investigate dried leaves of *Moringa oleifera (*MOR*)*, *Leucaena leucocephala (*LEU*)* and *Gliricidia sepium (*GLI*)* as supplements to cassava peels by 16 growing West African Dwarf goats, with a mixed concentrate (MC) of groundnut cake and wheal offals (50:50) as the reference supplement. Feed intakes, weight gain, feed conversion (FCR) and protein efficiency ratios (PER) were monitored. Crude protein contents of the browse leaves were high and ranged from 21.64 to 28.86 % for GLI and LEU respectively. Dry matter intakes ranged from 3.55 to 4.12 % of body weights for animals on gliricidia leaf and mixed concentrates supplements respectively. MOR supplementation resulted in an average weight gain of 20.83 g/animal/day, comparable ($P<0.05$) to the value of 21.43 g/animal/day for the MC supplementation. Feed and protein were however more efficiently utilized by animals on the MOR supplement, with FCR and PER values of 14.94 and 1.87 which were both significantly ($P>0.05$) lower than the corresponding values of 16.54 and 2.74 for animals on the MC supplement. The high potentials of MOR for replacing expensive concentrates as supplements to a wide array of fibrous crop residues, as represented by cassava peels, were demonstrated by the results of this study.

Keywords: WAD goats, concentrate feeding, cassava peels, *Moringa oleifera*, *Gliricidia sepium*, *Leucaena leucocephala*

1. Introduction

Livestock plays a very important role as an integral part of farming and rural life in developing countries; providing food and the critical cash reserve and income for many farmers who grow crops essentially for subsistence purposes (Preston & Leng1987). In the rural areas where most of the resource-poor farmers in Africa live, goats play an important socio-economic role (Anaeto *et al*., 2009), and form an integral part of the cultural life system of Nigeria's peasantry (Ajala, 2004). Goats are multipurpose animals producing meat, milk, skin and hairs (French, 1970). However, out of these products, meat is the major form in which goats are consumed in Nigeria (Alikwe *et al*., 2011). Goat meat is widely accepted and consumed in Nigeria because there is no taboo against it (Peacock, 1996). The demand for goat meat is very high especially in rural areas where it often commands higher market price than beef (Odeyinka, 2000). The meat from goat is preferable to those from other animal species because of its flavour, tenderness and palatability (Idiong & Orok, 2008). They are indispensable in marriage and religious rites (Gefu *et al*., 1994) and are an insurance against crop failure (Mattewman, 1980). In southern Nigeria, goats are a ready source of family income and a good medium to establish friendship or restore peace in a community (Idiong & Udom, 2011). The West African Dwarf (WAD) goat is a predominantly indigenous breed found in southern Nigeria (Odeyinka, 2000).

Small ruminants suffer scarcity of feed supply and pasture quality in the humid region of West Africa, especially during the dry season when the natural vegetation is of poor nutritive value (Aye, 2007). Specifically for goat production in Nigeria, Ahamefule & Elendu (2010) identified feed shortage as a major constraint. Native rangelands produce the cheapest source of nutrients for goats, and for a greater part of the year, grasslands do not supply