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EFFECT OF GOAT AND POULTRY MANURE APPLICATION ON SELECTED SOIL PROPERTIES AND YIELD OF GARDEN EGG (*Solanum melongena*) ON ACID SAND OF AKWA IBOM STATE OF NIGERIA.

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ABSTRACT

Field research was conducted at the University of Uyo Teaching and Research Farm in 2003 to determine the effect of goat and poultry manure application on selected soil Physico-Chemical properties, and yield of garden egg (*Solanum melongena*).The experiment was laid out in a Completely Randomized Design (CRD) with four replicates. Animal manure treatments were applied at 4 levels; Control [O t/ha], Goat Manure GM [lO t/ha], Poultry manure PM. [lO t/ha], and GM+ PM [5+5 t/ha] applied at 4 weeks after transplanting (WAT). Soil Samples were collected at 0-20 cm depth from treated plots at 1, and 3 months after transplanting [MAT] for laboratory analysis. Soil parameters analysed were; pH, organic matter, total Nitrogen, available Phosphorus, exchangeable Potassium, Calcium, Cation exchange capacity and base saturation percentage. Plant parameters sampled were; plant height urn), number of branches and leaves per plant, leaf area index (cm),and fruit yield (kg/ha).The result showed that poultry, goat manure and their combination [GM+PM] generally increased soil pH, with a range of 5.48-5.72 from initial pH of 4.24 in control plot. Poultry manure treatment alone, increased soil pH up to 5.87 representing 35.44 percent, and soil organic matter status by 6.66 % representing 126.53 percent over control respectively. Application of goat manure alone increased soil total Nitrogen status by 0.24 % representing 166.67 percent over control. Application of GM and PM alone improved base saturation percentage generally with PM giving a higher percent over control, application ot GM, PM alone and their combination significantly affected garden egg fruit yield.

INTRODUCTION

Arable soils of the tropics are degraded quickly in physical, chemical and biological qualities as a result of continuous cropping with persistent use of NPK fertilizers, increase soil acidity and physical degradation while crop yield may fall. Some of the fertilizers aggravate nutrient imbalance due to lack of soil testing programme (Ojeniyi, 2002). The use of animal manure as a source of plant nutrient is a well-established practice among the small scale farming sector in many counties including Nigeria. The vegetable farmers in some parts of Nigeria combine ground goat manure with wood ash or apply them separately to soil (Ojeniyi , 2000b). Garden egg mature and immature fruits are generally eaten as snacks, Salad and in sauce. The

fibre helps in relieving constipation and sometimes used in curing *diabetes mellitus* (Tindall, 1968). A number of organic materials, example goat and poultry manures can be used as soil amendments and suppliers of nutrients. Since many of these materials are waste products, they can sometimes be cheaply available especially if used near where there are produced.

According to IFA (1992), the rates at which organic manures are applied to soils should take into accounts both the expected nutrient supply available to crops and the need to minimize nutrient losses. Apart from its role as a store house for plant nutrient, it is a major contributor to cations exchange capacity and buffering agent to sustainable pH fluctuation (Jones 1973, Kwakiye, 1980). Opara-Nadi *et al* (1987) reported that organic manures help in maintaining more favourable soil chemical properties, caused less nutrient loss and increased organic carbon, total N, C: N ratio, soil pH, available P, CEC, Ca, K and Mg than soils treated with inorganic fertilizers. According to Nelson and Sommers (1982), organic manure conserves moisture, provide humus and improves the texture of the soil overtime. Goat dung helps in maintaining pH within neutral zone and also improves the availability of nutrients within the soils (Nelson and Tisdale 1975). The impact of animal manure treatment on soil for garden egg production has not received much research attention in South-eastern Nigeria. This study was carried out to investigate the response-of garden egg *Solanum melongena* to nutrients content of goat and poultry manures, applied at separate and combined levels on soil properties at different levels of their decomposition and their effect on garden egg growth and yield.

MATERIALS AND METHODS

The experiment was conducted in 2003 at the University of Uyo Teaching and Research farm to determine the effect of goat and poultry manure application on selected soil chemical properties and yield of garden egg (*Solanum melongena*)* Uyo is situated between latitude 5.17° and 5.27 °N and longitude 7.27.°E (UCCDA, 1998). The soils of Uyo are formed on coastal plain sand deposit [Arenic hapludult), and lies within the Humid Tropical Rainforest zone of South eastern Nigeria. The experiment was laid out in a Completely Randomized Design [CRD] with four replications. A plot sized 17m x 8m (136 m^2) was manually cleared and planting beds constructed using machete and spade.The 3-week old garden egg seedling with heights ranging from 20 - 28 cm were obtained from the University of Uyo commercial farm Use Offot, Uyo for planting. The seedlings were conveyed in polythene bags to the research site, and randomly planted in the evening. Each replicate had 16 garden egg seedlings with a total of 64 plants per plot. The spacing within and between row was lm x 0.6m. Goat and poultry manures were applied at 4 levels; control (Ot/ha), and Goat manure (GM) lO t/ha, Poultry manure (PM) lO t/ha and goat manure combined with poultry manure at 5t/ha+5 t/ha respectively at 4 weeks after transplanting (WAT). Weeding was done at three weeks internal. The manure levels were in co¬operated into the soil around plant stand at 10 cm depth and 10 cm radius. Furadan granules were applied to surface soil seven days after manure application. A mixture of 1 teaspoon of Karate and fungicide powder together in 1 liter of water was spread on garden egg plants at 28 days (flower initiation) after manure treatment for insect control.

Composite samples were collected from the treated plots at the end of final fruit harvest bulked analyzed. The selected soil properties

determined were; soil pH measured with pH meter in soil solution ratio 1:2 in 0.01m $CaCl_2$. Soil organic carbon (OC) was determined by the Walkey-Black method and total N by micro- Kjeldahl digestion method (Bremmer and Mulraney, 1982), after digestion of samples with concentrated H_2SO_4 acid. Available phosphorus (P) was determined by Bray and Kurtz (1945) extraction method. Exchangeable cations were extracted using NH_4OAc solution, K

Table 1.Physical and chemical properties of the soil before planting

Soil properties	Values
Soil pH(H_2O)	4.24
Organic matter (%)	2.94
Total Nitrogen (%)	0.09
Available P (mg/kg soil)	161.33
Effective cation exch. Capacity (ECEC) cmol/kg	3.60
Base Saturation percentage	53.41
Sand (%)	55.66
Silt (%)	27.40
Clay (%)	16.94

Table 2.Analysis of goat and poultry wastes used in the study.

Properties Values	*Goat manure*	*Poultry manure*
PH	*7.24*	*c*
Nitrogen %	*0.10*	*1.84*
Phosphorous %	*0.39*	*1.04*
K %	*20.00*	*1.97*
Ca %	*1.40*	*8.22*
Na %	*0.12*	*0.48*

Table 3. Effect of goat and poultry manure application on selected soil properties.

Treatment	MEAN VALUES Soil pH	Org. m	Total N	ECEC	Base saturation(%)
0	*4.24*	*2.94*	*0.09*	*3.6*	*53.41*
GM	*4.48*	*3.97*	*0.20*	*8.02*	*68.89*
PM	*5.53*	*5.04*	*0.2,1*	*9.68*	*72.21*
GM+PM	*9.72*	*4.36*	*0.20*	*8.68*	*70.76*
LSD(0.05)	*0.78*	*NS*	*NS*	*3.47*	*7.28*

NS - Not significant

and Na were read using flame photometer, while Ca, and Mg were determined on the atomic absorption spectrophotometer. Effective cation exchange capacity ECEC was established by summation of K, Ca, Mg and Na. The garden egg fruits were harvested first at 28 days after treatment application and later at 14 days (2 weeks) internal. The fresh fruits were weighed per treatment at each harvest using weighing balance. Plant height was measured in cm using meter rule, number of branches per plant was counted and leaf area was measured by taking length x breath in cm and multiplied product with 0.75 factor.

Data analysis

Soil and plant data collected were subjected to analysis of variance to test the differences among treatments. The means that should significant difference were separated using Fishers least significant difference (F-LSD)Wahua, (1999).

RESULTS AND DISCUSSION

Table 1 shows properties of the research plot, the soil was sandy acidic and low in organic matter total N, basic cations, but with high phosphorous status. The chemical properties of goat and poultry manures used in the study is shown in Table 2. When compared with control, application of goat, poultry and their combination generally increased soil pH from 4.24 to 5.72. This increase in soil pH was in order of GM> GM+PM>PM. This result agrees with Opara-Nadi *et al* (1987) findings on similar work on cow dung and poultry manure.

Organic matter: There was observable increase in soil organic matter content in manure treated soils, but such improvement was not statistically significant. Total Nitrogen was generally increased in the treated plots but it was not statistically different among applied treatments.

Effective cation exchange capacity {ECEC} application of goat and poultry manure significantly increased ECEC in PM plots up to 9.68 cmol/kg representing 168.89 percent over control. Base saturation percentage increased with source of manure treatment. Poultry manure gave a higher increase of 72.21% representing 35.20 percent over control. This increment is in agreement with Ahn (1993) that poultry is the richest and most concentrated manures available

Table 4.Effect of goat and poultry manure application on garden egg fruit yield(kg).

	Mean Value			
Manure Treatment	***1st Harvest***	***2nd Harvest***	***3rd***	
0	***6.88***	***3.86***	***6.06***	
GM	***2.26***	***2.76***	***40.15***	
PM	***2.63***	***24.60***	***86.98***	
GM+PM	***3.35***	***17.76***	***55.50***	*
LSD(0.05)	***NS***	***3.97***	***1.125***	

NS- Not Significant

Table 5.Effect of goat and poultry manure and their combination on garden egg yield parameters

Mean Value				
Manure Treatment	Height (cm)	Num. of branches	Leaf area Index(cm2)	Stem girth
0	96.75	36.23	87.20	3.83
GM	100.50	46.51	177.60	4.73
PM	97.15	35.51	167.60	4.13 t '
GM+PM	' 42.50	39.28	288.60	11.90
LSD (0.05)	NS '	4.61	8.56	1.81

in the farm. The richness of poultry manure is accounted for by the mixture of urine'and excreta together which contribute to higher M and P content.

Effect of goat and poultry manure application on garden egg growth parameters.

Plant height and number of branches per plant. There were small increase in garden eggplant height and branches number per plant, but they were not statistically significant.

Leaf area index.

Animal manure sources significantly increased garden egg leaf area generally over control. A combined application (GM+PM) increased leaf area and stem girth by 288.60 cm^2 and representing 230.96 percent over control the effect was in order of GM+PM>GM>PM. Leaf area and stem girth. A combined application of goat manure significantly increased garden egg leaf area index and stem girth by 288.60 cm^2 and 11.90 representing 230.96 and 210.70 percent over control.

Garden egg fruit yield.

Garden egg fruit yield was affected by sources of animal manure applied at three periods of harvest. At first harvest, there were no significant differences in garden egg yield over control. At the second harvest, garden egg yield varied with source of animal manures. Goat manure gave the highest mean yield of 24.60 kg/ha representing 537.31 percent over control. When goat manure was combined with poultry manure, garden egg fruit yield increased up to 55.50 kg/ha representing 815.84 percent over control. The increase in garden egg fruit yield and growth parameter as influenced by application of animal manures agrees with Jones (1971) reports that application of 5-10t /ha of manure can increase crop yield.

REFERENCES

Ahn, P. M. (1993). *Tropical Soils and Fertilizer use.* Longman Group. United Kingdom LTD Pp.114

Bray, R. H. and Kurtz (1945). Determination of total Organization and available form of phosphorus in soils. *Soil Sci.* 59:39-45.

Egawa, T. (1975). Utilization of organic materials as fertilizer in Japan. In: *FAO Soil Bull* 27:253-27

1FA (1992).*World fertilizer Use Manual Pub*. International fertilizer Industry Association, Paris Pp. 8-16

Jones, M.T. (1973). The organic matter contents of the Savannah Soils of West Africa, *Soil Science* 24: 42-53

Kwakye P. K. (1980). The effects of methods of dungs storage and its nutrient content in crop yield in the North East zone of Ghana. Inorganic cycling in Africa. *FAO Soil Bull* 43:286-288

Nelson, D. W. and Sommers, L. E. (1982).Total carbon, organic carbon and organic matter. ln:Page, A. L. Miller, R. H and Kenergy, D. R. (Eds). *Methods of Soil Analysis, Part 2. Amer. Soc. of Agron. Madison* Pp. 539-579

Nelson, W. L and Tisdale, S. (1975). *Soi1 fertilizer;*(3rdEd.)Macmilian Publishing Co. Inc. London.

Wahua, T. A. T. (1999). *Applied Statistics for Scientific Studies* Afrika - Link Books, University of Ibadan.

Opara-Nadi, 0. A, B. S. Ezuma and A. Wogu (1987). Organic manures and inorganic fertilizers added to acid ultisol in South Eastern Nigeria, effects on Soil chemical properties and nutrient loss. *Proceedings of the 15th Annual Conference of the Soil Science Society of Nigeria* Pp. 163 — 177

Ojeniyi, S. 0. (2000a). Effect of goat manure on soil nutrient contents on okra yield in rainforest area of Nigeria. *Applied Tropical Agriculture* 5: 20 - 23

Ojeniyi, S. 0. (2000b). Soil fertility management and plant nutrient sources in Nigeria. *Paper presented at 30th Annual conference of Agricultural Society of Nigeria, Bauchi Abstracts* P 36.

Tindall, H. D. (1968). *Commercial Vegetable Growing*. Pub. Oxford University Press Pp. 153,-156.