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Effect of Poultry Manure on the Growth, Yield and Nutrient Content of Fluted Pumpkin (*Telfaria occidentalis* Hook F)

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Abstract: This study investigated effect of poultry manure treatments and NPK fertilizer on growth, leaf nutrient content and yield components of Telfaria (*Telfaria occidentalis* Hook F) grown on Akure soil in the rainforest zone of Nigeria. The treatments applied were 0, 2, 4, 6 t ha^{-1} poultry manure and 250 kg ha^{-1} NPK 15-15-15 fertilizer. Growth and yield parameters such as number of leaves and branches, stem girth, length of internodes were increased by poultry manure treatments. However, NPK fertilizer increase stem girth and number of leaves more than poultry manure. Relative to control, 2, 4, 6 t ha^{-1} of poultry manure and NPK fertilizer increased number of branches by 6.01, 7.01, 7.23, 7.72 and 6.89%, respectively. The increases in number of leaves were 16.57, 20.17, 20.12, 20.63 and 22.50%. The 6.0 t ha^{-1} manure is recommended.

Key words: Poultry manure, growth, leaf nutrient, yield component, stem girth and length of internodes

INTRODUCTION

Soil productivity and fertility can be maintained by the use of fertilizers. The problem with the use of inorganic fertilizer on Nigeria soils is that, the fertilizers are not obtained at the right time in addition to the huge cost of procurement. Improper chemical fertilizer application has ruined tropical soils through its abuse (IFDC, 2005).

Poultry manure contains high percentage of nitrogen and phosphorus for the healthy growth of plants (Ewulo, 2005). Nitrogen is equally said to be the motor of plant growth (IFA, 2000). Organic matter is the ultimate determinant of the soil fertility in most tropical soils and this account for its use to raise seedling in tropical areas, the fertility of the soil could be sustained with the addition of poultry manure (Ikpe and Powel, 2002) *Telfaria occidentalis* produces leaves for a long periods and it is preferred to short season leavy vegetables such as *Amaranthus* spp. which are rarely harvested than three times in the life of the plant (Mnzara, 1997).

Productions of telfaria are predominant done by poor resource based farmers (Spore, 2005). Although integrated soil fertility management (ISFM) advocates the combined use of organic and inorganic of sources thereby exploiting the potential of positive interactions between both inputs (Vanlauwe *et al*., 2002) but efficient use and often low and/or unstable producer prices, limits farmers interest in fertilizer use (IFDC 2005). Recommended fertilizers rates of 250 kg ha^{-1} of NPK was used to raise *Telfaria occidentalis* (Grubben *et al*., 2004).

However, the general poultry dropping recommendation for most leafy vegetables to supply 110 kg N, 90 kg P_20_5 and 90 kg K_20 is 10 tonnes per hectare (Grubben *et al*., 2004). But, 10 tonnes of poultry dropping will be too bulky to be transferred by the cash limited farmers in tropical region. Also the information on the use of poultry dropping for production of Telfaria is inconclusive, therefore this work aimed at determining the effect of poultry dropping on the growth and yield,

nutrient uptake and to suggest rate(s) or treatment that will suit its production. Also, it is to study the field comparative effect of poultry dropping applications and NPK fertilizers on the growth, plant nutrient composition and Telfaria yield.

MATERIALS AND METHODS

Two field experiments were conducted between May and August 2005 at two sites in Akure (Latitude 7°30'N and Longitude 3°S52°E), in the rainforest zone of Southwest Nigeria. The sites were both located at the Federal University of Technology campuses (Obanla and Obakekere campus). The surface soils at the sites were sandy loam and the soils which overlies metamorphic rock of the basement complex is classified as toxic Troupudalf (Adepetu *et al*., 1979). The sites were dominated with chromoleana odorata and Ageratum conyzoides and had not been cropped for three years. The land were cleared using cutlass, stumps and trashes were removed and beds were constructed manually with hoe. The five treatments applied using ring method (Tisdale *et al*., 1985; FAO; IFA, 2000) to Telfaria were 0, 2, 4, 6 t ha^{-1} of poultry dropping and 250 kg ha^{-1} of NPK 15:15:15 fertilizer. Treatments were replicated three times at each site using a randomized complete block design. Seeds bought from Ministry of Agriculture were pre-germinated for 15 days in order to get equal seedling height transplanted into a plot of 9 m^2 with a planting distance of 1×0.6 m. The poultry dropping was obtained from the University poultry farm and it was aimed for two weeks before application.

Soil Analysis

Before commencement of experiments, surface (0, -5, 5-0 and 10-5 cm) soil samples were collected from the sites and bulked for analysis. Samples were air-dried and 2 mm sieved. Routine analysis was done as described by Tel (1984). Soil pH in 1:2 soil $CaCl_2$ suspension, total N by Kjeldahl approach and available P Bray-P1 extraction followed by molybdenum blue colorimetry, Exchangeable K, Ca and Mg were extracted using ammonium acetate, K was determined on flame photometer and Ca and Mg by EDTA titration. Soil organic matter was determined by wet dichromate method. Poultry manure was analysed as described for soil.

Leaf Analysis

Telfaria leaf samples collected at 8th week were air-dried and milled. The N was determined using micro-kjeldahl approach. For P, K, Ca and Mg samples were digested using nitric-perchloric-sulphuric acid mixture (Tel, 1984) and elements were determined as for soil.

Crop Data

Number of leaves was done by direct counting, stem girth was estimated by means of vernier caliper.

Statistical Analysis

Data were subjected to analysis of variance to determine treatment effect in measured parameters. The least significance difference at 5% level of significance was used to compare mean data.

RESULTS AND DISCUSSION

Data on initial soil mechanical analysis for experimental sites are shown in Table 1. Surface soil layers (0-5, 5-10, 10-15 cm) at the sites were sandy clay loam with sand between 58-65%, Silt 22-27% and clay 11-15%.

Table 1: Textural analysis of soil at sites of experiment

Site	Depth (cm)	Sand (%)	Silt (%)	Clay (%)	Texture
Obanla campus	0-5	60	27	13	Sandy clay loam
	5-10	63	20	16	Sandy clay loam
	10-15	58	27	15	Sandy clay loam
Obakekere campus	0-5	61	24	15	Sandy clay loam
	5-10	65	24	15	Sandy clay loam
	10-15	59	28	11	Sandy clay loam

Table 2: Chemical analysis of soil at sites of experiment

							Exchangeable			
Site	Depth (cm)	pH 1.2	Organic matter (%)	Organic carbon (%)	Total (%)	N available (P mg kg^{-1})	K (Cmol kg^{-1})	Ca (Cmol kg^{-1})	Mg (Cmol kg^{-1})	Na (Cmol kg^{-1})
Obanla campus	0-5	6.61	4.91	2.85	1.43	2.58	0.23	1.70	1.00	0.12
	5-10	6.38	4.91	2.85	1.43	2.75	0.12	1.50	1.00	0.12
	10-15	6.33	4.91	2.47	1.24	2.50	0.13	1.30	1.00	0.13
Obakekere campus	0-5	6.35	3.91	2.16	1.08	2.63	0.15	2.10	1.00	0.10
	5-10	5.92	2.41	1.40	0.70	2.00	0.15	1.10	1.00	0.10
	10-15	5.69	2.37	1.38	0.69	2.01	0.14	1.00	0.90	0.10

Table 3: Chemical composition DW3 of poultry manure used

Properties	
Organic carbon	12.70
Total N	2.10
P ratio	0.71
K	1.06
Ca	1.42
Mg	0.33
C:N	6.00

Source: University Laboratory Soil Analysis Laboratory

Table 4: Effect of poultry dropping in leaf area, fresh weight and dry weight of Telfaria at Obanla

Treatments	Leaf area (cm)	Fresh weight (g)	Dry weight (g)
T_1	7769.11	277.35	41.00
T_2	10,369.99	361.10	55.50
T_3	10,066.83	304.85	42.25
T_4	11,339.41	348.60	55.75
T_5	10,974.10	523.60	70.00
LSD (p = 0.05)	NS	NS	NS

Table 5: Effect of poultry manure and NPK on the nutrient uptake of Telfaria

Treatments	N (%)	K^2 (%)	P (%)	Ca^+ (%)	Na^{2+} (%)	Mg^{2+} (%)
T_1	1.01	2.45	2.45	2.50	0.90	0.48
T_2	1.20	3.10	3.20	3.40	1.10	0.50
T_3	1.25	3.40	3.40	3.90	1.10	0.60
T_4	1.36	4.80	4.80	4.80	1.70	0.50
T_5	1.42	4.80	5.00	5.00	1.50	0.40

Table 2 and 3 has data on chemical analysis. Organic matter varies between 1.82-3.07%, total N 0.69 -1.43 available P 2.01-25.50 mg kg^{-1}, exchangeable Ca, 1.00-2.10 cmol kg^{-1} and exchangeable Mg 0.90-1.10 cmol kg^{-1}. The soils are marginal in inorganic matter deficiency in N, P, K and Ca and adequate in Mg (Akinrinde and Obigbesan, 2000).

The effect of poultry droppings in the performances of fluted pumpkin (*Telfaria occidentalis)* as recorded in 8 weeks for the two sites are shown in Fig 1-5. The result in Fig. 1 had the length of vine; Telfaria when treated with 4 ha^{-1} gave the highest length of vine.

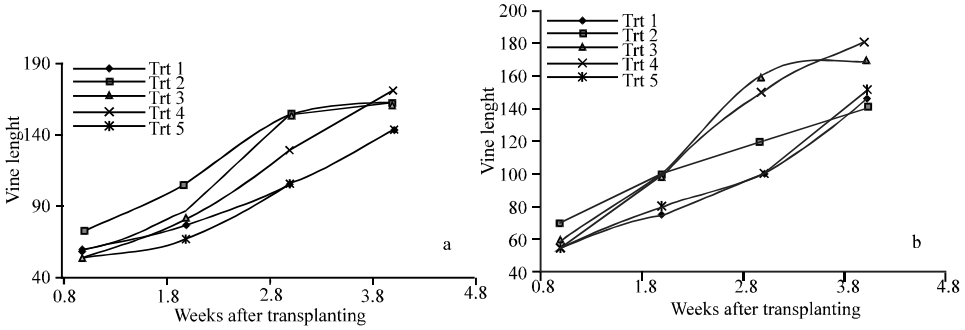

Fig. 1: Effect of poultry manure on vine length of *Telferia occidentalis*

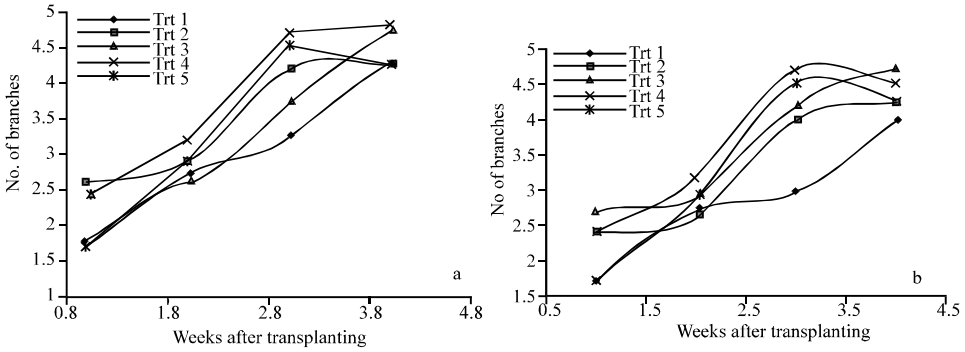

Fig. 2: Effect of polutry manner on number of branches of *Telfaria occidentails*

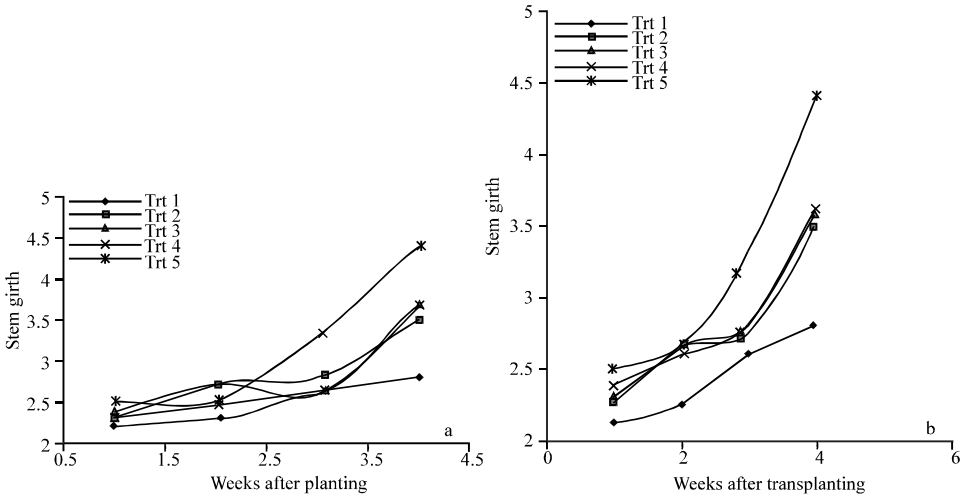

Fig. 3: Effect of polutery manure on the stem girth of *Telfaria occidentails*

Effect of poultry droppings on number of branches is shown in Fig. 2. Application of 6 t mg/ha gave the highest number of branches. The number of branches was found linearly and positively correlated with time interval after treatment application.

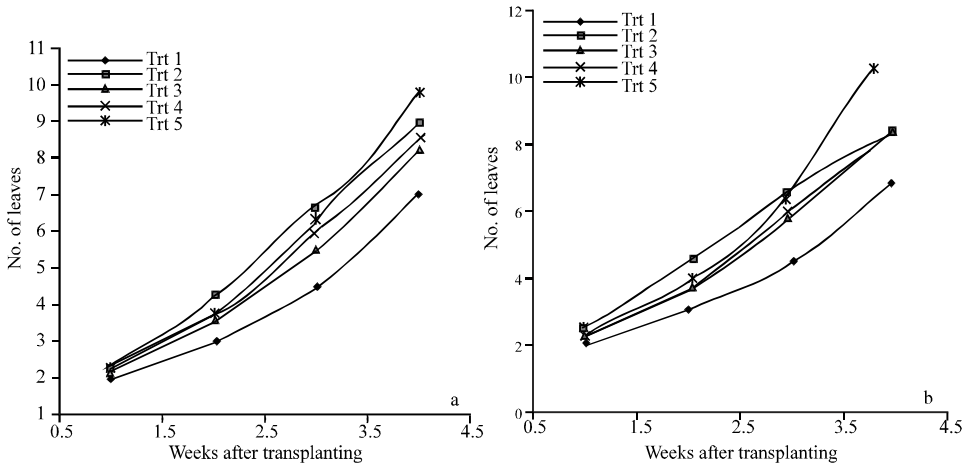

Fig. 4: Effect of poluutery manure on the number of leaves of *Telfaria occidentails*

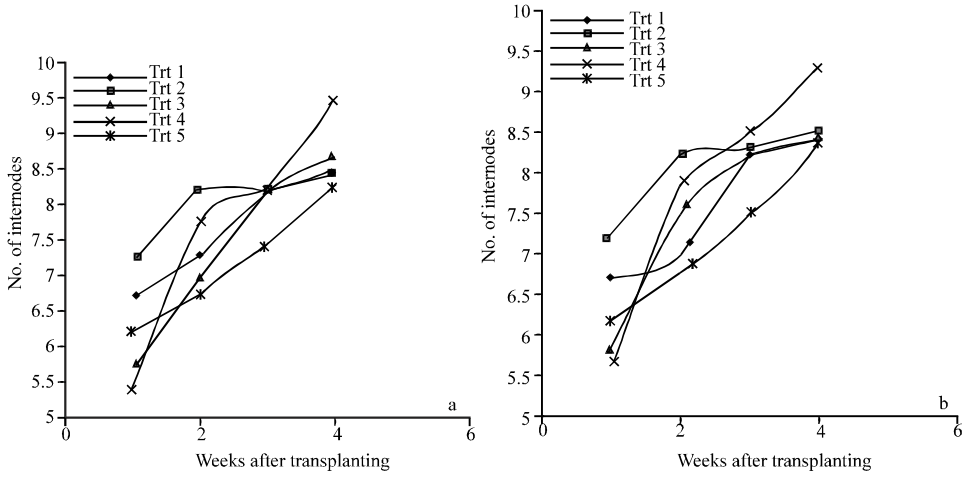

Fig. 5: Effect of polutery manure on the number of internodes of *Telfaria occidentails*

Figure 3 and 4 shows the effect of poultry droppings on stem girth and number of leaves, respectively. Application of 250 kg ha^{-1} of NPK gave the highest number of leaves and stem girth at the two sites. Earlier, Odedina *et al*. (2003) indicated that NPK increased branching more than agricultural wastes. This might be due to low and slow release of nutrients in the poultry dropping (Elmar and Wolfgang, 1990) as against the use of the mineral fertilizer. This mineral fertilizer contain adequate and balanced nutrients (IFA-UNEP, 2002).

Although the remarkable yield from telfaria is the leaves, application of poultry dropping still promoted its production. There is no significant difference in the stem girth produced by 250 kg ha^{-1} of NPK and the various levels of poultry dropping used. Also with better vine length and number of branches produced by 6 t ha^{-1} of poultry dropping used over the NPK fertilizer, what is lost in the area of production is gained in other areas. Thus making poultry droppings a good alternative to NPK fertilization in the production of *telfaria occidentalis*. The NPK fertilizer responses of vegetables differ across different ecological zones of the country (Olasantan, 1994).

Effect of poultry dropping in the number of nematodes is as shown in Fig. 5. 6 t ha^{-1} gave the highest root of nematodes.

Table 4 shows the mean leaf area, fresh weight and dry weight of Telfaria per plant.

From Table 4, it was observed that 6 t m ha^{-1} contributed more to the leaf area of Telfaria than other treatments, and also showed considerable improvement in the fresh and dry weight. The highest fresh weight produces by 250 kg ha^{-1} of NPK fertilizer was as a result of the highest values of stem girth and number of leaves produced by it.

Poultry manure and NPK fertilizer increased leaf N, P, K, Ca and Mg content of Telfaria at Obanla (Table 5) Leaf nutrient content tended to increase with level of poultry manure. Comparative analysis of poultry manure in its uptake with NPK fertilizer showed that poultry manure compete favourably. The better leaf of poultry manure could be adduced to lower C:N and C:P ratios recorded for poultry manure in previous standy (Macrere *et al*., 2001). Manure in general is known to have positive influence on soil (Joam *et al*., 2000; Aro; Agwu, 2005).

CONCLUSIONS

Poultry manure significantly improved nutrient status, growth and yield of Telfaria. However poultry manure was less effective in improving girth and yield of Telfaria. The manure applied at 6 t ha^{-1} was most effective among the levels investigated. Poultry manure is an effective source of N, P, K, Ca and Mg and organic matter for Telfaria production.

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