EFFECTS OF DIFFERENT SOURCES OF ORGANIC MANURE ON COCOYAM (*Colocasia spp*) PRODUCTION IN ISHIAGU LOWLANDS, EBONYI STATE.

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ABSTRACT

An experiment to find the effects of different sources of organic manure on cocoyam production in Ishiagu lowlands in Ebonyi State was conducted in a floodplain of Ivo River in 2005. The experiment involved four treatments which were applied at the rate of 7.5tons/ha in a Randomized Complete Block Design (RCBD). The treatments used included Swine waste, poultry droppings, Rice husk dust and Zero application which was the control. The cocoyam cormel seeds were planted on manually prepared raised beds at a spacing of 60cm x 60cm. The treatments were applied two weeks before planting. The parameters tested were the cocoyam growth and yield. The growth and yield data collected were subjected to analysis of variance (ANOVA). The result shows that the exchange complex site of the soil is dominated by calcium and magnesium with slightly acidic condition. The effects of the treatments on plant height did not show any significant statistical difference. Application of the treatments increased the number of leaves at 6, 8, and 9 weeks after planting ($P<0.05$ and $P<0.01$). None of the 3 treatments performed statistically better than the other.

Key words: Lowland. Floodplain, Ivo River. Organic manure, Cocoyam growth. Cocoyam yield.

INTRODUCTION

Cocoyam (*Colocasia spp*) is one of the major root tubers produced in large quantity in Nigeria, which is the highest producer in the world. She produces 40% of the world output, followed by Ghana which produces 31%. Eke-Okoro *et al* (2005) classified cocoyam into 6 cultivars: Coco-India (NCY 004), Green Edeofe (NCY 005), Purple Edeofe (NCY006), Giant Edeofe (NCY007), Ukpong (NCY008) and Ghana (NCY009). Cocoyam contains easily digestible starch as well as vitamin C, riboflavin and thiamine. The leaves are also edible. Cocoyam is known to have so many therapeutic values in treating potentially allergic infants and persons with gastro- intestinal disorder and for diabetic patient (Eke-Okoro *et al*, 2005). The crop requires 2-4 months rainfall per annum; average temperature of about 21°C and it grows on a wide range of soils. The swamp Taro grows best in heavy soils and tolerates water-logging conditions. Soil pH of 5.5-6.5 is ideal for cocoyam (Purseglove, 1976, and Eke-Okoro *et al*, 2005). Purseglove (1975) also reported that cocoyam does not grow well on dry, loose soils, but on wet heavy soils with good fertility. The yield of cocoyam per hectare varies from place to place, and cultivar to cultivar. The world average production is 5.5 tones per hectare. Yield as high as 15-30 tones per hectare have been recorded, with Ukong (NCY008) cultivar recording the highest (20-30t/ha) (Eke-Okoro *et al*, 2005). The rapid depletion of plant nutrients, low organic matter content (<2.0, according to Enwezor *et al*, 1990), and physical condition of the soil, constitute strong limitations to crop production in the area regarded as the major food belts of the eastern region. The high cost and non-available industrial fertilizer have made farmers to apply below the recommended fertilizer rate for crop production. These inorganic fertilizers have also caused a lot of soil and environmental degradation in many tropical areas. This study is therefore to examine the effect of organic manure sources on the growth and yield of cocoyam as compared with yield earlier obtained from industrial fertilizer application. Several studies have however, indicated positive effects of organic waste on soil productivity (Nwite *et al*, 2008, Nwite, 2007, Buri, *et al* 2004, Nnabude and Mbagwu, 2001, Nnabude and Mbagwu, 1999).

MATERIALS AND METHODS

The experiment was conducted at the flood plain of Ivo River near the Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria between May and October 2005 cropping season. The experimented design was Randomized Complete Block Design (RCBD). There were four treatments replicated three (3) times in the total of 12 plots. The treatments, each applied at the rate of 7.5 tons/ha are swine waste (T_1), poultry droppings (T_2), Rice husk (T_3), and control (no manure application) (T_0). The application of the treatments was done 2 weeks before planting. The variety of cocoyam used was the swamp Taro and was planted at a spacing of 60cm x 60cm on manually prepared raised beds. Soil samples were collected from each plot and composite into one major sample which was analyzed in the laboratory to determine the nutrient status of the soil before the amendment. Data collection on growth parameters of plant height and number of leaves started one month after planting. The plant height was estimated by measuring the height of sampled plants with meter rule at weekly intervals. The number of leaves was also estimated by weekly counting of number of leaves per sampled plant and the mean determined per plot at every counting. Yield data were got at the time of harvest, where the weight of the corms and cormels were determined on plot basis. Data collected were subjected to statistical analysis using the procedure for RCBD, analysis of variance (ANOVA) as described by Obi (2002).

RESULTS AND DISCUSSION

Chemical properties of the studied soil:

The chemical properties of the soil before amendments are shown on Table 1. The soil (Table 1) has pH of 5.2 and organic matter of 2.7% or 1.61% organic carbon. The soil of the exchange complex is dominated by calcium with 3.0 and 1.6 cmolkg^{-1} respectively.

Table 1: Some chemical properties of the studied soil.

Soil properties	Values
Organic carbon %	1.61
Organic matter %	2.77
Total nitrogen%	0.091
pH (H_2O)	5.2
Sodium (cmol kg^{-1})	0.35
Potassium (cmol kg^{-1})	0.11
Calcium (cmol kg^{-1})	3.0
Magnesium (cmol kg^{-1})	1.6
ECEC (cmol kg^{-1})	5.06
Exchangeable acidity (cmol kg^{-1})	1.8
Available phosphorus (mol kg^{-1})	22

Effects of manure type on cocoyam mean number of leaves and plant height (cm).

Tables 2 and 3 showed the effects of amendments on the plant number of leaves and height. The results indicated that the plant height was not significantly affected by the different manure applications. The plant number of leaves was highly significantly increased by manure application at 7 and 8 weeks after planting (WAP) at both 5% and 1% ($P<0.05$ and 0.01) probability levels respectively, while in week 6, it was increased very high statistically at 1% ($P<0.001$). The application of poultry droppings significantly ($P<0.05$ and 0.01) increased number of leaves higher, relative to all other treatments and the control in all the weeks..

Table 2: Effects of manure sources on cocoyam mean number of leaves.

	WAP5	WAP6	WAP7	WAP8	WAP9
T_1	9.12	11.07	14.41	14.79	20.89
T_2	6.48	11.45	14.49	14.80	17.79
T_3	7.18	8.56	15.60	13.55	17.48
To	3.00	3.00	4.00	5.00	9.00
F-LSD (0.05)	NS	1.71	3.04	3.87	NS

T_1, T_2, T_3, T_0 = Treatments 1,2,3 and 0. WAP= weeks after planting.
NS = Non Significant.

Table 3: Effects of manure types on cocoyam mean plant height (cm).

	WAP5	WAP6	WAP7	WAP8	WAP9
T_1	24.90	30.69	36.88	44.17	55.11
T_2	14.10	27.55	32.77	43.97	48.97
T_3	16.46	30.79	37.59	45.11	52.20
To	33.30	34.69	48.33	58.83	63.83
F-LSD (0.05)	NS	NS	NS	NS	N

T1, 2, 3 and 0 = treatments 1,2,3 and 0 (no application), WAP= weeks after planting and NS = non- significant.

Effects of manure type on cocoyam mean yield (ton/ha).
The result of Table 4 shows that application of the treatments statistically affected the yield of the crop ($P<0.05$ and $P<0.01$). The application of poultry droppings (treatment 2) gave significantly higher yield than other treatments and the control..

Table 4: Effects of manure applications on cocoyam mean yield (ton/ha)

Block/treatment	1	2	3	X	F-LSD (0.05)
Trt_1	11.35	8.66	10.81	10.27	2.79
Trt_2	8.72	11.31	12.90	10.98	
Trt_3	9.47	9.85	8.92	9.41	
Trt_0	5.01	4.26	5.64	4.97	

DISCUSSIONS

The results of the effects of the amendments on plant number of leaves and height showed that significant changes in the plant number of leaves and height occurred with varying manure sources. The results demonstrated the relative ability of the amendments to improve the plant height and number of leaves. However, the highest mean number of leaves recorded within 6,7 and 8 WAP in treatment 2 was reflected of the potential of poultry manure to contain higher nitrogen content which is known to increase vegetative levels of plant growth. This agreed with Nwite *et al*, (2008), that poultry manure contain higher nitrogen percent with 2.10%, than other manures, with rice husk recording least value (0.70%). The result on the cocoyam yield equally showed that poultry manure and swine waste (treatments 2 and 1 respectively) significantly influenced the yield of cocoyam over rice husk and control. This result demonstrated the ability of poultry manure and swine waste to improve the productivity of the soil better than rice husk. This agreed with the findings of Pauletto *et al*, (1990), and Nnabude and Mbagwu (2001), who reported that the incubation of rice husk and its

ash for 2-8 months on some Brazilian soils (Albaqualf and Hapludult) did not show significant effects on the soil fertility status, hence the yield of crop.

CONCLUSION

Based on the findings of the study, it is concluded that the application of the organic amendments highly improved the soil productivity, hence the growth and yield of cocoyam. The study showed that plant heights in cocoyam do not have any statistical influence on the yield, rather the number of leaves does. The 3 treatments used did not statistically differ from each other on their effects on the growth and yield of cocoyam. It is therefore recommended that the application of organic manure still would give the same range of yield with the yield obtained from the application of inorganic fertilizer. Farmers are advised to choose any of the 3 treatments for their cocoyam production, as none was statistically better than the other. Further studies should be undertaken using other rates of these manures to determine their level of effects.

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