Agronomic and Economic Effects of Varying Rates of Pig Manure on the Performance of Cucumber *(Cucumis sativus L.*) in Ikorodu Agro Ecological Zone

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ABSTRACT

This study was carried out to determine the effects of different levels of pig manure on the performance of cucumber (Cucumis sativus L). The experiment was laid out on Randomized Complete Block Design with six experimental treatments replicated three times. The treatments applied were 0, 5, 10, 15, 20, and 25 t/ha^{-1}. Data collected were vine length (cm), number of leaves, days to 50% flowering, weight of fruit (kg) number of fruits length of fruit (cm) and width of fruits (cm). The results show that 25 t/ha^{-1} pig manure significantly ($p<0.05$) has the highest yield, growth performance and cost effective than other treatments, therefore, it is recommended for the production of cucumber in Ikorodu Lagos.

KEYWORDS: cost effective, *Cucumis sativus*, highest yield, pig manure, Ikorodu Agro ecological zone

INTRODUCTION

Cucumber (*Cucumis sativus L.*) is the fourth most important vegetable crop after tomato, cabbage and onion and the second most widely cultivated cucurbit after melon (Tatlioglu, 1993). Production of cucumber in Nigeria has increased probably due to awareness being created by its market demand and economic returns, short duration in maturity or due to its nutritional and medicinal values. Hence it has become a popular vegetable crop in Nigeria.

Soil degradation and nutrient depletion have become serious threats to agricultural productivity in Nigeria and most parts of Sub-Saharan Africa (Ramaru *et.al.*,2008). These degradative processes and concomitant decline in soil quality decrease the capacity of soils to produce adequate yields of healthy and nutritious crops (Parr *et.al.*,1989; FAO, 1990). To ensure improved crop yield there in need for addition of fertilizers to improve the soil fertility. Onweremadu *et. al.,* (2003) and Mbagwu *et.al* (1994) recorded increase in soil productivity as a result of using Pig manure. This could possibly be due to higher content of total N, P and K in pig manure compared to the other manure types.

Although pig manure is very cheap and effective as a good nutrient source for sustainable crop production, its availability remains an important issue due to its bulky nature, while inorganic fertilizer is no longer within the reach of resource poor farmers due to its high cost (Rahman, 2004). The objectives of this study is to know the effect of variable rates of pig manure on the growth and yield of cucumber (*Cucumis sativus*) and the most cost effective rate of pig manure application in cucumber production.

Materials and Methods

Experimental location and land preparation

The experiment was carried out on a total area of land measuring 236.5m^2 which has been under continuous cultivation for over three years without any forms soil amendments at the Teaching and Research Farms Lagos State Polytechnic, Ikorodu, Lagos State Nigeria and was laid out in Randomized Complete Block Design (RCBD**)**. The land was divided into 3 blocks of 21.5m x 3m (63m^2), each plot size is 3m x 3m (9m^2) with a discard of 0.5m to give a total number of 18 plots. The land was ploughed and harrowed to obtained a fine tilt. The consists of different rates of pig manure (0, 5, 10, 15, 20 and 25 t/ha^{-1}) applied to the plots two weeks before planting by broadcasting method to allow for mineralization and was replicated 3 times.

Crop establishment and maintenance

Cucumber seeds (Poinsett 76 variety) was obtained from agro-allied store Sabo market Ikorodu, Lagos State and planted at 2 seeds per hole spacing of 75cm x 75cm (Eifediyi and Remison, 2010), thinned to one stand each at one week after planting and supply also done to replaced missing stands to give a total of 16 plants per plot and a total of 288 plants. Other cultural practices such as weeding and insect pest control were carried out as at when due.

Pre-cropping Soil and Pig Manure analysis

Composite soil samples were randomly collected with auger from ten (10) different locations in the study area and were composited, air dried and sieved through 5mm sieve and their physiochemical characteristics were determined before application of treatment following standard laboratory procedure (Page *et al*., 1989). Pig manure was obtained from a piggery section, Farm Settlement Odogunyan, Ikorodu, Lagos State, cured, pulverized and subjected to standard laboratory procedure to determines its chemical constituents.

Data collection and Statistical Analysis

Six (6) plant stands were randomly tagged per plot for collection of growth parameters at 3, 5 and 7 weeks after planting (WAP) and yield attributes at harvest. Data collected were subjected to Analysis of Variance (ANOVA), and when significantly different, means of treatments were compared using Duncan Multiple Range Test (DMRT) at 5% level of probability using ASSISTAT 7.1 statistical software.

Economic Analysis

Economic analysis was carried out to determine the benefit cost ratio and monetary outlay for eggplant production. The gross margin (GM) is the differences between total revenue (TR)

obtained based on the average market retail prices for the period considered and total variable cost (TVC). The cost ratio is dividing the total variable cost of production by the total revenue.

Gross Margin (GM) = TR - TVC

Total Return (TR) = P x Q

Cost Ratio (CR) = TR / TVC

Where P = prevailing market price and Q = quantity of produce

Results and Discussion

Pre-planting soil physio-chemical and Pig manure analysis

The pre-cropping physical and chemical characteristics of the experiment soil shows that the soil is sandy clay loam in texture (sand 72.50%, silt 27.0% and clay 0.50%) and slightly acidic with pH 6.47. The soil is low in Organic Carbon (1.02%), Total N (0.08%), Available P (3.42mg/kg^{1}), exchangeable bases Na (0.74cmol/kg), K (0.01cmol/kg), Ca (0.85cmol/kg) and Mg (1.26cmol/kg). The chemical analysis of pig manure analysis showed that it contains Organic Carbon (0.64%), Total N (0.6%) and Available P (0.39mg/kg^{-1}) and exchangeable bases. Na (0.02cmol/kg), K (0.06cmol/kg), Ca (0.2cmol/kg) and Mg (0.35cmol/kg).

The inherent low fertility status of the soil is due to the continuous cropping of the soil without additional external inputs inform of fertilizer and is expected to benefits from the amendment with pig manure by improving the soil fertility status, reduced soil acidity and ultimately increase crop growth and yield.

Effects of different levels of pig manure on vegetative growth of cucumber

Results presented in Table 1 showed that 25 t/ha^{-1} has the longest vine length (14.27cm) follow by 15 t/ha^{-1} (9.93cm), then 20 t/ha^{-1} (8.33cm), 10 t/ha^{-1} (7.27cm) control (6.50cm) with 5 t/ha^{-1} having the least (5.10cm) vine length. Vine length of cucumber was significantly ($p<0.05$) affected by different levels of pig manure at 3WAP and not significantly ($p<0.05$) affected at 5WAP and 7WAP.

Number of leaves was significantly ($p<0.05$) affected by different level of pig manure at 3 and 5 WAP with 25 t/ha^{-1} had the highest number of leaves (9.27 and 43.27) follow by 20 t/ha^{-1} (6.77 and 32.30), 15 t/ha^{-1} (7.27 and 28.47), 10 t/ha^{-1} (6.60 and 26.63), control (6.03 and 19.93) and 5tonnes t/ha^{-1} having the least (5.23 and 16.30) number of leaves. At 7 WAP there were no significant difference ($p<0.05$) in the number of leaves produced by cucumber.

The results show that vine length increases as treatment increases except for 5 t/ha^{-} (3WAP, 5WAP and 7WAP) and 10 t/ha^{-1} (7WAP) having shorter vine lengths than the control plot, this might be due to the inherent soil fertility of the experimental location. This is in contrast to Sanni and Adenubi (2015) who reported that best growth characteristics of okra was found in soils amended with 5 t/ha^{-1} and also recorded the pig manure poorly influence the vine length of watermelon. The improved number of leaves due to manure application could be attributed to the mineralization of the manure. This is in line with the findings of Akanni (2005) that; manure

application improves Organic matter, N, P, and Exchangeable Cation concentrations in the soil that could benefit grown crop.

Table 1. Effects of different levels of pig manure on cucumber growth.

	Vine length (WAP)			Number of leaves (WAP)		
Treatments	**3**	**5**	**7**	**3**	**5**	**7**
0 t/ha	6.50bc	46.30	118.32	6.03b	19.93bc	52.17
5 t/ha	5.10c	34.87	90.94	5.23b	16.30c	41.06
10 t/ha	7.27bc	52.53	117.59	6.60b	26.63bc	51.80
15 t/ha	9.93b	65.57	136.36	7.27ab	28.47bc	68.89
20 t/ha	8.33bc	65.97	142.18	6.77b		70.77
				32.30ab		
25 t/ha	14.27a	83.93	157.49	9.27a	43.27a	92.93

Means with similar letter(s) in the same column are not significantly different at 5% D.M.R.T.

The result in Figure 1 shows that different rates of pig manure had significant effects ($p< 0.05$) on number of days to 50% flowering. From the result cucumber planted on plots amended with 25 t/ha^{-1} flowered earlier than other plots; closely followed by t/ha^{-1}, 20 t/ha^{-1}, 10 t/ha^{-1}while 5 t/ha^{-1}and control plots flowered late. This was in accordance with Abd-Allah *et.al.*, 2001; Bayoumi, 2005; Ehaliotis *et.al.*, 2005; who reported that Fe, Zn and Mn encourages vegetative growth, total chlorophyll and the photosynthetic rate of plants which enhance early flowering and fruiting, leading to an increase early fruit maturity.

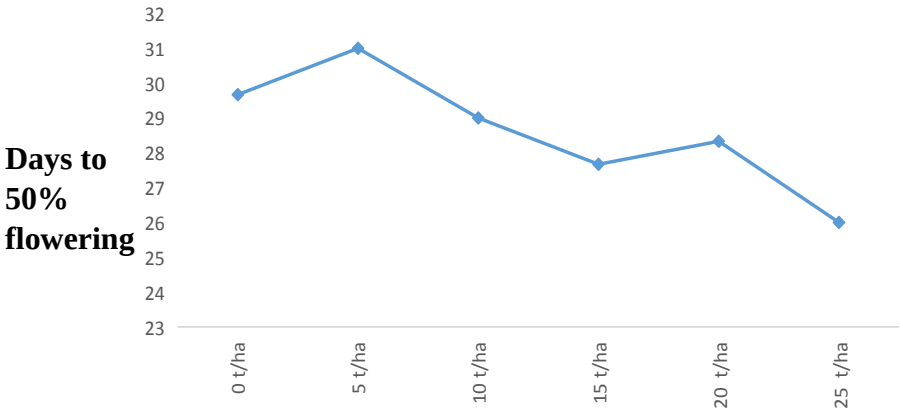

Figure 1: *Effects of different levels of pig manure on the days to 50% flowering of cucumber plants.*

Effects of different levels of Pig manure on the Yield Attributes of Cucumber

Statistical analysis of the data indicated that number of harvested fruits, weight, width and its length were not significantly ($p<0.05$) affected by different rates of pig manure application (Figure 2). Treatment mean values showed that highest number of fruits were harvested from 25 t/ha^{-1} (7.65) closely followed by 20 t/ha^{-1} (5.67), 10 t/ha^{-1} (4.67), 15 t/ha^{-1} (3.33), 5 t/ha^{-1} (2.00) and control (2.00) having the least fruits. Similar trend was observed for fruit length, weight and

width respectively. The nutrients absorbed by the cucumber plants were effectively utilized in the formation of fruits, leaves and stem tissues. This is in agreement with Ibeawuchi *et. al.*, (2007) who posited that dry matter accumulation affected the grain yield and 1000 maize relative yield.

The increased availability of nutrients in soil, due to application of the manures, expectedly led to increased uptake of N, P, K, Ca, and Mg. The findings that Organic manure significantly increase crop growth and yield is attributable to improve soil physio chemical properties. Better utilization of nutrients might also be the reason towards the increase in Cucumber yield obtained in this experiment. The higher yields obtained from plots with treatments may be due to their higher nutrient content particularly Fe, Zn and Mn in Compost (Akanbi, 2002).

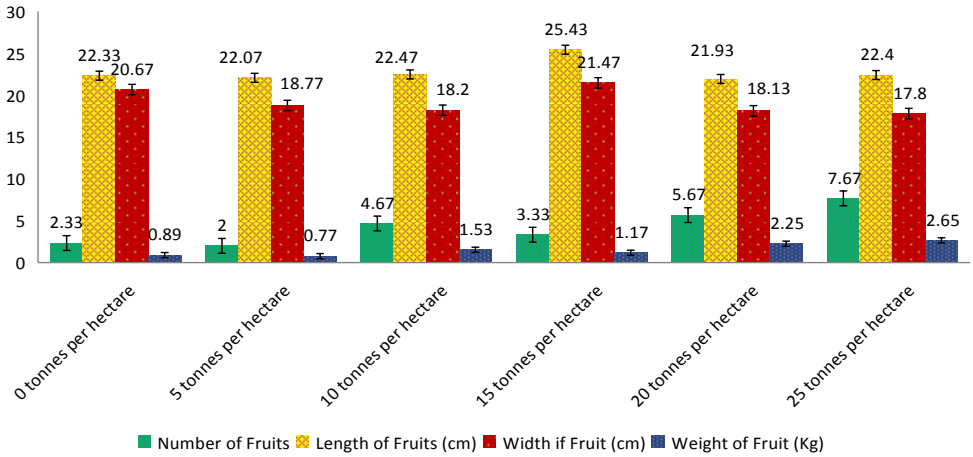

Figure 2: *Effects of different levels of Pig manure on the Yield Attributes of Cucumber*

Analysis Gross Margin and Cost Ratio analysis for Each Treatment

Table 2 shows the gross margin and cost ratio analysis of cultivation of cucumber using varying rates of pig manure. It is observed from the result that growing cucumber in the study area using 25 t/ha^{-1} has the highest gross margin (₦ 5345:00), while other treatments have gross margins less that ₦1:00 which makes their production not profitable and running at a loss. 25 t/ha of pig manure had cost ratio greater than 1.00 with makes is more profitable than other treatments has they had cost ratio less than 1.00 meaning their production is running at a loss This makes 25tonnes per hectare the most cost effective treatment for the production of cucumber.

Table 2. Analysis for Gross Margin and Cost Ratio Analysis of Each Treatment

Treatment	Cost of production (₦)	Yield(kg)	Price per kg (₦)	Total revenue (₦)	Gross margin (₦)	Cost ratio
0 t/ha	11900:00	18.9	100:00	1890:00	-10010:00	0.16
5 t/ha	11927:00	14.4	100:00	1440:00	-10487:00	0.12
10 t/ha	11954:00	65.8	100:00	6580 :00	-5374:00	0.55
15 t/ha	11981:00	36.0	100:00	3600:00	-8381:00	0.30

20 t/ha	12008:00	113.9	100:00	11390:00	-618:00	0.94
25 t/ha	12035:00	173.8	100:00	17380:00	5345:00	1.44

Source: Field survey 2018.

Conclusion

The results obtained from this study clearly indicated that pig manure is a valuable source of crop nutrition which can improve soil biophysical and chemical conditions thereby making the soil more productive and sustainable for cucumber production. This organic manure is presently being wasted and constitute environmental nuisance, it can be converted to wealth by using them for the cultivation of organic crop production. Based on the outcome of the study, Pig manure at the rate of 25 t/ha^{-1} is the best for cucumber production and most profitable and cost effective in Ikorodu Local Government Area of Lagos State as it improved its growth and yield.

Recommendation

1. Farmers in Nigeria should be encouraged to use pig manures in the production of Cucumber (Cucumis sativus).
2. It helps in increasing productivity by producing healthy plants and good fruits. Cucumber with pig manure of 25 tons per hectare are found to very appealing to the eyes cost effective.

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