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EFFECT OF VARYING LEVELS OF POULTRY MANURE AND INORGANIC FERTILIZER ON THE GROWTH AND YIELD OF CUCUMBER IN ANYIGBA, KOGI STATE

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ABSTRACT

The growth and yield of cucumber in response to the effect of poultry manure and inorganic fertilizer (NPK 20:10:10) was evaluated at the Teaching and Research farm of Kogi State University Anyigba, Nigeria during the 2021 raining season. Treatment consisted of poultry manure which was applied at 0, 7.5 and 15t/ha and inorganic fertilizer (NPK 20:10:10), applied at the rate of 0, 0.2, 0.4 and 0.6t/ha respectively. The experiment was laid in a Randomized Complete Block Design (RCBD) with three replicates following all agronomic practices as recommended. Combined rates of poultry manure at 15t/ha and 0.6t/ha of fertilizer were found to significantly increased ($P \leq 0.05$) growth characters such as number of leaves, vine length at 4, 6 and 8WAS. Longest vines of 602.75cm and 213.75leaves was obtained with combined application of 15t/ha PM + 0.6t/ha NPK fertilizer at 8WAS respectively. Similarly, Fruit length, Number of fruits, Fruit weight/plant, Fruit yield/ha were significantly influenced ($P \leq 0.05$) by the combined application of 15t/ha PM + 0.4t/ha NPK, while the control plots consistently gave the least yield across sampling periods.

Keywords: Fruit weight/ha, Fruit length, Interaction, Number of fruits, Poultry Manure (PM), Vine length.

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INTRODUCTION

Cucumber is a monoecious annual crop in the *Cucurbitaceae* family and has been cultivated by man for more than 3000 years (Okonmah 2011). It serves as a major source of vitamins, it is cultivated in most part of Northern Nigeria and some parts of eastern Nigeria by small scale farmers who lack information on some important cultural practices which has resulted in low yield owing to several factors, with nutrient/water observed to be the limiting factor (Ayotamuno *et al.*, 2007), and the production of fruit with yellow bellies, which are highly marketable. Cucumber has been rated suitable for greenhouse cultivation in comparison with traditional agricultural practices (El-Amir *et al.*, 2001). Increase in cucumber production can be achieved either by bringing more area under its cultivation, or by adopting improved varieties and better cultural practices. The second approach is more often preferred and among various cultural practices fertilizer application is one of the quickest and easiest ways of increasing the yield per unit area under cucumber. In spite of the increasing relevance of cucumber in Nigeria, low yields are obtained in farmers' fields because of declining soil fertility due to continuous cropping and the disregard for soil amendment materials. (Enujeke 2013). Inorganic manure has been used as a soil conditioner since ancient times and its benefits have not been fully harnessed due to large quantity required in order to meet up the nutritional requirements of crops (Makinde *et al.*, 2007). Organic manure improves soil structure, water, air and nutrient retention in the soil, buffers soil chemical imbalances, supports living organisms, etc (I.F.A.S, 2005). Dauda *et al.*, (2008) attributed the vigorous growth and increased fruit yield of watermelon to increased supply of nutrient elements associated with high photosynthetic activities which promote growth and yield. Aliyu, (2000) made similar report that higher rates of poultry manure resulted in higher yield of eggplant. Eliakira and Peter (2014) in their soil amendment research work on tomato variety Tanya grown on selected soil of Morogoro Region in Tanzania applied 8t/ha poultry manure which yielded 31fruits/plants compared to the 22fruits/plants obtained when they applied 0.4t/ha NPK 23:10:5 fertilizer. Integrated nutrient management have proven worthy in terms of growth, yield and yield characters in cucumber production in Nigeria [Opara *et al.*, (2012), Eyifediyi and Remison (2010)]. The basic concept underlying the principles of integrated nutrient management is the maintenance and improvement of soil fertility for sustaining crop productivity on a long term basis and can be achieved through the use of mineral fertilizers (Opara *et al.*, 2012). DIPA (2006) had suggested that manure should be applied at rates and times of the year that are compatible with the nutrient requirement and growing characteristics of the crop so as to achieve the desired growth and yield enhancement. Ahmed

et al. (2007) reported that an increase in nitrogen application resulted in maximum fruit length, fruit weight, vine length and yield of cucumber.

Cucumber being one of the most sought-after exotic food materials in Nigeria, is insufficient to meet the demand of consumers due to the problems highlighted above (Opara *et al.*, 2012). Also, much work has not been done in the tropics, especially in Nigeria on both the production of cucumber and soil nutrients management practices for better productivity. Integrating both nutrient sources can help boost the production of cucumber and meet up with the quantity demanded by the society as cucumber is a short gestation crop that requires fast release of nutrients in the field, which conventional fertilizer can do better when integrated with organic manure (Marjan, 2005). Hence there is need to evaluate and establish the level of inorganic fertilizer and organic manure use necessary for high yield in Anyigba environment. Therefore; this research seeks to; Identify the effect of varying rates of Organic nutrient sources (Poultry Manure) and Inorganic Fertilizer (NPK 20:10:10) on the growth, yield characters and yield of cucumber in Anyigba environment.

MATERIALS AND METHODS

Experimental Location

This field experiment was carried out at the teaching and research farm of the Kogi State University, Anyigba which is located on the Northeast part of Kogi State lying on the Lat. 7°15'N and 7°29'N and Long. 7°11'E and 7°12'E with an Altitude of 20m above sea level. Mean Annual temperature and rainfall are 27°C and 12600mm (Amhakhian *et al.*, 2006).

Soil Analysis

Samples were collected from all plots at 0-15cm depth and aggregated on their basis of homogeneity to form a composite sample with the aid of soil auger to help assess the initial physio-chemical properties of the soil. Samples were air-dried at room temperature (27°C) for some days and sieved through a 2mm mesh. Thereafter physio-chemical properties including pH, total Nitrogen, Organic carbon, available phosphorus, and magnesium and particle size, was carried out as described by Bouyoucos (1962), total N was determined by Kjeldahl (Bremer 1982), Walkey and Black procedures (Nelson and Summer 1996) respectively. Soil pH was determined by the method described by IITA, available phosphorus by Bray-1 method, while flame photometric method was used to determine Ca, mg, and K. CEC was obtained by the summation of the exchangeable cations (K^+ , Na^+ , Ca^{+2} , Mg^{+2}) and total exchangeable acidity (Spark *et al.*, 1996).

Land preparation

Experimental area was ploughed, harrowed and ridged prior to the planting operation. A land area measuring 306m² (34m x 9m) was used for the experiment. Lining and Pegging was used to divide areas into plots and blocks using an intra row and inter row spacing of 1m x 1m respectively.

Treatments and Experimental Design

The experiment was laid in a Randomized Complete Block Design (RCBD) with 3 replications. Factorial combination of treatments in a randomized manner gave a total of 36plots. Four levels of inorganic fertilizer (NPK 20:10:10) coded F₀, (Zero NPK) F₁ (0.2tha⁻¹NPK), F₂ (0.4 tha⁻¹NPK), F₃ (0.6 tha⁻¹NPK) and three levels of poultry manure coded as P₀ (Zero PM), P₁ (7.5 tha⁻¹ PM) and P₂ (15tha⁻¹ PM) were considered in the experiment.

Planting and source of Planting materials

Seed of proven variety of cucumber was obtained from Premier Seed Limited Zaria. Sowing was done in the month of August when there was sufficient soil moisture. Seeds were sown at the rate of 2/hole with a spacing of 6cm x 65cm and a depth of 2.5cm. however, seedlings were later thinned to one per hole giving a total population of 12plants per plot of 4cm² alley pathway of 1m was made for easy access to all plots.

Source of Nutrients Used

Poultry manure was obtained from a deep litter pen of the Teaching and Research farm of Kogi State University prior to the period of experiment, allowed to decompose for at least 3months because organic matter tend to take more time to release their principal nutrients at the time the plants needs it for best growth (Marjan and Lippert 2005). while NPK was purchased from the Kogi State Ministry of Agriculture and Natural Resources.

Agronomic Practices

Recommended agronomic practices involving regular weeding (manual), pest and disease control, staking of cucumber vines, harvesting among others were employed appropriately throughout the period of experiment.

Observation and Data Collection

Four plants were randomly selected and tagged for data collection throughout the period of the experiment. Growth parameters such as number of days to first flowering, number of days to emergence, number of days to harvest maturity, vine length and number of leaves were collected. Yield parameters including fruit length/plant, fruit weight/ha, fruit girth/plant, number of fruits/plant and fruit yield/ha were collected at harvest from net plot.

Data Analysis

All data collected was collated and subjected to Analysis of variance (ANOVA) as described by Snedecor and Cochran (1967) for a RCBD experiments. Significantly different treatment means was subjected to the New Duncan Multiple Range Test (N-DMRT).

RESULT AND DISCUSSION

Table 1. Pre-Planting Soil Analysis Result

<u>Physical properties (%)</u>	Depth (0 – 15cm)
Clay	10.32
Silt	4.72
Sand	84.96
Textural class	Sandy-Loam
<u>Chemical Properties (g/kg)</u>	
pH (H ₂ O)	6.8
Organic Carbon	5.2
Organic Matter	10.0
Available Phosphorus (ppm)	79.1
Total Nitrogen	0.28
<u>Exchangeable Bases (Cations)</u>	
Calcium (Cmol/kg)	3.04
Magnesium (Cmol/kg)	1.25
Potassium (Cmol/kg)	2.00
Sodium (Cmol/kg)	0.86

Table 1 presents the result of soil analysis. soil in the experimental field is obviously low in total N (a major requirement), organic carbon and organic matter. However, analysis of exchangeable cations indicated that soil contained values greater than 1.00 cmol/kg except for Na.

Effect of Poultry Manure, NPK 20:10:10 and Interaction (PM x NPK 20:10:10) on the growth characters of Cucumber plants in Anyigba, Kogi State.

Observations showed that there were no significant differences number of days to emergence among all plots as emergence was observed 2-4days after sowing. As plants subjected to fertilizer and poultry manure treatments attained harvest maturity at 56DAS, control plots were observed to be matured for harvest at 60DAS. Results of the effects of organic and inorganic nutrient on cucumber growth characters are presented in table 2. Vine length was found to increase significantly ($P \leq 0.05$) with the application of poultry manure and NPK at 6 and 8WAS. Application of 15tha^{-1} of poultry manure consistently produced the longest vines (1408.56cm and 2148.51cm) at 6 and 8WAS respectively. This was followed by application of 7.5tha^{-1} . However, control plots for poultry manure consistently gave the shorter vines across all sampling periods. This result corroborates with the findings of Enujeke (2013), who obtained the longest vines of cucumber with 20tha^{-1} application of poultry manure. Similarly, reports have been gathered from other authors who attributed increased growth of

crop plants to the release of more nutrient elements through the moisture that has been made available by the organic manure [(Adekiya and Ojeniyi 2002), Ewulo *et al.*, (2008), Mangila *et al.*, (2007)]. This is also in harmony with the report of John *et al.*, (2004) who indicated that poultry manure released essential elements which promoted high photosynthetic activities that enhanced growth and yield of watermelon. Application of 0.6tha^{-1} of NPK 20:10:10 consistently produced longer vines (976.83cm and 1561.70) at 6 and 8WAS respectively, this was followed by application rates at 0.4tha^{-1} and 0.2tha^{-1} . However, control plots gave shortest vines across all sampling periods. This is in corroboration with Michael *et al.*, (2018) who reported a progressive increase in the length of vines of cucumber with increased NPK 20:10:10 application up to 90kg ha^{-1} . This also support Imran *et al.*, (2014) findings. PM x NPK interactions was significant for vine length at 6 and 8WAS (table 2). Combine application of 15tha^{-1} PM + 0.6tha^{-1} NPK produced the longest vines which was found to be significantly higher than all other application rates combined followed by 15tha^{-1} PM + 0.4tha^{-1} NPK (table 4). However, control plots from both nutrient source produced the shortest vine length. This shows that low N application in cucumber crop adversely shorten their length of vines which implies deterred growth. In the same way, combine application of 15tha^{-1} PM + 0.6tha^{-1} NPK produced the longest vines which was found to be significantly higher than all other application rates at 8WAS (table 5) followed by 15tha^{-1} PM + 0.4tha^{-1} NPK. However, vine lengths obtained from combine application of 15tha^{-1} PM + 0.2tha^{-1} NPK was not significantly different ($P \geq 0.05$) from those obtained when 7.5tha^{-1} PM + 0.4tha^{-1} NPK was applied. This is an indication that uptake of N from organic sources (PM) is more vigorous than inorganic source (NPK). Control plots from both nutrient source produced the shortest vine length. This result is similar to those of Eyifediyi and Remison (2010), who reported longer vines from combine application of 10ton/ha farmyard manure 400kg/ha inorganic fertilizer.

Table 2. Effect of Poultry Manure and Inorganic Fertilizer on the Vine Length (cm) of cucumber plants at 4, 6 & 8WAS at Anyigba.

Treatments	Weeks After Sowing		
	4	6	8
<u>Poultry manure</u>			
P ₀ (0tha^{-1})	245.67c	790.01c	1602.76c
P ₁ (7.5tha^{-1})	458.42b	1297.24b	1910.42b
P ₂ (15tha^{-1})	601.99a	1408.56a	2148.51a
F-LSD _(0.05)	11.61	1.48	6.39
<u>NPK 20:10:10</u>			
F ₀ (0tha^{-1})	226.98d	633.02d	1190.98d
F ₁ (0.2tha^{-1})	340.87c	922.02c	1371.76c
F ₂ (0.4tha^{-1})	363.17b	963.94b	1537.25b
F ₃ (0.6tha^{-1})	375.06a	976.83a	1561.70a
F-LSD _(0.05)	11.61	1.48	6.39

Interaction			
PM x NPK	ns	*	*

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

Table 3. Effect of Poultry Manure and Inorganic Fertilizer on the Number of Leaves/plant of cucumber plants at 4, 6 & 8WAS at Anyigba.

Treatments	Weeks After Sowing		
Poultry manure	4	6	8
P ₀ (0tha ⁻¹)	85.5c	244.75c	651.00c
P ₁ (7.5tha ⁻¹)	161.5b	376.00b	740.25b
P ₂ (15tha ⁻¹)	197.45a	537.5a	798.5a
F-LSD (0.05)	0.73	2.03	1.55
NPK 20:10:10			
F ₀ (0tha ⁻¹)	65.25d	224.75d	501.0d
F ₁ (0.2tha ⁻¹)	117.5c	288.0c	541.0c
F ₂ (0.4tha ⁻¹)	128.7b	320.0b	563.75b
F ₃ (0.6tha ⁻¹)	133.0a	325.5a	584.0a
F-LSD (0.05)	0.73	2.03	1.55
Interaction			
PM x NPK	*	*	*

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

Table 4. Interaction of PM x NPK rates on the Vine Length of cucumber plants at 6WAS at Anyigba.

	NPK 20:10:10 (tha ⁻¹)			
Poultry manure (tha ⁻¹)	0	0.2	0.4	0.6
0	181.76l	192.06k	206.33i	209.86h
7.5	194.88j	358.15f	369.88e	374.33c
15	256.38g	371.81d	387.73b	392.64a
F-LSD (0.05)	1.48			
CV (%)	1.00			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

Table 5. Interaction of PM x NPK rates on the Vine Length of cucumber plants at 8WAS at Anyigba.

	NPK 20:10:10 (tha ⁻¹)			
Poultry manure (tha ⁻¹)	0	0.2	0.4	0.6
0	315.33l	404.9h	443.3f	439.3f
7.5	430.1g	457.3e	503.2d	519.7c
15	445.5f	409.5d	590.7b	602.7a
F-LSD (0.05)	6.39			
CV (%)	2.40			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

Application of Poultry manure significantly increased ($P \leq 0.05$) the number of leaves produced by cucumber plants (table 3) across all sampling period. 15tha⁻¹ PM produced the highest number of leaves followed by 7.5tha⁻¹ PM, while 0tha⁻¹ PM application produced the least number of leaves. This is similar to the findings of Enujeke (2013), who reported that the superiority in number of leaves/plant of cucumber is based on rate of poultry manure received in tons/hectare. This is also consistent with Mangila *et al.*, (2007), Agbede *et al.*, (2008), and Ewulo *et al.*, (2008) who indicated that poultry manure (the richest known animal manure) is essential for establishing and maintaining the optimum soil physical condition for

plant growth. Adding that poultry manure is not only cheap and effective source of N for sustainable crop production, but improves soil physical properties by reducing temperature, bulk density, and increasing total porosity, if higher rates are applied. Similarly, application of 0.6tha^{-1} NPK produced more leaves followed by 0.4tha^{-1} NPK, 0.2tha^{-1} NPK in that order. However, application of 0tha^{-1} NPK consistently produced the least number of leaves across all sampling period. PM x NPK interactions was significant for number of leaves across all sampling periods (table 3). At 4 and 6WAS, combine application of 15tha^{-1} PM + 0.6tha^{-1} NPK gave the highest yield in terms of number of leaves, this was not significantly different from number of leaves obtained when 15tha^{-1} PM + 0.4tha^{-1} NPK was applied (table 6 & 7). This result is also supported by Eyifediyi and Remison (2010) findings, who asserted that higher values of the vine length and number of leaves produced per cucumber plant are due to the higher nutrients applied to them which was needed for rapid growth and development considering the composition of the farmyard manure which was incorporated into the soil during land preparation. However, control plots for both nutrient source gave the lowest number of leaves. At 8WAS, 15tha^{-1} PM + 0.6tha^{-1} NPK produced the highest number of leaves followed by 15tha^{-1} PM + 0.4tha^{-1} NPK and 15tha^{-1} PM + 0.2tha^{-1} NPK. Decreasing the application rate of inorganic fertilizer as N source is quite effective for high yield in terms of leaf production in cucumber in the experimental area. This is in agreement with Fuchs *et al.* (1970) who reported that nutrients from mineral fertilizers enhances the establishment of crops while those from the mineralization of organic matter promotes yield when manures and fertilizers are combined.

Table 6. Interaction of PM x NPK rates on the Number of leaves of cucumber plants at 4WAS at Anyigba.

Poultry manure (tha^{-1})	NPK 20:10:10 (tha^{-1})			
	0	0.2	0.4	0.6
0	18.75i	20.25h	22.25g	24.25f
7.5	22.25g	42.75e	46.75d	49.75c
15	24.25f	409.5b	59.7a	59.0a
F-LSD _(0.05)	0.73			
CV (%)	3.44			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05level of probability.

Table 7. Interaction of PM x NPK rates on the Number of leaves of cucumber plants at 6WAS at Anyigba.

Poultry manure (tha^{-1})	NPK 20:10:10 (tha^{-1})			
	0	0.2	0.4	0.6
0	57.5i	61.0h	62.75h	63.5h
7.5	76.5g	93.25e	101.5d	104.75c
15	90.75f	133.75b	155.75a	157.25a
F-LSD _(0.05)	2.03			
CV (%)	3.72			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05level of probability.

Table 8. Interaction of PM x NPK rates on the Number of leaves of cucumber plants at 8WAS at Anyigba.

Poultry manure (tha ⁻¹)	NPK 20:10:10 (tha ⁻¹)			
	0	0.2	0.4	0.6
0	149.0k	160.25j	164.25i	177.5g
7.5	173.5h	185.75f	188.0e	192.75d
15	178.25g	195.0c	211.5b	213.75a
F-LSD (0.05)	1.55			
CV (%)	1.51			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05level of probability.

Table 9. Effect of Poultry Manure and Inorganic Fertilizer on the yield characters of cucumber plants grown at Anyigba.

Treatments	Fruit length (cm)	Fruit girth (cm)	Number of Fruits/plant	Fruit weight/plant (cm)	Fruit Yield (t/ha)
<u>Poultry manure</u>					
P ₀ (0tha ⁻¹)	197.45c	160.9c	86.25c	16.79c	23050.0c
P ₁ (7.5tha ⁻¹)	237.23b	191.47b	120.5b	20.02b	16683.3b
P ₂ (15tha ⁻¹)	251.6a	205.63a	145.25a	27.66a	14141.6a
F-LSD (0.05)	0.48	0.24	0.51	0.06	2.04
<u>NPK 20:10:10</u>					
F ₀ (0tha ⁻¹)	165.1d	133.28d	73.75d	13.27d	11058.3d
F ₁ (0.2tha ⁻¹)	169.0c	139.64c	86.25c	16.09c	13408.3c
F ₂ (0.4tha ⁻¹)	176.4a	143.32a	96.5a	17.7a	14808.3a
F ₃ (0.6tha ⁻¹)	175.78b	141.85b	95.5b	17.52b	14600.01b
F-LSD (0.05)	0.48	0.24	0.51	0.06	2.04
<u>Interaction</u>					
PM x NPK	*	ns	*	*	*

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05level of probability

Effect of Poultry Manure, NPK 20:10:10 and Interaction (PM x NPK 20:10:10) on the Yield Characters and Yield of Cucumber plants in Anyigba, Kogi State.

The effect of poultry manure and NPK application on yield characters and yield of cucumber plants are presented in table 9. Application of 15tha⁻¹ PM produced the longest fruit length (251.6cm), thicker fruit girth (205.63cm), highest number of fruits (145.25), highest fruits weight/plant (27.66) and high fruit yield (14141.6tha⁻¹) followed by 7.5 tha⁻¹ PM. However, control plots consistently gave the lowest yield characters. In the same manner, 0.6tha⁻¹ NPK gave the highest yield in all characters investigated above, followed by 0.4 tha⁻¹, 0.2tha⁻¹ in that order. However, 0 tha⁻¹ NPK gave the lowest yield characters. This is in harmony with the reports of Agbede *et al.*, (2008) who indicated that higher rates of manure increases crop yield. However, the reduction in the yield of cucumber as observed by the application 0.6t/ha of inorganic fertilizer when compared to 0.4t/ha was in agreement with John *et al.*, (2004) who indicated that extensive use of inorganic fertilizer had a depressing effect on the yield of watermelon. They observed that it caused reduction in the number of fruits, delayed and reduced fruit setting leading to delayed ripening. PM x NPK interaction was found to be statistically significant for fruit length, fruit numbers, fruit weight/plant, and final fruit yield/ha (table 9). This has been reported by Eyifediyi and Remison (2010), who asserted that

combination of farmyard manure $\times$ inorganic fertilizer significantly influenced cucumber yields compared to farmyard manure and fertilizer alone especially at higher rates of application, they attributed this increase in yield of cucumber to the fact that nutrients were more readily available when organic and inorganic fertilizers are combined. This correlates to Hector *et al.*, (2005) who reported that over 80% of the total crop nutrient removed in cucumber plants usually take place during the fruiting stage of the crop growth.

Table 10. Interaction of PM x NPK rates on the fruit lengths of cucumber plants at Anyigba.

	NPK 20:10:10 (tha^{-1})			
Poultry manure (tha^{-1})	0	0.2	0.4	0.6
0	47.46k	48.23j	51.21h	50.55i
7.5	56.38g	58.06f	60.91e	61.88d
15	61.26e	62.71c	64.28a	63.35a
F-LSD _(0.05)	0.48			
CV (%)	1.48			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

Table 11. Interaction of PM x NPK rates on the number of fruit/plant of cucumber plants at Anyigba.

	NPK 20:10:10 (tha^{-1})			
Poultry manure (tha^{-1})	0	0.2	0.4	0.6
0	14.25i	21.0h	26.25f	24.75g
7.5	24.75g	29.25e	32.0d	34.5c
15	34.75c	36.0b	38.25a	36.25b
F-LSD _(0.05)	0.51			
CV (%)	3.07			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

Combine application of 15tha^{-1} PM + 0.6tha^{-1} NPK gave the longest fruit length (table 10). However, this was not significantly different ($P \geq 0.05$) from those obtained when 15tha^{-1} PM + 0.4tha^{-1} NPK was applied. However, control plots for both nutrient source consistently produced shortest fruits. Decreasing NPK use to rates above 0.2tha^{-1} may be essential for more fruit production in Anyigba environment keeping poultry manure rate at 15tha^{-1} . control plots for both nutrient source consistently produced least number of fruits. Similarly, application of 15tha^{-1} PM + 0.4tha^{-1} NPK gave the highest fruit yield/ha (table 13).

Table 12. Interaction of PM x NPK rates on the fruit weight/plant of cucumber plants at Anyigba.

	NPK 20:10:10 (tha^{-1})			
Poultry manure (tha^{-1})	0	0.2	0.4	0.6
0	2.73i	4.55i	4.84g	4.85g
7.5	4.74h	4.99f	5.19d	5.1c
15	5.8c	6.55b	7.74a	7.57a
F-LSD _(0.05)	0.06			
CV (%)	2.23			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

Table 13. Interaction of PM x NPK rates on the number of fruit yield/ha of cucumber plants at Anyigba.

	NPK 20:10:10 (tha^{-1})			
Poultry manure (tha^{-1})	0	0.2	0.4	0.6
0	2275.0k	3791.67j	4033.4h	4041.67h

7.5	3950.0i	4158.3g	4325.0e	4250.0f
15	4833.3d	5458.3c	6450.0a	6308.34b
F-LSD _(0.05)	51.69			
CV (%)	24.91			

Means followed by the same letter(s) within a sampling period are not statistically significant at 0.05 level of probability.

This was followed by the combine application of 15tha⁻¹ PM + 0.6tha⁻¹ NPK and 15tha⁻¹ PM + 0.2tha⁻¹ NPK in that order. Control plots for both nutrient source consistently produced the lowest yield/ha of cucumber plants. These results are similar to those of Opara *et al.*, (2012) who obtained higher yield and yield character with combined application of 10 t/ha poultry manure supplemented with 0.6 t/ha of NPK and 5 t/ha of poultry manure supplemented with 0.12 t/ha of NPK during dry and rainy seasons respectively. Bayu *et al.* (2006) also reported that sorghum yield increased when 5 t/ha of farmyard manure was combined with 20 kg N + 10 kg P ha⁻¹. Makinde *et al.* (2007) reported increased melon growth and optimum yield with Organo-Mineral fertilizer at 4 t/ha or the application inorganic fertilizer at 41 kg N+ 20kg P. Dainello (2005) have also advised the use of both inorganic and organic fertilizers for relatively high levels of soil nutrient necessary for successful vegetable production.

CONCLUSION

Application of both organic and inorganic fertilizer showed significant improvement in cucumber growth compared to when either of the nutrient is applied singly. Combine application of 15tha⁻¹ PM + 0.6tha⁻¹ NPK 20:10:10 increased growth parameters but not yield parameters when compared to the combine application of 15tha⁻¹ PM + 0.4tha⁻¹ NPK. In like manner, 0.6tha⁻¹ NPK gave the highest yield in terms of vegetative characters. however, it fails to surpass application of 0.4tha⁻¹ of NPK in term of yield characters measured.

RECOMMENDATION

1. In Anyigba environment, not greater than 0.6t/ha of inorganic fertilizer should be used for effective economic yield in cucumber production.
2. The combine use of poultry manure and inorganic fertilizer is highly recommended for cucumber farmers especially at rates not lower than 15tha⁻¹ poultry manure and not higher than 0.6tha⁻¹ NPK 20:10:10 in Anyigba environment especially during the raining seasons
3. It is very important to conduct a study on the location of poultry farms and vegetable farms with respect to their proximity to Anyigba environment on effective disposal of poultry manure at vantage point to benefit vegetable farmers.

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