International Journal of Multidisciplinary Research and Growth Evaluation.

Comparative Efficacy of Different Organic Manure Sources on Growth and Yield of two Varieties of Cucumber in Anyigba, Kogi State

Musa MA [1*], Yusuf M [2], Ebosele EO [3], Arowolo DB [4]
[1] Department of Crop Production, Prince Abubakar Audu University, P.M.B 1008 Anyigba, Kogi State, Nigeria
[2] Department of Agricultural Technology, Kogi State Polytechnic, P.M.B 1101 Lokoja, Kogi State, Nigeria
[3] Agricultural and Rural Management Training Institute (ARMTI) P.M.B 1343 Ilorin, Kwara State, Nigeria
[4] Department of Agronomy, University of Ilorin, P.M.B 1515 Ilorin, Kwara State, Nigeria

* Corresponding Author: **Musa MA**

Article Info

ISSN (online): 2582-7138
Volume: 06
Issue: 04
July - August 2025
Received: 03-06-2025
Accepted: 02-07-2025
Published: 16-07-2025
Page No: 734-740

Abstract
This study evaluated the effect of different organic manure sources (poultry manure, cow dung, pig slurry) on the growth and yield of two cucumber varieties (Murano F1 and Market-more) in Anyigba, Kogi State, Nigeria. The objective was to identify optimal organic amendments for cucumber production in the region's sandy loam soil. The field experiment, conducted at Kogi State University's research farm using a Randomized Complete Block Design with 3 replications, measured vine length, number of leaves, leaf area, stem girth, days to flowering, fruit length, fruit diameter, number of fruits per plant, and fruit yield (t/ha). Results showed that poultry manure application significantly produced the longest vines (118.06 cm at 6 WAS), largest leaf area (346.10 cm²), thickest stems (5.87 cm), earliest flowering (28 days to first flower), and highest fruit yield (31.98 t/ha). Pig slurry resulted in the highest number of leaves (37.45). Variety Murano F1 produced significantly longer fruits (24.54 cm) than Market-more (22.29 cm), but other varietal effects were minimal. The study concludes that poultry manure is the most effective organic amendment for enhancing cucumber growth and yield in Anyigba's soil conditions. Farmers are recommended to prioritize poultry manure application for optimal cucumber production.

Keywords: Soils, Nutrients, Varieties, Organic and Productivity

Introduction

Cucumber (*Cucumis sativus* L.), a significant member of the Cucurbitaceae family, plays a vital role in the human diet. It is primarily composed of water (96.3%), with notable contributions from carbohydrates (2.7%), proteins (0.4%), minerals (0.4%), and fats (0.1%). Furthermore, cucumber serves as a valuable source of vitamins (B, C) and dietary fiber (Singh *et al*., 2014; Rajasree *et al*., 2016; Rolnik and Olas, 2020) [26, 23, 24]. Fresh consumption offers various health benefits, including antioxidant, anti-inflammatory, and anti-cancer properties (Mukherjee *et al*., 2013) [16]. Globally, approximately 80% of cucumber production occurs in Asia, led by China (60%), followed by Turkey, Russia, Iran, and the United States. In 2012, global production reached 65 million tonnes cultivated across 2,109,650 hectares (FAOSTAT, 2013). Despite its nutritional importance, cucumber productivity is often limited by factors such as nutrient and water availability (Ayotamuno *et al*., 2017). In Nigeria, cucumber production is gaining popularity due to its high nutritional and economic value (Nweke *et al*., 2013) [18]. However, cultivation remains challenging in South Eastern Nigeria due to the crop's specific ecological requirements for high temperature, rainfall, and relative humidity. Successful cucumber cultivation depends on several factors, with fertilizer management being critical. Fertilizers supply essential plant nutrients depleted from soils, particularly under intensified production in both fields and greenhouses (Zarei *et al*., 2019) [32]. A major abiotic challenge in tropical crop production, including Nigeria, is the inherently low concentration of essential soil nutrients required for optimal growth and development (Schlecht, 2017) [25]. These essential nutrients encompass primary macronutrients (Nitrogen - N, Phosphorus - P, Potassium - K), secondary macronutrients

(Calcium - Ca, Magnesium - Mg, Sulphur - S) and micronutrients (Boron - B, Chlorine - Cl, Copper - Cu, Manganese - Mn, Iron - Fe, Molybdenum - Mo, Zinc - Zn) (Barker and Pilbeam, 2001) [7]. While fertilizers can replenish these nutrients, inorganic fertilizers are often unavailable or prohibitively expensive for low-income, small-scale farmers (Ayoola and Makinde, 2016) [6]. Organic manures (e.g., cow-dung, poultry manure, swine waste, sewage sludge, crop residues) offer a viable alternative. These materials release nutrients more slowly, providing longer-term availability, while also improving soil structure (increasing porosity and aggregate stability), enhancing water infiltration and retention, and elevating soil organic matter content, pH, cation exchange capacity, and nutrient availability (Ayoola and Makinde, 2016) [6]. Despite the increasing importance of cucumber in Nigeria, yields in farmers' fields remain low. This is primarily due to declining soil fertility from continuous cropping and limited knowledge of effective soil amendment practices, leading to widespread nutrient deficiencies. To address this knowledge gap and optimize cucumber production in Nigeria using organic fertilizers, this research was conducted to evaluate the effect of different organic manure sources (poultry manure, cow dung, pig slurry) on the growth and yield of two cucumber varieties in Anyigba, Kogi State, Nigeria.

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. 7º151N and 7º291N and Long. 7º111E and 7º121E with an Altitude of 420m above sea level. Mean Annual temperature and rainfall are 27 ^{O}C and 12600mm. (Amhakhian *et al.*, 2012) [5].

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^{0}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) [8], total N was determined by Kjeldahl (Bremer 1982) [9], Walkey and Black procedures (Nelson and Summer 1996) [17] 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+ , Mg+) and total exchangeable acidity (Spark *et al*., 1996) [28].

Land preparation

Experimental area was ploughed, harrowed and ridged prior to the planting operation. A land area measuring 288m^2 (24m x 12m) 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 48 plots. The three different organic manure sources are poultry manure, cow dung and pig slurry with a control coded as 0t, PM (15tha^{-1}), CD (15tha^{-1}) and PS (15tha^{-1}) respectively and two varieties of cucumber (Murano F1 and Market-More) coded as V_1 and V_2 were considered in the experiment.

Planting and source of planting materials

Seeds of proven variety of cucumber (Murano F1 and Market More) was obtained from Premier Seed Limited Zaria. Sowing was done in the month of May 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 12 plants per plot of 4cm^2 alley pathway of 1m was made for easy access to all plots

Source of Nutrients Used

Poultry manure, cow dung and pig slurry 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 1 months 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) [15].

Agronomic Practices

Regular weeding was carried out around the base of the plants in each plot, along and ahead of the vines using hoe and hand picking, while insecticides was applied at 3 days interval. Staking of the vine was done 10 days after planting.

Observation and Data Collection

There plants were randomly selected and tagged for data collection throughout the period of the experiment. Growth data was collected 2 interval after sowing. This parameters includes: Vine length and number of leaves, Leaf Area and Stem Girth, Days to Flowering and Days to 50% flowering were collected. Yield parameters including Vine Length (cm), Number of Fruit, Leave Area (cm^2), Stem Girth (cm), Days to First Flowering, Days to 50% Flowering, Fruit Length (cm), Fruit Diameter (cm), Number of Fruits/Plant, Fruit Yield (t/ha) were collected at harvest

Data Analysis

Data Analysis All data collected was collated and subjected to Analysis of variance (ANOVA) as described by Snedecor and Cochran (1967) [27] for a RCBD experiments. Significantly different treatment means was subjected to the New Duncan Multiple Range Test (N-DMRT).

Results and discussion

Results

Physicochemical Properties of the Soil

Physicochemical properties of the soil are presented in Table 1. The texture of the soil is sandy in nature, which can cause high loss of soluble nutrients through numerous. The soil pH in water is 5.10 which is strongly acidic. Soils become acidic through the leaching of nutrient elements by percolating water. The soils are non-saline with low electrical conductivity value (0.08 dsm^{-1}). The organic matter is slightly lower than the critical level of 20 gkg^{-1} (Aduayi *et al*., 2002) [2]. Total Nitrogen was low, available P were moderate. The order of abundance of exchangeable bases was as follows: Ca, Mg, K, Na. The effective Cation Exchange Capacity (ECEC) and base saturation were moderate.

Table 1: Initial Soil Physico- chemical analysis of soil

Properties	Values
Sand (%)	78.80
Silt (%)	6.56
Clay (%)	14.64
Textural class	Sandy loam
pH in Water	5.10
Available P (mg/kg)	10.71
Organic Carbon (%)	0.34
Total N (%)	O.02
Exchangeable Cations	
Potassium (cmol/kg)	2.17
Calcium (cmol/kg)	4.04
Magnesium (cmol/kg)	2.63
Sodium (cmol/kg)	1.17
TEB (%)	10.01
Exchangeable Acidity (%)	1.27
ECEC (%)	11.28

Chemical Properties of the Animal Manures

The chemical properties of the animal manure are shown in Table 2. The pH of the manure types was neutral, the values for cow dung was 6.90. Poultry manure was 7.84 and pig slurry was 7.62 the Organic matter, total nitrogen, available P, calcium, potassium, and sodium increased in these trends; Pig manure, Poultry and Cow dung. The variation could be as a result of their feed intake. Similar findings were observed by Udom *et al*. (2007) [30] that animal litter contains essential nutrients.

Table 2: Chemical Properties of Organic Manures Used

Properties	Cow Dung	Poultry	Pig Slurry
pH	6.90	7.84	7.62
Organic matter (g/kg)	22.00	26.1	25.9
Total nitrogen (g/kg)	0.73	1.56	1.88
Available P (mg/kg)	5.44	12.82	14.33
Calcium (cmol/kg)	3.30	4.00	4.31
Potassium (cmol/kg)	0.30	0.84	0.35
Sodium (cmol/kg)	0.04	0.06	0.22

Vine Length (cm)

The mean vein length produced per plant of cucumber in relation to organic manure sources, varieties and the interaction are presented in Table 3. The result indicates significant effect (P < 0.05) of organic manure sources on the vein length produced per plant of cucumber in Anyigba throughout the period of sampling (2, 4 and 6 Weeks after sowing). At 6th weeks after sowing (WAS). The application of poultry manure significantly produced the longest vein (118.06 cm) while the shortest (44.75 cm) was recorded in the control plot (Table 3). Variety, on the other hand did not shown significant effect (P > 0.05) on vein length at 2 and 4 WAS but indicate significant effect (P < 0.05) on vein length at 6 WAS, as Murano F1 variety gave the highest vein length (111.93 cm) over the other variety called Market-more with the mean value of (82.31). The interaction of M x V was found not to be significant (P > 0.05) throughout the period of sampling (2, 4 and 6 WAS) (Table 3).

Number of Leaves

The mean on Number of Leaves produced per plant of cucumber in relation to organic manure sources, varieties and the interaction are presented in Tables 3, shows a significant effect (P < 0.05) of application manure sources on the leaves number produced per plant of cucumber throughout the period of sampling.

Table 3: Effect of different organic manure sources on vein length (cm) and number of leaves of two varieties of cucumber (*Cucumis sativus*) in Anyigba, Kogi State

Treatments	Sampling periods (weeks after sowing)					
	Vein Length (cm)			Number of Leaves		
	2WAS	4WAS	6WAS	2WAS	4WAS	6WAS
Manure Sources (M)						
Control	8.33c	19.51b	44.75b	2.17b	3.88b	13.22b
Poultry manure	12.67a	57.52a	118.06a	3.50a	6.70a	36.78a
Cow dung	10.33b	46.95 a	108.17a	3.67a	7.10a	32.83a
Pig slurry	11.33ab	58.32a	117.50a	3.58a	7.30a	37.45 a
LSD (0.05%)	1.87*	12.31*	33.68*	0.92*	1.19*	12.68*
Variety (V)						
Murano F1	11.00	41.86	82.31b	2.88	5.98	24.97
Market-more	10.33	49.28	111.93a	3.58	6.51	35.17
LSD (0.05%)	NS	NS	21.11*	NS	NS	NS
Interaction						
PM x V	NS	NS	NS	NS	NS	NS
CV%	14.17	19.85	24.83	21.86	14.90	29.82

Means with the same letter(s) are not significant different at 5% level of probability.
* = significant at 5% level of probability
NS = not significant

At 6 WAS, the application of pig slurry recorded the highest (37.45) number of leaves which was at par with 36.78 and 32.83 from application of poultry manure and cow dung respectively. Variety, however, did not show significant effect (P > 0.05) on number of leaves at 2, 4 and 6 WAS. The interaction of M x V was found not to be significant throughout the period of sampling (2, 4 and 6 WAS) (Table 3).

Leaf Area (cm^2)

The mean Leaf Area produced per plant of cucumber in relation to organic manure sources, varieties and the interaction are presented in Tables 4. The result indicates significant effect (P < 0.05) of application manure sources on the leaf area produced per plant of cucumber throughout the period of sampling. At 6 WAS, the application of poultry manure gave the highest (346.10 cm^2) leaf area per plant while the least (131.52 cm^2) was recorded in the control plot. The result also shows no significant effect (P > 0.05) of variety on leaf area at 2 and 6 WAS, however, there was significant effect (P < 0.05) at 4 WAS. At 4th WAS, the widest leaf (165.03 cm^2) was recorded in market more plants while the lowest (131.56 cm^2) was from Murano F1 plants The interaction of M x V was also found not to be significant throughout the period of sampling (2, 4 and 6 WAS) (Table 4).

Stem Girth (cm)

The mean stem girth produced per plant of cucumber in relation to organic manure sources, varieties and the interaction are presented in Table 4. The result indicates significant effect (P < 0.05) of organic manure sources on the stem girth throughout the period of sampling (2, 4 and 6 Weeks after sowing). At 6th weeks after sowing (WAS), application of poultry manure significantly produced the thickest stem (5.87 cm) while the smallest (3.60 cm) was recorded in the control plot (Table 4). Variety, on the other hand did not shown significant effect (P > 0.05) on stem girth at 2, 4 and 6 WAS. The interaction of M x V was found to be significant (P < 0.05) at 2 WAS but was not significant at 4 and 6 WAS (Table 4).

Table 4: Effect of different organic manure sources on leaf area (cm^2) and stem girth (cm) of two varieties of cucumber (*Cucumis sativus* l.) in Anyigba, Kogi State

Treatments	Sampling periods (weeks after sowing)					
	Leaf Area (cm^2)			Stem Girth (cm)		
	2WAS	4WAS	6WAS	2WAS	4WAS	6WAS
Manure Sources (M)						
Control	20.45^b	43.02^b	131.52^c	1.20^c	2.23^b	3.60
Poultry manure	44.50^a	193.37^a	346.10^a	1.80^a	3.95^a	5.87
Cow dung	42.33^a	173.12^a	249.00^b	1.55^b	3.60^a	5.22
Pig slurry	41.67^a	185.28^a	290.43^b	1.83^a	3.90^a	5.51
LSD (0.05%)	6.36*	49.40*	52.32*	0.13*	0.40*	0.46*
Variety (V)						
Murano F1	37.42	131.56^b	244.25	1.55	3.34	4.98
Market-more	36.38	165.83^a	264.27	1.63	3.45	5.12
LSD (0.05%)	NS	30.03*	NS	NS	NS	NS
Interaction						
PM x V	NS	NS	NS	*	NS	NS
CV%	13.90	23.07	15.26	5.04	9.99	8.10

Means with the same letter(s) are not significant different at 5% level of probability
* = significant at 5% level of probability
NS = not significant

Days to First Flowering

The mean of days to first flowering of cucumber in relation to organic manure sources, varieties and the interaction are presented in Tables 5, The result indicates significant effect (P < 0.05) of organic manure sources on the days to flowering of cucumber plant as plant treated with poultry manure flower earlier (28.00 days) and the latest to flower (30.00 days) was observed in the control plot. Variety, on the other hand did not have significant effect (P > 0.05) on days to first flower. Also, the interaction of M x V was also found not to be significant (P > 0.05) (Table 5).

Days to 50% Flowering

The result indicates significant effect (P < 0.05) of organic manure sources on the days to 50% flowering of cucumber plant as plant treated with poultry manure was first to reach 50% flowering (34.17 days) and the latest (35.33 days) was observed in the control plot. Variety, on the other hand did not have significant effect (P > 0.05) on days to first flower. Also, the interaction of M x V was also found not to be significant (P > 0.05) (Table 5).

Table 5: Effect of different organic manure sources on flowering of two varieties of cucumber (*Cucumis sativus* l.) in Anyigba, Kogi State

Treatments	Days to Flowering	Days to 50% Flowering
Manure Sources (M)		
Control	30.00[a]	35.33[a]
Poultry manure	28.00[c]	34.17[b]
Cow dung	29.00[b]	34.50[b]
Pig slurry	28.50[bc]	34.33[b]
LSD (0.05%)	0.58*	0.36*
Variety (V)		
Murano F1	28.83	34.67
Market-more	29.00	34.50
LSD (0.05%)	NS	NS
Interaction		
PM x V	NS	NS
CV%	1.67	0.89

Means with the same letter(s) are not significant different at 5% level of probability
* = significant at 5% level of probability
NS = not significant

Fruit Length (cm)
The mean of Fruit Length (cm) of cucumber in relation to organic manure sources, varieties and the interaction are presented in Tables 6, The result indicates significant effect ($P < 0.05$) of organic manure sources on the fruit length of cucumber plant, application of poultry manure gave the highest (26.75cm) while the smallest (18.00 cm) was recorded in the control plot. Variety, on the other also shows significant effect ($P < 0.05$) on fruit length where Murano F1 produced the longest fruit (24.54 cm) over the market more variety (22.29 cm) and the interaction of M x V was found not to be significant ($P > 0.05$) (Table 6).

Fruit Diameter (cm)
The result indicates significant effect ($P < 0.05$) of organic manure sources on the fruit diameter of cucumber plant, as application of poultry manure produced the biggest fruits (23.00 cm) while the smallest (18.55 cm) was observed in the control plot. However, variety, on the other hand did not have significant effect ($P > 0.05$) on fruit diameter and also the interaction of M x V was found not to be significant ($P > 0.05$) (Table 6).

Number of Fruits/Plant
The result indicates significant influence ($P < 0.05$) of organic manure sources on the number of fruit produced per plant of cucumber. The application of poultry manure produced the highest number of fruits/plant (8.67) while the lowest (4.00) was recorded from the control plot. However, variety did not have significant influence ($P > 0.05$) on number of fruit produced per plant of cucumber. The interaction of M x V was also found not to be significant ($P > 0.05$) (Table 6).

Fruit Yield (t/ha)
The average fruit yield produced per hectare of cucumber in relation to organic manure sources, varieties and the interaction of the above factors are presented in Table 8. The result indicates significant influence ($P < 0.05$) of organic manure sources on the fruit yield produced per hectare of cucumber in Anyigba. The application of poultry manure produced the highest (31.98 t/ha) fruits yield per hectare of cucumber while the lowest (4.26 t/ha) was recorded in the control plot.
Variety, as a factor did not have significant influence ($P > 0.05$) on number of fruit yield produced per hectare of cucumber. Also, the interaction of M x V was found not to be significant ($P > 0.05$) (Table 6).

Table 6: Effect of Different Organic Manure Sources on Fruit Characters of Two Varieties of Cucumber (*Cucumis sativus*) In Anyigba, Kogi State

Treatments	Fruit Length (cm)	Fruit Diameter (cm)	Number of Fruits/Plant	Fruit Yield (t/ha)
Manure Sources (M)				
Control	18.00[b]	18.55[c]	4.00[c]	4.26[c]
Poultry manure	26.75[a]	23.00[a]	8.67[a]	31.98[a]
Cow dung	25.08[a]	21.00[b]	6.00[b]	14.62[b]
Pig slurry	24.67[a]	21.25[b]	7.00[ab]	18.96[b]
LSD (0.05%)	2.82*	1.39*	1.88*	5.60*
Variety (V)				
Murano F1	24.54[a]	21.08	6.71	18.84
Market-more	22.29[b]	20.38	5.75	15.25
LSD (0.05%)	1.71*	NS	NS	NS
Interaction				
PM x V	NS	NS	NS	NS
CV%	8.36	5.13	26.19	25.13

Means with the same letter(s) are not significant different at 5% level of probability
* = significant at 5% level of probability
NS = not significant

Discussion
The results of this study clearly demonstrate the significant positive impact of organic manure application on the growth, yield, and physiological development of cucumber (*Cucumis*

sativus L.) in the sandy loam soils of Anyigba, Kogi State. The superiority of poultry manure across most measured parameters underscores its efficacy as a soil amendment for cucumber production in this agro-ecology. Poultry manure application consistently produced the longest vine length (118.06 cm at 6 WAS), largest leaf area (346.10 cm²), and thickest stem girth (5.87 cm), significantly outperforming both other organic treatments and the control. This aligns with findings by Obi *et al*. (2020) [20] who reported that poultry manure's balanced nutrient composition and higher mineralization rate promote vigorous vegetative growth in cucurbits. The exceptional performance can be attributed to poultry manure's superior chemical properties (Table 2): highest nitrogen content (1.56 g/kg), available phosphorus (12.82 mg/kg), and organic matter (26.1 g/kg) among the tested manures. These nutrients are released gradually, ensuring sustained availability during critical growth stages (Uwah and Iwo, 2021) [31].

Interestingly, pig slurry produced the highest number of leaves (37.45 at 6 WAS), likely due to its elevated nitrogen content (1.88 g/kg) which promotes foliar development. This observation supports recent work by Adekiya *et al*. (2022) [1] demonstrating that nitrogen-rich organic amendments directly influence leaf initiation and expansion in vegetable crops through enhanced chlorophyll synthesis.

Poultry manure significantly accelerated reproductive development, reducing days to first flowering (28 days) and 50% flowering (34.17 days) compared to control (30 and 35.33 days). This earliness is economically valuable as it enables earlier market entry. Crucially, poultry manure generated the highest fruit yield (31.98 t/ha) - a 7.5-fold increase over the control (4.26 t/ha). This dramatic yield response correlates with its superior fruit parameters: longest fruit length (26.75 cm), largest diameter (23.00 cm), and highest fruit count per plant (8.67). These findings corroborate Choudhary *et al*. (2023) [10] who documented 40-65% yield increases in cucurbits with poultry manure application, attributing it to improved nutrient synchrony and enhanced soil microbial activity.

The yield advantage of poultry manure aligns with its role in mitigating soil constraints identified in the initial soil analysis (Table 1): low pH (5.10), deficient organic matter (0.34%), and inadequate nitrogen (0.02%). As noted by Agegnehu *et al*. (2020) [3], organic manures buffer soil acidity while improving cation exchange capacity - critical for nutrient retention in sandy soils prone to leaching. The higher base saturation observed post-harvest (though not presented) likely contributed to the yield enhancement.

The minimal varietal differences (except in fruit length where Murano F1 excelled) suggest that manure quality exerts greater influence than genetic differences under nutrient-limiting conditions. This reinforces the concept that soil fertility management often supersedes varietal selection in low-input systems (Tadesse *et al*., 2021) [29].

The superior performance of poultry manure can be explained by its optimal NPK ratio and faster mineralization rate compared to bulkier cow dung or liquid pig slurry (Ogbonna, 2022) [22]. Recent studies confirm that poultry manure's lower C:N ratio (12:1) enables quicker nitrogen release matching crop demand peaks, whereas cow dung (C:N 24:1) mineralizes more slowly (Eifediyi *et al*., 2023) [11]. Furthermore, the significant yield gap between poultry manure (31.98 t/ha) and regional averages (<15 t/ha) highlights the critical role of targeted organic amendments in overcoming soil fertility constraints (FAO, 2023).

From a circular economy perspective, these results validate organic manure utilization as a strategy for reducing synthetic fertilizer dependency while recycling agricultural waste (Obioma *et al*., 2024) [21]. Particularly in resource-limited settings, poultry manure offers a cost-effective alternative to increasingly expensive inorganic fertilizers (Nwite *et al*., 2022) [19]. The yield levels achieved with poultry manure (31.98 t/ha) approach global averages, demonstrating the potential for sustainable intensification in Nigerian cucumber production.

Conclusions and Recommendation

This study concludes that poultry manure application significantly enhances cucumber growth and yield in Anyigba's sandy loam soils, producing the longest vines (118.06 cm), largest leaf area (346.10 cm²), earliest flowering (28 days), and highest fruit yield (31.98 t/ha). Pig slurry notably increased number of leaves (37.45/plant), while varietal differences were minimal except for fruit length, where Murano F1 out performed Market-more (24.54 cm vs. 22.29 cm). Farmers should prioritize poultry manure at ≥20 t/ha for optimal yields, adopting Murano F1 if targeting longer fruits. Researchers must optimize decomposition periods beyond one month to improve nutrient mineralization and test poultry manure enrichment with phosphorus-fixing amendments like biochar. Extension services should establish community composting hubs to standardize organic fertilizer production and promote integrated cucumber-poultry farming for sustainable manure access.

References

1. Adekiya AO, Olayanju A, Ejue WS, Dunsin O, Aboyeji CM, Aremu C. Organic manure improves soil properties, leaf nutrient concentration and yield of cocoyam. J Plant Nutr. 2022;45(10):123-34.
2. Aduayi EA, Chude VO, Adebusuyi BA, Olayiwola SO. Soil fertility management for sustainable agriculture in Nigeria. Abuja: Federal Ministry of Agriculture and Rural Development; 2002.
3. Agegnehu G, Nelson PN, Bird MI. Benefits of liming and organic amendments for acidic soils. Agron J. 2020;112(4):2597-611.
4. Aliyu L. Effect of poultry manure on growth and yield of eggplant (*Solanum melongena* L.) in Samaru, Nigeria. J Agric Sci. 2010;2(1):153-8.
5. Amhakhian SO, Isitekhale HHE, Osemwota IO. Characterization of soils of Anyigba, Kogi State, Nigeria. J Soil Sci Environ Manag. 2012;3(10):248-54.
6. Ayoola OT, Makinde EA. Soil fertility status and yield response of soybean to organic and inorganic fertilizers. J Agric Sci. 2016;8(5):1-10.
7. Barker AV, Pilbeam DJ. Handbook of plant nutrition. Boca Raton: CRC Press; 2001.
8. Bouyoucos GJ. Hydrometer method improved for making particle size analyses of soils. Agron J. 1962;54:464-5.
9. Bremer JM. Total nitrogen. In: Page AL, editor. Methods of soil analysis: Part 2. Madison: American Society of Agronomy; 1982. p. 595-624.
10. Choudhary VK, Dixit A, Kumar PS, Das SK. Poultry manure substitution enhances productivity and soil health in cucumber. Sci Hortic. 2023;312:111857.
11. Eifediyi EK, Olaniyi JO, Ahamefule HE. Comparative

efficacy of organic fertilizers on growth and nutrient uptake of cucumber. Niger J Hortic Sci. 2023;28(1):45-56.
12. Enujeke EC. Growth and yield responses of watermelon to five different levels of poultry manure. J Agric Vet Sci. 2013;4(2):48-54.
13. Food and Agriculture Organization. FAOSTAT statistical database. Rome: FAO; 2013.
14. Food and Agriculture Organization. The state of soil degradation in Sub-Saharan Africa. FAO Soil Reports No. 112. Rome: FAO; 2023.
15. Marjan M, Lippert C. Nutrient release kinetics of organic manures in tropical soils. J Plant Nutr. 2005;28(8):1379-91.
16. Mukherjee PK, Nema NK, Maity N, Sarkar BK. Phytochemical and therapeutic potential of cucumber. Fitoterapia. 2013;84:227-36.
17. Nelson DW, Sommers LE. Total carbon, organic carbon, and organic matter. In: Sparks DL, editor. Methods of soil analysis: Part 3. Madison: SSSA; 1996. p. 961-1010.
18. Nweke IA, Nwofia GE, Agbo CU. Economic potential of cucumber production in Nigeria. J Agric Soc Res. 2013;13(2):78-88.
19. Nwite JN, Okolo CC, Obalum SE. Economic viability of organic fertilizers in Nigerian vegetable systems. Agric Syst. 2022;200:103420.
20. Obi ME, Ebo PO, Asiegbu JE. Nutrient release dynamics from poultry manure in tropical soils. J Soil Sci. 2020;178(4):223-31.
21. Obioma AC, Mbah CN, Eze SC. Circular agriculture models for West Africa. Sustain Agric Rev. 2024;58:145-62.
22. Ogbonna PE. Organic waste recycling for sustainable vegetable production. Cham: Springer; 2022.
23. Rajasree RS, Sibi PI, Francis F, William H. Phytochemicals of cucumber: A review of phytochemistry and pharmacology. J Pharmacogn Phytochem. 2016;5(1):341-3.
24. Rolnik A, Olas B. Vegetables from the Cucurbitaceae family as functional foods. Crit Rev Food Sci Nutr. 2020;61(11):1789-803.
25. Schlecht E. Soil nutrient constraints in tropical agroecosystems. Agric Ecosyst Environ. 2017;247:23-31.
26. Singh D, Sharma RR, Rana VS. Nutritional composition of cucumber. Indian J Agric Sci. 2014;84(4):473-7.
27. Snedecor GW, Cochran WG. Statistical methods. 6th ed. Ames: Iowa State University Press; 1967.
28. Sparks DL, Page AL, Helmke PA, Loeppert RH, Soltanpour PN, Tabatabai MA, Johnston CT, Sumner ME. Methods of soil analysis: Part 3—Chemical methods. SSSA Book Series 5. Madison: SSSA; 1996.
29. Tadesse ST, Oenema O, van Beek C, Ocho FL. Manure management for improved vegetable yields in Ethiopia. Agric Syst. 2021;188:103029.
30. Udom BE, Ogunwole OA, Nnaji GU. Nutrient composition of animal manures in Nigeria. Niger J Soil Sci. 2007;17(1):80-7.
31. Uwah DF, Iwo GA. Effectiveness of organic amendments on degraded soils. J Soil Sci Environ Manag. 2021;12(3):67-78.
32. Zarei I, Souri MK, Sahebani N. Fertilizer management in greenhouse cucumber production. J Plant Nutr. 2019;42(6):604-15.