



RESPONSE OF CUCUMBER (*CUCUMIS SATIVUS*) PRODUCTION TO POULTRY MANURE APPLICATION IN RIVERS STATE, NIGERIA

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ABSTRACT

The experiment on the response of cucumber (*Cucumis sativus*) to poultry manure application in Rivers State, Nigeria was conducted between May and July, 2019 at the Teaching and Research Farm of the Department of Crop and Soil Science, Ignatius Ajuru University of Education (IAUE), Ndele campus, Rivers State, Nigeria with latitude 4°58N and longitude 6°48N which is found in the humid rainforest of Nigeria. The quantity of poultry manure used in the experiment were 0,5 and 10 tons per hectare. The experiment was replicated three times and laid out in a Randomized Complete Block Design (RCBD). The growth characteristics measured in the field were vine length (cm), number of leaves, leaf area (cm²) while yield parameters measured included number of flowers, fruit length(cm), fruit number, fruit diameter. The growth and yield parameters significantly increased in the production of cucumber with the application of higher rate of poultry manure. The application of 10 tons of poultry manure resulted in the highest growth and yield parameters in the experiment. The vine length was 156.93cm, number of leaves was 86.26 and leaf area was 30.53 (growth parameter). Application of 5tons gave rise to 108.86cm, 66.66 and 23.60 for vine length, no. of leaves and leaf area respectively. The poorest performance was recorded in 0 tons application which was the control where the vine length, no of leaves and leaf area were 84.46cm, 62.40 and 15.06² respectively. In yield parameters measured, application of 10 tons of poultry manure also gave significantly higher values followed by the application of 5 tones while application of 0 tons gave the poorest values in the experiment. With this research study, it was recommended to apply 10tons of poultry manure for reasonable production of cucumber in Rivers State. Again, further research that will involve other organic manure rather than poultry manure should be conducted to ascertain their productivity potential on cucumber production.

KEYWORDS: Poultry manure, Rivers State, cucumber, growth parameters, fruit yield, creeping vine.

INTRODUCTION

The cultivation of vegetable crop such as cucumber (*Cucumis sativus*) is widely recommended due to its shocking importance to the farmer, the general populace economy and the environment. Cucumber is a creeping vine crop that bears cylindrical fruits which are used as culinary vegetables enjoyed by the populace and eaten in salad or sliced into stew in River State. Cucumber possesses essential vitamins and minerals such as vitamins A, B1, B2, B6, B12 and vitamin C which are vital for normal bio-physiological and chemical metabolic activities in human body (Duke, 2007). The significance of cucumber include possession of more than 85% of water which aids the body's hydration level and thus performed enormous biological functions of removing waste metabolic substances from the body (Binning et al., 2003). According to Duke (2007), cucumber serves as a source of silicon for treating skin

diseases and sunburn, vital in reproduction processes, helps in food digestion, cures open wounds, destroys internal worms, useful in reducing dark circles, keeps renal system healthy, etc. Cucumber is an important vegetable crop that is required by both the young and old for proper functioning of the body.

The cultivation of cucumber is not hazardous to the environment due to its friendly status in the soil because it does not cause much soil depletion. In the rating of vegetable crops universally, cucumber occupies the eighth most cultivated horticultural crop after dry onions, sweet potatoes, maize, cassava, water melons, tomatoes, sugar beet (Edom, 2017). It is a crop of immense value. The production of cucumber is steadily increasing in Rivers State owing to its huge health benefits and friendly nature to the soil. The leaves when dried improved nutrient status of the soil. Cucumber originated

in India where many varieties are cultivated (Johnson and Mullinix, 2009). The varieties of cucumber cultivated include lemon, market more, market more 96, palace king hybrid, Miss pickler (exotic varieties) while local varieties include prize ridge, yellow ring, bush champion etc. Stansis Luccy and Kingsly ring are good exotic and local variety respectively. Cucumber is the most recognized member of cucurbitaceae family and one of the oldest vegetable crops cultivated by early man (Eifediyi and Remison, 2010): It is cultivated in almost all the agro-ecological zones of Nigeria ranging from the rainforest zone, the costal and savanna zones. The savanna region was known for the production of the crop but researches have shown that it can grow in the southern region of Nigeria (Wiro and Iyagba, 2020). In the tropical rainforest geographical zone, cucumber can be cultivated as a sole crop or be intercropped with other crops. Cucumber grows best when planted in full sun (Noble, 2011). The crop does well when planted as to get enough sunlight as cucumber that did not receive enough sunlight performs poorly. It is best to plant cucumber in area that has at least eight hours of direct sunlight each day. It does well from sea level of 1000m but higher than this sometimes (Adams et al., 2002). Cucumber is best suited in drier zones because it is liable to several attacks of fungi diseases but the proper use of fungicides can be successful under medium rainfall.

Much of the agricultural land in developing countries like Nigeria used for traditional farming is shifting cultivation, bush fallow system and continuous cropping. However, due to increasing pressure on land resulting from high population growth and economic development (Urbanization), it is no longer possible to maintain the long fallow periods necessary for soil fertility improvement (Wilson, et al., 2007). This has led to the use of poultry manure to restore the soil fertility.

The growth and yield of cucumber is greatly hampered by several challenges despite its importance. These problems include lack of certified seeds, lack of viable farming system, lack of appropriate plant spacing, weed infestation, poor soil fertility, Wiro (2020) noted that only 20% of the horticultural farmers use certified seeds in Rivers State which greatly affected production because use of uncertified seeds leads to poor productivity. Cucumber is a horticultural crop. Ansa and Wiro (2018) observed that the type of cropping system adopted in cultivation of a crop has great influence on the productivity of that crop. One of the greatest challenges of agriculture is the need to develop viable farming for increased and sustained crop production with minimum soil degradation. Appropriate plant spacing ensures good growth and high crop yield (Islam et al., 2011).

Weeds infestation has caused a great reduction in the vegetative growth and yield of crops from the beginning of agriculture. Weed infestation reduces crop productivity which lowers the interest of farmers in agro-

business due to poor income generation from their production. Wiro and Ansa (2019) observed that for the small holder farmers, the food crop yields and financial earnings realized are sufficient to attract their participation. This means that low participation of farmers will occur where their financial earnings in the production activities is low due to weed interference.

Poor soil fertility results to poor growth and yield of crops. Organic farming which involves the use of crop residues, mulching, crop rotation, green yard manure, cover cropping, farm yard materials and farm yard manure is advocated for use in cucumber production due to its ability to enhance crop productivity and improve soil structure, texture, silt and to supply essential soil nutrients (Patidar, 2015). The use of organic manure has been advocated for a long time cropping activities in the tropics as slow mineralization of these manures promote high crop productivity (Gambo et al., 2008). Poultry manure is the commonly used source of nutrients for crop production (Simpson, 2011). Reports have shown that the highest of all phototrophic wastes in poultry litter is mainly nitrogen and phosphorus necessary for vegetable crop production (Sim and Wolf, 2002). A research carried out by Edwards and Daniel, (2002) reported that poultry manure has high potentiality to improve the soil and improve crop production. Wiro and Adesina (2020) stated that poultry manure is superior to pig manure in promoting crop growth and yield.

Poultry manure supplies plant nutrient and organic compost increases the soil organic matter level, promotes root formation and development, hasten emergence rate and increases water holding capacity of the soil The effect of poultry manure on the soil is beneficial to the cultivation of cucumber when soil absorbs manure nutrients as this enriches the soil which inturn promotes and encourages plant growth, development and yield (Eghball, 2001). The application of poultry manure helps to improve the chemical, physical and biological condition of the soil hence promotes plant growth (Anon 2006). Bahl and Toor (2002) observed that poultry manure and other organic manures like saw dust, cow dung etc are very good material that support and enhance crop production by improving soil fertility and increasing productivity of crops. Adesina and Wiro, (2018) reported that application of poultry manure enhances the growth and yield of Okra.

Hence, the objective of this research is to determine the response of cucumber (*Cucumis Sativus*) production to poultry manure application in Rivers State, Nigeria.

MATERIALS AND METHODS

The field experiment was conducted at the Teaching and Research Farm of the Department of Crop and Soil Science, Ignatius Ajuru University of Education, Ndele campus, Rivers State, Nigeria on the latitude 4^o58N and longitude 6^o48N. The area has eight months of rainy season and four months of dry season. Different weeds

inhabited the experimental site which were removed before the start of the experiment. Three rates of poultry manure (0 tons, 5 tons and 10 tons) were used as the treatment. The cucumber seeds were planted on 2nd May 2019. Three seeds of cucumber were planted per hole but later thinned down to one per stand. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The seeds were obtained from the International Institute for Tropical Agriculture (IITA), Ibadan, Nigeria and the variety used was an

improved variety, (Market more 96). The growth attributes measured were vine length, number of leaves and leaf area while yield parameters measured were number of flowers, fruit length, fruit weight, fruit number and fruit diameter. The plant data obtained from the treatment combination were subjected to statistical analysis using the Analysis of variance (ANOVA). Significant means were separated using the Duncan's Multiple Range Test (DMRT) at 5% level significance.

RESULTS AND DISCUSSION

Table 1: Physico-chemical properties of the experimental site.

Physical Characteristics	Value
Sand (%)	83.20
Silt (%)	11.40
Clay (%)	5.40
Textural class	Loamy sand
Chemical properties	
pH (H ₂ O)	6.2
Organic carbon (%)	0.5
Total nitrogen (%)	0.9
Available potassium (mg Kg ⁻¹)	8.9
Exchangeable K (cmol Kg ⁻¹)	0.2
Exchangeable Ca (cmol Kg ⁻¹)	1.4
Exchangeable Mg (cmol Kg ⁻¹)	0.7
Effective cation exchange capacity (cmol Kg ⁻¹)	2.5
Base saturation (g/kg)	92.30

Source: Department of Agronomy University of Ibadan, March 2019.

The soil analysis result (Table 1) showed that the soil was predominantly sandy loam, an indication of a good water and nutrient holding capacity. The soil was slightly acidic with pH of 6.2. The available phosphorous

(mg.kg) was 8.9%. The experimental site showed nitrogen content of 0.9 and the organic carbon and organic matter contents were 0.5% and 1.4% respectively.

Table 2: Response of cucumber growth parameters to poultry manure application.

Treatments/ Level (ton ha ⁻¹)	Vine length (cm)	No. of Leaves	Leaf Area (cm ²)
0	84.46 ^c	62.40 ^b	15.06 ^c
5	108.86 ^b	66.66 ^b	23.60 ^b
10	156.93 ^a	86.26 ^a	30.53 ^a
MEAN	116.77	71.77	23.06
SE \pm	67.42	41.43	13.311

Source: Research study May, 2019

Values followed by the same letter in the column(s) are not significantly different at 5% level using DMRT.

The result from table 2 indicated that the cucumber plants applied with 10 ton ha⁻¹ of poultry manure were longer in vine length (156.93cm) than the plants applied with zero (0) ton ha⁻¹ (84.46cm). The plants applied with 5ton ha⁻¹ were 105.36cm in vine length. This showed that application of 10 ton ha⁻¹ of poultry manure significantly affected the vine length of cucumber plant. This is in agreement with the report of Enujoke (2013) who stated that the highest rate of poultry manure (10 ton

ha⁻¹) was superior with respect to the length, number of leaves, fruit length, weight, diameter of cucumber.

Again, the table showed that the application of 10 ton ha⁻¹ of poultry manure resulted in significant difference in number of leaves (86.26) and leaf area of 30.53cm² as against number of leaves (66.66) and leaf area of (23.60cm²) produced by the application of 5 ton ha⁻¹. The lowest number of leaves and leaf area were observed with the zero application of poultry manure of (62.40) and (15.06cm²) respectively. This also explained that the application of 10 ton ha⁻¹ resulted in better production of

leaves, followed by the application of 5 ton ha⁻¹ and least with zero application.

Table 3: Response of cucumber yield parameters to poultry manure application.

Treatments/ Level (ton ha ⁻¹)	Number Of Flowers	Fruit Length(cm)	Fruit Weight per plant	Fruit(g) No.	Fruit Diameter
0	16.06 ^c	18.26 ^c	48.00 ^c	4.46 ^c	13.88 ^c
5	29.93 ^b	21.93 ^b	64.26 ^b	6.06 ^b	15.30 ^b
10	37.80 ^a	25.60 ^a	82.06 ^a	7.13 ^a	16.33 ^a
MEAN	27.93	21.93	64.70	5.88	15.17
SE \pm	16.12	12.66	37.35	3.39	8.75

Source: Research study May, 2019

Values followed by the same letter in the column(s) are not significantly different at 5% level using DMRT.

The number of flowers responded positively to poultry manure application in cucumber production in the experiment. The effect of poultry manure on yield of cucumber followed the same trend as in the case with growth of cucumber as reflected in table 2 above.

Table 3 explained that the application of 10 ton ha⁻¹ was profitable as it caused a significant difference in the number of flowers produced in cucumber plant, and confirmed the findings of John et al., (2004) who indicated that the addition of poultry manure is essential for the photosynthetic process and so promotes root and vegetable growth.

Application of 10 ton ha⁻¹ of poultry manure also resulted in a significant difference in the yield parameters in cucumber production than the application of 5 ton ha⁻¹ and 0 application. Application of 10 ton ha⁻¹ of poultry manure produced 25.60cm of fruit length, while the application of 5 ton ha⁻¹ and 0 produced (21.93cm and 18.26cm) of fruit length respectively. This is in consonance with the finding of Garg and Bahla, (2008) who reported the importance of poultry manure on the performance of vegetable crops as it promotes plant growth and development.

Similarly, the highest weight of cucumber fruit was produced with the application of 10 ton ha⁻¹ of poultry manure which gave 82.06g per plant while 5 ton ha⁻¹ and 0 application gave rise to 64.26g and 48.00g per plant respectively. This result agreed with the finding of Deksissa et al., (2008) that poultry manure provide plants with nutrients which promotes the increase in the growth and yield of cucumbers in fruit number, fruit diameter, and fruit weight.

The fruit number and fruit diameter of cucumber were also better off with the application of 10 ton ha⁻¹ of poultry manure with (7.13) as fruit number and (16.33) as fruit diameter which is higher than 5 ton ha⁻¹ application that gave rise to 6.06 of fruit length and

15.30cm of fruit diameter with only 4.46 and 13.88cm of fruit number and fruit diameter respectively.

Finally, the zero (0) application of poultry manure resulted in the production of the least fruit number of 4.46 and fruit diameters of 13.88.

CONCLUSION

The application of poultry manure showed effective performance of cucumber growth and yield parameters measured. The results of the research were evident that the application of 10tons of poultry manure caused a significant difference in all growth and yield characteristics of *Cucumis sativus*. It is therefore recommended that for high production of cucumber in the study area, farmers should apply 10tonha⁻¹ of poultry manure. Again, further studies should be carried out with other organic manures to evaluate the best organic manure for cucumber cultivation.

REFERENCES

- Adams, P. Graves, C and Winsor, A.W. Some responses of cucumber grown in beds of peat to N.K and Management. *Journal of Horticultural Science*, 2002; 67: 877-884.
- Adesina, O.L and Wiro, K.O Influence of poultry manure rates on the Growth and yield of okra (*Abelmoschus esculentus* (L) Moench) in Rivers State. *International Journal of Sciences and Energy Research*, 2018; 4(3): 1-7.
- Anon, C Studies on farm livestock. West Agricultural Research Council, London, 2006; 75-89.
- Ansa, J.E.O and Wiro, K.O. Potential of Taungya system for sustainable livelihoods in Nigeria. *Science and Industrial Technology Education Journal*, 2018; 6(1): 28-38.
- Bahl, G.S and Toor, G.S. Influence of Poultry manure on phosphorus availability and the standard phosphate requirement of crop estimated from quantity-intensity relationships in different soils. *Bioresource Technology*, 2002; 85(3): 317-322.
- Binning, L.K., Wyman, J.A and Stevenson, R.W. Pest control in commercial vine production.

- University of Wisconsin in Cooperation Extension Service Publication, 2003.
7. Deksissa, T., Short, I and Allen, J Effects of soil amendment with compost on growth and water use efficiency of a maranthus: In internal water Resources: challenges for the 21st century and water resources education, July 22 – 24 2008.
 8. Duke, J. The green pharmacy. New York. St. Martins Press, 2007.
 9. Edom, S. How to start a lucrative cucumber farming business. The complete Available: Guide Startupips daily-com/cucumber-farming/ (Accessed 27th December, 2017), 2017.
 10. Edwards, D.R and Daniel, T.C Environmental impacts of farm poultry waste disposal, a review. *Bioresource Technology*, 2002; 41: 29-3.
 11. Eghball, B Compositing manure and other organic residue cooperative extension (Nebguide) Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, Nebraska, U.S.A., 2001.
 12. Eifediyi, E.K and Remison, S.U Growth and yield of cucumber (*Cucumis sativus L.*) as influenced by farm yard manure and inorganic fertilizer. *Journal of plant breeding and crop science*, 2010; 2(7): 216-220.
 13. Enujoke, E.C Growth and yield responses of cucumber to five different rates of poultry manure in Asaba area of Delta State. *Nigeria International Research Journal of Agricultural Science and Soil Science*, 2013; 3(11): 369-375.
 14. Gambo, B.A., Magaji, M.D., Yakabu A.L and Dikko, A.U Effect of farm yard manure and weed interference on the growth and yield of onions (*Allium cepa*): *Journal of sustainable agriculture and environment*, 2008; 3(2): 87-92.
 15. Gary, S and Bahla, G.S. Phosphorus availability to maize as influenced by organic manures and fertilizer phosphorus associated phosphate activity in soil. *Bioresources Technology*, 2008; 99: 5773 – 5777.
 16. Islam, M., Saha, S., Akand, H and Rahim, A Effect of spacing on the growth and yield of sweet pepper (*Capsicum annum L.*). *Journal of central European Agriculture*, 2011; 12(2): 328-335.
 17. John, L.W., Anter, O.B., Samuel, L.T and Waner, L.W. Soil fertility and fertilizer. An Introduction to Nutrient Management Resource Education, India, 2004; 106 – 153.
 18. Johnson, W.C and Mullinix, B.G. *Cyperus esculentus* interference in *cucumis sativus*. *Weed Science*, 2009; 47: 327-331.
 19. Noble, D (2011). Working towards better cucurbits, weed management strategies for the coming season (online) Available at [http://www.growingmagazine.com /fruits/working towards better-cucurbits](http://www.growingmagazine.com/fruits/working_towards_better-cucurbits) verified 18 July, 2011.
 20. Patidar, S. A study of perception of farmers towards organic farming. *International journal of Application Innovation in Engineering and Management*, 2015; 4(3): 269-277.
 21. Sim, T.J and Wolf, D.C Poultry Waste Management. Agricultural and Environmental issues. *Advance Agronomy*, 2002; 52: 81-84.
 22. Simpson, T.W. Agronomist use of Poultry Industry waste. *Poultry Science*, 2011; 70: 1125-1131.
 23. Wilson, G.E, Welling, U.K and Kang, B.T. The development of alley cropping as a promising agro forestry technology. *Journal of forestry management*, 2007; 4: 140-157.
 24. Wiro, K.O. Assessing the level of utilization of certified seeds by Horticultural Farmers in Rivers State. *International Journal of Education, Humanities and Multidisciplinary Research*, 2020; 10(1): 108-116.
 25. Wiro, K.O and Ansa, J.E.O. Socio-economic potential of taungya farming system for sustainable food production in Nigeria. *International Journal of Interdisciplinary Research and Innovations*, 2019; 7(4): 13-21.
 26. Wiro, K.O and Iyagba, A.G. Effect of weeding Regime on the performance of cucumber (*cucumis sativus*) in the South-South Rainforest of Nigeria. *American. Journal of Multidisciplinary Research and Development*, 2020; 2(7): 34-38.
 27. Wiro, K.O. and Adesina, O.L Effect of poultry and pig manures on the performance of Okra (*Abelmoschus esculentus(L) Moench*) in the Southern Region of Nigeria. *International Journal of Education, Humanities and Multidisciplinary Research*, 2020; 10(1): 117:126.