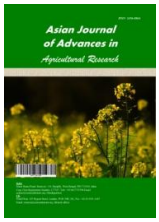

*Asian Journal of Advances in Agricultural Research*

***13(2): 1-8, 2020; Article no.AJAAR.55885***
***ISSN: 2456-8864***

# Effect of Poultry Manure and NPK Fertilizer on the Growth, Fruit and Yield of Cucumber (*Cucumis sativus* L.) in Afaka Community of Guinea Savannah, Kaduna State, Nigeria

**A. I. Sodimu[1*]**

*[1]Federal College of Forestry Mechanization, Forestry Research Institute of Nigeria, P.M.B.2273, Afaka-Kaduna, Kaduna State, Nigeria.*

***Author's contribution***

*The sole author designed, analysed, interpreted and prepared the manuscript.*

***Article Information***

DOI: 10.9734/AJAAR/2020/v13i230098
Editor(s):
(1) Saad Farouk Mohamed Hussiien Gadalla, Mansoura University, Egypt.
(2) Oguz Dolgun, Adnan Menderes University, Turkey.
(3) Daniele de Wrachien, The State University of Milan, Italy.
Reviewers:
(1) Chemutai Roseline, Bukalasa Agricultural College, Uganda.
(2) Julian Gonzalez Trinidad, Autonomous University of Zacatecas, Mexico.
Complete Peer review History: http://www.sdiarticle4.com/review-history/55885

***Original Research Article***

***Received 01 February 2020***
***Accepted 06 April 2020***
***Published 01 May 2020***

## ABSTRACT

The experiment was conducted at the Federal College of Forestry Mechanization, Afaka-Kaduna, to determine the effect of poultry manure and NPK fertilizer on the growth, fruit and yield of cucumber. Two (2) treatment of poultry manure (10tons/ha and 15tons/ha) and two (2) treatment NPK fertilizer (150 kg/ha) and (200 kg/ha) were used. Experiment was laid out in a Randomized Complete Block Design (RCBD) and parameters measured include number of leaves, leaf diameter, vine length, number of flowers, fruit weight and fruit diameter the data was collected at 3, 6 and 9 WAP and subjected to analysis of variance and Duncan's Multiple Range Test (DMRT) at the end of the experiment, the results showed a significant effect ($P < 0.05$) of above treatment generally, poultry manure (15ton/ha) has the highest yield ($P < 0.05$), while the control plant has the lowest ($P < 0.05$) yield. It is recommended that the horticulturist in the study area should adopt poultry manure (15 tons/ha) for effective growth and good fruit yield of cucumber.

**Corresponding author: Email: akintundesodimu@yahoo.com;*

*Keywords: Growth; fertilizer; manure; yield; fruit; Afaka; community.*

## 1. INTRODUCTION

Cucumber (*Cucumis sativus* L) is an important vegetable and one of most popular members of the *cucumbitaceae* family [1,2] and one of the oldest vegetables cultivated by early man [3] It is thought to be one of the oldest vegetables cultivated by man with historical records dating back 5, 000 years [4]. The crop is the fourth most important vegetable after tomato, cabbage and onion in Asia [5]. The second most important vegetable crop after tomato in Western Europe [6]. In tropical Africa, its place has not been ranked because of limited use. Fertile soils are used for the cultivation of cucumber infertile soils result in bitter and misshapen fruits which are often rejected by consumers. Bush fallowing has been an efficient balanced and sustainable agricultural system for soil productivity and fertility restoration in the tropics [7,8], but as a result of increase in the population, the fallowing periods have decreased from ten years to three years and this has had an adverse effect on the fertility restoration leading to poor yields of crops. Therefore, the use of external inputs in the form of farmyard manures and fertilizer has become imperative. Farmyard manure has been used as a soil conditions since ancient times and its benefit have not been fully harnessed due to large quantities required in order to satisfy the nutrition needs of crops [9,8]. The need for renewable forms of energy and reduced cost of fertilizing crops, have revived the use of organic manures worldwide [7] Improvement in environmental conditions and public health are important reasons for advocating increased use of organic materials [10,11]. However, because it is bulky, the cost of transportation and handling constitute a constraint to its use by peasant farmers. Farm yard manure release nutrients slowly and steadily and activates soil microbial biomass [12,13,8]. Organic manures can sustain cropping systems through better nutrient recycling and improvement of soil physical attributes [14].The use of inorganic fertilizer has not been helpful under intensive agriculture because of its high cost and it is often associated with reduced crop yields soil degradation nutrient imbalance and acidity [15,16].

Cucumber (*Cucumis sativus* L.) is a creeping vine that roots in the ground and grows up of trellises or other supporting frames; wrapping around supports with thin, spiraling tendrils. The plant has large leaves that form a canopy over the fruit. The fruit of the cucumber is roughly cylindrical elongated with tapered ends, and may be as large as 60 centimeters (24in) long and 10 centimeters (3.9in) in diameter. Having an enclosed seed and developing from a flower, botanically speaking, cucumbers are classified a necessary fruit. Much like tomatoes and squash they are often also perceived, prepared and eaten as vegetables. Cucumbers are usually more than 90% water [17]. Cucumber is a warm season grown year-round locally. The optimum temperature for growth is about 30°c, while the optimum night temperature is 18-21$^0$c. The soil should be fertile and rich in organic matter with a soil PH ranging from 6.5 to 7.5. [17]. Cucumber is gaining popularity due to high rate of consumption therefore it demand has evolved, necessitating increase in production. [18] stated that cucumber contain vitamin A, Niacin trace, vitamin C, calcium, iron, phosphorus, potassium, carbohydrate and calories. These elements are very essential for body development. Cucumber reduces the risk of heart attack and help in digestion of food. The diet of most people across the world especially in Nigeria today depends largely on vegetable and fruits. This is due to the high vitamin content they contain. Application of fertilizer or manure will help the farmers to improve in the yield. Poultry manure is relatively cheaper and can easily be available to farmers. To increase their yield and productivity, there is need for cheap source of fertilizer which will also be environmental friendly. Therefore, the use of external inputs in the form of farmyard manures and fertilizer has become imperative. Therefore, this study is carried out to increase cucumber production for farmer's and the populace at large. The objective of the study is to determine the effects of poultry droppings and NPK fertilizer on the vegetative growth and fruit yield of cucumber (*Cucumis sativus* L.).

## 2. MATERIALS AND METHODS

### 2.1 Experimental Site Description

The experiment was conducted at the Research Farm of Federal College of Forestry Mechanization, Afaka – Kaduna. It is located at 644m above sea level on latitude 10°E37$^1$N and 10°41$^1$N and longitude 7°47$^1$E Northern Guinea Savannah Ecological Zone of Nigeria [19]. Soil sample for chemical analysis were randomly collected from the top 0-15 cm depth, bulked together and then analysed for physical and

chemical properties prior to cropping. The soil in the research farm is of the sandy loam textural class and slightly acidic.

### 2.2 Land Preparation and Planting

The field was cleared and bedded before planting. Seeds of cucumber (*Griffaton france*) distributed by Isah Agro Seeds and chemical company, Zaria was planted on 2.25 x 2.25 m plots at spacing of 75 x 75 cm with two seeds planted in a hole which was later thinned after two (2) weeks to one seedling per stand.

### 2.3 Treatments and Experimental Design

The experiment was laid out in a Randomized Complete Block Design (RCBD) and the treatment was two levels of poultry dropping (10, 15 t/ha) and NPK fertilizer at (100 and 200kg/ha). It was replicated four (4) times with the control resulting in twenty plots [20] altogether. The treatments are;

T1- poultry 10 tons/ha
T2- poultry 15 tons/ha
T3- NPK 150kg/ha
T4- NPK 200kg/ha
T5- Control

### 2.4 Field Layout and Plot Size

The field layout comprises of 20 plots and the plot size was 2.25 m by 2.25 m, the spacing between plots was 0.5 m while spacing between replicates was 1 m.

### 2.5 Nutrient Application

Poultry manure of 5.1kg and 7.7kg was applied to the plots of 10, 15 tonnes, spreading evenly and manually two (2) weeks before planting. It was incorporated into the soil, and then watered on daily basis for one week prior to planting The N.P.K 15:15:15 was applied at two (2) weeks after planting at the rate of 0.051 kg and 0.102 kg per stand on the plot of 100 and 200 kg.

### 2.6 Supplying

The ungerminated spot was supplied with the ones thinned from the germinated spot.

### 2.7 Materials

The material used were hoe, measuring tape, digger, cutlass, watering can and bucket.

### 2.8 Weeding

West India hoe and hand was used to weed and it was carried out at 2,4,6 and 8 weeks after planting.

### 2.9 Data Collection

Observation was made and data were collected on vine length, number of branches, leaf area, number of flowers and fruit harvested and so on was collected.

### 2.10 Data Analysis

Data collected was subjected to Analysis of Variance (ANOVA) treatment means were compared using the Least Significant Difference (LSD) test at ($P>0.05$) level.

## 3. RESULTS AND DISCUSSION

### 3.1 Chemical and Physical Properties of the Soil Used

Table 1 shows that the soil in the experimental plot is of sandy loam textural class and slightly acidic with a pH of 6.11. It had an organic matter content of 4.50% and organic carbon of 0.27%. The N, P and K contents were 2.70%, 12.10mg $kg^{-1}$ and 0.026 cmol $kg^{-1}$ respectively.

### 3.2 Chemical Composition of Poultry Manure Used

Table 2 shows that the poultry manure is slightly alkaline with a pH of 8.10. It was high in organic matter (720 gKg-1) and had more nitrogen (50.2 gKg-1) and calcium (36.5gKg-1) than potassium (4.5 gKg-1) and Magnesium (5.6 gKg-1). The low nitrogen and phosphorus (0.5 gKg-1) of the soil are expected to benefit from the application of the poultry manure.

### 3.3 Number of Leaves

Table 3 shows that there were significant differences on the number of leaves at 3, 6 and 9WAP. Poultry Manure 15 tons had the highest number of the leaves at 3, 6, and 9 WAP with values of 8.6, 41.75 and 16.33 respectively. The control (i.e. o+ $ha^{-1}$) gave significantly lower number of Leaves per plant (7.35, 30.15 and 13.50 respectively). On the other hand, treatment 1 and 2 of poultry manure gave significantly

**Table 1. Pre – planting physical and chemical properties of soil at the study site**

| S/N | Property | Value |
|---|---|---|
| 1. | pH | 6.10 |
| 2. | Organic carbon | 0.27% |
| 3. | Organic matter | 4.5% |
| 4. | Total N | 12.10 mg $Kg^{-1}$ |
| 5. | Available P | 0.026 cmol $Kg^{-1}$ |
| 6. | Exchangeable K | 0.026 cmol $Kg^{-1}$ |
| 7. | $Ca^{2+}$ | 2.28 cmol $Kg^{-1}$ |
| 8. | $Mg^{2+}$ | 1.22 cmol $Kg^{-1}$ |
| 9. | $Na^{+}$ | 0.42 cmol $Kg^{-1}$ |
| 10. | Sand | 85.70% |
| 11. | Silt | 10.10% |
| 12. | Clay | 4.20% |
| 13. | Texture | Sandy Loam |
| 14. | $K^{+}$ | 0.027 cmol $Kg^{-1}$ |
| 15. | $Na^{+}$ | 0.43 cmol $Kg^{-1}$ |

**Table 2. Chemical composition of poultry manure**

| S/N | Properties | Values |
|---|---|---|
| 1. | pH | 8.10 |
| 2. | Organic matter | 720g$Kg^{-1}$ |
| 3. | N | 50.2g$Kg^{-1}$ |
| 4. | P | 0.5g$Kg^{-1}$ |
| 5. | Ca | 36.4g$Kg^{-1}$ |
| 6. | Mg | 5.6g$Kg^{-1}$ |
| 7. | K | 4.5g$Kg^{-1}$ |
| 8. | Na | 0.7g$Kg^{-1}$ |
| 9. | Fe | 396g$Kg^{-1}$ |
| 10. | Mn | 495g$Kg^{-1}$ |
| 11. | Cu | 25.3g$Kg^{-1}$ |
| 12. | Zn | 330g$Kg^{-1}$ |

**Table 3. Effect of poultry manure and NPK fertilizer on number of leaves per plant at 3, 6 and 9 WAP of cucumber**

| Treatment | 3WAP | 6WAP | 9WAP |
|---|---|---|---|
| Poultrymanure10tons | 7.92ba | 35.10ba | 14.20a |
| Poultry manure 15tons | 8.60a | 41.75a | 16.3a |
| NPK 100kg | 7.67a | 25.97b | 12.07a |
| NPK 200kg | 7.17b | 28.65b | 12.70a |
| Control | 7.35b | 30.15b | 13.50a |
| SE± | 0.21 | 1.88 | 1.00 |

*(i) Mean with the same letters are not significant difference from each other (P < 0.05) using Duncan's Multiple Range Test (DMRT), (ii) WAP (Weeks after Planting)*

higher values of ($T_1$ – 7.92; 35 – 10, 14 – 200, $T_2$ – 41.75, 8.60, 16.325 respectively) while that of NPK fertilizer at 3, 6 and 9$^{th}$ week gave ($T_3$ – 7.67, 25.97 and 12.07, $T_4$ – 7.17, 28.65 and 12.70 respectively). Number of leaves /plant increased in that of poultry droppings to that of NPK fertilizer. Treatment 5 (i.e. treatment with no fertilizer) could not support appropriate growth of the plants because the residual nutrient content of the soil was inappropriate to support growth of cucumber, probably the nutrient content of the soil was below the critical level hence poor performance of the crop. This means that the higher the nutrient applied in the soil, the higher the number of leaves/plant. The vigorous growth experienced in the crop was evidenced in the increase in the number of leaves/plant with an increase in treatment 0 – 15+ per ha of poultry

dropping and 0 – 200 kg per ha of NPK fertilizer. This observation agrees with works of [21,20]. They earlier reported that nutrients from mineralization of organic matter promoted growth, fruit and yield of cucumber.

### 3.4 Leaf Diameter

Table 2 shows significant (P<0.05) difference in leaf diameter per plant among the treatments of the 3; 6 weeks while that of the 9th week, there was no significant difference. The control produces significantly lower values of leaf area throughout the period of observation though some treatment under the control did well, because of the soil nutrient of that particular area or the residual nutrient of that formal project carried out. The NPK fertilizer treatment did not do well like that of the poultry manure i.e. to show that poultry manure is better than NPK fertilizer. The poultry manure significantly gave higher means values of leaf area per plant in all the period of assessment. This result corresponded with the report previously presented by [10] that variations treatments do not usually give a significant variation on leaf area per plant of any crop.

### 3.5 Vine Length

Table 3 shows significant (P< 0.05) variation in the vine length among the treatment in the experiment during the period of study. In all period of assessment, control significantly produced lower vine length per plant at the 3, 6 and 9WAP such as 22.4 cm, 107.68 cm and 122.90 cm while the poultry manure produced significantly higher value, such as 33.5 cm, 191.8 cm, 201.68 cm of cucumber vine length as shown in (Table 3) than that of the N P K fertilizer which are 18.9 cm, 98.8cm and 106.20 cm. Vine length per plant increased with an increase in quantity of poultry manure applied. Treatment without poultry droppings or fertilizers could not support appropriate growth of the plant because the residual nutrient content of the soil was inappropriate to support growth of cucumber; probably the nutrient content of the soil was below the critical level hence poor performance of the crop, Therefore, making them to produce shorter vine length per plant. The ability by these plants to photosynthesis, has led to an increase in growth and development of the crop resulting into the production of longer vine length per plant. This observation agreed with [2,12]. They observed that organic manure can sustain cropping systems through better nutrient recycling which would give rise to crop improvement in growth and development as well as yield.

### 3.6 Numbers of Flowers

Higher number of flower was produced by the treatment that received the higher rate of poultry manure possibly because the manure established and maintained soil physical condition for plant growth. This is consistent with the report of [22,23,24] which indicated that poultry manure (the richest known animal manure) is essential for establishing and maintaining the optimum soil physical condition for plant growth. The more the number of flowers the more fruit that will be produced.

### 3.7 Fruit Weight

The response of weight of fruit of cucumber to poultry manure is shown in (Table 5) plants that received 15 ton/ha of manure had higher weight of fruit (4.2 ton/ha) while plants in the NPK plot had lower yield to that of poultry manure, while plants in the control plot had the lowest fruits weight (1.93 ton/ha). Higher fruit weight was obtained from cucumber plants that received. 15ton/ha i e. treatment of poultry manure possibly because higher rates of manure

**Table 4. Effect of poultry manure and NPK fertilizer on leave diameter at 3, 6 and 9 WAP of cucumber**

| Treatment | 3WAP | 6WAP | 9WAP |
|---|---|---|---|
| Poultrymanure10tons | 16.00ba | 17.83ba | 9.00 |
| Poultry manure 15tons | 18.10a | 17.65ba | 8.825 |
| NPK 100kg | 15.00b | 14.33c | 17.18 |
| NPK 200kg | 13.60b | 15.53bc | 7.03 |
| Control | 14.50b | 19.50a | 7.40 |
| SE± | 0.52 | 0.53 | 0.37 |

*(i) Mean with the same letters are not significant difference from each other (P < 0.05) using Duncan's Multiple Range Test (DMRT). (ii) WAP (Weeks after Planting)*

**Table 5. Effect of Poultry manure and NPK fertilizer on vine length at 3, 6 and 9 WAP of cucumber**

| Treatment | 3WAP | 6WAP | 9WAP |
|---|---|---|---|
| Poultrymanure10tons | 27.15ba | 142.53ba | 1.61.58ba |
| Poultry manure 15tons | 33.58a | 191.83a | 201.68a |
| NPK 100kg | 20.83b | 91.35c | 105.85c |
| NPK 200kg | 18.98b | 98.75bc | 106.20c |
| Control | 22.40b | 107.68bc | 122.90bc |
| SE± | 1.77 | 11.40 | 11.14 |

*(i) Mean with the same letters are not significant difference from each other (P < 0.05) using Duncan's Multiple Range Test (DMRT); (ii) WAP (Weeks after Planting)*

**Table 6. Effect of Poultry manure and NPK fertilizer on number of flowers per plant at 3, 6 and 9 WAP of cucumber**

| Treatment | 6WAP | 9WAP |
|---|---|---|
| Poultrymanure10tons | 26.83b | 4.48a |
| Poultry manure 15tons | 33.50a | 6.08a |
| NPK 100kg | 19.90c | 4.17a |
| NPK 200kg | 18.78c | 2.75a |
| Control | 24.10b | 7.75a |
| SE± | 1.67 | 1.00 |

*(i) Mean with the same letters are not significant difference from each other (P < 0.05) using Duncan's Multiple Range Test (DMRT), (ii) WAP (Weeks after Planting)*

**Table 7. Effect of poultry manure and NPK fertilizer on fruit weight per plant at3, 6 and 9 WAP of cucumber**

| Treatment | Yield (Kg/Plot) |
|---|---|
| Poultrymanure10tons | 2.68b |
| Poultry manure 15tons | 4.16a |
| NPK 100kg | 2.07cd |
| NPK 200kg | 2.60cb |
| Control | 1.97d |
| SE± | 0.19 |

*(i) Mean with the same letters are not significant difference from each other (P < 0.05) using Duncan's Multiple Range Test (DMRT). (ii) WAP (Weeks after Planting)*

**Table 8. Effect of poultry manure and NPK fertilizer on fruit diameter at 3, 6 and 9 WAP of cucumber**

| Treatment | Diameter |
|---|---|
| Poultrymanure10tons | 35.47b |
| Poultry manure 15tons | 37.93a |
| NPK 100kg | 35.28b |
| NPK 200kg | 34.58b |
| Control | 31.68c |
| SE± | 0.51 |

*(i) Mean with the same letters are not significant difference from each other (P < 0.05) using Duncan's Multiple Range Test (DMRT). (ii) WAP (Weeks after Planting)*

improved the soil condition for crop establishment as well as released adequate nutrient elements for yield enhancement. This is in harmony with the reports [25,10,23,26] which indicated that higher rates of manure increases crop yield.

### 3.8 Fruit Diameter

The response of fruit diameter of cucumber to poultry manure is shown in plant that received 15ton/ha of poultry manure had highest fruit diameter of 37.9 cm to that of the NPK fertilizer

35.5 cm of which is interior to poultry manure. While plants in the control plot had the lowest fruit diameter (31.8 cm) the fruit diameter of plants that received 15ton/ha of poultry manure was than the fruit diameter of plants that received NPK fertilizer and control with all other ratio possibly because the high rate of manure seduced moisture availability which favored the release of more nutrients for higher growth and yield, this is in consonance with the findings of [27,28] who attributed the vigorous growth and increased fruit yield of watermelon to higher supply of nutrient elements from the applied manure.

## 4. CONCLUSION AND RECOMMENDATIONS

### 4.1 Conclusion

The result of the study shows that plants that received 15 $tha^{-1}$ of poultry manure were superior in the parameters tested compared to NPK fertilizer for yield, growth and development of cucumber.

### 4.2 Recommendations

It is recommended that farmers in the study community should apply 15ton/ha of poultry manure for better growth, development and yield of cucumber. However, more research work should be carried out using other organic materials for growing of cucumber.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

## REFERENCES


1. Lower RL, Edwards MD. Cucumber breeding. In: M. J. Basset (ed.). Breeding vegetable crops. West port, Connecticut USA: AV1 Publishing Co. 1986;173-203.
2. Thoa DK. Cucumber seed multiplication and characterization. AVRDC/ARC Training Thailand. 1998;5-10.
3. Eifediyi EK, Remison SU. Growth and yield of cucumber (*Cucumis sativum* L.) as influenced by farm yard manure and inorganic fertilizer. Journal of Plant Breeding and Crop Science. 2010;2(7): 216-220.
4. Wehner TC, Guner N. Growth stage, flowering pattern, yield and harvest date prediction of four types of cucumber tested at 10 planting dates. Proc. XXVI IHC. Advances in vegetable Breeding (Eds) J.D. Mc Creight and E.J. Ryder. Acta. Hort. 2004;637.
[ISHS: 2004]
5. Tatlioglu T. Cucumber (*Cucumis sativus* L.). In: Kailov G. and Bo Bergn, (eds.) Genetic improvement of vegetable crops. Oxford Pergamum Press. 1997;197–227.
6. Phu NT. Nitrogen and potassium effect on cucumber yield. AVI 1196 Report, ARC/AVRDC Training Thailand. 1997;13.
7. Ayoola OT, Adeniran ON. Influence of poultry manure and NPK fertilizer on yield and yield components of crops under different cropping systems in South West Nigeria. Afr. J. Biotechnol. 2006;5: 13361392.
8. Khalid AA, Tuffour HO, Bonsu M, Adjei-Gyapong T, Abubakar A, Boateng IY, Kpotor P. Effects of poultry manure and NPK fertilizer on growth and yield of garden eggs (*Solanum Melongena*) in a sandy soil in Ghana. International Journal of Scientific Research in Knowledge. 2014;2(6):257.
9. Makinde EA, Ayoola OT, Akande MO. Effects of oregano-mineral fertilizer application on the growth and yield of(egusi) melon. Australian J. Basic Appl. Sci. 2007;1:15-19.
10. Ojeniyi SO. Effect of goat manure on soil nutrients and okra yield in a rain forest area of Nigeria. Appl. Tropical Agric. 2000; 5:20-23.
11. Marithus LHT, Vleic PLG. The Management of Organic Matter in Tropical Soils: What are the Priorities? Nutrient Cycling in Agro Ecosystem. 2001;61:1.
12. Ayuso MA, Pascal JA, Garcia C. Hernandez T. Evaluation of urban wastes for urban agricultural use. Soil Sci. Plant Nut. 1996;42:105111.
13. Belay A., Classens AS, Wehner FC, De Bear JM. Influence of residual manure on selected nutrient element and microbial composition on soil under long term crop rotation. South Africa Journal of plant and soil. 2001;18:1-6.
14. El-shakwee MHA, El-sayad EA, Ewees MS. Soil and plant analysis as a guide for interpretation of the improvement efficiency of organic conditioners added to different soils in Egypt. Communication in Soil

Science and Plant Analysis. 1998;29:2067-2088.
15. Kang BT, Juo ASR. Management of low activity clay soils in tropical Africa for food crops production. In: Terry E.R., K.A. Oduro and S. Caveness (Eds.). Tropical Root crops. research strategies for the 1980s.Ottawa, Ontario IDRC. 1980; 129-133.
16. .Obi ME, Ebo PO. The effects of different application rates of organic and inorganic fertilizers on soil physical properties and maize production in severely degraded ultisol in southern Nigeria. Bioresource Technology. 1995;2 (3):117-123.
17. Cucumber production Guide. Cucumber production Guide Info. Bulletin, No. 152/1999.PCARRD; 2015. Available:www.wikipedia.org/wiki/cucumber.
18. FAO. Statistical analysis of crop response of fertilizer, Food Agricultural organization of united Nation. 2005;104-112.
19. Otegbeye GO, Owonubi JJ, Oviasuyi PK. Interspecific variation growth of eucalyptus growing in Northern Nigeria. Proceeding of 27th Annual conference of Forest Association, Nigeria. 2001;12-16
20. Dada OA, Fayinminnu OO. Influence of cattle and weeding regimes on period of weed control in Okra. Not. Bot. Hort. Agrobot. Cley. 2010;38(1)149–154
21. Aduloju MO, Fawole OB, Abubakar AJ, Olaniyan JO. Effect of sawmill wastes, Animal manure and NPK fertilizer on the performance of okra (*Abelmos chuseculentus* L. moench) on an Alfisol. Department of Agronomy, University of Ilorin – Nigeria. 2010;17-25.
22. Lombin LG, Adeputu JA, Ayetade KA. Complementary use of organic manures and inorganic fertilizers in arable crop production proceeding of national organic fertilizer Seminar held in October 20th – 22nd at University of Ibadan. 1992;146–162.
23. Mangila E, Tabiliran FP, Naguit MRA, Malate R. Effects of organic fertilizer on the yield of watermelon. 2007;27-35.
24. Enejeke EC. Effects of poultry manure on growth and yield of improved maize in Asaba Area of Delta state, Nigeria. 10SR.J. Agric and Veterinary sci. (10SR – JAVS). International Organization of scientific Research, India. 2013;4(5):24–30.
25. Aliyu L. Effects of organic and mineral fertilizer on growth, yield and composition of pepper (*Capsicum annum* L.). Biol. Agric. Hort. 2013;18:29-36.
26. Agbede TM, Ojeniyi SO, Adeyemo AJ. Effect of poultry manure on soil physical and chemical properties, growth and grain yield of Sorghum in South west, Nigeria, AM – Eurasian J. sustain Agric. Hort. 2008;18:29–36.
27. Adekiya AO, Ojeniyi SO. Evaluation of tomato growth and soil properties under methods of seedling bed preparation in an Alfisol in the rainforest zone of southwest, Nigeria. Bioresource Technology. 2002; 96:509–516.
28. John LW, Jamer DB, Samuel LT, Warner LW. Soil fertility and fertilizers; An introduction to Nutrient management, Pearson Education, India. 2004;106–53.



*Peer-review history:*
*The peer review history for this paper can be accessed here:*
*http://www.sdiarticle4.com/review-history/55885*