Advances in Science and Technology, Vol. 5, No. 1, March / April, 2011, pp 42 - 48

Effect Of Combination Of Different Poultry Manure Rates And Constant Crushed Neem Leaves On The Productivity Of Cucumber *(Cucumis Sativus)* In Owerri, Nigeria.

I.I. Ibeawuchi*, B.C. Ezeh and J.C. Obiefuna.
Department of Crop Science and Technology Federal University of Technology PMB 1526,
Owerri Imo state, Nigeria.
(Submitted: February 10, 2011; Accepted: April 12, 2011)

Abstract

A field experiment was conducted on the effect of different poultry manure rates on the productivity of cucumber in Owerri, South-eastern Nigeria. The experiment was established using a Randomized Complete Block Design (RCBD) with four replications. The treatments consist of seven application rates including zero application, 0 + 0.25kgCNL (a constant rate), 0.2ton/ha +CNL (crushed neem leaves), 0.4ton/ha + CNL, 0.6ton/ha + CNL, 0.8ton/ha + CNL and 1ton/ha +C NL. The cucumber (Ashley) was planted at 75cm x 75cm spacing. Data on various growth and yield parameters on cucumber were collected and subjected to statistical analysis while the means were separated using the least significant difference at 5% level of probability. Results indicate that 0.8ton/ha poultry manure plus 0.25kgCNL and 1ton/haPM + CNL, produced significantly higher growth and yield of cucumber and were better than other rates of combined applications investigated. The experimental results indicated significant difference in percentage emergence, vine length, leaf area, number of leaves per plant, and fruit development (length, diameter and weight). However, there was no significant difference in the number of flower at 6WAP. In this experiment, it had been proved that the application of 0.8ton/ha poultry manure plus 0.25kg of crushed neem leaves is better for production of cucumber *(Cucumis sativus)* in Owerri South-eastern Nigeria than the other combined rates of application investigated.

Keywords: Cucumber productivity, Rates, poultry manure, Crushed neem leaves, Owerri, Nigeria.

1.0 Introduction

Vegetables are consumed in small quantities either as a relish with a staple food or as side dishes. Large scale vegetable production aimed at improving human nutrition in Nigeria has not been given serious attention. However, the production of fruit vegetables in Nigeria is vastly in the northern part. This is usually done at subsistence level and has led to losses and damages incurred en transit during distribution to other parts of Nigeria. Cucumber is a fruit vegetable grown as salad supplements or as fresh fruit dessert. It is widely grown in the Northern part of Nigeria and has been under introduction in Southern part which accounts for the largest consumption in Nigeria. Cucumber is cherished for its; vitamin content, delicious taste, and medicinal value. It is usually eaten fresh with peanut in this part of the world.

Production of crops in South-eastern Nigeria usually involves traditional continuous cropping and bush fallow systems. This system is always characterized with little time of recovery and maintenance through incorporation of organic supplements to enrich soil for sustainable production. Soil enrichment through organic means is done using poultry manure, compost, farm yard manure, green manure, sea weed manure, vermicompost, oil cakes, night soil, sewage etc. (Onwubiko *et al.*, 2009). The use of poultry manure is an age-long practice in Nigeria and it is the cheapest source of nutrient for improving the fertility and productivity of soils. Cucumber production in Nigeria has so much been improved by the use of organic manure. The nature of soils in south-eastern Nigeria comprises of low organic matter, heavily leached and comprises of sandy-loam and is highly acidic; a characteristic ultisol (Eshett and Anyanwuche, 1992), this requires supplementation through the use of poultry manure. Recent improvements of vegetable production in Nigeria have been made with poultry manure and organic fertilizer such as neem (its crushed leaves or cake from oil seed). Neem is a botanical cousin of

* **Corresponding Author's e-mail: ii_ibeawuchi@yahoo.co.uk**

mahogany, and used as a natural pest control materials for the past three decades (Schmutter, 2002). It has been used traditionally and scientifically in solving most agricultural problems including plant pest control in field and in storage.

Studies of the use of poultry manure at different rates have so far helped to provide best rates for producing several vegetables in Nigeria. Poultry manure is the best supplier of nitrogen and other essential nutrients. Its use for maintenance and improvement of soil fertility in Nigeria can be said to have started five decades ago (Sevaisso, 1987). Cucumber respond well to various nutrient level especially nitrogen, potassium and phosphorus. Phu (1996) reported that nitrogen and potassium fertilizer applications have significant effect on yield of cucumber (cv. Poung). Devi *et al.* (2002) reported that better fruit girth, weight and yield were recorded for 120kgN per hectare. Kotsiras *et al.* (2005) reported that higher cucumber yield and better fruit quality were obtained, during spring and winter at 100ppm of nitrogen application. Report of a positive effect of all nitrogen treatments over control plots regarding number of fruit and marketable yield in cucumber was obtained by Osman *et al.,* (2004). The test of cucumber productivity in this study using poultry manure and crushed neem leaves was stimulated by the premium prices organic vegetables command (Tuzel *et al.* 2005), and because organic farming seems to be a solution in environmentally sensitive zone prone to pollution risks (Aiyelaegbe *et al.* 2007).

This study is necessary as it provides farmers with relatively affordable choice of soil amendments suitable for cucumber production. The objective is to assess the best possible combination of crushed neem leaves and poultry manure rate that will give maximum yield of cucumber in Owerri Southeastern Nigeria.

2.0 Materials and Method

2.1 Study Area

The experiment was conducted at the Federal University of Technology Owerri Teaching and Research farm located at latitude 5° 27' and 5°30' North and longitude 7°02' and 7°49'33" East. Owerri is located in the tropical rain forest zone of Nigeria and has its peak rainfall from July to September with a break in August. The annual mean rainfall is 2,500mm with maximum and minimum temperatures of 32°C and 20°C, and a relative humidity of between 88-91% respectively. The experimental site was cleared and the field mapped out. The field has an area of 134.52cm^2 (i.e. 11.4m x 11.8m). Five levels of cured poultry manure combined with 0.25kg crushed neem leaves (0.25kgCNL): 0.2+CNL, 0.4+CNL, 0.6+CNL, 0.8+CNL and 1.0 tonnes/ha + CNL, with a zero application, and zero + crushed neem leaves (CNL) application, to make up the seven treatments used. The study was laid out in a Randomized Complete Block Design (RCBD), each replicated four times in a distance of 1m between blocks and 0.5m between plots. The cucumber was planted in a distance of 75 cm x 75 cm in a plot size of 2.2 m x 1.2 m. the treatments were applied immediately after land preparation i.e. two weeks before planting.

2.2 Data Collection and Analyses

Particle size distribution was determined by hydrometer method (Gee and Or, 2002). Soil pH was measured in H_2O and in 0.1N KCL at soil-solution ratio of 1: 2.5 (Hendershot *et al.*, 1993). Organic carbon was determined by wet oxidation method (Allison 1996) while available phosphorous was determined by the method of Olson and Sommers (1982). Total exchangeable acidity was evaluated tritimetrically (Maclean, 1982). Exchangeable calcium and magnesium were determined by ethylene diamine tetra-acetic titration while exchangeable potassium and sodium were estimated by flame photometry. Percentage nitrogen was determined by the modified kjehdahl method by Bremmer and Mulvarey (1982). The exchangeable cations and anions were determined using appropriate methods for both the soil (collected at the depth of 0 to 20 cm) and poultry manure.

Emergence count was done at two weeks after planting while percentage emergence was calculated as

$$= \frac{\text{Number of seedlings/plot}}{\text{Number of seeds planted/plot}} \times 100\%.$$

Experimental plots were weeded regularly throughout the experiment with hoe. Data on number of leaves per plant, leaf area (cm^2) and vine length (cm) were taken at 4, 8 and 12 weeks after planting

Flower count started from the time of set and was recorded at 6 and 8 weeks after planting. Data were also collected on fruit weight (g), fruit length (cm) and fruit diameter (cm). All data collected were taken from three randomly selected plants per plot. Data collected were analyzed statistically using Analysis of Variance (ANOVA). Means were tested using the Least Significant Difference (LSD) at P=0.05.

3.0 Results

The results of the physical and chemical analyses of the soil and the chemical analysis of the poultry manure are shown in Table 1. The field is a characterized by sandy-loam soil and has low percentage NPK when compared with poultry manure.

3.1 Vegetative Growth

There was significant influence in the rates of applications on the percentage seedling emergence (Figure 1 and Table 2), number of leaves at 4, 8 and 12 weeks after planting, and leaf area at 4, 8 and 12 weeks after planting as shown in Table 2. However, application of 0.4t/ha + CNL and 1t/ha + CNL gave the highest percentage seedling emergence. Effects of application of 0.6t/ha + CNL, 0.8t/ha + CNL and 1t/ha + CNL were similar but differ significantly from the other application on the number of leaves at 4, 8 and 12 weeks after planting. Table 2 shows high performance in the three as 1t/ha + CNL (5.58)

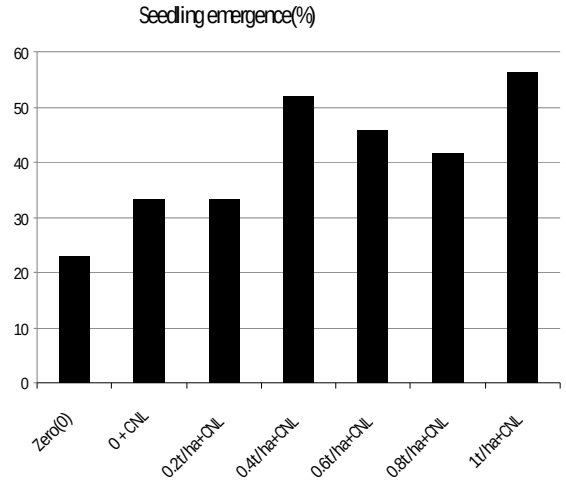

Figure 1: Effects of poultry manure rate and crushed neem leaves on the percentage seedling emergence of cucumber.

Table 1: Soil chemical and physical analysis and poultry manure analysis.

Property	pH in H_2O	pH in KCl	Organic matter (%)	Organic Carbon (%)	Organic Nitrogen (%)	P 100m Soil (Cmol/kg)	MeqMg/ 100g soil (Cmol/kg)	MeqNa/ 100g soil (Cmol/kg)	Meq/ K 100g soil (Cmol/kg)	MeqCa/ 100g soil (Cmol/kg)	Moisture content (%)	Exch. Acidity (Cmol/kg)	Bulk Density (g/cm^2)	Silt (%)	Clay (%)	Sand (%)	Textural Class
Soil	5.10	4.80	0.91	1.21	0.75	2.01	0.96	0.58	1.31	0.74	0.93		278	1.88	28.4	69.72	Sandy loam
Poultry manure	7.78	-	39.3	22.8	2.58	14.82	0.51	0.58	2.51	1.42	-	4.61	-	-	-	-	-

was highest at 4WAP while 0.6t/ha (14.00) and 0.8t/ha (23.03) were the highest at 8WAP and 12WAP respectively. Effects of treatment on leaf area showed high performance in 1t/ha + CNL (42.27cm^2) at 4WAP, 0.6t/ha (84.10 cm^2) at 8WAP and 0.8t/ha (139.46 cm^2) at 12WAP. However, the effect of treatments did not differ significantly among application at 0.6t/ha + CNL, 0.8t/ha + CNL and 1t/ha + CNL but have high significantly difference in other application rates.

The effect of treatment on the vine length is shown in Table 3. Application of 0.6t/ha + CNL, 0.8t/ha + CNL and 1t/ha + CNL significantly increased the vine length and showed similarity, but differ significantly when compared to other treatments and zero application. However, the highest lengths of vine were obtained in plots receiving the highest treatments (1.0t/ha + CNL) at 4WAP (9.04cm), 8WAP (66.88cm) and 12WAP (166.43cm).

3.2 Flower Production

There was no significant difference in the number of flowers counted at 6WAP. The highest number of flower was obtained at the treatment with the largest application (1t/haPM + CNL) and there was significant relationship among treatments at this point. However, number of flowers counted at 8WAP showed significant differences in treatments receiving 0.8t/ha + CNL and 1t/ha + CNL. They showed high flower production than other treatments as shown in Table 3.

3.3 Fruit yield

Fruit set started at 8weeks after planting. The effects of treatment on fruit yield (fruit weight, fruit length and fruit diameter) are shown in Table 3. The table shows that the highest fruit length (13.52cm), weight (167.54g) and diameter (5.22cm) were obtained from 0.8t/ha + CNL followed by 1t/ha + CNL and 0.6t/ha + CNL. The least fruit length (5.56cm), weight (59.78g) and diameter (3.29cm) were obtained in plots with zero treatment.

4.0 Discussion

The process of enhancing the soil with poultry manure is commonly known to improve its nature and structure. Poultry manure usually assist farmers improve the soil through addition of essential nutrients and also serves as a reservoir of soil chemical properties that are essential for plant growth (Fagbenro, 1998). Cucumber is a temperate crop (Adams *et al*., 1992) but recently being adopted in the tropics. It does well at the early stage of growth usually without nutrient supplement (Ahmad *et al.*, 2007). This result did not concur with effect of treatments on the plots with zero application due to

Table 2: Percentage seedling emergence, number of leaves at 4, 8 and 12 WAP and leaf area at 4, 8 and 12 WAP in cucumber as affected by different rate of poultry manure and crushed neem leaf application.

Poultry manure Rates & crushed neem leaves (CNL)(tons/ha)	Percentage Seedling Emergence (%)	Number of Leaves at 4 WAP	Number of Leaves at 8 WAP	Number of leaves at 12 WAP	Leaf area At 4 WAP (cm^2)	Leaf area At 8 WAP (cm^2)	Leaf area At 12 WAP (cm^2)
Zero(0)	22.92	3.99	6.95	8.50	3.00	21.61	51.82
0 + CNL	33.34	5.32	7.75	10.30	7.63	32.61	67.44
0.2 + CNL	33.34	5.04	8.88	13.64	13.16	54.28	93.31
0.4 + CNL	52.09	4.63	8.63	14.48	14.31	42.33	78.37
0.6 + CNL	45.83	5.29	14.00	21.63	27.48	84.10	126.03
0.8 + CNL	41.63	5.56	12.00	23.03	41.23	83.20	139.45
1.0 + CNL	56.25	5.58	13.29	20.88	42.27	74.00	126.66
LSD(0.05)	19.42	0.73	2.31	2.30	13.58	16.27	23.02

Abbreviations: WAP = weeks after planting, CNL = crushed neem leaves

soil status in Owerri which Eshett and Anyanwuche (1992) reported as an ultisol that is a soil that is heavily leached, has low organic matter content and is high in acidity. From the result, the soil is slightly acidic sandy-loam while the poultry manure is slightly basic with high organic matter content. In this study, cucumber vegetative growth as well as its yield components was significantly enhanced by crushed neem leaves and poultry manure applications. Poultry manure and crushed neem leaves rates produced significant increase in number of cucumber leaves, vine length, leaf area, percentage emergence and fruit development at 0.8t/haPM + CNL and 1t/haPM + CNL. The result shows higher performance in plant elongation (vine length) and number of flower in 1t/haPM + CNL application than 0.8t/haPM + CNL application, while fruit development and leaf parameters were greater in 0.8t/haPM + CNL application than the 1t/haPM+CNL application. This result may be due to nutrient imbalance experienced in high application of poultry manure in the soil as reported by Azeez, (2010).

Results obtained from this experiment showed that the effect of different rate of poultry manure and crushed neem leaves application on vine length, number of leaves, leaf area is significantly superior at 4WAP and 8WAP in 1t/haPM + CNL application. This result may be due to high nutrient availability and supply by poultry manure and agreed with Rwenyemany (1989) and Richert and Solomon (1998). However, the effects of the treatments showed significant differences in; vine length, number of leaves, and leaf area at 12WAP with 0.8t/haPM + CNL being the best. This is due to its effective nutrient absorption by the root and low senescence as observed in the field. High reduction was experienced in zero applications at 4, 8 and 12WAP planting when comparing the effects of treatments on vine length, leaf area and number of leaves. From the results, percentage seedling emergence was generally low and the highest (56.25%) was obtained at 1t/haPM + CNL application probably due to high concentration of nutrient and nature of crop.

The results also, indicate superiority of 0.8t/haPM + CNL application in fruit weight (167.57g), fruit length (13.52cm) and fruit diameter (5.22cm) over all other treatments. This result agrees with the findings of Ahmad *et al.* (2007), who reported that increased application of manure resulted in maximum fruit length, fruit weight, vine length and yield of cucumber. Field observations indicated that floral initiation started 40 days after planting. However, there was no significance difference in the number of flowers counted at 6WAP. Low fruit development was observed at zero application. This result indicates that increase in the poultry manure rate led to increased growth and reproduction of the crop in the application of 0.8t/haPM + CNL application with a sharp decrease at 1t/haPM + CNL application. This result agreed with Kamran *et al.*, (2008) who reported that fruit yield of cucumber increased as nitrogen levels increased up to a certain limit and afterwards declined.

Table 3: Vine length, number of flower, fruit weight (g), fruit length (cm) and fruit diameter (cm) in cucumber as affected by different rate of poultry manure and crushed neem leaf application.

Poultry manure rates &crushed Neem leaves (CNL)(tons/ha)	Vine length at 4WAP (cm)	Vine length at 8WAP (cm)	Vine length at 12WAP (cm)	Number of Flower at 6 WAP	Number of Flower at 8 WAP	Fruit Weight (g)	Fruit Length (cm)	Fruit Diameter (cm)
Zero(0)	6.56	10.93	85.33	1.75	4.65	59.78	5.56	3.29
0 + CNL	7.08	19.69	94.48	2.25	4.71	66.40	6.73	3.44
0.2 + CNL	7.29	22.13	117.83	2.75	7.00	74.63	8.09	3.48
0.4 + CNL	6.98	22.75	120.68	2.75	7.10	85.74	9.32	3.48
0.6 + CNL	8.13	65.29	161.86	3.23	9.23	124.96	11.03	3.48
0.8 + CNL	8.74	58.50	167.05	4.03	10.84	167.54	13.52	5.22
1.0 + CNL	9.04	66.88	166.43	4.38	12.64	159.70	12.33	4.64
LSD(0.05)	0.33	17.72	5.10	Ns	2.84	20.22	1.92	0.36

5.0 Conclusion

It is a common knowledge that low nutrient status of the soil leads to low productivity, and does not promote high yield in crops. Generally, the process of cucumber production requires high supply of nutrient at possibly every stage of development. This experiment having showed various rate of application of poultry manure and crushed neem leaves had distinguished the best rate of application among others. The experiment showed maximum production at 0.8t/haPM + CNL application. Although 1t/haPM + CNL application did well at the early stage, 0.8t/haPM + CNL application turned out to be the best at the productive stage and is thereby confirmed as the best application by this study.

Acknowledgement

I wish to acknowledge all who have helped in the completion of this work especially the staff and students of crop science and technology department, FUTO. I also wish to thank the laboratory attendants and field assistants for their unrelenting supports. We owe u all.

REFERENCES

Adams, P., Graves, C.J. and Winsor, G.W. 1992, "Some responses of cucumbers, grown in beds of peats to N, K and Mg", Hort. Sci **67**, 877 – 884.

Ahmad, N. M.H. Baloch, Haleem A., Ejaz M., and Ahmad, N., 2007, "Effect of different level of nitrogen on the growth and production of cucumber", Life Sc. Int. **1**(7), 99 – 102.

Allison L.E. 1996, "Organic carbon", In C.A. Black (ed). Methods of analysis: Chemical and microbiological properties. Part 2. agro, Madison, Wisconsin. pp 1367 – 1378.

Azeez, J.O., Van Averbeke, W., 2010, "Nitrogen mineralization potential of three animal manures applied on a sandy clay loam soil", Bioresource Tech.,**101**(14), 3645-5655.

Bremmer, J.M and Mulvancy, C.S., 1982, "Total Nitrogen" in Page A.L Miller, R.H. and Keeney D.R. (eds). Methods of soil analysis parts II American Soc. of Agron., Madison Wisconsin, pp 595 – 624.

Devi, J.J., T.K. Maity, N.C.Paria and U. Thapa. 2002, "Response of brinjal to different sources of nitrogen", Veg. Sci. **29**(1), 45 – 47.

Eshett and Anyanwuche 1992, "Soil pH increases due to biological decarboxylation and organic anions", Soil biology and Biochemistry **28**, 617 – 624.

Fagbenro, J. A. 1988, "Studies on extraction of soil organic matter and the effect of poultry manure, cow dung and inorganic fertilizer on growth of *Techonia grandis* seed".

Gee, G.W. and D. Or. 2002, "Particle size analysis", In: Dane, J. H. and Topp G. C. (eds). Methods of soil analysis part 4, Physical Methods, Soil Sci.Soc. Am Book Series, No.5 ASA and SSSA Madison WIPP255-293.

Hendershot, W.H., Lalande, H and Duquette, M. 1993, "Soil reaction and exchangeable acidity", In: Carter M. R (ed). Soil sampling and methods of soil analysis, *Canadian Society of Soil Science*, Lewis publishers, London, pp 141-145.

Kamran Q.M., Waseem K. and Jilani M.S. 2008, "Effect of different nitrogen levels on growth and yield of cucumber (*Cucumis sativus L.)"*, J. Agric. Res., **46**(3), 256-266.

Kotsiras, A., Olympics, C.M. and Passan, H.C. 2005, "Effect of nitrogen form and concentration on the yield and quality of cucumbers grown on rookwool during spring and winter in southern Greece", J. Pl. Nutri. **28**(11), 2027 – 2035.

Macleans, E.O. 1982, "Soil pH and lime requirement", In: Methiods of soil analysis, page, A.L., R.H. Miller and D.R. Keeney (Eds) part 2, 2nd edition, *Agron. Monogr.* No. 9 ASA and SSSA, Madison, Wisconsin, pp 199-234.

Olson, S.R. and Sommers, L.E. 1982, "Phosphorus In: Methods of Soil Analysis part 2(ed. Page, A.L., Miller, R.H. and Keeney D.R) *Amer Soc. Agron.* Madison, Wisconsin, pp 15-72.

Onwubiko, N.I, Echereobia, C.O. and Polu– Mbah, P.C. 2009, "A Review on Organic Manure for Commercial Farming", Proceedings of the 5th National conference of Organic Agriculture Project in Tertiary Institutions in Nigeria, pp 336 – 339.

Osman, A., M.S. Sidahmed, Al-Rawahi, and F.S. Al-Raisy 2004, "Response of cucumber to nitrogen fertigation under plastic horse conditions", Sudan J. Agr. Res. (4), 13 – 17.

Phu, N.T. 1996, "Nitrogen and Potassium Effect on cucumber yield. ARC Training Report. 1996.

Richert, A.S., and Solomon, E. 1998, "Application of broiler chicken manure to lettuce and cabbage crops: effect on yield, plant nutrient utilization and

mineral nitrogen in the soil. ActaHorticulture, **571**; 10-12.

Rweyemany, I.C., and Massemo, S.M.S., 1989, "Evaluation of the effects of cattle and poultry manure in combination with inorganic fertilizer on seed yield components and seed quality of common bean (*P. vulgaris)(L)* grown in different plants stands per hill", Bean research **4**, 88-98.

Schmutter, H. 2002, "The neem Tree (Azadirachtaindica A. Juss) and other Meliaceous Plants: Sources of Unique Natural Products for Integrated Pest Management, Medicine, Industry and Other Purposes", Neem Foundation, Mumbai, India, 893.

Sevaisso, 1987, "Present and potential role of fertilizer in meeting Nigeria food's needs", *Nigeria Agric. J.* **11**, 100 – 107.

Tuzel Y., Gul, A., Tuncay, O., Anac, D., Madanlar, N., Yoldas, Z., Gumus, M., Tuzel, I.H., and Engindeniz, S. 2005, "Organic cucumber production in the greenhouse:A case study from Turkey", Renewable Agriculture and Food Systems **20**(4), 206-213.