

**YIELD AND NUTRITIONAL ENHANCEMENT IN
CUCUMBER (*Cucumis sativus L.*) THROUGH
COMBINATION OF POULTRY MANURE AND NPK
FERTILIZER**

BY

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Introduction

- Cucumber (*Cucumis sativus* L.) is an annual vegetable crop that belongs to the family of Cucurbitaceae, which comprises of 90 genera and 750 species (Onyia *et al.*, 2012).
- It is native to Africa and Asia where it has been consumed for over 3,000 years. It is one of the oldest vegetable crops grown for at least five thousand years (Okonmah, 2011).
- It is cultivated for its soft and succulent fruits which are sources of minerals, vitamins A, C, K, B6, potassium, pantothenic acid, magnesium, phosphorus, copper and manganese (Vimala *et al.*, 1999).

- The fruit is eaten alone as salad and in combination with other vegetables.
- Its juice is often recommended as source of silicon to improve the health and complexion of the skin (Duke, 1997). The ascorbic acid contained in cucumber helps to reduce skin irritation and swelling (Okonmah, 2011).
- Fertile soils are used for the cultivation of cucumbers, infertile soils result in bitter and misshapen fruits which are often rejected by consumers (Eifediyi and Remison, 2010).

- Cucumber does best in warm sandy-loamy soil (Opara *et al.*, 2013).
- Despite the economic potentials of the crop, the full production potentials in Nigeria have not been realized.
- Yields obtained by farmers in the region often are very low especially, in intensive cropping systems due to imbalance in the use of fertilizer and continuous cropping which have led to several nutrients becoming deficient (Mahmood *et al.*, 1999; Onyia, *et al.*, 2012; Enujeke, 2013).

Justification and objectives

- In spite of increasing relevance of cucumber in Nigeria where it is widely consumed, low yields are obtained in farmers' field because of declining soil fertility due to continuous cropping and disregard for soil amendments, which has led to several nutrients becoming deficient.
- It is in attempt to fill the gap in our present knowledge that this research work was carried out to evolve a package for the optimization of the production of cucumber in Nigeria agro-ecology through adequate fertilizer applications, complemented with poultry manure.
- This study investigated the effects of varying rates of poultry manure and inorganic manure (N.P.K. 15, 15, 15) on the growth and yield of cucumber.

Materials and Methods

- **Location**
- **Germination test**
- **Soil and Poultry Manure Test**
- **Experimental Design and Field Layout** : A total of 27 treatment combinations were laid out in a 3x3 factorial arrangement fitted into a Randomized Complete Block Design (RCBD) for field trials. Factor A consisted of two treatment materials and factor B comprised of six rates of application. The experiment was replicated three times.

Cultural Practices

- **Field Layout**
- **Planting**
- **Fertilizer application:** NPK fertilizer and poultry manure were applied according to treatments; poultry manure at rates of 0 t/ ha = 0 kg per plot (3x4m), 5 t / ha = 6 kg per plot (3x4m) and 10 t/ ha = 12 kg per plot (3x4m) while N.P.K 15:15:15 was applied at 0 t/ ha = 0 kg per plot (3x4m), 200 kg/ha = 0.24 kg per plot (3x4m) and 400 kg/ ha = 0.48 kg per plot (3x4m).

Data collection and Statistical analysis

- **Percentage emergence**
- **Number of leaves per plant**
- **Leaf area**
- **Number of branches per plant at harvest**
- **Vine length**
- **Number of flowers by sex**
- **Fruit girth**
- **Fruit length**
- **Fruit weight**
- **Yield**
- **Statistical analysis**

Results

- **Table 1: Soil Physical and Chemical Analysis and Properties of the Poultry Manure used for the Study**

• <u>Property</u>	<u>Soil</u>	<u>Poultry Manure</u>
• pH in (H ₂ O)	5.10	7.78
• pH in Kcl	4.80	
• Organic matter (%)	1.57	39.3
• Organic Carbon (%)	0.91	22.8
• Nitrogen (%)	0.75	2.58
• Phosphorus mg kg ⁻¹	2.01	41.82
• Magnesium (Cmol kg ⁻¹)	0.96	1.42
• Sodium (Cmo1/kg)	0.58	0.51
• Potassium (Cmo1/kg)	1.31	2.51
• Calcium (Cmo1/kg)	0.74	4.81
• Aluminum (cmo1kg ⁻¹)	1.39	
• Moisture content (%)	0.93	
• Hydrogen (cmo1kg ⁻¹)		3.22
• Bulk density (g/cm ³)	1.24	
• Silt (%)	1.88	
• Clay (%)	28.40	
• Sand (%)	69.72	
• Textural class	Sandy loam	

Table 2: Percentage Emergence (%) Cucumber As Influence by Poultry Manure and NPK Fertilizer

		Poultry Manure Rate (Kg/ha)				
NPK Rate (Kg/ha)		0	5	10	Mean	Day to 50% emergence
0		48.62	46.00	45.36	46.66	4.62
200		44.52	44.04	44.66	44.41	5.01
400		44.22	42.02	42.08	42.77	4.52
Mean		45.78	42.02	44.03		
LSD _{0.05} NPK	NS					
LSD _{0.05} Poultry manure	NS					
LSD _{0.05} NPK x Poultry-manure	NS					

Table 3: Cucumber number of leaves at 8 WAP As Influenced by Poultry manure and NPK fertilizer (cm).

		Poultry Manure Rate			
(t/ha)		0	5	10	Mean
NPK					
Rate (Kg/ha)					
8 WAPS					
0		12.12	12.57	15.53	13.41
200		11.83	15.57	15.67	14.36
400		15.20	15.80	15.60	15.53
Mean		13.06	14.64	15.60	
LSD _{0.05} NPK	0.3858				
LSD _{0.05} Poultry manure	0.3858				
LSD _{0.05} NPK x Poultry-manure	0.6682				

Table 4. Leaf Area (cm²) in Cucumber at harvest as influenced by Poultry Manure and NPK Fertilizer

		Poultry Manure Rate (t/ha)			
NPK Rate (Kg/ha)		0	5	10	Mean
0		10.04	15.14	26.64	17.3
200		14.30	24.48	28.80	22.53
400		21.56	24.60	30.44	25.50
Mean		15.3	21.41	28.63	
LSD _{0.05}	NPK	3.40			
LSD _{0.05}	Poultry manure	4.06			
LSD _{0.05}	NPK x Poultry-manure	2.44			

Table 5. Cucumber vine length (cm) at 8 WAP as Influenced by Poultry manure and NPK Fertilizer

				Poultry Manure Rate (t/ha)			
NPK				0	5	10	Mean
Rate (Kg/ha)							
8 WAP							
0				67.83	105.13	130.57	101.18
200				99.70	136.17	145.43	127.10
400				134.33	149.53	154.83	146.23
MEAN				100.62	130.28	146.23	
LSD _{0.05}	NPK	4.20					
LSD _{0.05}	Poultry manure	4.31					
LSD _{0.05}	NPK x Poultry-manure	7.28					

Table 6: Cucumber fruit length (cm) at maturity, As Influenced by Poultry manure and NPK fertilizer.

		Poultry Manure Rate (t/ha)			
		0	5	10	Mean
NPK Rate (Kg/ha)					
0		10.63	15.10	17.30	14.34
200		14.33	18.47	19.67	17.49
400		16.77	19.47	20.77	19.00
MEAN		13.91	17.68	19.24	
LSD _{0.05}	NPK		0.4159		
LSD _{0.05}	Poultry manure		0.4159		
LSD _{0.05}	NPK x Poultry-manure		0.7203		

Table 7: Cucumber fruit girth (cm) at maturity, As Influenced by Poultry manure and NPK fertilizer.

				Poultry Manure Rate (t/ha)			
NPK				0	5	10	Mean
Rate (Kg/ha)							
0				9.53	14.10	16.20	13.24
200				13.21	17.23	18.34	16.26
400				15.47	18.23	19.56	17.75
MEAN				12.74	16.49	18.03	
LSD _{0.05}	NPK	0.31					
LSD _{0.05}	Poultry manure	0.20					
LSD _{0.05}	NPK x Poultry manure	0.52					

Table 8: Cucumber fruit yield (kg) at maturity, As Influenced by Poultry manure and NPK fertilizer.

rate (t/ha)			Poultry manure			
			0	5	10	Mean
NPK			0	5	10	Mean
Rate (Kg/ha)						
0			1.03	2.27	2.70	2.00
200			2.07	3.43	5.17	3.56
400			2.23	4.97	6.40	4.76
MEAN			1.78	3.56	4.76	
LSD _{0.05}	NPK	0.43				
LSD _{0.05}	Poultry manure	0.56				
LSD _{0.05}	NPK x Poultry-manure	0.75				

Discussion

- The combined rates of poultry manure and NPK fertilizer produced longest vines, highest number of very broad leaves. Also cucumber fruit length, fruit girth, and fruit yield were significantly ($P = 0.05$) influenced by application of poultry manure and NPK fertilizer.
- This observation agrees with other findings (Aduloju *et al.*, 2010; Dada and Fayinminnu, 2010). They had reported that nutrients from mineralization of organic matter promoted growth and yield of cucumber.
- The application of poultry manure and NPK fertilizer resulted in significant increases in cucumber fruit yield. The control rates produced a significantly lower fruit yield of cucumber.
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- The treatment containing the highest rates of combination of poultry manure and NPK fertilizer recorded the highest yield. This indicates that the increase in poultry manure and NPK fertilizer will result to significant increase in fruit yield.
- This is in line with the study of El-Shakweer *et al.*, (1998) who reported that elevated rates of poultry manure among other soil amendments increased tomato yield.
- Makinde *et al.*, (2007) also reported increased melon growth and optimum yield with organo-mineral fertilizer. Hamma *et al.*, 2012 confirmed that combination of poultry manure and NPK fertilizer will enhance growth and yield of cucumber.

Summary and Conclusion

- In the face of declining soil productivity occasioned by climate change impact, this trial clearly indicated that production of cucumber can be enhanced by combined application of poultry manure and NPK fertilizer.
- Farmers are therefore advised to use the highest rate of combined application of 10,000 kg/ha of poultry manure and 400 kg/ha of NPK fertilizer. They have proved to be effective in supplying the required nutrients for growth and yield of cucumber crop.
- This study recommends that there is need to continue research studies on the responses of cucumber to poultry manure and NPK fertilizer for further findings and improvement in this recent research work.
- This will help to solve the soil fertility problems facing cucumber production.

THANK YOU