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Original Article

The effect of organo-mineral on the early growth of cucumber

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ABSTRACT

Cucumis sativus L. is an important vegetable and a member of the Cucurbitaceae family. This study examined the effect of different levels of organo-mineral on the growth of cucumber. The experiment was carried out at the National Horticultural Research Institute, Ibadan located within longitude 7° 40'N and latitude 3°. It was laid out in a completely randomized design, with four treatments and replicated 3 times. The parameters assessed were number of leaves, stem diameter (mm), and plant height (cm). Data were subjected to descriptive statistics, means, and analysis of variance. The means found to differ from each other were subjected to Lysergic acid diethylamide. The best overall in leaf production was observed in seedlings treated with 1 kg of manure +180 g of NPK (T_3) in block I with an average value of 37 leaves. Analysis of variance revealed that there was a significant difference among the treatments and blocks, but no significant relationship in the interaction between treatment and block. Stem diameter results showed that the best overall performance was established in block III for seedlings treated with 1 kg manure + 180 g NPK (T_3) with an average mean of 1.73 cm. Statistical analysis showed that there was a significant difference among the treatment used, but no significant difference in the interaction between the blocks and the treatment at 5% level of probability. The result from height development showed that the best in height increase was in block I for seedlings treated with 1 kg of manure +180 g of NPK (T_3) at 65.0 cm. Analysis of variance showed that there was a significant difference among the treatments, blocks, and the interaction between the blocks and the treatment all at 5% level of probability. This implies that varying the quantities of organo-mineral fertilizer has significant effect on the growth of *C. sativus* seedlings. This research showed that decomposition from poultry droppings can be converted to organo-mineral which has been proven to support the growth and development of *C. sativus*.

Keywords: Cucumber, development, growth, organo-mineral

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INTRODUCTION

Cucumber (*Cucumis sativus* L.) is an important vegetable and one of the most popular members of the Cucurbitaceae family.[1] It is one of the oldest vegetables cultivated by man with historical records dating back 5000 years.[2] Cucumber (*C. sativus* L.) is an annual, crawling fruit vegetable grown in the temperate and subtropical zones of the world.[3] Cucumbers are usually eaten as in salads, or as accompaniments to various foods. The crop is the fourth most important vegetable after tomato, cabbage, and onion in Asia[4] and the second most important vegetable crop after tomato in Western Europe.[5] Cucumber is a very good source of Vitamins A, C, K, B6, potassium and also provides dietary fiber, pantothenic acid, magnesium, phosphorus, copper, and manganese. Nweke[6] reported that cucumber production in most parts of Nigeria is fast becoming popular, probably because of its high nutritional and medicinal values, as well as being a useful component ingredient in pharmaceuticals. In spite of the good attributes, cucumber production is still mainly done by very few farmers in Nigeria.

Fertile soil is required for cucumber cultivation and unfertile soils result in bitter and misshaped fruits which are unmarketable.[7] Cucumber responds positively to organic, inorganic, or combined nutrient applications for optimum growth and productivity though they noted that excessive fertilizer results in excessive vegetative growth and low yields.[7]

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ECOLOGY

Cucumber requires a warm climate. In cool, temperature countries, it is grown in greenhouse; only during hot summer can it be grown in the open. The optimum temperature for growth is about 30°C and the optimum night temperature 18–21°C; the minimum temperature for good development is 15°C picking cultivars are usually more adapted to low temperatures. Sensitivity to day-length differs per cultivar; short day-length usually promotes vegetative growth and female flower production. High light intensity is needed for optimum yields. Cucumber needs a fair amount of water but it cannot withstand Waterlogging. Low relative humidity results in high plant evaporation due to the large leaf area and sufficient irrigation is then very important. High relative humidity facilitates the occurrence of downy mildew. The soil should be fertile, well-drained, with a P^H of 6.0–7.0.[8]

Cucumber is a tender warm season crop that produces an abundant harvest in small garden if provided with enough growing room and proper growing conditions. There are average monthly temperatures of 21–25°C. Cucumber can be grown on almost any good soil but a considerable amount of crop is grown on sand, loam. This is important when earliness is desired. Good drainage with high moisture-holding capacity is also desirable. Plant distance vary with the shape of the land (Topography) where the cucumber is grown in hills, these hills are usually spaced 2 m by 2 m or 2 m by 2.5 m apart when in rows, the rows are spaced 1.5 m by 2 m.[3]

CLIMATIC CONDITIONS

Cucumbers are well adapted to warm climates but will grow well at lower temperature than melons. Accurate temperature, humidity, and carbon dioxide are important. The temperature requirements for cucumbers during day are 75–77°F and for night at 70°F until first picking. After picking has started, the nighttime temperature may be reduced by 2 per night until a temperature of 63°F is met, but only temporarily for 2–3 days to stimulate growth. Exceeding the maximum temperature temporarily can used to cause some flower abortion and maintain the fruit-vine balance. In general, cooler temperatures are used when light intensities are low. For best results, concentration of 1000–1500 ppm in a cooled plastic house atmosphere should be maintained. Increases of 20–40% in yield have been reported for various vegetables when carbon dioxide levels were increased. Water requirement is high but a very high humidity encourages the development of leaf diseases and may affect flower production.

IMPORTANCE AND USES

Cucumber is generally consumed fresh or pickled. The pickling cultivars produce smaller fruits but all cultivars may be used for both purposes. In the United States, cucumber is consumed mostly as pickle and salad, whereas in some countries it is consumed also as a cooked vegetable. It is a primary source of vitamins and minerals in the human diet, but the caloric and nutritional value of cucumber are very low. Cucumbers are low in food value and are found in group 4 on food production efficiency. This vegetable is used as an appetizer or mixed with other vegetables for its distinctive flavor and texture. Table 1 gives the detail of the Nutritional values of cucumber per 100 g edible portion.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the National Horticultural Research Institute (NIHORT) Ibadan located with longitude 7° 40'N and latitude 3°84'E with an altitude of about 195 m. The study area is in the forest savanna transition zone with a bimodal rainfall pattern having long rainy season which usually starts in late March while the short rainy season extends from September to early November after a short dry spell in August. Mean monthly minimum and maximum temperatures ranged from 25°C to 27°C and from 30°C to 37°C, respectively, and annual rainfall of about 1100–1500 mm.

Materials

The materials used include the following: *C. sativus* seeds, topsoil, sieve, polythene pot, germination box, hand trowel, wheelbarrow, organo-mineral (made from poultry manure and NPK 15:15:15

Procurement of Materials

The seeds of *C. sativus* were bought from premier seeds company while the NPK 15:15:15 fertilizer was bought at an industrial store along around Dugbe in Ibadan, a city located in Oyo-State, Nigeria The poultry droppings were gotten from a household poultry farm. The site used for the experiment was an experimental field within NIHORT.

The organic manure and NPK 15:15:15 fertilizer were applied in powdered form at different grams. The treatments were:

T_1- (A_1B_1) 0g of organic manure + 0 g of NPK 15:15:15 + 4 m^2 of land area (control)

Table 1: Nutritional values of cucumber per 100 g edible portion

Energy	12 cal	Vitamin A	45 IU
Protein	0.6 g	Vitamin B1	0.03 g
Fat	0.1 g	Vitamin B2	0.02 g
Carbohydrate	2.2–3.6 g	Niacin (Vitamin B3)	0.3 g
Dietary fiber	0.5 g	Vitamin C	12 mg
Calcium	14 mg		
Magnesium	15 mg	Iron	0.3 mg
Potassium	124 mg	Sodium	5 mg
Phosphorus	24 mg	zinc	0.2 mg

T_2- (A_2B_2) 0 g of organic manure + 280 g of NPK 15:15:15 + 4 m^2 of land area
T_3- (A_3B_3) 1 kg of organic manure + 180 g of NPK 15:15:15 + 4 m^2 of land area
T_4- (A_4B_4) 2 kg of organic manure + 280 g of NPK 15:15:15 + 4 m^2 of land area

A: Treatment
B: Replicate

Experimental Design

The experiment was laid out in a completely randomized design, with four treatments which was replicated 3 times.

Experimental Layout

A_2B_2	A_1B_1	A_3B_3
A_1B_1	A_3B_3	A_2B_2
A_4B_4	A_2B_2	A_4B_4
A_3B_3	A_4B_4	A_1B_1

Method

The land was cleared and divided into twelve (12) different experimental units (2 m by 2 m) in size, with a spacing of 0.5 m between each unit. The poultry manure was added to the cleared land area before planting so as to aid its disintegration. After a week of adding the manure, the seeds were added to the planting site (12 per unit), after about 2 weeks of germination, NPK 15:15:15 fertilizer was added. Proximate analysis was carried out on the top soil at the planting site and the poultry manure. All laboratory tests were carried out at the National horticultural research institute of Nigeria (NIHORT).

Data Collection

The collection of data commenced 3 weeks after the planted seeds germinated on the field; the data was collected bi-weekly for eight (8) weeks. The parameters assessed include number of leaves stem, diameter (mm), and plant height (cm) of *C. sativus*.

Data Analysis

The germination data were subjected to descriptive statistics, means and analysis of variance (ANOVA) was used to analyze the data obtained. The means were found to differ from each other and were subjected to Lysergic acid diethylamide.

RESULTS AND DISCUSSION

Leaf Production

Table 2 above showed that seedlings raised with application of 1 kg of manure mixed with 280 g of NPK (T_3) performed best in leaf production in blocks I and II with an average mean of 37 and 31.75 leaves respectively at week 9. In block III, T_3 (1 kg of manure mixed + 180 g of NPK) and T_4 (2 kg of manure mixed + 280 g of NPK) performed best with an average mean of 32 leaves each. The best overall in leaf production was observed with seedlings treated with 1kg of manure +180 g of NPK (T_3) in block I with an average value of 37 leaves.

Analysis of variance in Table 3 presented above reveals the significant effect of blocks and treatment applied on leaf production of *C. sativus* seedlings at 9 weeks of assessment. The result obtained revealed that there is a significant difference among the treatments and blocks, but no significant relationship in the interaction between treatment and block.

In Table 4 above, it was observed that seedlings treated with 1 kg of manure +180 g of NPK (T_3) performed best in block I and III with an average values of 1.83 cm and 1.73 cm,

Table 2: Effect of organo-mineral fertilizer on leaf production *Cucumis sativas*. L

Treatments	Weeks			
	3	5	7	9
Block 1				
T1	6.25^{b}	12.25^{cd}	14.00^{cd}	16.75^{c}
T2	6.75^{b}	11.75^{cd}	17.25^{c}	25.05^{bc}
T3	7.75^{ab}	23.00^{a}	29.75^{b}	37.00^{a}
T4	7.05^{ab}	17.25^{b}	22.75^{b}	29.25^{b}
Block 2				
T1	6.75^{b}	8.50^{d}	13.25^{cd}	15.50^{c}
T2	5.50^{c}	8.75^{d}	9.50^{d}	12.25^{d}
T3	7.00^{ab}	17.00^{b}	23.75^{b}	31.75^{ab}
T4	6.50^{b}	12.00$^{ab`}$	16.25	20.45
Block 3				
T1	4.75^{cd}	5.75e	7.50e	12.50^{d}
T2	5.75^{c}	4.25^{d}	10.50^{d}	15.50^{c}
T3	7.50^{ab}	17.00^{b}	20.00^{bc}	32.00^{ab}
T4	8.00^{a}	12.00^{ab}	26.00^{ab}	32.00^{ab}
Lysergic acid diethylamide	0.97	2.32	2.72	3.27
%CV	10.2	24.5	32.7	37.8

^{a,b,c,d}Significant at 5% level of probability.

Table 3: Analysis of variance for leaf production

Source of variance	Degree of freedom	Source of square	Mean of square	F.tab	F.cal
Treatment	3	954.73	318.24	14.92	<0.001*
Block	2	739.54	369.77	17.34	<0.001*
Treatment *Block	6	346.46	57.74	2.71	0.0028^{NS}
Error	36	767.75	21.33		
Total	47	2808.48			

***Significant at 5% level of probability. NS: Not significant at 5% level of probability**

respectively, at week 9. T4 (2 kg manure + 280 g NPK) did best in block II in terms of stem girth increase with an average value of 1.38. the best overall performance was established in block III for seedlings treated with 1 kg manure + 180 g NPK (T_3) with an average mean of 1.73 cm.

Table 5 above shows that there was a significant difference among the treatment used but no significant difference was established among blocks and the interaction between the blocks and the treatment at 5% level of probability for a period of 9 weeks in stem girth development of *C. sativus*.

Table 6 above revealed the effect of organo-mineral fertilizer at varying quantities on height development of *C. sativus* seedlings for a period of 9 weeks. It showed that the seedlings treated with 1 kg of manure +180 g of NPK (T_3) had the highest height increase in block I and II while seedlings treated with 2 kg manure +280 g fertilizer (T4) performed best in block III with an average value of 65 cm, 63 cm and 54.50 cm, respectively, all at 9 weeks. The overall best in height increase was established in block I for seedlings treated with 1kg of manure +180 g of NPK (T_3) the average value obtained was 65.0 cm.

Analysis of variance in Table 7 presented above showed that there was a significant difference among the treatments, blocks, and the interaction between the blocks and the treatment all at 5% level of probability. This implies that the varying quantities

Table 4: Effect of organo-mineral fertilizer on stem diameter development of *Cucumis sativus*

Treatments	Weeks			
	3	5	7	9
Block 1				
T1	0.39	0.60	0.69	0.94
T2	0.46	0.65	0.71	0.94
T3	0.71	0.67	1.33	1.83
T4	0.59	0.73	0.88	1.21
Block 2				
T1	0.45	0.63	0.85	1.13
T2	0.41	0.53	0.79	1.01
T3	0.55	0.65	0.93	1.23
T4	0.51	0.65`	1.01	1.38
Block 3				
T1	0.30	0.37	0.63	0.81
T2	0.33	0.35	0.50	0.71
T3	0.59	0.81	1.16	1.73
T4	0.65	0.80	1.23	1.63
Lysergic acid diethylamide	0.16	0.24	0.33	0.47
%CV	22.1	27.3	26.1	27.0

Table 5: Analysis of variance for stem diameter development

Source of variance	Degree of freedom	Source of square	Mean of square	F.tab	F.cal
Treatment	3	4.2085	1.4028	13.11	<0.001*
Block	2	0.0170	0.0085	0.08	<0.924^{NS}
Treatment *Block	6	1.5480	0.2580	2.41	0.0028^{NS}
Error	36	3.8513	0.1070		
Total	47	9.6248			

***Significant at 5% level of probability. NS: Not significant at 5% level of probability**

Table 6: Effect of organo-mineral fertilizer on height development of *cucumis sativas*. L

Treatments	Weeks			
	3	5	7	9
Block 1				
T1	5.38	16.80	30.50	38.80
T2	5.01	20.40	35.00	44.50
T3	8.25	41.5	53.50	65.00
T4	6.62	33.5	49.50	59.00
Block 2				
T1	5.75	15.4	26.50	31.00
T2	4.50	12.2	25.20	32.20
T3	6.50	29.0	44.50	63.00
T4	6.12	31.0	38.80	50.20
Block 3				
T1	2.62	4.10	5.80	9.20
T2	4.38	6.20	9.20	12.80
T3	7.88	22.80	38.20	50.20
T4	8.62	38.00	50.50	64.50
Lysergic acid diethylamide	1.99	11.08	13.39	14.04
%CV	23.3	34.2	28.2	23.1

Table 7: Analysis of variance on height development

Source of variance	Degree of freedom	Source of square	Mean of square	F.tab	F.cal
Treatment	3	10391.08	3463.69	36.14	<0.001*
Block	2	1784.62	892.31	9.31	<0.001*
Treatment *Block	6	2695.04	449.17	4.69	0.001*
Error	36	3450.50	95.85		
Total	47	18321.25			

***Significant at 5% level of probability**

of organo-mineral fertilizer applied gave significant effect on the increase in height of *C. sativus* seedlings. The block effect also influenced the growth rate. Interactions between the blocks and the treatments were also established to have influenced the growth performance of *C. sativus* seedlings at the 9th week of assessment.

CONCLUSION AND RECOMMENDATION

Conclusion

The study revealed that NPK 15:15:15 fertilizer and poultry manure (organo-mineral) had influence on the growth and development of *C. sativus*. The results obtained showed that the seedlings treated with 1 kg of manure +180 g of NPK (T_3) had the best performance in terms of the leaf production, stem girth, plant height, and fruit production of *C. sativus* within 4 m^2 of land area.

Recommendation

From this research, poultry manure and NPK 15:15:15 fertilizer (organo-mineral) can be used to improve the growth and development of *C. sativus*. Wastage resulting from the decomposition of poultry droppings can be converted to organo-mineral which has been proven to support the growth and development of *C. sativus*.

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