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Full Length Research Paper

Response of Cucumber (*Cucumis sativus*) to Seed Dressing Pesticide and Poultry Manure Rates in the Humid Tropical Environment of Owerri.

[1]Ndulue N.K., [2]Harriman J.C., [1]Okoye A.I., [1]Okagbue S.C.,[3] Obiekwe N. J., [1]Okafor J.M., [1]Okoye L.E. and [1]Omumuabuike J.N.

[1]*Department of Agricultural Technology, Anambra State College of Agriculture, Mgbakwu, Awka. Nigeria.*
[2]*Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.*
[3]*Faculty of Agriculture, Nnamdi Azikiwe University, Awka, Nigeria*

Corresponding author: Ndulue N.K.

Abstract

An experiment to study the response of cucumber (cucumis sativus) to seed dressing pesticide and poultry manure rates was conducted in The Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology Owerri. Apron star 42 wettable powder seed dressing pesticide was used on seeds as treated, and untreated seeds as control in combination with five poultry manure rates; 0, 10, 20, 30 and 40 t/ha as a 2x5 factorial experiment in a Randomized Complete Block Design. Results showed that Apron star 42 wettable powder significantly enhanced earlier seed germination and emergence than the untreated (control). Poultry manure application significantly improved the growth and yield parameters compared with the control (0t/ha). Plant height, number of leaves and number of branches were significantly increased with increasing rates of poultry manure. The highest fresh fruit yield (44.90t/ha) obtained with 40t/ha qualified that rate as the best.

Key words: *Cucumis sativus, seed dressing, Apron star 42 wettable powder and humid tropics.*

Introduction

Cucumber (*Cucumis sativus*) is an important vegetable crop grown in the temperate and tropical areas of the world. It belongs to the family *cucubitaceae* (Tindall, 1968). Cucumber is leading commercial crops and popular home garden vegetables (Swiader *et al.,* 1992). In some parts of the world the leaves and the stems are edible. The green cucumber fruit has high water content that makes it a refreshing vegetable although the crop has low nutritive value (Bianchini *et al.*, 1976). In the advanced countries of the world cucumber is processed and made available for consumption throughout the year. In Nigeria cucumber is scarce due to low yield resulting from poor crop management. The few available cucumber vegetable in our local market remains generally costly and makes it the crop of the rich. There is therefore need to increase its production to meet the demand of the people. One way of meeting this target is by application of new technology of seed dressing and application of nitrogen rich organic manure such as poultry manure. Poultry manure has long been recognized as desirable organic fertilizer because it contains many of the elements required to grow plant (Ghebrieyessus, *et al*., 2002). Land application of manure can produce crop yield equivalent to those obtainable with inorganic fertilizer. Peirce (1987) recommended the use of 10-15 t/ha of animal or green manure equivalent for optimum production of cucumber, when applied in conjunction with inorganic fertilizer. Unfortunately, information on the use of poultry manure from deep litter source for intensive production of cucumber in the humid tropical environment of Owerri in Imo State has been scanty. The use of poultry manure is one such cheap source of input in the production of cucumber but the growth and yields response of cucumber to poultry manure application in Imo state is not known. This situation needs to be redressed. Seed dressing with chemicals that has broad base for control of pest and disease pathogens is necessary for improved plant development in the field. The few farmers in Imo state that cultivate cucumber do so without pre- treating their seeds with chemicals before planting. It is not known what really are responsible for the low yield of the crop in the area. It is therefore necessary to investigate whether the use of seed dressing chemical Apron star 42 wettable powder could have effect on germination, growth and yield of cucumber. The experiment to determine the response of cucumber to seed treatment with Apron star 42 wettable powder and poultry manure rates was carried out to determine; the effect of poultry manure rates on the growth and yield of cucumber, and the effect of chemical seed dressing on the growth and yield of cucumber.

Materials and Methods

Experimental Site

The experiment on response of cucumber to seed dressing and poultry manure rates was conducted in the Teaching and Research farm of the Department of Crop Science and Technology, Federal University of Technology, Owerri, at latitude 5^0 27^l North and longitude 7^02^l East in the Tropical Rainforest zone of Southeastern Nigeria. The site had a mean annual rainfall of 2190 mm and relative humidity of 81.6%.The soil was characterized as an ultisols with sand fraction of 87.36%, clay 11.76% and silt fraction of 0.88%. The soil environment had a pH of 5.68(1soil: 25 water) organic matter 2.22%, Total Nitrogen 0.12, 8.4 (ppm) phosphorous. Exchangeable cation, calcium, Magnesium and potassium were 0.74, 0.34 and 0.65 meq/100g respectively.

Land Preparation

The experimental field was manually cleared with matchet, stumped and the thrash was packed. The experimental site was then marked into 4 blocks each measuring 19.5m x 2.0m and separated by 1.0m path way . Each of the blocks was divided into Ten (10) plots of 2.0m x 1.5 each and separated by a path way measuring 0.5m. The plots were tilled manually with hoe and leveled to give a fine tilth for the planting.

Treatments and Experimental Design

The treatment consisted of chemical (Apron star 42 wettable powder) seed treatment with the untreated seeds serving as control as factor A, and five rates: 0, 10, 20, 30 and 40 t/ha with the 0t/ha as the control and the poultry manure rates as factor B . The two rates of chemical seed dressing and the five rates of poultry manure were combined in all possible ways to give 10 treatments. The 10 treatment combinations were randomly assigned to plots and replicated 4 times. Apron star 42 wettable powder (0.5g) was wetted with a drop of water and 400g of cucumber seeds were added to the slurry in a plastic container and thoroughly mixed to ensure that all the seeds were dressed with the chemical.

Preparation of Poultry Manure

Poultry manure was obtained from a poultry farm of the Federal University of Technology, Owerri. The system of poultry farming practiced was deep litter in which the floor of the pen was covered with wood shaving. The poultry manure was air dried for 14days. The cured poultry manure was weighed into five different rates of 0kg poultry manure/$3m^2$, 3kg poultry manure/$3m^2$, 6kg poultry manure/$3m^2$, 9kg poultry manure/$3m^2$ and 12kg poultry manure/$3m^2$ representing 0,10, 20,30 and 40t/ha respectively in which each measurement was repeated 8 times.

Soil Application of Poultry Manure

Poultry manure was applied to each of the plots according to the calculated rates before the sowing of the cucumber seeds. The poultry manure was lightly worked into the prepared seed beds and allowed for two days before planting to make sure no heat was released to affect the sown seeds.

Sowing

Cucumber seeds were sown at the spacing of 50cm x 45cm to give 13stands/plot. The seeds were sown at the rate of 4 seeds per hole and later thinned to 2 plants/stand four days after germination to give a total plant population of 26 plant per plot (44,444 plant/ha).

Field Maintenance

Hoe weeding was done once at 2weeks after planting to ensure a weed free environment.

Data Collection

Data collected were;

i. Days to 50% seedling emergence.
ii. Days to 50% flowering (Anthesis)
iii. Days to 50% fruit formation.
iv. Plant height.
v. Number of leaves per plant.
vi. Fruit weight at first harvest.
vii. Number of fruits per plant
viii. Number of fruits per plot.

Data Analysis

All data collected were subjected to statistical analysis according to the analysis of variance (ANOVA) Procedure outlined by Wahua(1999).

Results and discussion

Application of 30t/ha of poultry manure forced earlier seed germination and emergence than the control and other plots that received 40, 20 and 10t/ha of poultry manure respectively (Table1). On the other hand, seeds treated with apron star 42 wettable powder pre-planting seed dressing chemical germinated faster than the untreated seeds. Days to 50% anthesis, seeds that received 30 and 40t/ha poultry manure developed flowers earlier than those of 20 and 10t/ha, while the control with 0t/ha flowered later (Table 1). Fruit formation, mean number of days to 50% fruit formation significantly differed with poultry manure rates. Cucumber from plots that received 20, 30 and 40t/ha developed fruits earlier than those of 10t/ha and the control. Although, plots with 40t/ha poultry manure significantly hastened fruiting than the 20 and 30t/ha poultry manure treatment. The highest number of branches was obtained with 30t/ha poultry manure rate while the least was obtained with the control (0t/ha). Chemical seed treatment and interaction effects were not significant (Table 1). Table 2, shows that poultry manure rates significantly affected plant height of cucumber at 2 weeks after planting. Although 30t/ha of poultry manure differed significantly. Seed treatment and interaction showed no significant effect on plant height. At 4 weeks after planting all poultry manure rates produced plants that were taller than those of the control (Table2). There were no seed treatment and interaction effect. Poultry manure rates significantly affected number of leaves of cucumber at both 2 and 4 weeks after planting while seed treatment and interaction showed no significant effect (Table 2). At 2 weeks after planting, poultry manure rates of 30 and 40t/ha produced the same

number of leaves, which were significantly higher than those of the control, 10 and 20t/ha. At 4 weeks after planting, number of leaves significantly increased from 19 leaves /plant in the control (0t/ha) to 29 leaves/plant in the 30 and 40t/ha of poultry manure rates.

Table 1: Effect of chemical seed treatment and poultry manure rates on Days to 50% seedling emergence, anthesis, fruit formation of cucumber and number of branches at maturity.

	Poultry	manure	Rates	(t/ha)		
Seed Treatment	**0**	**10**	**20**	**30**	**40**	**Mean**
50%seedling emergence						
Untreated seeds	10.50	9.75	9.25	8.25	9.00	9.35
Treated seeds	5.50	5.50	5.50	5.25	5.25	5.40
Mean	8.00	7.63	7.38	6.75	7.13	
LSD $_{(0.05)}$ for two C.T mean = 0.41						
LSD $_{(0.05)}$for two P.M mean = 0.65						
LSD $_{(0.05)}$for P.M X C.T = 0.92						
50% Anthesis						
Untreated seeds	36.00	34.00	34.25	32.00	33.25	33.85
Treated seeds	35.75	34.00	32.75	32.50	32.50	33.45
Mean	35.87	33.50	33.50	32.90	32.90	
LSD $_{(0.05)}$ for two C.T mean = 1.01						
LSD $_{(0.05)}$for two P.M mean = NS						
LSD $_{(0.05)}$for P.M X C.T = NS						
50% fruit formation						
Untreated seeds	39.50	37.00	36.75	35.75	36.00	37.00
Treated seeds	39.25	37.50	37.25	36.75	36.25	37.40
Mean	39.38	37.25	37.00	36.25	36.13	
LSD $_{(0.05)}$ for two C.T mean = 1.01						
LSD $_{(0.05)}$for two P.M mean = NS						
LSD $_{(0.05)}$for P.M X C.T = NS						
No. of branches at maturity						
Untreated seeds	4.0	6.0	11.0	12.0	11.0	8.8
Treated seeds	4.0	6.0	10.0	14.0	12.0	9.2
Mean	4.0	6.0	10.5	13.0	11.5	
LSD $_{(0.05)}$ for two C.T mean = 0.86						
LSD $_{(0.05)}$for two P.M mean = NS						
LSD $_{(0.05)}$for P.M X C.T = NS						

P.M = poultry manure, C.T = Chemical treatment, NS = Not significant

Table 3, showed that poultry manure rates significantly affected number of fruit per plot, number of fruit per plant and fresh fruit yield (weight) per hectare. Poultry manure rate of 40t/ha resulted in significantly more number of fruits per plot than 30, 20, 10, and control (0t/ha). Chemical seed dressing did not show any significant effect on the mean number of fruit per plot. Similarly there was no significant Interaction effect for the fruit yield per plant. Application of 30t/ha produced more number of fruits per plant than others. This was followed by plants with 40, 20, 10 and control (0t/ha) respectively. Chemical seed treatment did not show any significant difference. Fresh fruit yield increased with increasing poultry manure rates. Poultry manure rates at 40t/ha out-yielded the rest of the rates including the control. Treated and untreated seeds did no differ in the mean yield of fresh fruit. There was also no significant interaction effect on fresh fruit yield.

Discussion

In Table 1, it was observed that application of 30t/ha poultry manure significantly hastened cucumber seed germination and emergence, this suggest that 30t/ha poultry manure in combination with seed treatment produced favourable condition for seed germination. Adeoye and Afolabi (1999) reported that seed treatment disinfect and disinfest seeds from seed borne or soil borne pathogenic organisms, both of which contribute to poor seed germination and emergence. With regards to time of flowering, 30 and 40t/ha poultry manure rates provided adequate maturation for plants. This suggested why cucumber plants in those treatments grew and approached maturity earlier than others. The inability of the plants to flower uniformly irrespective of the manure rates showed lack of response to the prevailing photoperiod. Earlier fruiting of the cucumber in the plots that received poultry manure than the cucumber in the control indicated an improved feeding due to availability of nutrients resulting from the application of the poultry manure. High rate of poultry manure (40 t/ha) could have provided enough nutrients which sustained the plant and help them to maintain normal high level of fruiting hormones. Adams *et al.*(1984) reported that cucumber naturally have high content of auxin, which enables fruit production in cucumber. Therefore better fruit production with 40 t/ha was attributed to nutrient in the soil. Improved plant height, Branching and leafiness in cucumber with increasing rate of poultry manure suggested

improved nutrient status of the soil due to application of the manure. According to Ghebrieyessus *et al* (2003), poultry manure can increase soil nitrogen by as much as 0.25%, although the quantity of the manure applied was not stated. Similar report has been made on tomato, pepper and cucumber (Ghebrieyessus *et al* 2003). However, poor performance of lower rates (10 and 20t/ha) of poultry manure in this experiment was attributed to low nitrogen content of 1.9% in the poultry manure used in the experiment. Normally growth performance of crop plant is generally known to influence yield positively. Dhingra (1981) observed that it was the dry matter accumulated in the vegetative parts of legumes that becomes partly translocated to the fruit portion. Although cucumber is a cucurbit which has not been attributed to legume characteristics, its vegetative performance can as well result in good fruit yield performance. This explains why cucumber treated with 30 and 40t/ha of poultry manure significantly produced more number of fruits and higher fresh fruit weight than the control and the lower rates. Results of this experiment show that 40t/ha manure was the best for cucumber production in owerri. No significant effect of seed dressing chemical on other growth parameters of cucumber after germination suggested that seed mortality could be the major problem of cucumber production and requires pre-planting seed treatment to enhance germination.

Table 2. Effect of chemical seed treatment and poultry manure rates on plant height (cm) at 2 and 4 WAP and number of leaves of cucumber at 2 and 4WAP.

	Poultry	manure	Rates	(t/ha)		
Seed Treatment	**0**	**10**	**20**	**30**	**40**	**Mean**
Plant height						
At 2WAP(cm)						
Untreated seeds	15.9	29.5	62.6	62.9	51.2	44.4
Treated seeds	41.2	50.2	46.1	69.1	62.3	53.8
Mean	28.6	29.9	54.4	66.0	56.8	
LSD $_{(0.05)}$ for two C.T mean =3.91						
LSD $_{(0.05)}$for two P.M mean = NS						
LSD $_{(0.05)}$for P.M X C.T = NS						
Plant height						
at 4WAP (cm)						
Untreated seeds	24.50	131.00	370.30	375.00	364.20	253.0
Treated seeds	80.40	165.60	330.30	431.80	477.20	299.0
Mean	52.45	148.30	350.30	403.40	420.70	
LSD$_{(0.05)}$ for two C.T mean = 22.4						
LSD $_{(0.05)}$for two P.M mean = NS						
LSD $_{(0.05)}$for P.M X C.T = NS						
No. of leaves at 2 WAP						
Untreated seeds	12.00	16.00	21.00	24.00	22.00	19.0
Treated seeds	14.00	17.00	20.00	24.00	27.00	20.4
Mean	13.00	16.50	20.50	24.00	24.5	
LSD$_{(0.05)}$ for two C.T mean = 0.39						
LSD $_{(0.05)}$for two P.M mean = NS						
LSD $_{(0.05)}$for P.M X C.T = NS						
No. of leaves at 4 WAP						
Untreated seeds	18.00	21.00	27.00	29.00	26.00	24.2
Treated seeds	20.00	22.00	26.00	29.00	31.00	25.6
Mean	19.00	21.50	26.50	29.00	28.50	
LSD$_{(0.05)}$ for two C.T mean = 0.69						
LSD $_{(0.05)}$for two P.M mean = NS						
LSD $_{(0.05)}$for P.M X C.T = NS						

P.M = poultry manure, C.T = Chemical treatment, NS = Not significant

Recommendation and Conclusion

The experiment on response of cucumber to seed dressing and poultry manure rates conducted in the humid tropical environment of Owerri, Imo state shows that chemical seed treatment with Apron star 42 wettable powder enhanced seedling emergence and is recommended for pre–planting treatment of cucumber seeds to disinfest seed and kill soil pathogens that may cause delay and poor germination and poor stand development. Similarly, the use of poultry manure for the cultivation of cucumber in Imo state is advocated since the application of 40t/ha of poultry manure gave significantly higher fruit yield of cucumber than the rest of the treatment. The 40tons/ha is recommended for cucumber production in Imo state.

Table 3: Effect of chemical seed treatment and poultry manure rates on number of fruit per plot, number of fruit per plant, and fruit weight (t/ha) of cucumber at maturity.

Chemical seed treatment	Poultry manure rates (t/ha)					
	0 t/ha	10 t/ha	20 t/ha	30 t/ha	40 t/ha	Mean
Number Of fruit	**Per**	**Plot**				
Untreated seeds	3	6	9	19	20	11.4
Treated seeds	3	6	10.	19	20	11.6
Mean	3	6	9.5	19	20	

$LSD_{(0.05)}$ for two P.M mean = 0.88
$LSD_{(0.05)}$ for two C.T mean =NS
$LSD_{(0.05)}$ for PMX CT =NS

Number of	**Fruit**	**Per**	**Plant**			
Untreated seeds						
Treated seeds	1.10	1.20	2.20	4.60	3.80	2.58
Mean	1.20	2.00	2.10	3.70	3.80	2.56
	1.15	1.60	2.15	1.15	3.80	

$LSD_{(0.05)}$ for two P.M mean = 0.25
$LSD_{(0.05)}$ for two C.T mean =NS
$LSD_{(0.05)}$ for PMX CT = NS

Fruit	**Weight**	**(t/ha)**				
Untreated seeds						
Treated seeds	5.00	10.33	13.00	36.67	40.00	21.00
Mean	6.00	12.33	19.33	36.67	49.67	24.80
	5.50	11.33	16.17	36.67	44.90	
$LSD_{(0.05)}$ for two PM	2.62					
$LSD_{(0.05)}$ for two C.T	Mean = NS					
$LSD_{(0.05)}$ for P.M X	CT= NS					

P.M = poultry manure, C.T = Chemical treatment, NS = Not significant

Conclusion

From the results of the experiment it was concluded that Apron star 42 wettable powder is good for treating cucumber seeds before planting. However, the chemical had no influence in the later growth and yield of cucumber. The crop cucumber responded positively to application of poultry manure at any of the rates used in the experiment. For optimum yield of cucumber, it is concluded that no optimum rate was established because the highest yield was obtained with the highest rate (40tons/ha) of poultry manure. Further experiment using more number of poultry manure rate should be carried out in future to determine the optimum rate for the production of cucumber.

Recommendation

Seed treatment disinfect and disinfest seeds from seed borne and soil borne pathogens, both of which contribute to poor seed germination and emergence It can therefore be recommended that Apron star 42 wettable powder should be used for treating cucumber seeds before planting to induce early germination. Based on this research however, 40 t/ha of poultry manure is recommended for maximum fruit yield.

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