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Research Article

Effect of Rabbit Urine on Growth and Yield of Cucumber

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Abstract

This study was conducted in year 2020 and 2021 to determine the effect of rabbit urine on growth and yield of two varieties of cucumber at the National Horticultural Research Institute, Ibadan, Oyo State. The experimental design was a 2 × 4 factorial fitted into randomized complete block design with three replicates. The factors comprised of 2 varieties of cucumber (Marketer and Poinsett) and four treatments (application of rabbit urine to leaf and soil, NPK and no fertilizer application). Five plants within each plot were randomly selected and tagged for data collection on Vine length, numbers of leaves, numbers of branches), leaf length, leaf width, vine diameter, fruit length, fruit diameter, fruit weight, number of fruit/plant and fruit yield (t/ha). Data collected were subjected to analysis of variance (ANOVA) using GENSTAT and significant means were separated using duncan multiple range test. Result from this study showed that application of rabbit urine had significant effect on growth and yield of cucumber. Cucumber with application of rabbit urine either as soil applied or foliar applied had significantly longer vines of 36.33cm and 34.02cm (2020) and 39.51cm and 38.5 cm (2021) respectively, likewise fruit yield of cucumber with application of rabbit urine to soil and leaves were significantly higher (3.85 t/ha and 3.8 t/ha respectively in 2020 and 4.3 t/ha and 4 t/ha respectively in 2021) than both the ones with application of NPK and those without fertilizer application. It can therefore be concluded that rabbit urine improved growth and yield of cucumber better than NPK and it could therefore be recommended for use as organic fertilizer for crops especially vegetables.

Keywords: *cucumber, growth, organic fertilizer, rabbit urine and yield.*

Introduction

Cucumber (Cucumis sativus L.) is one of the most important vegetable crops of the Cucurbitaceae family (Ahmed, et. al., 2007; Ibeawuchi et al., 2008; El-Wanis et al., 2012). The crop is the fourth most important vegetable after tomato, cabbage and onion in Asia and the second most important vegetable crop after tomato in Western Europe (Wehner and Guner, 2004; Eifediyi and Remison, 2010). Cucumber is a very good source of vitamins A, C, K, B6, potassium, pantothenic acid, magnesium, phosphorus, copper and manganese (Vimala et al., 1999). The ascorbic acid and caffeic acid contained in cucumber help to reduce skin irritation and swollen (Okonmah, 2011). In Nigeria, cucumber is quickly gaining popularity as a vegetable crop, where it is used in salads or as a snack with roasted peanuts. In spite of the increasing relevance of cucumber in Nigeria, low yields are obtained in farmers' fields because of declining soil fertility due to continuous cropping and disregard for soil amendment materials

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(Enujeke, 2013). The quality and yield of cucumber have been reported to be significantly influenced by soil fertility (Eifediyi and Remison, 2010).

Considering the high cost and shortage in the supply of inorganic fertilizer in Nigeria as well as the associated environmental problems, organic manure poses a sustainable alternative for nutrient management in cucumber cultivation (Ayoola and Adediran, 2006). According to Mutryarny et al. (2014), liquid organic fertilizer from rabbit urine increased plant height growth, leaf number, leaf width, fresh weight, and mustard plant weight. According to Rosdiana (2015), the treatment of rabbit urine liquid organic fertilizer dosage of 12 ml / l gave the highest results for plant height, number of leaves, leaf length, leaf width, wet weight, and weight mustard. Rabbit urine contains nutrients such as nitrogen, phosphorus, and potassium, which are better than other livestock urine, namely 2.72% nitrogen, 1.10% phosphorus, and 0.50% potassium (Nurrohman 2014). According to Atia et al. (2005), rabbit urine contains high levels of nitrogen since their major food preference is forage and drinks little water. Ammonia (NH3) and other nitrogenous gases which a colourless, strong in odour and lighter than air contained in rabbit urine are by-products of protein digestion, some of which are lost in manure and urine. This liquid animal waste can be used as liquid organic fertilizer (Salisbury and Ross, 1995). The use of rabbit urine as a source of organic manure have been reported by Said et al. (2018), Stark et al. (2008), Atia et al. (2005). It has been suggested for increased agronomic parameters and yield of vegetable crops as one of the least expensive forms of fertilizer (Indabo and Abubakar, 2020). It was also suggested to be a suitable alternative to chemical fertilizers since it poses minimal risks to the ecosystem while still providing the essential nutrients needed for adequate plant growth. The objective of this study was therefore to investigate the effect of rabbit urine on the growth and yield two cucumber varieties.

Materials and Methods

The experiment was carried out between July and October 2021 and 2022 at the National Horticulture Research Institute's (NIH0RT) Vegetable Research Farm in Ibadan, Oyo state, which is situated in Nigeria's rain forest agroecological zone (Longitude 30 511E and Latitude 70 241 N 172 m above sea level). Pre-cropping soil samples were randomly taken at a depth of 0 to 15 cm and analyzed revealed that the soil had the following properties: pH-5.6, Organic matter-1.18%; Organic Carbon-0.68%; 0.08% Nitrogen and 6.3mg kg-1 Available P. Other properties of the soil included exchangeable Ca, Mg, K and Na as 0.86, 0.48, 0.46 and 0.24 cmol kg-1 respectively and Cation Exchange Capacity was 2.10 cmol kg-1. The soil was sandy-loam with 80% sand, 10% silt and 10% clay.

The experimental design was a 2 × 4 factorial randomized complete block design with three replicates. The factors comprised of 2 varieties of cucumber (Marketer and Poinsett) and four treatments (application of rabbit urine to leaf and soil, NPK and no fertilizer application). Rabbit urine was diluted with water at ratio 1:5 (https://www.farminggarden.com/use-rabbit-urine-as-organic-fertilizer-or-pesticide/) and applied at the rate of 100 liters/ha of rabbit urine to 400 liters/ha of water to either the soil or cucumber leaves as foliar spray.

The field was disc-ploughed twice and harrowed before planting. Plot size was 2m × 2m (4m2) while the experimental field size was 23m ×8m (184m2). Cucumber was planted at spacing of 50cm × 50cm, giving rise to plant population of 40,000 plants/ha. Weeding was done manually using hoe at 3 and 6 weeks after planting. Five plants were randomly selected from each plot and tagged for data collection on growth and yield as follows:

Vine length ((cm): Determined by using meter rule to measure the length from the soil level to the last apical bud. Number of leaves: Leaves per plant were counted. Leaf length (cm): Determined by measuring the mid-rib length of leaves using meter rule. Leaf width (cm): Determined by measuring the broadest part of leaves using the meter rule. Vine diameter (mm): Determined using a digital vernier caliper. Fruit length (cm): Determined by measuring distance

from the base to the tip of fruits using a measuring tape. Fruit diameter (mm): Determined using a digital vernier caliper was used. Fruit weight (g): Weight of individual fruit was determined using a weighing balance. Number of fruit/plants: Number of fruits harvested per plant was recorded. Fruit yield (t/ha): Fruit weight per plot was determined and converted to yield per hectare in tonnes. Data collected were subjected to analysis of variance (ANOVA) using GENSTAT and significant means were separated using duncan multiple range test.

Results and Discussion

From this study, result of analysis of variance (ANOVA) showed that significant varietal difference existed among the two varieties of cucumber used for this study only in terms of vine length only in the first year, likewise leaf length in the second year of the trial while number of leaves, branches, leaf length and width and vine diameter of the two varieties of cucumber were not significantly different from each other (Table 2). Marketer produced longer vines (31 cm) than poinsett which produced vines of 28 cm in length, likewise leaf length of marketer was 12 cm while poinsett was 10.7cm (Table 2). Result of analysis of variance (ANOVA) also showed that from this study showed that there was no significant varietal difference in the fruit length of the two varieties of cucumber used for this study but the fruit diameter and fruit yield of the two varieties were significantly different form each other. Poinsett has wider fruits (37.2 mm) than marketer (34.3 mm). Marketer produced significantly higher fruit yield of 3.5 t/ha than poinsett that produced fruit yield of 2.7 t/ha (Table 3).

Application of rabbit urine had significant effect on vine length, number of leaves, leaf length and leaf width but not on number of branches and vine diameter. Cucumber with application of rabbit urine either as soil applied or foliar applied had significantly longer vines of 36.33cm and 34.02cm (2020) and 39.51cm and 38.5 cm (2021) respectively followed by cucumber with application of NPK fertilizer (27.16 cm in 2020 and 31.5cm in 2021) while the control (i.e. cucumber with no application of fertilizer) produced the shortest vines of 20.7cm and 25.3cm in 2020 and 2021 respectively. Number of leaves produced by cucumber with application of rabbit urine (both soil and foliar applied) and NPK fertilizer produced comparable number of leaves which was significantly higher than that of the control (Table 2). Leaf length and leaf width of cucumber with application of rabbit urine were significantly longer and wider than those with NPK fertilizer while the Control was significantly shorter than others (Table 2). This might be as a result of the fact that the fertilizer applied added nutrients to the soil and improves the soil to enhance better performance of the crop. This result is in accordance with the observation of Orluchukwu and Amadi (2022) who observed in a field trial experiment the effect of application of organic (poultry manure, and spent mushroom substrate) and inorganic (NPK 15:15:15) fertilizers as soil enrichment materials which resulted in the better performance of cucumber in terms of growth and yield compared to the control.

Application of rabbit urine significantly affected both fruit length, fruit diameter and fruit yield (Table 3). Cucumber with application of rabbit urine either as soil applied or foliar applied and those with application of NPK produced fruits that were not significantly longer and bigger than one another but all of them produced fruits that were significantly longer and bigger than the control (Table 3). Fruit yield of cucumber with application of rabbit urine to soil and leaves produced significantly higher fruit yield which were comparable with each other (3.85 t/ha and 3.8 t/ha respectively in 2020 and 4.3 t/ha and 4 t/ha respectively in 2021). This was followed by cucumber planted with application of NPK (2.77 t/ha and 2.9 t/ha in 2020 and 2021 respectively) while cucumber with no application of fertilizer produced the least fruit yield of 2.1 t/ha and 2.2 t/ha in 2020 and 2021 respectively (Table 3). This could probably be due the fact that organic fertilizers/organic materials have been shown to have important chemical functions such as the provision of macro and micro-nutrients (N, P, K, Ca, Zn, Cu and Mo) in relative amounts (Izaurralde et al., 2000) which improves root system and plant stems better than chemical

compounds (Benchasri and Simla, 2017). Comprehensive test carried out on both livestock waste and chemical fertilizer revealed that livestock waste is more efficient, more effective and environmentally friendly. Livestock waste increases the availability of nutrients in food crops, thereby increasing yield (Leite et al., 2010; Wildayana, 2017; Vasileva et al., 2017).

Conclusion

Based on the results from this study, rabbit urine improved growth and yield of cucumber better than NPK, it may therefore be a suitable alternative to chemical fertilizers since it poses minimal risks to the ecosystem while still providing the essential nutrients needed for adequate plant growth. It could therefore be recommended for use as organic fertilizer for crops especially vegetables due to it low risk of food safety for human consumption. Further work could be carried out to ascertain appropriate rate of application for optimum yield and economic returns.

Declaration of competing interest.

The authors have no relevant financial or non – financial interest to disclose.

Author's Contributions.

i. Okonji, C. J. Conceptualize the study and wrote the first draft of the manuscript.
ii. Ajayi, E.O. Conducted the field trial, performed the statistical analysis and corrected the reviewed manuscript.
iii. Obisesan. O.I. Managed the literature
iv. Osundare, O.T. Managed the analyses and contributed to development of manuscript
v. Adetuyi. A.O Conducted the field trial and carried out data collection.This work was carried out in collaboration with the authors**.**

Reference

Ahmed, N., M.H. Baloch, A. Haleem, M. Ejaz and N. Ahmed. (2007). Effect of different levels of nitrogen on the growth and production of cucumber. *Life Sci. Int. J.,* 1: 99– 102.

Atia, A., Haugen-Kozyra, K. and Amrani, M. (2005)."Ammonia and hydrogen sulfide emissions from livestock production." Manure research findings and technologies: From science to social issues [Online]. Alberta Agriculture, Food and Rural Development. Pp. 47. Available at www.agric.gov.ab.ca/$department/deptdocs.

Ayoola, O. T, and Adediran, O. N, (2006). Influence of poultry manure and NPK fertilizer on yield and yield components of crops under different cropping system in South-West, Nigeria. *Afr. J. Biotechnol.,* 5: 1336-1392.

Benchasri, S. and Simla, S. (2017). Potential of Chilli Varieties under Chemical and Organic Agricultural Systems in Thailand. *Bulgarian Journal of Agricultural Sciences*, 23(1): 58-70.

Eifediyi, E. K. and Remison, S. U. (2010). Growth and yield of cucumber (*Cucumis sativus* L.) as influenced by farmyard manure and inorganic fertilizer. *J. Plant Breeding and Crop Sci. 2(7): 216-220.*

El-Wanis, A., Mona, M., Abdel-Baky, M. H. and Salman, S. R. (2012). Effect of grafting and salt stress on the growth, yield and quality of cucumber grown in NFT system, *Journal of Applied Sciences Research*, 8 (10): 5059-5067.

Enujeke E.C. (2013). Growth and yield responses of cucumber to five different rates of poultry manure in Asaba area of Delta state, Nigeria. *International Research Journal of Agricultural Science and Soil Science.* 3(11): 369-375.

Ibeawuchi, I. I., Iheoma, O. R., Obilo, O. P. and Obiefuna, J. C. (2008). Effect of time of mulch application on the growth and yield of cucumber (*Cucumis sativus*) in Owerri, Southeastern Nigeria". *Life Science Journal*, 5(1): 68-71

Indabo, S. S. and Abubakar, A. A. (2020). Effect of rabbit urine application rate as a bio-fertilizer on agro-mophorlogical traits of UC82B tomato (*Lycopersicon*

esculentum Mill) variety in Zaria, Nigeria. *Dutse Journal of Pure and Applied Sciences* 6 (2): 344-352.

Izaurralde, R.C., McGill, W.B. and Rosenberg, N.J. (2000). Carbon Cost of Applying Nitrogen Fertilizer. *Science*, **288**: 811–812.

Leite, L.F.C., Oliveira, F.C., Arau, A.S.F, ´jo, S.R., Galvao, S. and Lemos, J.O. (2010). Soil organic carbon and biological indicators in an acrisol under tillage systems and organic management in North-Eastern Brazil. *Soil Research*, **48**: 258–265.

Mutryarny, E., Endriani., and U. S. Lestari (2014). The Utilization of Rabbit Urine to increase growth and production of Mustard Greens (*Brassica juncea* L.) of Tosakan Variety. *Agricultural Scientific Journal.* Vol (3), No (2): 11 – 17.

Nurrohman W.M, A Suryono and K. Puji. (2014). The use of fermented Paitan (*Tithonia diversifolia* L) extract and liquid rabbit manure as a source of nutrients in the hydroponic cultivation of mustard greens (*Brassica juncea* L.). *J. Plant Production*, 2 (8): 649-657

Okonmah, L. U., (2011). Effects of different types of staking and their cost effectiveness on the growth, yield and yield components of cucumber (*Cucumis sativus* L.). *Int. J. Agric. Sci.* 1(5), 290-295.

Orluchukwu, J. A and Amadi, Confidence (2022). Effect of organic and inorganic fertilizers on the growth and yield of cucumber (*Cucumis sativa* L.) in South-South Nigeria. *International Journal of Agricultural Policy and Research* Vol.10 (2), pp. 31-37

Rosdiana. (2015). Growth of Pakcoy Plants after giving Rabbit urine fertilizer. *Journal of Mathematics, Saint, and Technology*, 16 (1), 1-9.

Said, M. I., Asriany, A., Sirajuddin, S. N., Abustam, I. E., Rasyid, R., and Al-Tawaha, A. R. M. (2018). Evaluation of quality of liquid organic fertilizer from Rabbit's Urine waste fermented using local microorganisms as decomposers. *Iraqi Journal of Agricultural Sciences*, **49**(6):990-1003.

Salisbury F. B. and Ross C. W. (1995). Plant Physiology III. In: Development of Plant and Environmental Physiology. Translation Lukman D R, Sumaryono Bandung: ITB Publisher

Stark, C. H., Condron, L. M., O'Callaghan, M., Stewart, A. and Di, H. J. (2008). Differences in soil enzyme activities, microbial community structure and short-term nitrogen mineralization resulting from farm management history and organic matter amendments. *Soil Biology and Biochemistry*, **40**: 1352– 1363.

Vasileva, V., Kertikov, T. and Ilieva, A. (2017). Dry mass yield and amount of fixed nitrogen in some forage legume crops after treatment with organic fertilizer Humustim. *Bulgarian Journal of Agricultural Sciences*, **23** (5): 816–819.

Vimala P, Ting C.C, Salbiah H, Ibrahim B, Ismail L (1999). Biomass production and nutrient yields of four green manures and their effects on the yield of cucumber. *Journal of Tropical Agric and Food Science* 27:47-55.

Wehner T.C. and N. Guner (2004). Growth stage, flowering pattern, yield and harvest date prediction of four types of cucumber tested at 10 planting dates. *Acta Hort.* 637 ISHS

Wildayana, E. (2017). Challenging constraints of livelihoods for farmers in the south Sumatra Peatlands, Indonesia. *Bulgarian Journal of Agricultural Sciences*, **23** (6): 894–905.

Table 1: Result of rabbit urine analysis

Parameter	
Organic matter (%)	0.38
pH	9.2
Total N (%)	0.03
Available P (mg/kg)	31.95
Cations	
Ca(mg/kg)	2.14
Mg (mg/kg)	2.07
K (%)	0.34
Na (%)	0.9
Micro-nutrients	
Mn (mg/kg)	1.70
Fe (mg/kg)	24.73
Cu (mg/kg)	0.46
Zn (mg/kg)	11.4
$S\text{-}SO_4$ (mg/kg)	6.05
Heavy metal	
C/N ratio	7.3
Cd (mg/kg)	0.00
Pb(mg/kg)	0.0

Table 2: Growth parameters of two varieties of cucumber as affected by rabbit urine

Factors	**Vine length (cm)**		**Number of leaves**		**Number of branches**		**Leaf length (cm)**		**Leaf width (cm)**		**Vine diameter (mm)**	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Varieties												
Marketer	31.3a	34.5	7.1	10.1	2.3	2.5	8.21	12.0a	10.66	12.58	5.77	7.35
Poinsett	28.09b	32.9	6.6	9.8	2.2	2.2	8.12	10.73b	10.28	12.55	5.20	6.80
F sig. ($P \leq 0.05$)	**	ns	ns	ns	ns	ns	ns	**	ns	ns	ns	ns
Treatment												
Soil applied	36.33a	39.51a	8.0a	11a	2.6	2.5	9.1a	11.8a	11.8a	13.4a	5.9	7.5
Foliar applied	34.02a	38.5a	7.3a	10a	2.4	2.5	8.6ab	11.7a	11.8a	13.4a	5.5	7.0
NPK	27.16b	31.5b	6.8a	9.9ab	2.2	2.3	8.0b	11.5a	10.1b	12.5a	5.5	6.9
No fertilizer (Control)	20.74c	25.3c	5.5b	8.5b	1.9	2.0	6.8c	10.3b	8.1c	10.8b	4.9	6.7
F sig. ($P \leq 0.05$)	**	**	**	*	ns	ns	**	**	**	**	ns	ns

Note: Means with the same letter(s) along the same column are not significantly different ($P \leq 0.05$) using Duncan Multiple Range test (DMRT). *and ** indicate significance at 5% and 1% probability level respectively.

ns. Not significant

Table 3: Means of yield and yield attributes of two varieties of cucumber as affected by rabbit urine

Factors	**Fruit length (cm)**		**Fruit diameter (mm)**		**Fruit weight (g)**		**Fruit yield (tha^{-1})**	
	2020	2021	2020	2021	2020	2021	2020	2021
Varieties								
Marketer	14.7	15.3	37.2a	38.1	680.6a	686.9a	3.5a	3.9a
Poinsett	14.1	14.6	34.3b	35.66	394.7b	408.2b	2.7b	2.9b
F sig. ($P \leq 0.05$)	ns	ns	*	ns	**	**	**	**
Treatment								
Soil applied	15.2a	15.8a	39.2a	40.6a	842.3a	864.2a	3.85a	4.3a
Foliar application	15.2a	15.7a	39.2a	39.8a	656.7a	661.5a	3.8a	4a
NPK	15.1a	15.6a	37.8a	39.2a	339.2b	345.8a	2.7b	2.9b
No fertilizer (Control)	12.2b	12.8b	26.9b	27.8b	312.7b	318.8b	2.1c	2.2c
F sig. ($P \leq 0.05$)	**	**	**	**	**	**	**	**

Note: Means with the same letter(s) along the same column are not significantly different ($P \leq 0.05$) using Duncan Multiple Range test (DMRT). *and ** indicate significance at 5% and 1% probability level respectively.

ns. Not significant

Table 4: Means of interaction of growth, yield and yield component of two varieties of cucumber as affected by rabbit urine

Interaction	Number of branches		Leaf length (cm)		Leaf width (cm)		Fruit diameter (mm)		Fruit weight (g)		Fruit yield (tha^{-1})	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Marketer × soil applied	1.8b	1.7b	9.66	11.9ab	10.7bc	12.6	37.4bc	39.5bc	182.3ed	184.3ed	4.2ab	4.9a
Marketer × foliar applied	3.2a	3a	8.57	10.2c	12ab	13.8	39.2b	40.8ab	328.3ed	334ed	4.7a	5a
Marketer × NPK	2.0b	2b	7.77	10.9bc	9.73cd	12.5	33.5c	34.2c	117.7e	122.7e	2.9cd	3.1bc
Marketer × No fertilizer	1.9b	2b	6.83	9.9c	8.72ed	11.3	27.2d	28d	950.7ab	992ab	2.3de	2.4cd
Poinsett × soil applied	3.0a	3a	8.63	11.86ab	12.9a	14.3	38.2bc	38.9bc	1131a	1138.7a	3.4bc	3.7b
Poinsett × foliar applied	2.0b	2b	8.81	12.9a	11.7ab	13	39.2b	40.4ab	350cde	357.7cde	2.8cd	3cb
Poinsett × NPK	2.5ab	3a	8.29	12.6a	10.5bcd	12.4	44.8a	45.4a	507.7cd	515cd	2.6d	2.8c
Poinsett × No fertilizer	2b	2b	6.75	10.7bc	7.5e	10.4	26.7d	27.6d	734bc	736.3bc	1.8e	2.1d
F sig. ($P \leq 0.05$)	**	**	ns	**	**	ns	*	*	**	**	*	*

Note: Means with the same letter(s) along the same column are not significantly different ($P \leq 0.05$) using Duncan Multiple Range test (DMRT) *and ** indicate significance at 5% and 1% probability level respectively.

ns. Not significant.