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COMPARATIVE ANALYSIS OF THE APPLICATION OF INORGANIC UREA AND POULTRY DROPPINGS IN THE GROWTH AND YIELD OF TOMATO

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Abstract
This study examined the effects of applying inorganic urea and chicken droppings on tomato growth and yield in comparison. The investigation yielded three distinct aims. The Biology Demonstration Garden at the Alvan Ikoku Federal College of Education in Owerri served as the experimental location. Laboratory studies were carried out on the soil samples taken from each plot and poultry manure's chemical analysis was also assessed. A Randomized Complete Block Design (RCBD) was used to experiment. The tomato seed used for the nursery is a Dera f1 seed. To collect data, a sample population consisting of fourteen middle stands was used. The experiment's findings demonstrated that although urea has a lasting effect on plants, chicken droppings had less of an impact on seed germination and growth. Therefore, it was suggested that the government raise public knowledge of the dangers of using inorganic manure and lower the cost of organic manure for farmers.

Keywords: Inorganic Urea, Poultry Droppings, Growth, Yield, Tomato

Introduction

Solanum lycopersicum, often known as tomatoes, are edible plants in the Solanaceae family. According to Zeidan (2005), the species first appeared in Western South America, Mexico, and Central America before spreading to other regions of the world. At the close of the 1800s, tomato was brought to Nigeria and other parts of West Africa (Villareal, 2012). For their edible fruits, tomatoes are widely grown. Tomatoes, although classified as a vegetable for nutritional reasons, are rich in vitamin C and include the phytochemical lycopene. The fruits are frequently consumed raw in salads, cooked and served as a vegetable, pickled, and as an ingredient in other prepared foods. Because tomatoes are high in folic acid, vitamin C, potassium, and oxalic acid, tomatoes and tomato-based products have the potential to improve health (Bruulsesema, 2015).

According to Ali (2012), because poultry dung has a high organic matter content combined with readily available nutrients that are needed for promoting plant growth, it has more plant nutrients than any other type of organic manure. It is a great soil amendment and is widely used. To restore soil fertility overall, the manure encourages microbial activity. One aspect of better soil management is the addition of poultry manure to the soil to raise the output of tomatoes (Omolayo et al., 2013).

However, the scarcity of inorganic fertilizers and their high cost have forced farmers to turn to using poultry manure to grow leafy vegetables. The application of poultry manure increases soil retention and plant nutrient uptake; it also boosts soil micro-organism diversity and number, especially in sandy conditions; this improves crop health by increasing the availability of water and nutrients and suppressing harmful levels of fungi, bacteria, and plant parasitic nematodes. NPK stands for nitrogen, phosphorus, and potassium (K)." This information is provided by the Food and Fertilizer Technology Centre (FFTC, 2010). These three components are necessary for plant growth. NPK is present in most compound fertilizers. NPK is a member of the macronutrient class of plant nutrients. A compound fertilizer's NPK proportions are shown as a number.

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Materials and Methods

Alvan Ikoku Federal College of Education in Owerri, Imo State, was the study's location. One of the most well-known colleges in Nigeria, AIFCE is situated between Orlu-Owerri Road and Onitsha Road in Owerri, the state capital of Imo State. Additionally, the Federal Medical Center is to the east, the Nworie River is to the west, and the Imo State Government House is to the north. The college offers conventional degree programs, sandwich degrees, evening programs, NCE programs, postgraduate degree programs, and so on. On the Alvan Campus, at the Alvan Biological Garden, field experiments were conducted. In a typical humid region with a bimodal rainfall pattern with peaks in July and September and an interrupted dry spell in August, the trials were carried out throughout the 2021–2022 agricultural seasons. A 33 x 9 -8 m^2 plot of land was chosen for the study, and it was manually cleared and marked out using basin formation by the experimental layout. Composite samples were taken from the plot at a depth of 0.15 cm to evaluate the initial physiochemical properties of the soils. Plot sizes of 2.6 x 2.25 m^2 were created.

Following three days of air drying at 270 degrees Celsius, the composite soil samples that were taken from each plot were pulverized and sieved through a 2 mm aperture. The hydrometer method's particle size distribution is one of the characteristics that are examined (Gee & Bauder, 1979). Using a 1:2:5 soil/water suspension ratio and a Rye Unican model MK2PH meter, the PD was calculated. The Walkley-Black wet oxidation method was used to measure the amount of organic carbon (Nelson & Sommers, 1996). The micro-Kjeldahl distillation method, as detailed by Bremner and Mulvaney (1982), was used to calculate total nitrogen. The Bray No. 1 technique (ITTA, 1979) was used to calculate the amount of available phosphorus. Flame photometers were used to measure exchangeable potassium, and the ammonium acetate saturation method was used to measure cation exchange capacity (CEC) (Rao, & Srinivers, 2017). The experiment's poultry manure's chemical analysis was assessed using the proper techniques outlined in the IITA Manuals (1979). Three repetitions were used in a Randomized Complete Block Design (RCBD) to experiment. Poultry manure and urea rates were 0, 10, 20, and 30 tons per hectare. The tomato seed used for the nursery is a Dera f1 seed. The validity of the seed was conducted in Thailand, while we still re-run the testing at the research laboratory of the Biology Department, Alvan Ikoku University of Education, Owerri. To obtain data, a sample population of fourteen middle stands was used.

Plant height, leaf count, leaf area, grain weight, and number of grains/cob were all recorded. Tape measure the height of the plant starting at the base of the first tassel. Using the non-destructive analysis method of length x breadth with a correction factor of 0.75, the leaf area was also measured with tape. The quantity of leaves and grains/cobs were counted directly, as stated by Duke and Dueleras as reported by Enujeke (2013). A weighing scale was used to measure the weight of the grains. According to Wahua (1999), the collected data were subjected to Analysis of Variance (ANOVA) and means separated with Turkey's W text. This is given in equation (1):

$$W = q_{\alpha} puS_{\bar{x}} \tag{1}$$

$$S_{\bar{x}} = \sqrt{\frac{EMS}{n}} \tag{2}$$

where

q_{α}: is obtained from the table

p: the treatment

u: EMS (Error Mean Square)

$S_{\bar{x}}$: Standard error

Soil Preparation, Soil measurement, Soil and manure addition, and validity of tomato seed.

The soil used for the nursery was properly sieved, measured and transferred to the nursery tray, for the experiment under a controlled environment.

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Soil Measurement

800g of the sieved soil was divided into four, 200g respectively and was labelled as follows: Sample 1, Sample 2, Sample 3 and Sample 4.

Soil and Manure Addition

1. Sample 1 soil (200g) was mixed with 10g of urea.
2. Sample 2 soil (200g) was mixed with 10g of poultry dropping.
3. Sample 3 soil (200g) was mixed with 10g of urea and 10g of poultry droppings.
4. Sample 4 soil (200g) was not mixed with any manure and was used as a control.

Results

The result obtained from the comparative analysis on the application of inorganic urea and poultry droppings in the growth and yield of tomatoes were written and tabulated as follows: Nursery: The nursery tray for the experiment was divided into four according to the soil sample, viz: sample 1, sample 2, sample 3 and sample 4.

Table 1: Nursery Composition

	Urea	Poultry droppings	Poultry droppings/Urea
Sample soil (200g) 1	10g	_____	_____
Sample soil (200g) 2	_____	10g	_____
Sample soil (200g) 3	10g	10g	Urea mixed with poultry dropping.
Sample soil (200g) 4	_____	_____	_____

Table 2: Germination/Yield of Tomato

Sample	Name	Number of Seed Planted	Number of Germinated	Number alive after 5 days	The number dead after 5 days
1	Urea	50 seeds	34 seeds	21	15
2	Poultry Droppings	50 seeds	50 seeds	50	Nil
3	Urea/Poultry Droppings	50 seeds	Non	Non	Non
4	(Control) without manure	50 seeds	50 seeds	50 seeds	nil

The results obtained, calculated q and q_{α} compared showed no significant difference in the outcome with the one in Table 2 above. The results of the experiments showed that poultry droppings have nitrogen, phosphorus, calcium and magnesium that help in improving soil nutrients, grow plants and have a less residual effect on germination and growth of seed, while urea causes a residual effect on plants. The emission of ammonia from urea causes soil pollution, and disposal problems and also brings about nitrate toxicity.

Discussion

The study's findings demonstrated that the development, characteristics, and output of tomatoes were considerably enhanced by the use of poultry manure. This may be caused by the poultry manure's nutritional condition. Accordingly, the quantity and quality of manure applied determines the quality of nutrients supplied to plants by organic manure (Christo et al., 2008; Khaitov, 2019). The plant that received the maximum amount of poultry manure also had the highest percentage of emergence. This contradicts the findings of Hussein (1997), who claimed that the quantity and quality of applied organic manure affect the amount of nutrients released. Another reason for this might be that poultry manure is rich in nutrients and releases more of them when it is used in greater quantities (Madukwe et al., 2008). This is also in agreement with the findings of Han et al. (2016) who suggest that organic manure enriches the soil with minerals while inorganic manure depletes the soil in many ways. Barc (1997) had earlier recorded a similar observation on the impact of urea concentration on tomato development. The germination % data obtained indicated a reduction in germination percentage with an increase in urea level. This result is consistent with that of Becker and Hank (2000), who found a concentration-dependent relationship between the effects of urea pollution on seed germination.

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Conclusion

There were notable differences in the chemical characteristics of the organic and inorganic waste as compared to the control in an experiment that tracked the application of urea and chicken droppings on tomato germination and growth. The use of both organic and inorganic fertilizers has a major impact on tomato plant performance. On the other hand, the nutrient-rich droppings of chicken demonstrated better potential for enhancing plant performance, as it affected all yield components of the tomato plant in general. Therefore, it is advised that chicken droppings can be used to increase tomato output.

Recommendations

Based on the results, the following recommendations are made:

1. Since the result of the study shows that poultry manure enhances growth, its use should be encouraged during the growth of tomatoes.
2. Farmers, both local and commercial should adopt the use of organic manure in the growth and development of crop plants.
3. More research works should be carried out on other plants to ascertain the effect of urea on the plants.

References

Ali, I. (2012). Effect of poultry manure, NPK 15-15-15 and combination of their reduced levels on maize growth and soil chemical properties. *Niger J. Soil Sci*. *15*(1), 34-41.

Barc (1997). Fertilizer recommendation guide. Dhaka: *Bangladesh Agricultural Research Council,* 1-72

Becker, A.M. , & H.A. Hank (2000): Phytoremediation using plants to clean up spills Agricultural Research, 48, 4-10

Bremner, J. M. (1982). *Nitrogen-total.--p. 595-624* (No. Colección general/631.41 M592m v. 2). En: Methods of soil analysis: part 2; chemical and microbiological properties. Wisconsin, US: American Society of Agronomy, 1986.Bruulsema, T.W. (2015). Nutrients and product quality. *Better Crops*, *86*(1), 18-19.

Bruulsema, T.W. (2015). Nutrients and product quality. *Better Crops*, 86(1), 18-19.

Christo, I. E. C., Madukwe, D. K., & Onuh, M. O. (2008). Growth and yield of cowpea (Vigna unguiculata (L.) Walp) As influenced by cultivar and organic manure source in the Humid Tropical Environment. *International Science Research Journal*, *1*(1), 47-52.

Enujeke, E.C. (2013). Effects of poultry manure on growth and yield of improved maize in Asaba Area of Delta State, Nigeria. *Journal of Agriculture and Veterinary Science*, *4*(5), 24-30.

FFTC (2010). *Managing soil fertility for vegetable production*. Food & Fertilizer Technology Centre (online serial).

Gee, G. W., & Bauder, J. W. (1979). Particle size analysis by hydrometer: a simplified method for routine textural analysis and a sensitivity test of measurement parameters. *Soil Science Society of America Journal*, *43*(5), 1004-1007.

Han, S. H., An, J. Y., Hwang, J., Kim, S. B., & Park, B. B. (2016). The effects of organic manure and chemical fertilizer on the growth and nutrient concentrations of yellow poplar (Liriodendron tulipifera Lin.) in a nursery system. *Forest science and technology*, *12*(3), 137-143.

Hussein, T. O. (1997). Effect of poultry manure on growth of tomato proceeding of 15th annual conference. *Hortson Apr*, 8-11.

IITA (1979). *Selected methods for soil and plant analysis*. International Institute of Tropical Agriculture. Manual Series No. 1, Ibadan.

Khaitov, B., Yun, H. J., Lee, Y., Ruziev, F., Le, T. H., Umurzokov, M., ... & Park, K. W. (2019). Impact of organic manure on growth, nutrient content and yield of chilli pepper under various temperature environments. *International journal of environmental research and public health*, *16*(17), 3031.

Madukwe, D.K., & Christo, T.E. (2008). Effect of organic manure are cowpea (Vignia unquiculata) varieties on the chemical properties of the soil and root. *Nodulayion. Sciences and World Journal*, *3*(1), 23-30.

Nelson, D. W., & Sommers, L. E. (1996). Total carbon, organic carbon, and organic matter. Methods of soil analysis: Part 3 Chemical methods, 5, 961-1010.

Omolayo, O. & Ayodele, O. (2013). *Crop, soil and environmental sciences*. University of Ado-Ekiti Press.

Rao, C. S., & Srinivas, K. (2017). Potassium dynamics and role of non-exchangeable potassium in crop nutrition. *Indian Journal of Fertilizer 13*(4), 80-94.

Villareal, R.E. (2012). *Tomato in the tropics*. Longman, London pp:135-140.

Wahua, T. A. T. (1999). Applied statistics for scientific studies. *Afrika-Link Books, Nigeria,* 250-287.

Zeidan, O. (2005). Tomato production under protected conditions. *Israeli Ministry of Agriculture and Rural Development, Extension Service*.