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## Effects of Application of Different Rates of Poultry Manure on the Growth and Yield of Tomato (*Lycopersicum esculentum* Mill.)

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### ABSTRACT

Tomato is an important vegetable and a cheap source of vitamin C, thus ranks number one in their contribution to diet. However, the yield in Nigeria, especially in Southern eastern part is very low when compared to other parts. There is widespread of soil degradation, which is brought about by loss of organic matter, which consequently results in soil acidity, nutrient imbalance and low crop yields. This study therefore focused on the effect of application of different rates of poultry manure on the growth and yield of tomato (*Lycopersicum esculentum* Mill). The study was investigated at the Teaching and Research Farm of Department of Agricultural Education, Nwafor Orizu College of Education Nsugbe, Anambra State during 2013 cropping season. The treatment rates were 0.0, 5.0, 7.5 and 10.0 t ha<sup>-1</sup> poultry manure. The experimental design was a randomized complete block design replicated four times. The parameters measured were number of branches per plant, number of trusses, flowers and fruits per plant, plant height and fruit and seed weight. The result showed that 10 t ha<sup>-1</sup> poultry manure performed better than others in both growth and yield parameter while the plants in control plots gave the least performance. It is therefore recommended that 10 t ha<sup>-1</sup> rate of poultry manure should be applied to tomato for optimum growth and yield in the study area.

**Key words:** Poultry manure, *Lycopersicum esculentum*, growth and yield

### INTRODUCTION

Tomato (*Lycopersicum esculentum* Mill) is an annual crop which belongs to the family Solanaceae. It is said to have originated from Peru and Mexico in present day south and Central America from where it spread to other parts of the world (Zeidan, 2005). Tomato was introduced to West Africa and Nigeria in particular at the end of the 19th century (Villareal, 1980). Tomato is an important vegetable grown commercially in large scale because it is a cheap source of vitamin C. Tomato ranks number one in their contribution to the diet, hence consumed in large quantities. Fresh tomato provides half the recommended dietary allowance of vitamin C for an adult for a day (Splittstooesser, 1990). The fruit may

be eaten raw with, salad or more frequently cooked into stew, savoury dishes, made into pure sauce juice and ketchup (Villareal, 1980). They are refreshing in beverages and are especially good as flavorings for soup. Tomato can be used to give colour and make green salads more inviting (Ano and Agwu, 2005). Medicinally, tomato and tomato products have a health promoting power because it is rich in folic acid, vitamin C, potassium and oxalic acid (Bruulsema, 2002). Despite the immense importance of tomato, the yield in Nigeria, especially in Southern eastern part is very low, when compared to other parts. There is widespread of soil degradation which is brought about by loss of organic matter, which consequently results in soil acidity, nutrient imbalance and low crop yields (Agbede *et al.*, 2008). Application of

organic fertilizer is an important means of maintaining soil fertility status and is also environmental friendly. This is because nutrients contained inorganic manures are released more slowly and are stored for a longer time in soil, thereby ensuring a long residual effect (Sharma and Mittra, 1991). In many tropical soils, organic manure has been reported to be the major sources of nitrogen phosphorus, potassium, calcium as well as magnesium (Awodun, 2007).

Organic manure when properly applied has the potentials of improving soil infiltration capacity, as well as impact beneficial effects on the structure of the soil (Ojeniyi, 2006). The objective of this study was to determine the effect of different rates of poultry manure on the growth and yield of tomato in Nsugbe area of Anambra State.

### MATERIALS AND METHODS

**Study area:** Field experiment was conducted at the teaching and research farm of Department of Agricultural Education, Nwafor Orizu College of Education Nsugbe, Anambra State (6°25N, 6°82E) during the 2013 cropping season to determine the effect of different rates of poultry manure on the growth and yield of tomato. Nsugbe is located in the tropical rainforest zone with an annual rainfall ranging from 1,500-2,000 mm and are characterized by a bimodal rainfall pattern that peaks in July and September with a short dry spell in August (NIMET., 2011). The site was cleared manually using local implement.

**Experimental design:** The experiment was laid out in a randomized complete block design, replicated four times. The treatment comprised of four levels of poultry manure (0.0, 5.0, 7.5 and 10.0 t ha<sup>-1</sup>) on dry weight basis.

**Land preparation/sowing:** Seed beds measuring 3×3 m and 0.5 m apart were prepared to a fine tilt. The cured manure was obtained from the college poultry farm and was incorporated manually with hoe after broadcasting at different rates, two weeks prior to transplanting as recommended by Brown *et al.* (1995). The poultry manures were applied at 0.0, 5.0, 7.5 and 10.0 t ha<sup>-1</sup>. Seeds were sown by drilling, watered daily using water can and other cultural practices were observed until the seedlings were ready for transplanting.

**Transplanting:** Transplanting was done in the evening when tomato seedlings were four weeks old and transplanted at a spacing of 75×75 cm (35,556 plants ha<sup>-1</sup>). The ball of earth method of transplanting was used.

**Statistical analyzes:** Data were collected on number of trusses, flowers and fruits per plant, number of branches, fruit and seed weight and plant height which was measured with a

meter rule from the base of the plants. The data collected were analyzed using ANOVA and means separated using Duncan multiple range test at 5% level of probability.

### RESULTS AND DISCUSSION

The results in Table 1 show the physicochemical properties of the soil of the experimental area and poultry manure used. The result showed that the soil is slightly acidic and very low in essential elements, hence the need for additional nutrient amendment to the soil. The poultry manure was rich in plant nutrients and the acidity was near neutral.

The results revealed that there were significant increase in number of branches and plant height. Significant difference (p<0.05) were observed among the different rates of poultry manure all through the period (Table 2). Plants sown on plot treated with 10 t ha<sup>-1</sup> rate of poultry manure had statistically the highest values of 88.49 cm and 7.03 as plant height and number of branches respectively (Table 2). In comparison with the control, poultry manure treated plots had significantly higher increase than the control plots (Table 2). The non treated plots (control) significantly resulted in shorter plants and few numbers of branches suggesting that fertilization enhances the growth of tomato. The significant increase of number of branches in the treated plots suggest more number of fruits and invariably more tomato yield which is the ultimate goal of the farmer. This agreed with the work of Direkvandi *et al.* (2008) and Ayeni *et al.* (2010) who reported significant increase in plant height, number of branches and

Table 1: Physico-chemical properties of soil sample of the experimental site and poultry manure used

Properties	Soil samples	Poultry manure
Sand	82.20	-
Silt	10.90	-
Clay	6.90	-
PH (H <sub>2</sub> O)	5.90	7.20
Organic carbon (g kg <sup>-1</sup> )	0.58	8.30
Total nitrogen	0.46	1.26
Available P (mg kg <sup>-1</sup> )	6.75	6.90
Exchangeable bases (cmol kg <sup>-1</sup> )		
Na <sup>+</sup>	0.16	0.12
K <sup>+</sup>	0.17	8.03
Ca <sup>2+</sup>	0.92	3.08
Mg <sup>2+</sup>	1.50	0.45
CEC	3.75	-

Table 2: Effects of different rates of poultry manure on number of branches and plant height of tomato at 4 weeks

Treatments (t ha <sup>-1</sup> )	Plant height (cm)	No. of branches
0.0	60.53 <sup>d</sup>	4.58 <sup>c</sup>
5.0	73.37 <sup>c</sup>	6.25 <sup>b</sup>
7.5	79.15 <sup>b</sup>	6.75 <sup>b</sup>
10.0	88.49 <sup>a</sup>	7.03 <sup>a</sup>

Means with the same letters on the same column are not significantly different at p>0.05 level of probability using DMRT

Table 3: Effects of different rates of poultry manure on number of trusses, flowers and fruits of tomato after 4 weeks

Treatments (t ha <sup>-1</sup> )	No. of trusses plant <sup>-1</sup>	No. of flowers plant <sup>-1</sup>	No. of fruits plant <sup>-1</sup>
0.0	14.08 <sup>d</sup>	65.58 <sup>c</sup>	12.58 <sup>c</sup>
5.0	19.83 <sup>b</sup>	89.75 <sup>b</sup>	15.33 <sup>b</sup>
7.5	20.75 <sup>b</sup>	98.00 <sup>b</sup>	17.50 <sup>a</sup>
10.0	23.18 <sup>a</sup>	101.20 <sup>a</sup>	18.08 <sup>a</sup>

Means with the same letters on the same column are not significantly different at p>0.05 level of probability using DMRT

Table 4: Effects of different rates of poultry manure on tomato fruit and seed yield

Treatments (t ha <sup>-1</sup> )	Fruit yield (kg ha <sup>-1</sup> )	Seed yield (kg ha <sup>-1</sup> )
0.0	3813.33 <sup>c</sup>	14.66 <sup>b</sup>
5.0	6920.00 <sup>b</sup>	14.80 <sup>b</sup>
7.5	7413.33 <sup>a</sup>	18.13 <sup>a</sup>
10.0	8570.66 <sup>a</sup>	18.53 <sup>a</sup>

Means with the same letters on the same column are not significantly different at p>0.05 level of probability using DMRT

number of leaves as a result of application of poultry manure. The result obtained on number of trusses, flowers and fruits of tomato plant indicated that there were significant differences (p<0.05) among the different rates of poultry manure throughout the period. Plants sown on plots treated with 10 t ha<sup>-1</sup> poultry manure had the highest number of trusses, flowers and fruits per plant with the values of 23.18, 101.20 and 18.08, respectively (Table 3). This may be attributed to the sufficient release of nutrients particularly N.P.K contain in the poultry manure applied, as these nutrients improve the growth and yield of crops. This result is in line with the findings of Agbede *et al.* (2008) who found out that the number of fruits and leaves of crop significantly increased with increase in the concentration of poultry droppings. In comparison with the control, poultry manure treated plots had significantly higher number of trusses, flowers and fruits per plants than the control plots (Table 3).

The result on tomato fruit and seed yield indicated that significant differences were observed among the different rates of poultry manure used in the study. The application of 10 t ha<sup>-1</sup> rate of poultry manure resulted in highest fruit and seed yield values of 8570.66 and 18.13 kg hg<sup>-1</sup>, respectively (Table 4). This is in line with the findings of Ghorbani *et al.* (2008) who reported that tomato fruit weight increased with increasing manure source. In comparison with the control, poultry manure treated plots had significantly higher yield than the control (Table 4). This agreed with the finding of Agbede *et al.* (2008) who reported that fruit and fruit quality is improved as a result of application of poultry manure.

### CONCLUSION

The results showed that the applications of poultry manure at the rate of 10 t ha<sup>-1</sup> significantly resulted in enhanced and optimum growth and yield of tomato. It can therefore be recommended for tomato production in the tropical rainforest.

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