

# Effect of Organic Manure on the Growth and Yield of Tomato (*Solanum Lycopersicum*)

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## ABSTRACT

The study was conducted to evaluate the effect of different organic fertilizer on the growth and yield of tomato, the organic manures used for the study were poultry waste, cow dung and pig waste. Field experiment was carried out in the teaching and research farm of Federal College of Education (Technical), Asaba during the 2024 planting season. The tomato variety used for the study was platinum 701FI. The experiment was factorial experiment set in randomized complete block design, (RCBD) 3x1x3 and were replicated 3 times. The first factor was organic manure (poultry manure, pig manure and cow manure) and the second factor was tomato variety (Platinum FI). Data on vegetative growth were collected on plant height, number of branches, number of leaves and leaf area (cm<sup>2</sup>). This was taken at 2, 4 and 6 weeks after transplanting. Tomatoes were harvested twice weekly at the pink to red-ripe stage to measure the yield. Findings from the research revealed that application of 18kg of poultry manure per tomato plot measuring 3m<sup>2</sup> x 4m<sup>2</sup> recorded better growth and yield of tomato. The study recommended the application of 18kg of poultry manure on tomato plot measuring 3m<sup>2</sup> x 4m<sup>2</sup> per plot.

**Keyword:** Effect, organic, manure, growth and yield.

## INTRODUCTION

There is a growing demand for good quality and healthy food among humanity. In Nigeria agricultural sector is faced with the challenge of producing good quality and healthy food for human consumption. Many factors influence the quality and quantity of food production, one of the main factors is fertilization system (Fatimah et. al., 2016). Soil fertility is a major factor that affects the quality and quantity of crop production, as decline in soil fertility limits crop production, therefore to increase the fertility of soil and crop yield, crop farmers often use inorganic or chemical fertilizers (Chang, et al, 2010).

However frequent application of chemical fertilizers to the soil have some negative influences on the environment crops and the consumers of crops grown with chemical fertilizers. These includes pollution of the environment, alteration of soil structures and physical property, poor storage and quality of crops grown with chemical fertilizers especially vegetable crops. Nutritional quality of crops grown with continuous use of chemical fertilizers are reduced compared with that of organic manure. Chemical fertilizers are also costly compared to organic manure. Studies have shown that application of organic manures from animal extract or other agricultural and decomposable waste improves soil structures, stability and enhances yield and quality of crops (Marzouka & Kassem, 2011, Fatimah et. al., 2016).

Tomato is botanically known as *Solanum lycopersicum* is a very important vegetable crop which has relatively short duration period with high yield under the right climatic and good soil condition. It is a healthy vegetable crop rich in minerals, vitamins, essential amino acid, sugars and dietary fibers (Naika et al. 2005). Tomato fruits are eaten fresh in salad or cooked in sauces, stew, soup and meat. It can be dried or processed and canned

for future use (Fatimah et. al. 2016). The aim of this study is to evaluate the effect of different organic manure on the growth and yield of tomato. The organic manures used for the study were poultry waste, cow dung and pig waste. The specific objectives of the study were to: Determine the effect of different organic manure on the growth of tomato, evaluate the effect of different organic manure on the yield of tomato and to ascertain the effect of different organic fertilizers on the quality of harvested tomato fruits.

## METHODOLOGY

### Cultivar Selection and Seed Materials

The tomato variety used for the study was platinum 701FI. This variety has strong vigor and is disease resistant, it can withstand a lot of stress during the growing season. It can also perform well in raining and dry season. Platinum FI is one of the highest yielded seed in Nigeria and that was the reason for choosing it for this study.

### Study Site

The experiment was conducted at the teaching and research farm of Federal College of Education (Technical) Asaba, Delta State, Nigeria during the 2024 planting season. Asaba is located at latitude  $6^{\circ} 12' 21.35''$  N and longitude  $6^{\circ} 41' 45.22''$  E ( $6.2059^{\circ}$  N and  $6.659^{\circ}$  E) of the equator. The mean annual rainfall ranges from 1849mm to 2,700mm. Soil of the experimental site consists of sandy loam soil, slightly acidic with pH range of 6.08 the soil contains moderate organic carbon and organic matter of 1.25 and 2.06. (Chukwukelu, 2024)

### Experimental Design

The experiment was set in factorial experiment with randomized block design,  $3 \times 1 \times 3$  factorial experiment and was replicated 3 times. The first factor is organic manure (poultry manure, pig manure and cow manure) and the second factor is tomato variety (Platinum FI). Seeds were sown in poly bags at one seed per bag and later transplanted three weeks after planting to the main plot. The total number of plots were 4, plot dimension was  $3\text{m}^2 \times 4\text{m}^2$  and each plot received the same dosage of organic manure as follows:

1. Poultry manure 18kg per plot
2. Cow manure 18kg per plot
3. Pig manure 18kg per plot

The organic manure were added to the soil two times. First application was 9kg which were incorporated to the soil at the time of ploughing, this was done one week before transplanting while second application was done one month after transplanting.

### Data Collection

Data on vegetative growth were collected on plant height, number of branches, number of leaves and leaf area ( $\text{cm}^2$ ). These were taken at 2, 4, and 6 weeks after transplanting.

### Measurement of Yield Parameters

Tomatoes were harvested twice weekly at the pink to red-ripe stage. The following yields were measured.

1. Number of fruits per plant.
2. Weight of fruits per plot

### Statistical Analysis

The data were analyzed using analysis of variance (ANOVA) and Duncan's Multiple Range Test (DMRT).

## Procedures of Statistical Analysis System

Mean separation were performed by the least significant different (LSD) test. Statistical significance was indicated at a probability of  $p > 0.05$ .

## RESULTS

Findings from table 1 revealed that application of 18kg poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  had significant effect ( $p < 0.05$ ) on number of tomato leaves and leaf area at 2 weeks after transplanting, but had no significant effect ( $p > 0.05$ ) on the number of stems. Number of leaves obtained the highest mean rating of 31.44, followed by leaf area with 10.51 and number of stem 6.33. Result in table 2 revealed that application of 18kg cow manure on tomato plot measuring  $3m^2 \times 4m^2$  had significant effect ( $p < 0.05$ ) on number of tomato leaves, but had no significant effect ( $p > 0.05$ ) on number of stem and leaf area. Number of leaves recorded the highest mean rating of 25.34, followed by leaf area with 9.60 and number of stem with 5.56. Result in table 3 showed that at 2 weeks after transplanting, application of 18kg pig manure on tomato plot measuring  $3m^2 \times 4m^2$  had significant effect ( $p < 0.05$ ) on number of tomato leaves, but had no significant effect ( $p > 0.05$ ) on number of stem and leaf area. Number of leaves obtained the highest mean rating of 22.78, while leaf area had mean rating of 8.85 and number of stem had the lowest mean rating of 5.11. Result in table 4 revealed that application of 18kg poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  had significant effect ( $p < 0.05$ ) on number of tomato leaves, number of stem and leaf area at 4 weeks after transplanting. However, the effect was highly significant (\*\*) on number of leaves with the highest mean rating of 76.22, followed by number of stem with 11.33 and leaf area 10.51. Result in table 5 indicated that application of 18kg cow manure on tomato plot measuring  $3m^2 \times 4m^2$  had significant effect ( $p < 0.05$ ) on number of tomato leaves, number of stem and leaf area at 4 weeks after transplanting. However, number of leaves obtained the highest mean rating of 60.78, while number of stem and leaf area had mean rating of 9.22. Findings from table 6 showed that application of 18kg pig manure on tomato plot measuring  $3m^2 \times 4m^2$  had significant effect ( $p < 0.05$ ), on all the growth parameters measured at 4 weeks after transplanting. However, number of leaves obtained the highest mean rating of 42.67, while number of stem and leaf area had mean rating of 18.67 and 7.63 respectively. Result in table 7 showed that application of 18kg poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  had high significant effect ( $p < 0.05$ ) on number of tomato leaves and no significant effect ( $p > 0.05$ ) on number of stem and leaf area at 6 weeks after transplanting. Number of leaves also obtained the highest mean rating of 76.22, while leaf area had mean rating of 28.31 and number of stem had the lowest mean rating of 10.44. Result in table 8 showed that application of 18kg cow manure on tomato plot measuring  $3m^2 \times 4m^2$  had high significant effect ( $p < 0.05$ ) on number of tomato leaves and no significant effect ( $p > 0.05$ ) on number of stem and leaf area at 6 weeks after transplanting. Number of leaves also obtained the highest mean rating of 60.78, while leaf area had mean rating of 24.44 and number of stem had the lowest mean rating of 9.22. Result in table 9 showed that application of 18kg pig manure on tomato plot measuring  $3m^2 \times 4m^2$  had high significant effect ( $p < 0.05$ ) on number of tomato leaves and no significant effect ( $p > 0.05$ ) on number of stem and leaf area at 6 weeks after transplanting. Number of leaves also obtained the highest mean rating of 49.44, while leaf area had mean rating of 21.12 and number of stem had the lowest mean rating of 8.00. Result in table 10 revealed that application of 18kg poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  had high significant effect ( $p < 0.05$ ) on number of tomato fruits and weight of fruits per plot with mean rating of 29.33 and 0.67 respectively. Result in table 11 indicated that application of 18kg cow manure on tomato plot measuring  $3m^2 \times 4m^2$  per plot had high significant effect ( $p < 0.05$ ) on number of tomato fruits and weight of fruits with mean rating of 17.78 and 0.41 respectively. Result in table 12 showed that application of 18kg pig manure on tomato plot measuring  $3m^2 \times 4m^2$  per plot had significant effect ( $p < 0.05$ ) on number of tomato fruits and weight of fruits with mean rating of 9.22 and 0.24 respectively.

## DISCUSSION

The study was carried out to evaluate the effect of three different organic manures on the growth and yield of tomato in Asaba Delta State Nigeria. The three organic manures used for the study were poultry manure, cow manure and pig manure, all were applied at the same rate of 18kg per plot. Findings from the experiment revealed that organic manure had significant effects ( $p < 0.05$ ) on the growth of tomato with poultry manure

recording a higher significant effect and mean rating in all the growth parameters measured followed by cow manure and lastly pig manure. This agreed with the findings of Fatimah et al, (2016) on the effect of organic manure on yield and quality of tomato which revealed that organic manure had significant influence on growth, yield and quality of tomato fruits. Findings on yield indicated that organic manure had significant effect ( $p<0.05$ ) on the number of tomato fruits and weight of fruits. However poultry manure had higher significant effect on the yield of tomato with the highest mean rating of 29.33 for number of fruits and 0.67 for fruit weight while pig manure recorded the lowest mean rating of 9.22 for number of fruits and 0.24 for fruit weight. Findings from Chukwukelu, (2024) on the effect of poultry manure on the performance of maize showed that application of 6 tons per hectare of poultry manure increased the growth and yield of maize. In a study conducted by Adamu and Musa (2022) to determine the effect of cow dung on the growth and yield of okra, the result revealed that application of cow dung increased the growth and yield of okra. Application of 15 tons per hectare of cow manure showed the best growth and production of peanut plant (Andriana et al (2021). Findings on the effect of pig manure on the growth and productivity of twenty accession of *Moringa oleifera* showed that there were significant differences across accession in all the morphological plot and seed parameters evaluated (Stevenus et al, (2018). Furthermore, Enujoke et al, (2021), observed that application of 20 ton per hectare of pig manure on watermelon recorded outstanding growth and superior fruit quality with respect to fruit length, diameter and weight. Further facial evaluation of fruit quality revealed that tomato fruits harvested from plots treated with poultry manure looks fresher and more attractive than others thereby making them more salable than others.

## SUMMARY OF FINDINGS

Findings from the study showed that:

1. Organic manure from animal waste product had significant effect ( $p<0.05$ ) on the growth and yield of tomato
2. Application of 18kg poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  per plot significantly ( $p<0.05$ ) influenced the growth of tomato more than cow and pig manure when applied at the same rate.
3. Application of 18kg poultry of poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  per plot significantly ( $p<0.05$ ) improved the yield of tomato more than cow and pig manure when applied at the same rate.
4. Tomato fruits harvested from plots that were treated with poultry manure produced better quality fruits when compared with others.

## CONCLUSION

Based on the findings from this study the researches established that application of organic manure from animal waste can boost the growth and yield of tomato. Specifically, application of 18kg of poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  per plot proved to be the best source of organic manure from animal waste to boost growth, yield and quality of tomato fruits.

## RECOMMENDATION

Based on the findings of the study the following recommendations were made.

1. Organic manures from animal waste should be used in tomato cultivation because they are environmental friendly and also increases production.
2. Application of 18kg of poultry manure on tomato plot measuring  $3m^2 \times 4m^2$  per plot should be preferred over cow or pig manure for tomato cultivation.

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**Table: 1: Effect of poultry manure on tomato growth at 2WATP**

Poultry manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	30.00	6.33	11.33
2	33.00	6.66	10.41
3	31.33	6.00	9.30
Mean	31.44	6.33	10.51
LSD (0.05)	*	NS	*

**Table: 2: Effect of cow manure on tomato growth at 2WATP**

Cow manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	27.67	5.33	8.57
2	23.67	5.67	11.91
3	24.67	5.67	8.33

Mean	25.34	5.56	9.60
LSD (0.05)	*	NS	NS

**Table: 3 Effect of pig manure on tomato growth at 2WATP**

Pig manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	24.33	5.00	10.17
2	22.00	4.67	8.58
3	22.00	5.67	7.80
Mean	22.78	5.11	8.85
LSD (0.05)	*	NS	NS

**Table: 4: Effect of poultry manure on tomato growth at 4WATP**

Poultry manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	78.67	12.00	11.33
2	73.33	10.66	10.41
3	76.67	11.33	9.30
Mean	76.22	11.33	10.51
LSD (0.05)	**	*	*

**Table: 5: Effect of cow manure on tomato growth at 4WATP**

Cow manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	61.00	9.33	9.33
2	59.33	9.33	9.33
3	62.00	9.00	9.00
Mean	60.78	9.22	9.22
LSD (0.05)	*	*	*



**Table: 6 Effect of pig manure on tomato growth at 4WATP**

Pig manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	46.67	7.33	16.83
2	33.67	7.33	18.67
3	47.67	7.67	18.67
Mean	42.67	7.44	18.06
LSD (0.05)	*	*	*

**Table:7 Effect of poultry manure on tomato growth at 6WATP**

Poultry manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	78.67	11.33	33.30
2	73.33	9.67	24.87
3	76.67	10.33	26.76
Mean	76.22	10.44	28.31
LSD (0.05)	**	NS	NS

**Table: 8 Effect of cow manure on tomato growth at 6WATP**

Cow manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	61.00	9.33	23.17
2	59.33	9.33	28.57
3	62.00	9.00	21.57
Mean	60.78	9.22	24.44
LSD (0.05)	*	NS	NS

**Table: 9 Effect of pig manure on tomato growth at 6WATP**

Pig manure (18kg per plot)	Mean number of leaves	Mean number of stem	Leaf area (cm <sup>2</sup> )
1	47.33	8.67	22.00
2	51.00	7.33	21.47

3	50.00	8.00	16.90
Mean	49.44	8.00	21.12
LSD (0.05)	*	NS	NS

**Table: 10 Effect of poultry manure on tomato yield**

Poultry manure (18kg per plot)	Mean number of fruits	Mean weight of fruits (kg)
1	34.33	0.90
2	29.33	0.57
3	24.33	0.55
Mean	29.33	0.67
LSD (0.05)	**	**

**Table: 11 Effect of cow manure on tomato yield**

Cow manure (18kg per plot)	Number of fruits	Weight of fruits (kg)
1	18.00	0.40
2	17.67	0.45
3	17.67	0.39
Mean	17.78	0.41
LSD (0.05)	**	**

**Table: 12 Effect of pig manure on tomato yield**

Cow pig (18kg per plot)	Number of seeds	Weight of seed (kg)
1	14.00	0.22
2	13.67	0.24
3	15.00	0.27
Mean	9.22	0.24
LSD(0.05)	*	*