# To study growth and yield of Tomato (Lycopersicon esculentum L.) crop with application of different fertilizer treatments

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*Abstract*: The present investigation has been planned to assess the effects of various fertilizer treatment on growth and yield of tomato (Lycopersicon esculentum L.) by conducting field experiment through five treatments. Experimental plot size was 2 m x 1 m prepared in five treatments and three replications where  $T_5$  was kept as control and four other treatments were  $T_1$ -vermicompost @ 0.9 kg/plot (@ 0.45 kg/sq.m), T<sub>2</sub>-NADEP compost @ 1.25 kg/plot (@ 0.625 kg/sq.m), T<sub>3</sub>-pit compost @ 1.25 kg/plot (@ 0.625 kg/sq. m) and T<sub>4</sub>-chemical fertilizer (300:150:150 - N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O). Morphological parameters were measured after 90<sup>th</sup> days when fruits are matuared. At the time of harvesting (on 90<sup>th</sup> day) all crops were selected from each unit for recording biometric observations. Maximum plant height (84.41cm/plant) was recorded for the tomato plants for the treatment with NADEP organic fertilizer @ 1.25 kg/plot (@ 0.625 kg/sq. m). The maximum fruit yield of Tomato crop (Kg/plot) was recorded with chemical fertilizer treatment (T<sub>4</sub>) then followed by vermicompost, control, NADEP compost and pit compost treatment respectively.

Keywords: Fertilizer, Growth, Lycopersicon esculentum L., treatment, Tomato, yield

## Introduction:

Tomato belongs to the night shade family, solanaceae. The Tomato fruits can be used to make medicine. Tomatoes have high requirements due presence of nutrients including potassium (K) and Calcium (Ca) and some micronutrients such as iron (Fe), manganese (Mn) and zinc (Zn) hence are demanded in daily marckets. (Abbasi et al., 2002). Vermicompost increases growth and yield of various plants because of high porosity, aeration, drainage, and water-holding capacity (Edwards and Burrows, 1988). Vermicompost not only contain beneficial microflora and plant growth regulators but also nutrients like nitrates, phosphates, and exchangeable calcium and soluble potassium (Tomati et al., 1987; Orozco et al., 1996; Tomati et al., 1988; Grappelli et al., 1987; Edwards and Burrows, 1988; Grappelli and Tomati, 1987). All crops need to take a number of nutrients from environment for the growth and development. Nitrogen helps for the growth of crops, increases leaf sizes and quality, enhancing fruit and seed development (Foth and Ellis, 1988; Brady and Weil, 2008). Nitrogen is important a component in the plant cells (chlorophyll) which gives appearance of green colour for the plants. Phosphorous used to reduce grain moisture content. It also used to increase sugar content, protein content, P content (Havlin, 2005; Anonymous, 1999. Phosphorous fertilizers helps to enhance root growth and flowering. Potassium helps in plant nutrition and growth that influence both yield and quality of the crop (Njira and Nabwami, 2015). Potassium is important in flowering and fruiting purposes. Lack of potassium can have effects on plants protein synthesis. Root initiation, increased root biomass, enhance plant growth and development are the effects of vermicompost treatment. Earthworms stimulate microbial activity and metabolism. As consequence more available nutrients and microbial metabolism are resealed in to soil (Tomati et al., 1988). The high biological yield may be due to organic manure supplies direct available nutrients such as nitrogen to the plant and the organic manure improve the proportion of water stable aggregates of the soil (Asanagowda et al., 2008). Organic fertilizers significantly increased plant height over control. The results confirmed the outcomes of Ofosu and Leitch (2009). The aim of this paper is to access the effect of different fertilizer treatment on growth and yield parameters of Tomato crop.

# Materials and methods:

All total five treatments were made ( $T_1$ - vermicompost,  $T_2$ -NADEP compost,  $T_3$ -pit compost,  $T_4$  – Chemical fertilizers,  $T_5$ -control) and each treatment was with three replicates. Vermicompost ( $T_1$ ) was applied at the rate of 0.9 kg/plot (@ 0.45 kg/sq. m), (Saraswathy and Prabhakan, 2014). A comman dose of organic fertilizers such as NADEP ( $T_2$ ) and pit compost ( $T_3$ ) were applied at same rate @ 1.25 kg (@ 0.625 kg/sq. m) as per usual practice of agronomists (Aryal and Tamrakar, 2013). Straight chemical fertilizers (Urea-130.2 gm + single super phosphate -187.5 gm + murate of potash - 49.8 gm) combinally used in research plot ( $T_4$ ) (Krushidarshani, 2014). All fertilizers were were suplemented in plot size 2m x 1m with three replecation and randomized block design for cultivation of Tomato. Crop spacing of Tomato crop was kept as 90 cm x 30 cm of research plot (Krushidarshani, 2014). Total seven seeds were sown in each experimental plot using standard method of agronomy. No any fertilizers was tested on local variety of tomato plants (Lycopersicon esculentum L) through randomized block design method. Field trials were conducted using different fertilizers to determine their impact on different growth parameters of Tomato (Lycopersicon esculentum L) plants.

# **Result and discussion:**

All the all values of nutrients found after their analysis in laboratory using known standard methods for prepared organic fertilizers and experimental soil are represented in table 1.

Parameters	Soil	<b>T</b> <sub>1</sub>	<b>T</b> <sub>2</sub>	<b>T</b> <sub>3</sub>
pН	08.14	8.04	7.67	7.12
Moisture (%)	8.10	30.27	18.35	05.35
Org. matter (%)	1.00	16.39	11.76	11.30
N (%)	0.32	1.06	0.92	0.81
P (%)	0.27	1.52	1.06	0.20
K (%)	0.11	1.06	1.91	0.86

#### Table 1. Soil and organic fertilizers characteristics.

T1 indicates vermicompost, T2 indicates NADEP compost and T3 indicates Pit compost

Morphological parameters were measured after 90<sup>th</sup> days when fruits are matuared. At the time of harvesting (on 90<sup>th</sup> day) all crops were selected from each treatment unit for recording the biometric observations which are presented in Table 2.

Table 2. Effects of fertilizer treatment on growth of 1 omato after 90 <sup>th</sup> day						
Treatments	Mean Plant	Mean No. of	Average	Yield/ plot		
	height	fruits/ plant	weight of	(kg/plot)		
	(cm/plant)	_	fruits/ plant			
			(gm/plant)			
<b>T</b> 1	74.46	2.20	137.4	0.913		
	(±26.11)	(±2.03)				
<b>T</b> 2	84.41	2.40	103.5	0.713		
	(±17.54)	(±1.62)				
<b>T</b> <sub>3</sub>	63.53	3.02	92.9	0.616		
	(±8.34)	(±0.70)				
T <sub>4</sub>	80.02	2.25	190.6	1.24		
	(±12.13)	(±1.78)				
<b>T</b> 5	74.89	3.33	116.0	0.76		
	$(\pm 20.13)$	$(\pm 0.47)$				

Table 2. Effects of fertilizer treater	atment on	growth of Tomat	o after 90 <sup>th</sup> day
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T<sub>1</sub> indicates vermicompost, T<sub>2</sub> indicates NADEP compost, T<sub>3</sub> indicates pit compost, T<sub>4</sub> indicates chemical fertilizers and T<sub>5</sub> indicates control. The bracket values represent standard deviation.

# Plant height (cm/plant) after 90<sup>th</sup> days:

Mean plant heights (cm/plant) in the treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> were 74.46 cm, 84.41 cm, 63.53 cm, 80.02 cm and 74.89 cm respectively. Maximum plant height (84.14 cm/plant) was recorded for the tomato plants which were treated with NADEP organic fertilizer @ 1.25 kg/plot (@ 0.625 kg/sq.m) and the lowest plant height (63.53 cm/plant) was noted for tomato plants treated with pit compost @ 1.25 kg/plot (@ 0.625 kg/sq.m).



Fig. 1: Effects of fertilizer treatment on height of Tomato crop after 90th days

# Number of fruits/plant after 90<sup>th</sup> days:

Mean number of fruits/plant in the treatments  $T_1$ ,  $T_2$ ,  $T_3$ ,  $T_4$  and  $T_5$  were observed to be 2.2 (±2.03), 2.4 (±1.62), 3.02 (±0.70), 2.25 (±1.78) and 3.33 (±0.47) respectively. The results of the number of fruits for tomato plants showed that the highest growth in terms of fruits per plant (3.33) was obtained for the tomato plants grown in control and the lowest number of fruits/plant (2.20) was recorded with application of vermicompost treatment ( $T_1$ ).



Fig. 2: Effects of fertilizer treatment on number of fruits of Tomato crop after 90th days

### Average weight of fruits/plant after 90<sup>th</sup> days:

Mean total weights of fruits/plant (gm/plant) in the treatments  $T_1$ ,  $T_2$ ,  $T_3$ ,  $T_4$  and  $T_5$  were found to be 137.4 gm, 103.5 gm, 92.9 gm, 190.6 gm and 116 gm respectively. The highest mean total weights of fruits/plant (190.6 gm/plant) were recorded with chemical fertilizer treatment for the fruits of tomato plants. The lowest weight of mean total weights of fruits/plant (92.9 gm/plant) were recorded for tomato plants treated with pit compost treatment ( $T_3$ ) at rate of 1.25 kg/plot.



Fig. 3. Effects of fertilizer treatment on total weights of fruits of Tomato crop after 90<sup>th</sup> days Yield/plot (kg/plot) after 90<sup>th</sup> days:

Fruit yield of Tomato crop (kg/plot) in the treatments  $T_1$ ,  $T_2$ ,  $T_3$ ,  $T_4$  and  $T_5$  were found to be 0.913 kg, 0.713 kg, 0.616 kg, 1.24 kg and 0.76 kg respectively. The maximum fruit yield of Tomato crop (1.24 kg/plot) was recorded with chemical fertilizer treatment ( $T_4$ ) then followed by vermicompost treatment ( $T_1$ ) at rate 0.9 kg/plot (@ 0.45kg/sq.m). The lowest fruit yield of Tomato crop (0.616 kg/plot) was recorded with application of pit compost treatment ( $T_3$ ) at rate 0.25 kg/plot (@ 0.625 kg/sq.m).





Fig. 4: Effects of fertilizer treatment on fruit yield of Tomato crop after 90th days

Photo plate no.01: Experimental plot of Tomato crop

# **Conclusion:**

The study reveals that the fruit yield of Tomato crop is highest with application of chemical fertilizer treatment and the lowest fruit yield of Tomato crop is recorded with application of pit compost treatment.

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