

## Original Research Article

### **Effect of organic and inorganic fertilizers on the growth and yield of Tomato (*Solanum Lycopersicum*) under protected cultivation.**

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#### **ABSTRACT**

The present experiment was carried out during 2022 in Central Horticulture Research Farm of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design with 10 treatments replicated thrice. The treatments were T<sub>0</sub> Recommended dose of fertilizers (RDF), T<sub>1</sub> 75% (RDF) +25% (Vermicompost), T<sub>2</sub> 50% (RDF) + 50% (Vermicompost), T<sub>3</sub> 25% (RDF) +75% (Vermicompost), T<sub>4</sub> 75% (RDF) + 25% (FYM), T<sub>5</sub> 50% (RDF) +50% (FYM), T<sub>6</sub> 25% (RDF) +75% (FYM), T<sub>7</sub> 75% (RDF) + 25% (Poultry Manure), T<sub>8</sub> 50% (RDF) +50% (Poultry Manure), T<sub>9</sub> 25% (RDF) +75% (Poultry Manure). On the basis of our finding the best treatment was found to be T<sub>6</sub> (25% RDF + 75% FYM) which was found best in terms of growth parameters, yield parameters and quality parameters among different treatment combinations of tomato. Also the best B:C ratio 3.84 was found in T<sub>6</sub> (25% RDF + 75% FYM).

**Keywords:** *Vermicompost, FYM, Poultry manure, yield, growth, Randomized block design.*

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#### **INTRODUCTION**

Tomato, botanically known as *Solanum lycopersicum* L. or *Lycopersicon esculentum* Mill. belongs to the family *Solanaceae* bearing chromosome number  $2n=2X=24$  and originated from South America. It is one of the most popular and widely grown vegetable crops throughout the world and treated as “protective food” universally. It is rich source of vitamins, vegetable protein and minerals and holds a glorious position among vegetable after the potato and sweet potato. Tomato known as “love of apple in England”. Tomato is used as soup, salad, pickles, ketchup, puree, sauces, tomato paste, tomato juice and other products. The pulp and juice of tomato fruit are digestible and a mild aperient, a promoter of gastric secretion and a blood purifier.

The tomato plants typically grow 1-3 meters in height and have a weak stem that often sprawls over the ground and vines over other plants. Flower are generally borne in clusters of 4 to 8 but small fruited type may have 30 to 50 flowers per cluster. Tomato plants are dicots,

and grow as a series of branching stems, with a terminal bud at the tip that does the actual growing.

Tomato plays a major role in human nutrition, fruit contain 93.1% water, 1.9% protein, 0.3 g fat, 0.7% fibre, 3.6% carbohydrates, 23 calorie, 320 I.U vitamin A., 0.07 mg vitamin B1, 0.01 mg vitamin B2, 31 mg vitamin C, 20 mg calcium, 36 mg phosphorus and 0.8 mg iron. Tomato has valuable vitamins and cholesterol. Approximately 20–50 mg of lycopene per 100g of fruit weight can be obtained from tomato. The best fruit color and quality is obtained at a temperature range of 21-24°C. Tomato is one of the versatile crop in the world because of its fast and wide climate adaption and it is universally treated as protective food. Tomato contributes to a healthy, well balanced diet. They are rich in minerals, vitamins, essential amino acids, sugars, dietary fiber and it has many other uses tomato seed contain 24% of oil is used as salad oil and in the manufacture of margarine.

Generally, food security in world is very important because the large population and the better living standard need more food. In conventional farming, farmers using inorganic fertilizers for nutrient availability to increase crop production. However, for long term of period the usage of inorganic fertilizer could reduce soil fertility and crop productivity. Although organic manure is eco-friendly, it renders lower yield in comparison to inorganic fertilizers. In this regard, by applying organic manure in combination within organic fertilizer we can increase production as well as improve soil health. In addition, this combined application maximizes the use of available organic resources and minimizes the use of expensive inorganic fertilizers (Manral and Saxena, 2003; Ghosh *et al.*,2004). We hypothesized that incorporation of organic and inorganic fertilizers may provide better yield and quality of crop with improvement in soil health. Therefore, the present study was conducted to evaluate the performance of tomato varieties with different combinations of organic and inorganic fertilizers.

#### **MATERIALS AND METHODS: -**

The present investigation was done to understand the effect of organic and inorganic fertilizers at different doses combination on growth, yield and quality of tomato under protected cultivation variety Romon. The experiment was carried out at Horticultural Research Farm (HRF), Department of Horticulture, Naini Agricultural Institute SHUATS, Prayagraj, U.P., during the *Rabi* season of 2022. The different combination doses of organic

manures and inorganic fertilizers mentioned in table 1 and replicated thrice. Observations were recorded at different stages of growth periods.

**Physical properties of soil at Horticulture Research field (SHUATS).**

S. No.	Particulars	Mechanical Properties
1	Sand	48.15
2	Silt	21.34
3	Clay	30.51
4	Textural class	Sandy loam

**Chemical composition of the soil**

S. No.	Ingredients	Quantity
1	Soil pH	6.9
2	Organic carbon (%)	0.358
3	Available Nitrogen	212.56 kg/ha
4	Available Phosphorus	14.59 kg/ha
5	Available Potash (K)	225.1 kg/ha

Notation	Treatment combination
T <sub>0</sub>	100% Recommended dose of fertilizers (RDF) ( 180:100:80)
T <sub>1</sub>	75% (RDF) +25% (Vermicompost)
T <sub>2</sub>	50% (RDF) + 50% (Vermicompost)
T <sub>3</sub>	25% (RDF) +75% (Vermicompost)
T <sub>4</sub>	75% (RDF) + 25% (FYM)
T <sub>5</sub>	50 % (RDF) +50% (FYM)
T <sub>6</sub>	25 % (RDF) +75% (FYM)
T <sub>7</sub>	75% (RDF) + 25% (Poultry Manure)
T <sub>8</sub>	50% (RDF) +50% (Poultry Manure)
T <sub>9</sub>	25% (RDF) +75% (Poultry Manure)

**Table No 1:- Treatment details:-**

**Table No 2 :- Effect of organic and inorganic fertilizer on Plant height (cm), flowering parameters and yield related traits in tomato**

Treatment Notation	Treatment details	Plant height(120 DAT)	Days to first flowering	Days to 50% flowering	No. of flowers/cluster	Fruit set per cluster	No. of flower clusters/plant	Number of Fruit per plant	Fruit yield per plant (kg)	Fruit yield (250 sq. meter) (quantal)
T <sub>0</sub>	100% Recommended dose of fertilizer	248.18	31.05	49.11	7.45	5.75	10.02	57.61	4.65	55.79
T <sub>1</sub>	75% RDF + 25% Vermicompost	250.22	29.32	48.89	8.12	6.14	10.93	67.11	5.52	66.23
T <sub>2</sub>	50% RDF + 50% Vermicompost	250.62	29.90	46.33	8.32	6.23	10.83	67.47	5.57	66.82
T <sub>3</sub>	25% RDF + 75% Vermicompost	253.42	29.27	45.33	9.02	6.26	11.06	69.23	5.73	68.74
T <sub>4</sub>	75% RDF + 25% FYM	257.08	29.78	47.11	9.95	7.17	11.09	79.51	6.84	82.05
T <sub>5</sub>	50% RDF + 50% FYM	255.55	29.08	46.77	10.12	6.42	11.36	72.93	6.07	72.82
T <sub>6</sub>	25% RDF + 75% FYM	259.22	27.25	45.22	10.58	7.48	13.23	98.96	8.63	103.53
T <sub>7</sub>	75% RDF + 25% Poultry manure	258.98	28.08	47.21	10.25	7.19	12.96	93.18	8.03	96.33
T <sub>8</sub>	50% RDF + 50% Poultry manure	251.39	28.99	48.56	7.79	6.93	10.6	73.45	6.16	73.90
T <sub>9</sub>	25% RDF + 75% Poultry manure	254.72	30.18	48.67	10.22	6.92	12.06	83.45	7.11	85.29
<b>'F' test</b>		S	S	S	S	S	S	S	S	S
<b>S.E. (m) ±</b>		1.319	0.757	0.765	0.692	0.299	0.848	0.776	0.209	0.542
<b>C.D. at 5%</b>		2.722	1.563	1.579	1.428	0.618	1.751	1.602	0.431	1.118
<b>C.V.</b>		22.840	12.392	12.306	11.984	5.186	14.696	12.825	3.618	9.380

under

protected

condition.

## **Results and Discussion :-**

### **Plant height**

The height of plant significantly varied among different treatment combinations. The maximum plant height (259.22 cm) at 30 DAT was observed with treatment T<sub>6</sub> (T<sub>6</sub>-25% RDF + 75% FYM) followed by T<sub>7</sub> (75% RDF + 25% Poultry manure) with 258.98 cm. Minimum plant height (248.18 cm) was observed in T<sub>0</sub> (100% Recommended dose of fertilizer), while the remaining treatments are moderate in their growth habit.

### **Earliness parameter :-**

#### **Days to First Flowering and Days to 50% Flowering.**

Maximum days to 1<sup>st</sup> flowering and 50% flowering was recorded (31.05, 49.11) in T<sub>0</sub> (100% RDF) followed by (30.18, 48.67) in T<sub>9</sub> (25% RDF + 75% Poultry manure) and minimum (27.25, 45.22) in T<sub>6</sub> (25% RDF + 75% FYM).

#### **No. of Flower/Cluster, Fruit set/ Cluster, No. of flower cluster/ Plant.**

The effect of suitable doses of organic and inorganic fertilizer on number of flower/cluster of tomato is very obvious and consistent. There was significant difference among the doses of the different treatments, among the treatment applied the maximum number of flower/cluster was recorded in T<sub>6</sub> (25% RDF + 75% FYM) with (10.58) which was followed by T<sub>7</sub> (75% RDF + 25% Poultry manure) with (10.25) which was significantly superior over T<sub>0</sub> (100% Recommended dose of fertilizer) with (7.45) number of flower/cluster. . There was significant difference among the doses of the different treatments, among the treatment applied the maximum number of flower/cluster was recorded in T<sub>6</sub> (25% RDF + 75% FYM) with (7.48) which was followed by T<sub>7</sub> (75% RDF + 25% Poultry manure) with (7.19) which was significantly superior over T<sub>0</sub> (100% Recommended dose of fertilizer) with (5.75) fruit set/cluster. among the treatment applied the maximum number of flower/cluster was recorded in T<sub>6</sub> (25% RDF + 75% FYM) with (13.23) which was followed by T<sub>7</sub> (75% RDF + 25% Poultry manure) with (12.96) which was significantly superior over T<sub>0</sub> (100% Recommended dose of fertilizer) with (10.02) flower cluster/plant.

## **Yield parameters:-**

### **Number of Fruit per plant**

The effect of suitable doses of organic and inorganic fertilizer on number of fruit per plant of tomato is very obvious and consistent. There was significant difference among the doses of the different treatments, among the treatment applied the maximum number of fruit per plant was recorded in T<sub>6</sub> (25% RDF + 75% FYM) with (98.96) which was followed by T<sub>7</sub> (75% RDF + 25% Poultry manure) with (93.18) which was significantly superior over T<sub>0</sub> (100% Recommended dose of fertilizer) with (57.61) number of fruit per plant. Similar findings were reported by **Yadav et. al., (2017); Majumdar et. al., (2018); Singh et al. (2018)** in tomato.

### **Fruit yield/Plant (kg)**

The effect of suitable doses of organic and inorganic fertilizer on fruit yield per plant of tomato is very obvious and consistent. There was significant difference among the doses of the different treatments, among the treatment applied the maximum fruit yield per plant of tomato was recorded in T<sub>6</sub> (25% RDF + 75% FYM) with (8.63 kg) which was followed by T<sub>7</sub> (75% RDF + 25% Poultry manure) with (8.03 kg) which was significantly superior over T<sub>0</sub> (100% Recommended dose of fertilizer) with (4.65) kg.

### **Yield/250 sq. m (q)**

The effect of suitable doses of organic and inorganic fertilizer on fruit yield per 250 m<sup>2</sup> of tomato is very obvious and consistent. There was significant difference among the doses of the different treatments, among the treatment applied the maximum fruit yield per 250 m<sup>2</sup> of tomato was recorded in T<sub>6</sub> (25% RDF + 75% FYM) with (103.53 Qt) which was followed by T<sub>7</sub> (75% RDF + 25% Poultry manure) with (96.33 Qt) which was significantly superior over T<sub>0</sub> (100% Recommended dose of fertilizer) with (55.79) Qt.

## **Conclusion:-**

Hence, it is concluded that T<sub>6</sub> (25% RDF + 75% FYM) was found best in terms of growth parameters and yield of tomato under protected cultivation.

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