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## Effect of organic and inorganic fertilizers on growth, yield and quality of tomato (*Solanum lycopersicon* L.)

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### Abstract

Tomato (*Solanum lycopersicon* L.) is an annual vegetable crop of wide spread culture and popularity. Chemical fertilizers are used to increase the yield of crop whereas, continuous use of chemical fertilizers are synthetically manufactured in the factories and harm the useful microbes present in the soil and also decrease the soil fertility if used for longer time. In addition organic manures with inorganic fertilizers improve growth, yield and quality of tomato crop. Keeping this view in mind an experiment was carried out during Rabi 2022 at Agriculture Research Farm, Hajipur, Chandra Bhanu Gupta Agriculture PG College, B.K.T., Lucknow (U.P.). Nine treatments involving one variety F1 hybrid (Diamond) were trialed in randomized block design (RBD) with three replications. Total plots are twenty seven in numbers with 30X60 cm spacing. The transplanting of seedling was done on ridges and furrows at the distance of 30 x 60 cm. Results revealed that Maximum Dry matter content of fruit (g/plant) (5.56%), Minimum Days of first picking (66.00%), Minimum Days of 50% flowering (35.02%), Maximum no of fruit per plant (15.88) Maximum average fruit weight per plant 295.55 g, Maximum yield per ha (836.2 Q ha<sup>-1</sup>) were found with treatment T<sub>7</sub> (50% RDF + 6.25 t/ha FYM + 0.62 t/ha Vermicompost + 0.41 t/ha Poultry Manure) at harvest stage of fruits which was followed by T<sub>6</sub>(75% RDF + 1.10 t/ha Poultry Manure). However in quality parameters, Maximum Total soluble solids (5.14°B), ascorbic acid content (23.34 mg/100 g) was recorded with treatment T<sub>7</sub> (50% RDF + 6.25 t/ha FYM + 0.62 t/ha Vermicompost + 0.41 t/ha Poultry Manure) Whereas minimum values of these characters were found with control T<sub>9</sub> and minimum acidity content (0.51%) was recorded with treatment T<sub>7</sub>. Among various treatments, treatment T<sub>7</sub> (50% RDF + 6.25 t/ha FYM + 0.62 t/ha Vermicompost + 0.41 t/ha Poultry Manure) significantly gave better results in all parameters of growth, yield and quality respectively which was followed T<sub>6</sub> (75% RDF + 1.10 t/ha Poultry Manure) at respective stage of growth of crop significantly. This is due to availability of nitrogen, phosphorus and potash through organic and inorganic fertilizers resulting in better absorption of these nutrients by the tomato plant.

**Keywords:** Manures, vermicompost, RDF, total soluble solids, dry matter content, poultry manure, acidity

### Introduction

Tomato (*Solanum lycopersicon* L.) is a cool season vegetable crops that love the sun. It is mostly grown for vegetable purpose, yet it is widely consumed as salad or in processed form in fact it ranks first in processing. Chemical fertilizers are used to increase the yield of crop whereas, continuous use of expensive chemical fertilizers might harm the useful microbes present in the soil and also decrease the soil fertility if used for long time. On the contrary, organic manures are obtained from natural sources to the growers and their price is lower than that of chemical fertilizers and are ecofriendly (Adeel *et al.*, 2014) <sup>[1]</sup>. Continuous application of chemical fertilizer increases organic matter depletion and damage the chemical and physical properties of soil. Considering these facts, the society is being increasingly concerned about environmental hazard specially with respect to health hazards which are created by the indiscriminate use of agrochemical (Mudasir *et al.*, 2009) <sup>[4]</sup>. In contrast organic manures enhances fertility and improves soil health. The nutrients needed for tomato crop are supplied through organic and inorganic sources, their availability, acquisition, mobilization and influx into plant tissue increased and thus improved growth and yield components could be achieved (Kumari and Sharma., 2011) <sup>[3]</sup>. Organic fertilizers increases microbial activity in the soil, that stimulate the activities of aerobic and anaerobic bacteria and arbuscular mycorrhizae fungi that form networks of root extension for extensive nutrient availability to crops (Kayess *et al.*, 2017) <sup>[2]</sup>. Keeping the above facts in mind an experiment entitled "Effect of different doses of organic and inorganic fertilizers on growth, yield and quality of Tomato (*Solanum*

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*lycopersicon* L.)" was conducted at Agriculture Research farm, Chandra Bhanu Gupt Agriculture P G College, B.K.T., Lucknow (U.P.) with nine treatment and three replication during Rabi Season of 2022 to optimize the effect of combination of organic and inorganic fertilizers on growth, yield and quality of tomato plant. The interpretation of results are related to the cultivars, growing season, analysis methods and sampling procedures, Variations in the quality and shelf life of tomato is based on the nutrient management practice (Ranganna., 1986) [6]. The objective of this study is to evaluate the physio-biochemical changes of tomato grown under the combinations of different organic and inorganic fertilizer application.

### Material and Method

The present investigation entitled "Effect of different doses of organic and inorganic fertilizers on growth, yield and quality of Tomato (*Solanum lycopersicon* L.)" was conducted during Rabi season of 2022-2023. The climate of Lucknow is typical sub-tropical climate with hot summers and chill dry winter. Metreological condition prevailed during crop season are weekly monitored. Minimum and maximum temperature during the crop season ranged from 4.4 °C to 37.5 °C respectively and minimum and maximum relative humidity (%) ranged from 16.9 to 95.9% respectively, evaporation (mm) ranged from 8.0 to 8.1 mm and sunshine (hrs.) 2.3 to 9.7 hrs. Rainfall received during crop season was 3.6 mm. Nine treatments involving one variety F1 hybrid were trialed in randomized block design (RBD) with three replications. Total plots are twenty seven in numbers with 30X60 cm spacing. Treatments are (1) 50% RDF + 12.5 t ha<sup>-1</sup> FYM (2) 50% RDF + 2.5 t ha<sup>-1</sup> V.C (3) 50% RDF + 1.66 t ha<sup>-1</sup> P.M (4) 75% RDF + 8.33 t ha<sup>-1</sup> FYM (5) 75% RDF + 1.10 t ha<sup>-1</sup> P.M (6) 50% RDF + 6.25 t ha<sup>-1</sup> FYM + .62 t ha<sup>-1</sup> V.C + 0.41 t ha<sup>-1</sup> P.M (7) 50% RDF + 6.25 t ha<sup>-1</sup> FYM + .62 t ha<sup>-1</sup> V.C + 0.41 t ha<sup>-1</sup> P.M (8) 75% RDF + 3.12 t ha<sup>-1</sup> FYM + 0.32 t ha<sup>-1</sup> V.C + 0.20 t ha<sup>-1</sup> P.M (9) without fertilizer (Control). Seedlings of the tomato F1 hybrid (Diamond) were raised on raised beds. After 30 days, the seedlings of uniform size are transplanted. The

transplanting of seedling was done on ridges and furrows at the distance of 30 x 60 cm. The spray of Ridomil gold GR fungicide were common to all treatments to protect the plants. Chloropyrifos 20% E C is used as an insecticide when needed. data of growth, yield parameters like dry matter content of fruit (g/plant), Days to 50% flowering, Days to first picking, No. of fruit per plant, Average fruit weight per plant (g), Yield per hectare (q/ha), and quality parameters like TSS (%), Ascorbic acid content (mg), Acidity (%) were recorded and calculated was statistically analysed. The results were tested at five per cent level of significance. The critical difference was used to compare treatment means.

### Result and Discussion

Results of the present investigation entitled "Effect of different doses of organic and inorganic fertilizers on growth, yield and quality of Tomato (*Solanum lycopersicon* L.)." presented in table 1 and 2 revealed that maximum Dry matter content (5.56%), Days of 50% flowering (35.02), Days of first picking (66.00 days), no of fruit per plant (15.88), average fruit weight per plant (295.55 g), yield per ha (836.2 Q) were recorded with treatment T<sub>7</sub> ( 50% RDF + 6.25 t/ha FYM + 0.62 t/ha Vermicompost + 0.41 t/ha Poultry Manure) which was followed by T<sub>6</sub> (75% RDF + 1.10 t/ha Poultry Manure) at respective stages of crop growth respectively over control. The effect of fertilization was found to be statistically significant throughout the experimental periods. The highest dry weight was achieved in the plots with the high vermicompost and poultry manure with inorganic fertilizers. These results are similar with that of wange and kale 2007 who reported significantly maximum stover yield with the integrated use of area and compost. The early flowering and first picking of fruit with organic treatment could be attributed to the cumulative effect of higher dose of poultry manure, and vermicompost which improved soil fertility by the use of organic manure and adequate enhancement of vegetative growth with storing sufficient reserved food material for differentiation of buds into floral buds and early fruiting (Renuka and Ravisankar, 2001) [8].

**Table 1:** Effect of different doses of organic and inorganic fertilizers on dry matter content, days to 50% flowering and days of first picking of Tomato (*Solan lycopersicon* L.)

Sl. No.	Treatment	Dry matter content	Days to 50% flowering	Days of first picking
T <sub>1</sub>	50% RDF + 12.5 t/ha FYM	3.46	28.66	67.46
T <sub>2</sub>	50% RDF + 2.5 t/ha V.C	3.96	31.6	67.34
T <sub>3</sub>	50% RDF + 1.66 t/ha P.M	3.49	30.46	67.66
T <sub>4</sub>	75% RDF + 8.33 t/ha FYM	4.05	31.7	67.03
T <sub>5</sub>	75% RDF + 1.10 t/ha V.C	4.96	33.6	66.82
T <sub>6</sub>	75% RDF + 1.10 t/ha P.M	4.46	33.53	67.05
T <sub>7</sub>	50% RDF + 6.25 t/ha FYM + .62 t/ha V.C + .41 t/ha P.M	5.56	35.02	66
T <sub>8</sub>	75% RDF + 3.12 t/ha FYM + .32 t/ha V.C + .20 t/ha P.M	5.25	34.32	66.19
T <sub>9</sub>	RDF ONLY (CONTROL)	2.94	38.95	68.01
	SEm	0.112	0.145	0.068
	CD (P=.05%)	0.338	0.44	0.205

RDP = N:P:K:: 100:80:50

**Table 2:** Effect of different doses of organic and inorganic fertilizers on No of fruit per plant, Average fruit weight per plant and Yield per hectare (q) of tomato (*Solanum lycopersicon L.*)

Sl. No.	Treatment	No. of fruit per plant	fruit weight per plant (g)	Yield per hectare (q)
T <sub>1</sub>	50% RDF + 12.5 t/ha FYM	12.84	207.33	621.2
T <sub>2</sub>	50% RDF + 2.5t/ha V.C	13.44	225.17	675.5
T <sub>3</sub>	50% RDF + 1.66 t/ha P.M	13.19	218.15	654.8
T <sub>4</sub>	75% RDF + 8.33 t/ha FYM	14.36	235.82	705.2
T <sub>5</sub>	75% RDF + 1.10 t/ha V.C	14.68	260.66	691.5
T <sub>6</sub>	75% RDF + 1.10 t/ha P.M	14.42	280.33	853.8
T <sub>7</sub>	50% RDF + 6.25 t/ha FYM + .62 t/ha V.C + .41 t/ha P.M	15.88	295.55	836.2
T <sub>8</sub>	75% RDF + 3.12 t/ha FYM + .32 t/ha V.C + .20 t/ha P.M	15.32	261.13	783.5
T <sub>9</sub>	RDF ONLY(CONTROL)	10.86	198.85	596.8
	S.Em	0.011	0.037	0.089
	CD (P=.05%)	0.034	0.111	0.268

RDF = N:P:K:: 100:80:50

**Table 3:** Effect of different doses of organic and inorganic fertilizer on TSS, Ascorbic acid content and acidity content of tomato (*Solanum lycopersicon L.*)

Sl. No.	Treatment	TSS (%) (OB)	Ascorbic acid content (mg/100 g)	Acidity (%)
T <sub>1</sub>	50% RDF + 12.5 t/ha FYM	3.96	21.37	0.69
T <sub>2</sub>	50% RDF + 2.5 t/ha V.C	4.16	21.93	0.63
T <sub>3</sub>	50% RDF + 1.66 t/ha P.M	4.06	21.75	0.6
T <sub>4</sub>	75% RDF + 8.33 t/ha FYM	4.52	22.32	0.6
T <sub>5</sub>	75% RDF + 1.10 t/ha V.C	4.87	22.81	0.56
T <sub>6</sub>	75% RDF + 1.10 t/ha P.M	4.29	22.51	0.58
T <sub>7</sub>	50% RDF + 6.25 t/ha FYM + .62 t/ha V.C + .41 t/ha P.M	5.14	23.34	0.51
T <sub>8</sub>	75% RDF + 3.12 t/ha FYM + .32 t/ha V.C + .20 t/ha P.M	5.02	22.98	0.52
T <sub>9</sub>	RDF Only(Control)	3.31	20.83	0.76
	S.Em	0.012	0.009	0.007
	CD (P=.05%)	0.035	0.029	0.021

RDF = N:P:K:: 100:80:50

The increased number of fruits and average fruit weight in these treatments, could be attributed to higher metabolic activities because of optimum nitrogen supplies through 50% RDF and balanced dose of vermicompost and poultry manure (Ranjit and Bandhopadhyay., 2014) [7]. On the other hand tomato plants fertilized with inorganic fertilizer have soluble inorganic nitrogen and micronutrient whereas organic manure enhanced yield by supporting soil fertility. Data presented in Table 3 revealed that Maximum Total soluble solids 5.14<sup>o</sup>B, ascorbic acid content 23.34 mg/100 g, was recorded with treatment T<sub>7</sub> (50% RDF + 6.25 t/ha FYM + 0.62 t/ha Vermicompost + 0.41 t/ha Poultry Manure) at respective stage of crop growth. Which was followed by T<sub>6</sub> (75% RDF + 1.10 t/ha Poultry Manure) at all respective stage of crop growth. However, minimum TSS and ascorbic acid content were recorded with T<sub>9</sub> (control). Minimum acidity content was recorded with treatment T<sub>7</sub> (50% RDF + 6.25 t/ha FYM + 0.62 t/ha Vermicompost + 0.41 t/ha Poultry Manure) i.e. 0.51% of crop growth which was at par with T<sub>5</sub> (75% RDF + 1.10 t/ha Poultry Manure) i.e. 0.52%. However, maximum acidity was recorded 0.76% with T<sub>9</sub> (control).

### Conclusion

Effect of different doses of organic and inorganic fertilizers on growth, yield and quality of Tomato (*Solanum lycopersicon L.*)" concluded that among various treatments, treatment T<sub>7</sub> (50% RDF + 6.25 t/ha FYM + 0.62 t/ha Vermicompost + 0.41 t/ha Poultry Manure) significantly gave better results in all traits of growth and yield respectively

which was followed by T<sub>6</sub> (75% RDF + 1.10 t/ha Poultry Manure) in growth, yield and quality characters of tomato crop. This is due to availability of nitrogen, phosphorus and potash through organic and inorganic fertilizers resulting in better absorption of these nutrients by the tomato plant thus contributing to higher growth and yield characters.

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