Original Research Article

EFFECT OF ORGANIC MANURES AND INORGANIC FERTILIZERS ON GROWTH, FRUIT YIELD AND QUALITY OF CHERRY TOMATO (*Solanumlycopersicum*var. *cerasiforme*) c.v. PUSA CHERRY TOMATO-1 UNDER NATURALLY VENTILATED POLYHOUSE CONDITION

Abstract

The present investigation entitled **"Effects of Organic manures and Inorganic fertilizers on Growth, Fruit Yield and Quality of Cherry Tomato (*Solanumlycopersicum*var.*cerasiforme*) c.v. Pusa Cherry Tomato-1 under Naturally Ventilated Polyhouse Condition"** was carried out at Naturally Ventilated Polyhouse , Department of Horticulture, SHUATS, Prayagraj (U.P.) during winter season of 2021 - 2022,toevaluate the most suitable treatment combination of organic manures and inorganic fertilizers for growth, fruit yield and Quality of Cherry Tomato. The experiment was laid out in randomized block design with 13 treatments replicated thrice. The treatments consisted of different combinations of organic manures i.e., FYM, ~~Poultry~~ poultry manure and ~~Vermicompost~~ vermicompostand inorganic fertilizers. Among thirteen treatments under study, treatment T3 100% ~~Organic~~ organic ~~Manures~~manures(33% FYM+ 33% Poultry manure + 33% ~~Vermicompost~~vermicompost) recorded maximum plant height (235.20 cm), minimum days to first flowering (45.36), minimum days to 50% flowering (61.42), maximum number of branches per plant (11.33), ~~Maximum~~ maximum number of fruits per cluster (24.1667), minimum days to first fruit setting (55.97),maximum number of cluster per plant(12.2), maximum average number of fruits per plant (237.53), maximum fruit set ~~Percentage~~ percentage (86.65 %),maximum fruit weight (13.25 g), maximum fruit width (3.04 cm), maximum fruit yield per plant (3.92 kg), maximum fruit yield per hectare (130.59tonne), maximum TSS(10.64 Brix), maximum Juiciness (27%).Maximum number of flowers per cluster(29.33)was observed in T6(75% RDN + 25% ~~Vermicompost~~vermicompost),~~Maximum~~ maximum ascorbic acid content(24.57 mg/100g)was observed in T11(25% RDN + 75% ~~Poultry~~ poultry manure),~~Maximum~~ maximum B:C ratio was found in treatment T3 100% ~~Organic~~ organic ~~Manures~~ manures (33% FYM+ 33% ~~Poultry~~ poultry manure + 33% ~~Vermicompost~~vermicompost), *i.e.*, (9.34).

Keywords: Cherry Tomato, Organic,YieldandQuality.

Comment [Gh1]: Please don't repeat the topic here. State the main objective of your topic. Also, don't make it bold

Comment [Gh2]: Please state its full name at first

Comment [Gh3]: Please state the full name at first

Comment [Gh4]: What was the main conclusion of the research?

1. INTRODUCTION

Tomato (*Solanumlycopersicum*), also known as the Wolf peach and Love of Apple is one of the most popular vegetables grown all over the world. It is grown in small home garden and market garden for fresh consumption as well as processing purposes. Many population studies have established a link between dietary intake of tomatoes, a major source of the antioxidant lycopene, and a reduced risk of cancer and cardiovascular diseases **(Kanwar 2011).**Cherry tomato (*Solanumlycopersicum* var. *cerasiforme*) plants are one of the cultivars of tomato species. It has become, for many small farmers, a good alternative, for being rustic, productive, and marketable, besides tasting good.

Cherry tomato *(Solanumlycopersicum* var. *cerasiforme*) is a warm season crop and requires long growing periods to reap more harvests, it is the most promising crop under protected structures as a small variety of tomato and generally considered to be similar but not identical to the wild precursor of the domestic tomato. It is characterized by small size fruits, with a bright red colour resembling a cherry, having an excellent taste. Cherry tomato is becoming popular in the retail chains and marketed at a premium price compared to regular tomato. It is considered as an exotic vegetable, bringing new taste and appearance to dishes.Cherry tomato is a highly-priced culinary as well as it is an ornamental vegetable. Cherry tomatoes are normally much sweeter than large tomatoes. Cherry tomato has several medicinal values as it promotes gastric secretion, blood purification, intestinal antiseptic, cure cancer of the mouth and sour throat, apart from improving quality of the prepared foods. It is highly nutritious with good amount of vitamins. It is a good appetizer having pleasing test. Cherry tomatoes are determinate, semi-determinate, and indeterminate growth habit with long racemes and many fruits of intense colour and flavour and weighing between 10 and 30g **(Prema et al., 2011).**

To improve the yield and quality of the produce, it is necessary to pay attention on the optimum balanced use of nutrients through fertilizer application. Tomato requires large quantities of both organic and inorganic nutrients for its economic yields. Fertilizers play a key role in the production of both quantity and quality. of tomato. Tomato plants should be providing with adequate fertilizer, Nitrogen, phosphorus and potassium are the main elements which affect growth, yield and quality of tomato plants **(Olaniyi 2008).**

On the contrary, organic manures are easily available to the growers and their price is lower than that of chemical fertilizers **(Alam et al., 2007).** In addition, organic fertilizers improve higher growth, yield and quality of crops. They also contain essential macro and micronutrients, many vitamins, growth promoters and some beneficial microorganisms **(Natarjan, 2007; Sreenivasa et al., 2010).** Farmers apply various types of organic manures such as cowdung, poultry manure, goat manure, farmyard manure, compost, vermicompost, mustard oil cake, etc. for tomato production. Among these organic manures, cowdung @ 15 t/ha can play a key role in increasing growth and yield of tomato when it is applied in

combination with chemical fertilizers **(Rahman et al.. 1996).** Poultry manure also enriches the soils by enhancing the nutrient status and improving the structure of the soil **(Odiete and Ogunmoye, 2005).**

In the recent years, there has been reduction in usage of organic fertilizers by increased application of inorganic fertilizers to obtain higher yields from hybrids and improved varieties. Cherry tomato being a heavy feeder and exhaustic crop responds very well to nutrients application. Increased crop yield may obtain by use of chemical fertilizer done alone in the initial year but subsequently effects on the sustainability. The cost of chemical fertilizers is also increasing day by day. Therefore, to reduce dependence on chemical fertilizers along with sustainable production are vital issues in modern agriculture which can be achieved possible through integrated nutrient supply. On the other hand, organic manures like FYM, Vermicompost, poultry manure and pig manure are cheap and easily available in local condition and can be efficiently utilized for cherry tomato production. Integrated nutrient sources increase the nutrient use efficiently and soil fertility thus enhance the productivity of tomato.

2. MATERIALSANDMETHODS

The experiment was conducted in the Naturally Ventilated Polyhouse, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (UP) during 2021-22. All the facilities necessary for cultivation, including labour were made available by the department.The experiment was laid out in randomized block design (R.B.D.) with 3 replications. Cherry Tomato were planted in the polyhouse field at a spacing of **45 cm × 30 cm** in plot of **1 m × 1 m** size. Normal cultural practices and plant protection measures were followed during the cultivation process. The mean (maximum and minimum) temperature was 35.8 ^{0}C and 6.7^{0}C respectively, mean (maximum and minimum) relative humidity was 98 and 35. The experimental soil was sandy loam in texture, nearly neutral in soil reaction (pH 7.2), low in organic carbon (0.4%), available nitrogen (250 kg/ha), available phosphorus (135 kg/ha) and available potash (344 kg/ha). Cherry tomato seeds were sown in the month of October, 2021. The field beds were prepared and 30 days old seedlings were transplanted in the main field in the month of November 2021 with respective spacing and covered by soil. The observation regarding growth, yield and quality were recorded.

The sources of fertilizersused in this treatment are Urea **(**46% Nitrogen), DAP (Di-Ammonium Phosphate consists of 18% Nitrogen and 46% Phosphorous, MOP (Muriate of Potash) consists of 60% potassium, FYM (Farmyard Manure) consists of 0.5% N, 0.2% P and 0.5% K, Poultry manure consists of 3.03% N, 2.63% P and 1.4% K, Vermicompost consist of 2-3% N, 1.55-2.25% P and 1.85-2.25% K.

2.1 Statistical analysis

The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance Fisher (1950). The significance and non-significance of the treatment effect were judged with the help of ‘f’ value (variance ratio) was compared with the

Comment [Gh5]: You can combine these paragraphs

Comment [Gh6]: Please reword this sentence with improved English

Comment [Gh7]: What is the research gap? What is the aim of study?

Comment [Gh8]: Please add the subsection title with number for this paragraph

Comment [Gh9]: It is not required to bold these figures

Comment [Gh10]: Please change this number according to the previous new title

table value at 5% level of significance. If calculated value exceeded then the value, the effect of considered to be significant. The significant difference between the means was tested against the critical difference at 5% level of significance.

Comment [Gh11]: Statistical analysis is usually the last subsection of materials and methods. Therefore, move it to the last part.

2.2 Chemical analysis of soil

Composite soil samples are collected randomly before the layout of experiment was laid so as to determine the soil properties initially. The soil samples are collected from 0-15 cm depth and were dried under shade, then powdered with the help of a wooden pestle and mortar then sieved through a 2 mm sieve and was then subjected to further analysis. The physical properties of soil were evaluated by using the Bouyoucos hydrometer method outlined by **Bouyoucos (1927)** and for organic carbon by Wet method **Walkely and Black (1956).** Available nitrogen was estimated by alkaline permanganate method by **Subbiah and Asija (1956**), available phosphorus by Clasen's Calorimeter method by **Jackson (1967),** available potassium was determined by use of Flame Photometric method **(Perur*et al*., 1973)**.

3. Results and Discussions

Comment [Gh12]: There is no discussion. In addition, it is suggested that divide results subsections in 3 to 4 general ones to make it easier to understand.

3.1 Growth and Floral parameters

Data pertaining to growth parameters which are plant height, days to first flowering , days to 50% flowering, number of flowers per cluster, number of fruits per cluster , number of branches per plant, number of cluster per plant , days to first fruit setting were recorded and tabulated in Table-1.

Table-1.Effects of Organic manures and Inorganic fertilizers in terms of Plant heights, days to first flowering, days to 50 % flowering, No. of flower per cluster, No. of branches per plant, No. of fruits per cluster, number of cluster per plant, Days to first fruit setting of Cherry Tomato c.v. Pusa Cherry Tomato-1 recorded.

Sr.	Treatment	Plant height (cm)				Days to 1st Flowering	Days to 50 % Flowering	No. of Flowers/ Cluster	No. of Branches / Plant	No. of Fruits/ Cluster	No. of Cluster /Plant	Days to First Fruit Setting (DAT)
		30 DAT	60 DAT	90 DAT	120 DAT							
T1	Control	43.14	64.48	133.43	195.75	51.22	67.56	23.64	8.77	17.58	8.63	67.56
T2	RDF(150:100:50 kg/ha NPK)	45.70	73.55	130.87	203.72	47.94	65.75	27.02	10.89	22.88	9.16	59.28
T3	100%Organic Manures(33% FYM+ 33% Poultry manure+ 33% Vermicompost)	55.14	83.40	168.98	235.20	45.36	61.42	28.22	11.33	24.17	12.2	55.97
T4	75% RDN + 25% FYM	46.54	74.44	133.94	197.03	47.56	62.14	25.06	9.11	20.38	10.01	59.81
T5	75% RDN+ 25% Poultrymanure	47.20	77.39	142.32	190.45	52.11	68.17	26.91	8.61	19.42	9.49	62.22
T6	75% RDN+ 25% Vermicompost	48.09	75.04	153.00	181.94	50.11	64.00	29.33	9.09	21.53	10.46	58.69
T7	50% RDN + 50% FYM	50.53	81.55	160.87	216.64	47.47	63.61	26.08	9.00	21.53	11.38	56.89
T8	50% RDN+ 50% Poultrymanure	48.98	81.09	159.31	211.60	49.83	63.53	24.69	9.57	19.16	10.3	57.11
T9	50% RDN + 50% Vermicompost	49.08	79.94	148.36	213.96	53.61	67.11	23.65	9.50	15.95	8.87	62.31
T10	25% RDN + 75% FYM	45.24	68.72	141.73	200.61	50.86	67.56	29.05	8.33	19.29	9.55	62.39
T11	25% RDN+ 75% Poultrymanure	43.59	79.40	160.97	188.61	48.47	65.75	28.91	9.34	20.8	9.9	65.75
T12	25% RDN + 75% Vermicompost	45.30	76.59	143.47	193.36	48.44	63.61	26.24	9.40	20.7	9.96	64.00
T13	25% RDN + 25% FYM + 25% Poultry manure + 25% Vermicompost	44.12	76.21	141.73	195.96	49.00	62.14	28.37	9.99	20.65	9.4	62.14
	F-test	S	S	S	S	S	S	S	S	S	S	S
	S.Ed (±)	3.15	3.64	10.52	12.50	0.68	0.59	1.24	0.80	0.71	0.529	0.82
	C.D. @ 5 %	6.51	7.50	21.71	25.81	1.41	1.23	3.61	1.65	2.07	9.21	1.68
	C.V.	8.20	5.84	8.73	7.58	1.69	1.12	8.03	10.34	6.06	1.54	1.64

3.2 Plantheight(cm)

The maximum plant height (55.14 cm) at 30 DAT was observed with treatment T_3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T7 (50% RDN + 50% FYM) with 50.53cm. Minimum plant height (43.14cm) was observed in T1 Control.At 60 DAT the highest plant height (83.40cm) was recorded with treatment T_3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T_7 (50% RDN + 50% FYM) with 81.55cm. The minimum plant height (64.48cm) was recorded in T_1 Control.At 90 DAT maximum plant height (168.98cm) was observed in treatment T_3 100% Organic Manures (33% FYM + 33% Poultry manure + 33%Vermicompost) followed by T_{11} (25% RDN + 75% Poultry manure). Minimum plant height was recorded in T_2 RDF(150: 100 :50 kg/ha NPK) with 130.87cm. At 120 DAT the maximum plant height (235.20cm) was observed in treatment T_3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T7 (50% RDN+ 50% FYM) with 216.64 cm. Minimum plant height was recorded in T5 (75% RDN + 25% Poultry manure) with 190.45cm.

The organic manure applied in the form of FYM might have improved the soil physical and chemical properties and leading to the adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth while the minimum plant growth was due to non-availability of nutrients. Similar findings were reported by **Patil*et al.*(2004)** in tomato, **Suge *et al.* (2011)** in brinjal.

3.3 Days to First Flowering:

The minimum days (45.36) for first flowering was observed in treatment T_3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T7 (50% RDN+ 50% FYM) with 47.47 days. The maximum days (53.61) for first flowering was observed in T9 (50% RDN + 50% Vermicompost) while the other treatments were moderate in their flowering.

The time taken to the first flower appearance is an important pre- requisite which decides the early fruit yield. The earliness to flowering in treatment T3 might be due to better translocation of nutrients to the aerial parts. Similar findings were reported by **Prativa and Bhattarai (2011)** in tomato.

3.4Days to 50% Flowering:

The minimum days (61.42) for 50% flowering was observed in T_3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T4 (75% RDN + 25% FYM) and T13(25% RDN + 25% FYM + 25% Poultry manure + 25% Vermicompost) with 62.14 days. The maximum days (68.17) for 50% flowering was observed in T5(75% RDN + 25% Poultry manure).

It might be due to the effect of combined application of organic and inorganic sources of nutrients which increased metabolically active enzymes as well as production and translocation of the metabolites.

3.5 Number of flowers per cluster

The maximum number of flowers per cluster(29.33) was observed in treatment T6 (75% RDN + 25% Vermicompost) followed by T10 (25%RDN + 75% FYM), *i.e.*, (29.05). The minimum number of flowers per cluster (23.64) was noticed in T1(Control) while the other treatments are moderate in flower production.The maximum number of flowers per cluster in treatment T_6might be due to better availability of nutrients to the plant leading to the luxuriant vegetative growth and accumulation of more photosynthates and finally increasing flower production. Minimum number of flowers per cluster in T_1 might be due to unavailability of nutrients for its growth and development.

3.6 Number of branches per plant

The maximum (11.33) were observed in treatment T_3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by treatment T2 RDF (150: 100: 50 kg/ha NPK),*i.e.*, 10.89. The minimum number of branches per plant (8.33) was observed in T10(25% RDN + 75% FYM).

Number of branches are the contributors of yield as they bear the leaves, which fix the carbon dioxide through photosynthetic mechanism. As far as tomato is concerned, the leaf production is an important phenomenon especially for all the developing fruits. The results of the study are similar with **Siddaling et *al.* (2017)**.

3.7 Number of fruits per cluster

The maximum number of Fruits per cluster (24.17) was observed in treatment $T_3$100% Organic manures (33% FYM + 33% Poultry manure + 33% Vermicompost)followed by T_2 RDF (150 : 100 : 50 kg/ha NPK),*i.e.*, (22.89). The minimum number of fruits per cluster (15.95) was observed in T_9(50% RDN + 50% Vermicompost).

Maximum number of fruits incase of T3 might be due to increased number of flowers which might have formed into fruits due to adequate availability of major and minor nutrients during its growth and development. Minimum number of fruits per cluster in T_9(50% RDN + 50% Vermicompost)/might be due to non-availability of nutrients during its development. Similar findings were reported by **Rafi et *al.* (2002)** in tomato, **Poul et *al.*(2004)** in tomato, **Rodge and Yadlod (2009)** in tomato.

3.8 Days to First Fruit Setting

The minimum number of days to first fruit setting (55.97) was observed in T3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T7 (50% RDN + 50% FYM), *i.e*, 56.89. The maximum number of days to first fruit setting (67.56) was observed in T1 Control.

Yield Parameters

Data pertaining to yield parameters which are Fruit Set Percentage, Average no. of fruits/plant, Average Fruit weight (g), Average Fruit width (cm), Average yield per plant (kg), Average fruit yield (tonne/ha) were recorded and tabulated in Table-2.

Table 2.Effects of Organic manures and Inorganic fertilizers on Average no. of fruits per plant, Average fruit weight, Average fruit width, Average fruit yieldof Cherry Tomato c.v. Pusa Cherry Tomato-1

Sr.	Treatment	Fruit set Percentage	No. of Fruits/Plant	Weight (g)	Fruit Width (cm)	Yield (kg/plant)	Yield (t/ha)
T1	Control	74.17	151.74	11.80	2.37	1.8	60.03
T2	RDF(150:100:50 kg/ha NPK)	85.20	209.61	13.00	2.63	2.71	90.64
T3	100%Organic Manures(33% FYM+ 33% Poultry manure+ 33% Vermicompost)	86.65	237.53	13.25	3.04	3.91	130.59
T4	75% RDN + 25% FYM	81.48	184.28	12.80	2.76	2.62	87.26
T5	75% RDN+ 25% Poultrymanure	72.18	205.92	12.90	2.57	2.39	79.56
T6	75% RDN+ 25% Vermicompost	73.89	194.28	12.75	2.50	2.87	95.97
T7	50% RDN + 50% FYM	83.58	225.20	13.15	3.00	3.22	107.41
T8	50% RDN+ 50% Poultrymanure	77.72	206.21	12.50	2.69	2.47	82.43
T9	50% RDN + 50% Vermicompost	67.45	213.68	12.50	2.59	1.73	57.58
T10	25% RDN + 75% FYM	66.52	176.93	12.30	2.71	2.26	75.21
T11	25% RDN+ 75% Poultrymanure	71.92	179.31	12.80	2.68	2.63	87.63
T12	25% RDN + 75% Vermicompost	78.9	204.00	13.00	2.50	2.69	89.81
T13	25% RDN + 25% FYM + 25% Poultry manure + 25% Vermicompost	73.89	184.30	12.90	2.44	2.5	83.40
F-Test		S	S	S	S	S	S
S.Ed (±)		6.27	4.7352	0.65	0.14	0.23	7.54
C.D. @ 5 %		12.94		1.33	0.28	0.66	22

C.V.	10.06	10.73	6.20	6.24	15.05	15.05

Average Number of Fruits Per Plant:

Maximum number of fruits per plant (237.53) was observed in T3 100% Organic Manures (33% FYM + 33% Poultry Manure + 33% Vermicompost) followed by T7(50% RDN + 50% FYM), i.e, (225.20). The lowest number of fruits per plant (151.74) were observed in T1 Control.

Maximum number of fruits in case of T3 might be due to increased number of flowers which might have formed into fruits due to adequate availability of major and minor nutrients during its growth and development. Minimum number of fruits per plant in T1 Control might be due to non-availability of nutrients during its development. Similar findings were reported by **Rafi *etal.*(2002)** in tomato, **Poul et *al,* (2004)** in tomato, **Rodge and Yadlod (2009)** in tomato.

Average fruit weight (g):

The maximum average fruit weight (13.25 g) was observed in Treatment T3 100% Organic Manures (33% FYM + 33% Poultry Manure + 33% Vermicompost) followed by T7(50% RDN + 50% FYM),*i.e,* 13.15 g. The minimum average fruit weight (11.80 g) was recorded in T1 Control.

Maximum average fruit weight in Treatment T3 might be due to maximum availability of nutrients during all the critical stages of crop growth and for better translocation of photosynthates from vegetative parts to aerial parts which in turn helped in accumulation of dry matter. Similar findings were reported by **Singh *et.al.* (2010)** in chili.

Average fruit width (cm):

The maximum average fruit width (3.04 cm) was observed in Treatment T3 100% Organic Manures (33% FYM + 33% Poultry Manure + 33% Vermicompost) followed by T7(50% RDN + 50% FYM),*i.e.,* 3cm. The minimum average fruit width (2.37cm) was recorded in T1 Control.

Yield per Plant (kg):

The maximum yield per plant (3.92kg) was recorded in treatment T3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by treatment T7(50% RDN + 50% FYM) with 3.22 kg. The minimum yield per plant (1.73kg) was recorded in case of T9 (50% RDN + 50% Vermicompost)

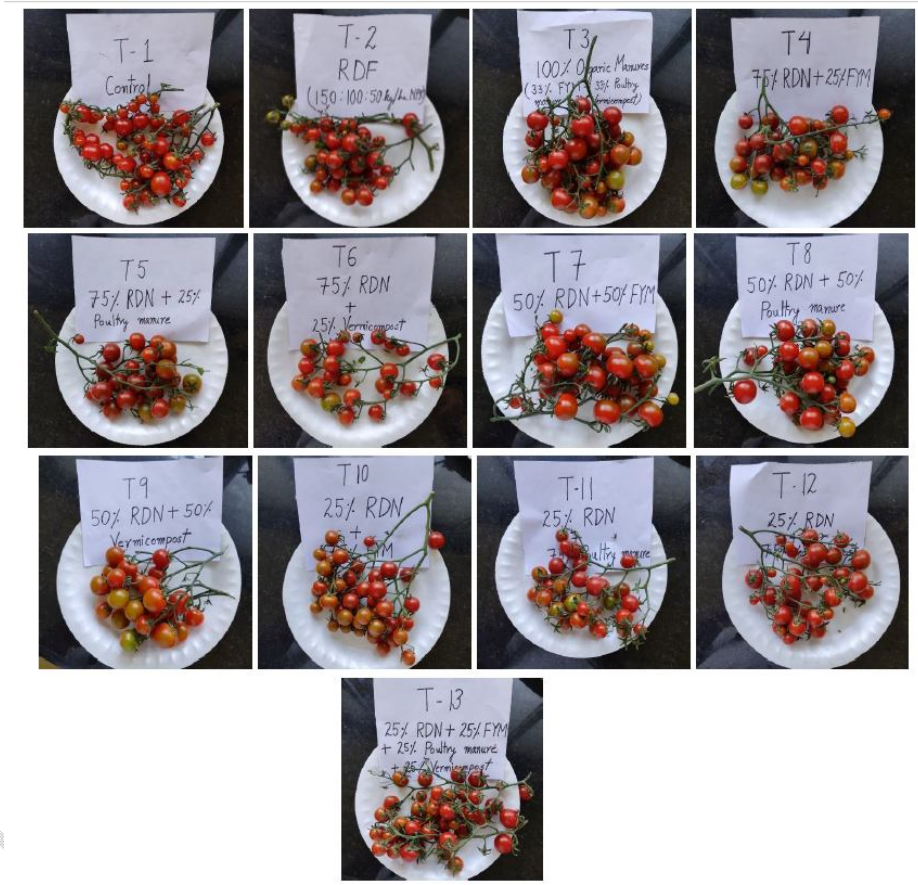
The increase yield per plant might be due to the increased growth and flower attributes which in turn lead to the increased photosynthetic activity and accumulation of photosynthates and dry matter production.

Yield per hectare (tonne):

The maximum yield per hectare (130.59 t) was recorded in treatment T3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by treatment T7(50% RDN + 50% FYM) with (107.41 t). The minimum yield per hectare (57.58 t) was observed in treatment T9 (50% RDN + 50% Vermicompost).

The maximum yield per ha in treatment T3 might be due to increased yield per plant and per plot which might have increased total yield per ha. Similar findings were reported by **Narayan et *al*.(2008)** in tomato and **Suge et *al*. (2011)** in brinjal.

Figure 1 :Characteristics of different treatments of Cherry Tomato c.v. Pusa Cherry Tomato-1



QUALITY PARAMETERS

Data pertaining to quality parameters which are TSS (Brix) , Ascorbic Acid (mg/100g), Juiciness (%) were recorded and tabulated in Table -3

Table 3: Effects of Organic manures and Inorganic fertilizers on TSS, Ascorbic acid and Juiciness % of Cherry Tomato c.v. Pusa Cherry Tomato-1

Sr.	Treatment	TSS (Brix)	Ascorbic Acid (mg/100g)	Juiciness (%)
T1	Control	8.07	23.07	18.86
T2	RDF(150:100:50 kg/ha NPK)	9.43	21.13	20.87
T3	100%Organic Manures(33% FYM+ 33% Poultry manure+ 33% Vermicompost)	10.64	22.54	27.00
T4	75% RDN + 25% FYM	9.28	21.89	21.27
T5	75% RDN+ 25% Poultrymanure	9.37	22.15	24.48
T6	75% RDN+ 25% Vermicompost	9.59	22.4	23.26
T7	50% RDN + 50% FYM	9.95	21.5	24.47
T8	50% RDN+ 50% Poultrymanure	9.73	21.7	24.39
T9	50% RDN + 50% Vermicompost	8.99	22.24	23.23
T10	25% RDN + 75% FYM	8.35	21.31	21.64
T11	25% RDN+ 75% Poultrymanure	8.80	24.57	23.22
T12	25% RDN + 75% Vermicompost	9.29	23.84	23.42
T13	25% RDN + 25% FYM + 25% Poultry manure + 25% Vermicompost	9.14	24.07	22.82
	F-test	S	S	S
	S.Ed (±)	0.49	0.80	1.43
	C.D. @ 5 %	1.02	1.66	2.96
	C.V.	6.49	4.38	7.64

TSS (Brix):

The maximum TSS (10.64 Brix) was observed in treatment T3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T7 (50% RDN + 50% FYM) with 9.95 Brix. The minimum TSS (8.07 Brix) was observed in treatment T1 Control.

Maximum TSS in treatment T3 might be due to increased availability of major as well as minor nutrients especially nitrogen and potassium, because they play vital role in enhancing the quality. The minimum TSS in T1 Control might be due to lack of availability of nutrients. This finding were also reported by **Patil*et. al.* (2004)** in tomato, **Krishna and**

Krishnappa (2002) in tomato.

Ascorbic Acid (mg/100g):

The highest Vitamin-c (24.57 mg/ 100g) was observed in treatment T11 (25% RDN+ 75% Poultry manure) followed by treatment T13 (25% RDN + 25% FYM + 25% Poultry manure + 25% Vermicompost) with 24.07 mg/100g. The lowest Vitamin-C (21.13 mg/ 100g) was observed in treatment T2 RDF(150:100:50 kg/ha NPK)

Maximum Vitamin-C content in treatment T11might be due to increased availability of major as well as minor nutrients especially nitrogen and potassium, because they play vital role in enhancing fruit quality. Minimum Vitamin-C in T2 might be due to Maximum TSS content. This finding were reported by **Singh *et al.* (2010)** in field grown tomatoes.

Juiciness (%):

The highest % of Juice (27.00) was observed in treatment T3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T5 (75% RDN + 25% Poultry manure) with 24.48%. The lowest % of juice was noticed in treatment T1 (Control) with 18.86 %.

Increase in quality parameters like Juiciness (%) in treatment T3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) might be due to increased availability of major as well as minor nutrients especially nitrogen and potassium, as they play vital role in enhancing the fruit quality. The minimum % of juice in T1 Control might be due to lack of availability of sufficient nutrients. Similar findings were reported by **KrishnaandKrishnappa(2002)** in tomato.

Economics:

In terms of Economics Maximum Benefit cost ratio, 9.34 was observed in treatment T3 100% Organic Manures (33% FYM + 33% Poultry manure + 33% Vermicompost) followed by T7

(50% RDN + 50% FYM) with 8.37 respectively, and minimum B. C ratio was observed in T9 (50% RDN + 50% Vermicompost)with 4.20.

Summary and Conclusions:

Examining Phenotypic expressions it has been observed that **Maximum Plant Height** (235.20) was recorded in T3 100% Organic Manures (33% FYM+ 33% Poultry manure+ 33% Vermicompost) followed by (216.64) in T7 (50% RDN + 50% FYM), and minimum (190.45) in T5 (75% RDN+ 25% Poultrymanure). Minimum days to **50% flowering** (61.42) is recorded in T3 Organic Manures (33% FYM+ 33% Poultry manure+ 33% Vermicompost) , followed by (62.14) in T4 (75% RDN + 25% FYM) and maximum in T5 75% RDN+ 25% Poultrymanure (68.17). The days for 50% flowering are indirectly correlated with the maturation period of different treatments. Maximum Yield (kg/plant) (3.92) found in T3 100% Organic Manures (33% FYM+ 33% Poultry manure+ 33% Vermicompost), followed by (3.22) in T7 (50% RDN + 50% FYM) and minimum in T9 (50% RDN + 50% Vermicompost) with 1.73 kg/plant.

The results from the present investigation, it is concluded that, the application of T3 (**100%Organic Manures (33% FYM+ 33% Poultry manure+ 33% Vermicompost)** is resulted with high fruit yield (3.92 kg/plant) in hectare (130.59 t/ha), Plant height (235.20 cm), number of fruits per plant (237.53), and fruit weight (13.25 gm) and benefit cost ratio of (9.34) as well as total production of the Cherry Tomato variety “Pusa Cherry-1”.

Comment [Gh13]: Please make these words regular, not bold

Comment [Gh14]: Make them regular

Comment [Gh15]: What was the main conclusion of study?

REFERENCES

Alam, M.N., Jahan, M.S. Ali, M.K. Islam. M.S. and Khandaker, S.M.A.T., 2007. Effect ofVermicompost and NPKS fertilizers on growth, yield and yield Components of red amaranth. *Australian Journal of Basic and Applied Science*, **1**(4): 706-716.

Bouyoucos, G. J. 1952. The hydrometer as a new method for mechanical, *analysis of soils*. *soil sci.*, **23**:343-350.

Jackson, M.L. 1973. Soil Chemical Analysis Prentice Hall inc. *England cliffs, New jerry*., 49.

Kanwar, M.S. 2011. Performance of tomato under greenhouse and open field condition in the trans- Himalayan region of India. *Ade in Hort Sci*.,**25**(1): 65-68

Krishna, H.C. and Krishnappa, K.S. (2002). Growth and yield of Tomato cv.Avinash-2 in relation to inorganic fertilizers and organic manures. *South Indian Hort.* 50(4/6): 335-341.

Narayan, S., Ahmed, N., Narayan, R., Shahnaz Mufti and Bhat, R. (2008). Effect of organic manures and inorganic fertilizers on fruit yield of tomato. *J. of Hort. Sci.***3**(1): 72-74

Natarajan,K., 2007. Panchagavya for plant. *Proc. Nation. Conf. Glory Gomatha, S. V. Veterinary.*

Olaniyi, J.O. and Ajibola, A.T. 2008. Effect of organic and organic fertilizers application on growth, fruit yield and quality of tomato (*SolanumLycopersicum* L). *Applied Biosciences***, 8**(1): 236-242.

Odiete, L.andOgunmoye. S.O., 2005. Comparative effect of poultry manure and phosphorus fertilizer on the growth and yield of soybean (*Glycine max*) in Plateau State. *The Proceedings of the 39th annual conference of the Agricultural Society of Nigeria*, Benin City, pp. 258-259.

Patil, M.B., Mohammed, R.G. and Ghadge, P.M. (2004). Effect of organic and inorganic fertilizers on growth, yield and quality of Tomato. *J. Maharashtra Agric. Univ.* **29**(2): 124-127.

Poul, A.S.. More, S.D.. Lohit, V.D. and Bodke, R.G. (2004). Effect of organic and inorganic nutrient sources on growth, yield and nutrient uptake in Tomato. *J. of Soils and Crops.***14**(1): 40-45.

Perur, N.G., Subramanaim, C.K., Mukhar, G.R and Roy, H.F. 1973. Soil fertility evaluation serve Indian farmer deptt. Agri (Mysore) and *univ. Agri. Sci. Bangalore.*

Prativa, K.C. and Bhattarai, B.P. (2011). Effect of Integrated Nutrient Management on the growth, yield and Soil Nutrient Status in Tomato. *Nepal J. of Sci, and Tech*. **12**: 23-28.

Comment [Gh16]: Please use more updated references

Prema, G. Indiresh, K. M and Santhosha, H. M. 2011. Evaluation of cherry tomato (SolanumLycopersicumvarCerasiforme) genotypes for growth, yield and quality traits. *Asian Journal of Horticulture*. **6**(1): 181-184.

Rahman, M. A., Shaha, J. H. U. K., Choudhury, A. R. and Choudhury, M. M. U., 1996. Growth and yield of tomato as influenced by fertilizers and manures. *Bangladesh Agricultural Publication*, **6**: 71-74.

Rodge, B.M. and Yadlod, S.S. (2009). Effect of organic and inorganic fertilizers on growth, yield and quality of Tomato (*Lycopersiconesculentum* Mill.). *The Asian J. Hort.* **4**(1): 221-224.

Singh, M.K. (2014). Impact of Front Line Demonstration of INM on Growth and Yield in Tomato. *Hort. FloraRes. Spectrum*. **3**(3).

Subbaia, B.V and Asija, C.L. 1956. Rapid procedure for the estimation of available nitrogen in soil. *Current sci.***25**:415-426.

Walkely, A. and Black, G.A. 1956. Critical exam of rapid method for determining organic carbon in soils, effect of variation in digestive condition and inorganic soil constituents. *soil science*., 251:632.