

# Effect of Different Concentration of water soluble Fertilizers on Growth, Yield and Quality Attributes of Cherry Tomato (*Solanum lycopersicum* var. *cerasiformae*) cv. Pusa Cherry Tomato-1 In Grow bags under polyhouse Condition

## ABSTRACT

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An experiment was carried out in naturally ventilated polyhouse where the seedlings were transplanted in grow bags in Department of Horticulture, SHUATS, Prayagraj (U.P.) during year 2020–2021 to find out the effect of water-soluble fertilizer on growth, yield and fruit quality parameters and to estimate the economics of various treatment of water-soluble fertilizer in cherry tomato. The experiment consisted of nine different treatments combination which was laid out in a completely randomized block design (RBD) with three replications. The result of present investigation revealed that among distinct treatments, the treatment T<sub>4</sub> NPK (20:20:20)15% outstands in all the aspects recorded. The highest plant height was (108.92 cm at 90 DAT) with maximum stem girth (10.41 cm). The maximum fruit weight was found to be (9.08 g). The maximum net return of Rs 103470.8 and the maximum cost:benefit (C:B) ratio was recorded to be 4.18, this might be due to the more yield, average fruit weight and fruit size.

**Keywords:** Growth, Quality, Cherry Tomato, Yield, Water Soluble Fertilizer

## INTRODUCTION

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Cherry tomatoes are small, round, cherry-sized fruits of the family solanaceae belongs to Mexican and Peruvian region. These tomatoes are normally much sweeter than other tomatoes. The size and color of cherry tomatoes have a wide range, as there are hundreds of different varieties. The perfect Cherry tomato could be, first and foremost, in-season. It must be almost firm, thin, and smooth-skinned. The Cherry tomato flavor will be a fine balance of sweet and tart. Mainly this crop is planted in two seasons i.e. - (1) Spring: Transplanting stage for spring in the greenhouse is last February or early March, (2) Autumn -The transplanting time to the greenhouse is mid-august. Like all tomatoes, the classification of Cherry tomatoes based on how they grow, as their plants grow in two different forms, they are determinate or indeterminate. Determinate type varieties grow on bush-like plants with short vines and bear just one crop per season, though indeterminate varieties are long, sprawling vine plants that bear fruit continuously throughout the season. (Reddy, 2019).

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 (**Ram, 1991**). Tomato juice contains lycopene one of the most powerful antioxidant and vitamin C which are most beneficial to human beings.

Among the solanaceous vegetables, tomato being the most widely used nutritive vegetable and thus has high demand throughout the year. Tomato being a warm season crop requires a relatively long growing season and moderately high temperature. With the availability of high value agriculture scheme, many farmers are resorting to vegetable cultivation in polyhouses. Presently, progressive farmers are adopting commercial protected cultivation for high value vegetables (**Maitra et al., 2020**). Following reasons are preferred for protected cultivation of tomato i.e., better quality produce, higher productivity, nursery raising and hardening of plants, better insect and disease control and reduced use of pesticides, Off-season cultivation and efficient use of resources.

Tomatoes unlike other vegetables, are heavy feeder and perform better when provided with plenty of nutrients to grow better. Water soluble fertilizers (WSF) are used as chemical fertilizer in sprinkler or drip irrigation systems and for foliar spray to augment yield and to improve quality of fruits and vegetable crops. These fertilizers are generally considered 100% soluble in water. This soluble property of fertilizers makes it ideal and safe to be applied to the soil, as well as the leaves of the plants. These fertilizers when applied to plants improves nutrient uptake efficiency more precisely. 25-30% of recommended dose of fertilizer can be reduced by using WSF. Essential nutrients can be applied uniformly to each and every plant even on daily basis and also it reduces accumulation of salts in soil. So, there is more scope for the growth and use of liquid or water-soluble fertilizers to increase the production of horticultural crops, these fertilizers are low in salt index to reduce the potential for burning of plant tissue and suitable for foliar application or fertigation. These are mostly combination of nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients with different ratios. These are high analysis fertilizers developed to suit the matrix of status of soil fertility, type of crop, quality of water to be used and climatic conditions. In water soluble fertilizers it is easy to make the precise amount of nutrient solution for plants. Water-soluble fertilizers should meet certain criteria such as 100% soluble and no inert matter, high purity, driven by R&D, nutrients in readily available form, free from sodium and chloride, low salt index, (EC=0.9-1.2), pH acidic (5.5 to 6.5), suitable for fertigation and foliar application, improve crop yields and quality of produce and ultimately higher nutrient use efficiency. Use of liquid or water-soluble fertilizers in India is meager in comparison to developed countries. In USA during 2009 the consumption of water-soluble fertilizers was 17% of the total fertilizers used in all crops (**Patel, 2011**).

## **MATERIALS AND METHOD**

### **Experimental Site:**

The experiment was carried out at naturally ventilated polyhouse in Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2021-2022 from July to November.

### **Geographical location of the experimental site:**

Allahabad is situated at an elevation of 78 meters above sea level at 25.87<sup>0</sup> North latitude and 81.15<sup>0</sup> East longitude.

### **Climate:**

This region has a sub-tropical climate prevailing in the south-east part of U.P. with both the extremes in temperature, i.e., the winter and the summer. In cold winters, the temperature sometimes is as low as 32° F in December – January and very hot summer with temperature reaching upto 115° F in the months of May and June. During winter, frosts and during summer,

hot scorching winds are also not uncommon. The average rainfall is around 1013.4 (cm) with maximum concentration during July to September months with occasional showers in winters.

#### **Nursery Techniques:**

The seeds were procured from Indian Agricultural Research Institute (IARI), New Delhi. The seeds of cherry tomato were sown during July 2021 in 98 celled portray having mixture of cocopeat and farm yard manure in 1:1 ratio as growing media during the nursery stage. Frequent irrigation and necessary plant protection measures were taken to raise good quality seedlings.

#### **Layout and Treatment:**

The experiment was laid out in randomized block design (RBD) having 9 Treatment which were replicated 3 times. The treatment combinations are as follows: T<sub>0</sub> (CONTROL), T<sub>1</sub> NPK (20:20:20)1 %, T<sub>2</sub> NPK (20:20:20)5 %, T<sub>3</sub> NPK (20:20:20)10 %, T<sub>4</sub> NPK (20:20:20)15 %, T<sub>5</sub> NPK (19:19:19)1 %, T<sub>6</sub> NPK (19:19:19)5 %, T<sub>7</sub> NPK (19:19:19)10 % & T<sub>8</sub> NPK (19:19:19)15 %. During August the 4-5 weeks old seedlings having 4 leaf stage were transplanted in grow bags at a distance of 60 cm between the plants in each row and 45 cm between rows. Staking was done after a month of transplanting. Irrigation was provided frequently and all the recommended cultivation practices were followed.

#### **Data collection and analysis:**

Observations on various growth, yield and quality attributes were recorded to see the performance of cherry tomato. The quality parameters viz., total soluble solids, titrable acidity, ascorbic acid content were determined. The data was subjected to statistical analysis.

#### **Biochemical Analysis:**

##### **Total soluble solid (<sup>0</sup>BRIX)**

The total soluble solids were determined by using a hand refractometer (Erma, Japan) by placing a drop of the filtered juice on the prism of the refractometer and observing the coincidence of the shadow of the sample with the reading on the scale and expressed as <sup>0</sup>Brix to standard procedure as given in **Ranganna, (2003)**.

##### **Acidity (%)**

Titrable acidity was determined by titrating a known quantity of sample (10ml) of the homogenized sample was taken and made up to 100ml volume in a volumetric flask. The contents were filtered through Whatman No. 1 filter paper. Titration against 0.1N NaOH was performed with a 10 ml aliquot using phenolphthalein as an indicator. The turn of the aliquot to light pink color which persists for 15 seconds was considered an endpoint. The titratable acidity was estimated in terms of percent and was analyzed as per the **Ranganna, (1986)**.

##### **Ascorbic Acid (mg/100g)**

Ascorbic acid was determined by 2,6-dichlorophenolindophenol (DCPIP) titration method (**AOAC, 2006**) as follows: 25 g of fresh tomato fruit was weighed and homogenized with 20 ml of oxalic acid (1%) using mortar and pestle. The homogenate was filtered through coarse filter paper into 100 ml volumetric flask, which was followed by rinsing of pestle with another 20 ml of oxalic acid and at the end flask was filled to the mark with same acid. 10 ml of filtrate was pipetted into 250 ml conical flask and titrated with the DCPIP until a light rose pink persisted for 15sec. The amount of DCPIP used in the titration was recorded and this data was used for the calculation of vitamin C content, using formula prescribed by method.

## **RESULTS AND DISCUSSION**

The data pertaining to growth, yield and quality parameters of different treatment of cherry tomato along with their statistical interpretations are presented and discussed below. It is evident from the table that there were significant differences among various treatment of cherry tomato at maturity time.

### **Growth Parameter:**

The data from table 1 reveals different growth parameters. A critical analysis of appendix ANOVA table shows that the data was affected by different treatments of water-soluble fertilizers.

In case of plant height, the data are presented in Table1- It is evident from the table that there were significant differences among various treatment of cherry tomato. The highest plant height was recorded in treatment T<sub>4</sub> NPK (20:20:20)15% which was (33.11cm), (54.56cm), (108.92cm) at 30, 60 and 90 DAT respectively followed by treatment T<sub>3</sub> NPK (20:20:20)10% which was (31.56cm), (53.89cm), (107.66cm) at 30, 60 and 90 DAT respectively and minimum plant height was recorded in treatment T<sub>0</sub> CONTROL i.e. 5.77cm, 48cm and 97cm at 30, 60 and 90 DAT respectively. The probable reason for increasing the plant height is due to the fact that as plant height is an initial sign of vegetative growth therefore, on time and required application of NPK (20-20-20) fertilizer increases the soil fertility which results in healthy crop. Due to proper application during root developing period the plants attain maximum height. While, minimum plant height was observed due to the unavailability of required amount of NPK fertilizer, required by the plants during growth and development stages. These results are in agreement with (**Jawad *et al.*, 2015; Arshad *et al.*, 2014**), who concluded that by increasing the rates of NPK fertilizer, the height of plant can also be increased.

The maximum stem girth at different stages of plant growth. was recorded in treatment T<sub>4</sub> NPK (20:20:20)15% was (2.37cm), (7.58cm) and (10.4 cm) at 30, 60 and 90 DAT respectively followed by treatment T<sub>3</sub> NPK (20:20:20)10% which was (2.28cm), (7.26cm), (10.29cm) at 30, 60 and 90 DAT respectively and the minimum plant stem girth was recorded in control T<sub>0</sub> i.e. (1.85cm), (5.71cm) and (9.06cm) at 30, 60 and 90 DAT respectively. The increasing stem girth is may be due to application of abundance of nitrogenous fertilizer which resulted in increased vegetative growth for photosynthesis activity and secondly nitrogen is a component of nucleic acid such as DNA which is a constituent of protein and is essential for formation of protoplasm, which promotes the cell division and cell enlargement and ultimately vegetative growth. Similar results were also reported by **Naik *et al.*, (2002)**.

In terms of plant spread at final harvest findings details are as follows: The maximum plant spread was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (63.55 cm) followed by T<sub>3</sub> NPK (20:20:20) 10% (61.66 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (54.89 cm). The increment may be due to application of abundance of nitrogenous fertilizer which resulted in increased vegetative growth for photosynthesis activity and secondly nitrogen is a component of nucleic acid such as DNA which is a constituent of protein and is essential for formation of protoplasm, which promotes the cell division and cell enlargement and ultimately vegetative growth. Similar results were also reported by **Naik *et al.*, (2002)**.

In case of leaf area at final harvest findings details are as follows: The maximum leaf area was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (23.25 cm<sup>2</sup>) followed by T<sub>3</sub> NPK

(20:20:20) 10% (21.59 cm<sup>2</sup>) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (13.78 cm<sup>2</sup>). The increased leaf area in the best treatment is may be due to application of nitrogen which is significant component of nucleic acid such as DNA and nitrogen which is a constituent of protein which is essential for formation of protoplasm, which promotes the cell division and cell enlargement and ultimately vegetative growth. Similar results were also reported by Naik *et al.*, (2002).

**Table 1: Plant height and stem girth as affected by different concentration of Water-Soluble Fertilizers**

Treatment no	Treatment	Plant height (cm)			Stem Girth (cm)			Plant spread at final harvest (cm)	Leaf area in final harvest (cm <sup>2</sup> )
		30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT		
T <sub>0</sub>	CONTROL	25.78	48.33	97.22	1.86	5.71	9.07	54.89	13.78
T <sub>1</sub>	NPK (20:20:20)1%	27.67	50.11	100.11	2.13	6.36	9.40	55.89	15.86
T <sub>2</sub>	NPK (20:20:20)5%	28.67	51.07	103	2.18	6.86	9.84	58	18.37
T <sub>3</sub>	NPK (20:20:20)10%	31.56	53.89	107.66	2.28	7.26	10.29	61.66	21.59
T <sub>4</sub>	NPK (20:20:20)15%	33.11	54.56	108.92	2.37	7.58	10.41	63.55	23.25
T <sub>5</sub>	NPK (19:19:19)1%	26.89	49.89	98.78	2.11	5.77	9.17	55.22	14.68
T <sub>6</sub>	NPK (19:19:19)5%	28.67	50.89	102.33	2.15	6.57	9.71	56.66	16.25
T <sub>7</sub>	NPK (19:19:19)10%	29.45	51.89	104.22	2.22	6.95	10.08	58.89	19.91
T <sub>8</sub>	NPK (19:19:19)15%	30.89	53.00	106.44	2.23	6.97	10.11	59.33	21.09
<b>F-Test</b>		<b>NS</b>	<b>NS</b>	<b>S</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>S</b>	<b>S</b>
<b>S.E.M=</b>		<b>1.68</b>	<b>1.49</b>	<b>1.96</b>	<b>0.22</b>	<b>0.47</b>	<b>0.51</b>	<b>1.64</b>	<b>1.64</b>
<b>CD (5%)</b>		<b>5.03</b>	<b>4.47</b>	<b>5.8</b>	<b>0.67</b>	<b>1.41</b>	<b>1.52</b>	<b>4.91</b>	<b>4.93</b>
<b>CV</b>		<b>9.95</b>	<b>5.02</b>	<b>3.29</b>	<b>17.79</b>	<b>12.25</b>	<b>9.01</b>	<b>4.87</b>	<b>15.54</b>

**Flowering and Fruiting parameters:**

The data from table 2 reveals different flowering and Fruiting parameters. A critical analysis of appendix ANOVA table shows that the data was affected by different treatments of water-soluble fertilizers.

Treatment no	Treatment	Days to first flowering	Days to first harvest	Number of flowers cluster per plant	Number of flowers per cluster	Number of fruit cluster per plant	Number of Fruits per cluster
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The minimum days taken to first flowering was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% which was found to be (35.77 days) followed by T<sub>3</sub> NPK (20:20:20) 10% (36.44 days) and the maximum was recorded in treatment T<sub>0</sub> CONTROL (43.55 days). In terms of duration of flowering and maturity, days to flowering is an important parameter to consider as it marks a transition from vegetative growth to reproductive stage. In this study fertilizer rates significantly influenced days to flowering in cherry tomato compared to control. The results agreed with **Heather et al (2012)** who reported that adequate NPK combination when applied stimulated early flowering and maturity.

In terms of minimum days taken to first harvest was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (65.44 days) followed by T<sub>3</sub> NPK (20:20:20) 10% (66.11days) and the maximum was recorded in treatment T<sub>0</sub> CONTROL (73.67). In terms of maturity, days to first harvesting is an important parameter to consider. In this study fertilizer rates significantly influenced days to maturity in cherry tomato compared to control. The results agreed with **Heather et al (2012)** who reported that adequate NPK combination when applied stimulated early flowering and maturity.

In case of the maximum number of flower cluster/plant was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% was (31) followed by T<sub>3</sub> NPK (20:20:20) 10% was (29.78) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (25) while the maximum no. of flower/cluster was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (11.78) followed by T<sub>3</sub> NPK (20:20:20) 10% (11.33) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (8.44). These results are in support with **Heather et al (2012)**

In terms of the maximum no. of fruit cluster/plant was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (19.45) followed by T<sub>3</sub> NPK (20:20:20) 10% (19) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (16.11) whereas the maximum no. of fruit/cluster was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15 % (9.34) followed by T<sub>3</sub> NPK (20:20:20) 10% (8.78) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (5.89). These results are in support with **Heather et al (2012)**

T <sub>0</sub>	CONTROL	43.55	73.67				
				25	8.44	16.11	5.89
T <sub>1</sub>	NPK (20:20:20)1%	40.89	70.55				
				25.78	9.33	16.78	6.55
T <sub>2</sub>	NPK (20:20:20)5%	39.33	68.78				
				27.11	10.11	17.89	7.56
T <sub>3</sub>	NPK (20:20:20)10%	36.44	66.11				
				29.78	11.33	19	8.78
T <sub>4</sub>	NPK (20:20:20)15%	35.77	65.44				
				31	11.78	19.45	9.34
T <sub>5</sub>	NPK (19:19:19)1%	42.11	71.77				
				25.22	8.78	16.33	6.22
T <sub>6</sub>	NPK (19:19:19)5%	40.11	69.77				
				26.67	9.78	17.33	7.11
T <sub>7</sub>	NPK (19:19:19)10%	37.88	67.55				
				27.89	10.56	18.22	8
T <sub>8</sub>	NPK (19:19:19)15%	37	66.66				
				28.67	10.89	18.67	8.44
<b>F-Test</b>		<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>NS</b>	<b>S</b>
<b>S.EM</b>		<b>1.32</b>	<b>1.32</b>	<b>1.22</b>	<b>0.63</b>	<b>1.09</b>	<b>0.69</b>
<b>CD (5%)</b>		<b>3.97</b>	<b>3.97</b>	<b>3.66</b>	<b>1.89</b>	<b>3.28</b>	<b>2.05</b>
<b>CV</b>		<b>5.83</b>	<b>3.33</b>	<b>7.70</b>	<b>10.81</b>	<b>10.67</b>	<b>15.74</b>

**Table2: Flowering and fruiting parameters as affected by different concentrations of water soluble fertilizer**

## YIELD PARAMETERS

The data from table 3 reveals different yield parameters. A critical analysis of appendix ANOVA table shows that the data was affected by different treatments of water-soluble fertilizers.

There was a significant difference for number of fruits per plant, average fruit weight, polar diameter, radial diameter, yield per plant and yield per 200 m<sup>2</sup> which was found significantly highest in T<sub>4</sub> NPK (20:20:20) 15% i.e., (183.27), (9.08g), (3.73cm), (4.26cm), (1670.89g), (12.36 q) respectively and lowest in treatment T<sub>0</sub> control i.e., number of fruits per plant (94.94), average fruit weight (4.92g), polar diameter (1.43cm), radial diameter(1.70cm), yield per plant(469.54g) and yield per 200 m<sup>2</sup> (3.47q).

Higher yield was mainly due to more number of fruits per plant as well as more number of flowers and fruits per cluster. The results reported by Shivanand (2008) in tomato. This observation is in agreement with that of Nafiu *et al.*, (2011) The result of this study demonstrated that highest yields of tomato were obtained from the plots treated with NPK fertilizer compared to the control.

**Table3: Yield parameters as affected by different concentration of WSF**

Treatment no.	Treatment	Number of Fruit per plant	Average fruit weight (g)	Polar diameter (cm)	Radial diameter (cm)	Yield per plant (g/plant)	Yield in q per 200 meter <sup>2</sup>
T <sub>0</sub>	CONTROL	94.94	4.92	1.43	1.70	469.54	3.47
T <sub>1</sub>	NPK (20:20:20)1%	111.77	5.83	1.56	2.06	685.05	5.07
T <sub>2</sub>	NPK (20:20:20)5%	134.77	7.17	1.80	2.53	982.43	7.27
T <sub>3</sub>	NPK (20:20:20)10%	165.64	8.58	1.96	3.83	1427.37	10.56
T <sub>4</sub>	NPK (20:20:20)15%	183.27	9.08	3.73	4.26	1670.89	12.36
T <sub>5</sub>	NPK (19:19:19)1%	100.85	5.42	2.46	1.86	538.26	3.98
T <sub>6</sub>	NPK (19:19:19)5%	123.31	6.5	2.83	2.23	808.16	5.98
T <sub>7</sub>	NPK (19:19:19)10%	146.50	7.67	3.16	2.73	1130.00	8.36

T <sub>8</sub>	NPK (19:19:19)15%	156.13	8	2.26	3.23	1245.71	9.22
<b>F-Test</b>		<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>S.EM</b>		<b>15.43</b>	<b>0.70</b>	<b>0.17</b>	<b>0.20</b>	<b>177.75</b>	<b>1.32</b>
<b>CD (5%)</b>		<b>46.27</b>	<b>2.10</b>	<b>0.52</b>	<b>0.61</b>	<b>532.90</b>	<b>3.94</b>
<b>CV</b>		<b>19.77</b>	<b>17.33</b>	<b>12.68</b>	<b>13.05</b>	<b>30.93</b>	<b>30.93</b>

### Quality parameters

Quality characters are very important in vegetables like tomatoes because they impart nutritional and processing quality of the produce. The data are presented in table 4.

#### Total soluble solid (<sup>0</sup>BRIX)

Findings details are as follows: The maximum TSS was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (7.63) followed by T<sub>3</sub> NPK (20:20:20) 10% (7.26) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (4.60).

The increase in total soluble solids with increasing nitrogen concentration in fruits due to NPK application might be due to fact that these nutrients are related to carbohydrates synthesis. When the nutrient supply became insufficient, the limited synthesized carbohydrates meet the requirements of only vegetative parts thus synthesized carbohydrates translocated to the fruits, which ultimately increased the total soluble solids of fruit. These results are in conformity with those of *Chaurasia et.al, (2006)*.

#### Acidity (%)

Findings details are as follows: The maximum acidity was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (0.38 %) followed by T<sub>3</sub> NPK (20:20:20) 10% (0.36 %) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (0.25 %).

#### Ascorbic Acid (mg/100g)

Findings details are as follows: The maximum ascorbic acid content was recorded in treatment T<sub>4</sub> NPK (20:20:20) 15% (43.48) followed by T<sub>3</sub> NPK (20:20:20) 10% (41.45) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (29.37).

The increase in quality might be due to the growth promoting substances which could have accelerated synthesis of carbohydrates, vitamins. These results are in conformity with those of *Chaurasia et.al, (2006)*.

**Table 4: Quality parameters of cherry tomato as affected by different concentration of WSF**

Treatment no	Treatment	TSS ( <sup>0</sup> Brix)	Acidity (%)	Vitamin-C (mg/100g)
T <sub>0</sub>	CONTROL	4.60	0.25	29.37
T <sub>1</sub>	NPK (20:20:20)1%	5.23	0.28	32.85
T <sub>2</sub>	NPK (20:20:20)5%	5.96	0.30	36.55

T <sub>3</sub>	NPK (20:20:20)10%	7.26	0.36	41.45
T <sub>4</sub>	NPK (20:20:20)15%	7.63	0.38	43.48
T <sub>5</sub>	NPK (19:19:19)1%	4.86	0.26	31.22
T <sub>6</sub>	NPK (19:19:19)5%	5.46	0.29	34.18
T <sub>7</sub>	NPK (19:19:19)10%	6.53	0.33	38.87
T <sub>8</sub>	NPK (19:19:19)15%	6.73	0.34	39.97
<b>F-Test</b>		<b>S</b>	<b>S</b>	<b>S</b>
<b>S.EM</b>		<b>0.28</b>	<b>0.037</b>	<b>1.67</b>
<b>CD (5%)</b>		<b>0.84</b>	<b>0.11</b>	<b>5.03</b>
<b>CV</b>		<b>8.12</b>	<b>20.63</b>	<b>7.98</b>

### **Cost Benefit Ratio of Cherry Tomato**

Cost benefit ratio was calculated for cherry tomato considering the fact and figures for total yield and relevant parameters and based on the price of Prayagraj region. The data from table 5 shows that the maximum net return of Rs 103470.8 and the maximum cost: benefit (C: B) ratio was recorded to be 4.18, were reported in the treatment T<sub>4</sub> NPK (20:20:20) 15% this might be due to the more yield, average fruit weight and fruit size.

**Table 5: Cost Benefit Ratio of Cherry Tomato**

<b>Sl. No.</b>	<b>Treatment Name</b>	<b>Total Cost of Cultivation</b>	<b>Yield (q/200 m<sup>2</sup>)</b>	<b>Gross Return (Rs.)</b>	<b>Net Return (Rs.)</b>	<b>Cost Benefit Ratio</b>
<b>T<sub>0</sub></b>	<b>CONTROL</b>	<b>27200</b>	<b>3.47</b>	<b>38220.28</b>	<b>11020.28</b>	<b>1.41</b>
<b>T<sub>1</sub></b>	<b>NPK (20:20:20)1%</b>	<b>27556</b>	<b>5.07</b>	<b>55763.12</b>	<b>28207.12</b>	<b>2.02</b>
<b>T<sub>2</sub></b>	<b>NPK (20:20:20)5%</b>	<b>28980</b>	<b>7.27</b>	<b>79969.85</b>	<b>50989.85</b>	<b>2.76</b>

<b>T<sub>3</sub></b>	<b>NPK (20:20:20)10%</b>	<b>30760</b>	<b>10.56</b>	<b>116188.2</b>	<b>85428.21</b>	<b>3.78</b>
<b>T<sub>4</sub></b>	<b>NPK (20:20:20)15%</b>	<b>32540</b>	<b>12.36</b>	<b>136010.8</b>	<b>103470.8</b>	<b>4.18</b>
<b>T<sub>5</sub></b>	<b>NPK (19:19:19)1%</b>	<b>27480</b>	<b>3.98</b>	<b>43814.75</b>	<b>16334.75</b>	<b>1.59</b>
<b>T<sub>6</sub></b>	<b>NPK (19:19:19)5%</b>	<b>28600</b>	<b>5.98</b>	<b>65784.03</b>	<b>37184.03</b>	<b>2.30</b>
<b>T<sub>7</sub></b>	<b>NPK (19:19:19)10%</b>	<b>30000</b>	<b>8.36</b>	<b>91981.96</b>	<b>61981.96</b>	<b>3.07</b>
<b>T<sub>8</sub></b>	<b>NPK (19:19:19)15%</b>	<b>31400</b>	<b>9.22</b>	<b>101400.5</b>	<b>70000.46</b>	<b>3.23</b>

\*Selling price fixed at Rs.110 per kg.

## **CONCLUSION**

From the present investigation, it is concluded that among different treatment combinations the treatment T<sub>4</sub> NPK (20:20:20)15% was identified as the superior for Cherry Tomato in terms of growth, yield and fruit quality. In terms of the economics, gross return, net return and cost benefit ratio was highest in the Treatment T<sub>4</sub> NPK (20:20:20)15% with Gross return Rs 1,36,010.8 and Net Return Rs 1,03,470.8 and Cost Benefit ratio 4.18.

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