

# **“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**

---

An experiment was carried out in naturally ventilated polyhouse in Department of Horticulture, SHUATS, Prayagraj (U.P.) during year 2020–2021 to find out their influence on growth, yield and fruit quality parameters of cherry tomato. The study revealed that, among nine different treatments, the treatment T<sub>4</sub> NPK (20:20:20)15% was found to be best in terms of all the parameters recorded. The maximum BC ratio was recorded to be 4.18.

*Keywords: Growth, Quality, Cherry Tomato, Yield*

## **INTRODUCTION**

---

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. Thus, this study was conducted to find out suitable treatment of water-soluble fertilizers in

relation to plant growth, yield and quality of cherry tomato & to estimate the economics of various treatments.

## **MATERIALS AND METHOD**

The present investigation entitled “Effect of Different Concentration of water soluble Fertilizers on Growth, Yield and Quality Attributes of Cherry Tomato (*Solanum lycopersicon* var.cerasiformae) cv. Pusa Cherry Tomato-1 In Grow bags under polyhouse Condition” 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. 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. 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. The present experiment was conducted in Randomized Block Design having 9 Treatment which were replicated 3 times. The experimental material comprised of 9 Treatment i.e., 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 % of Cherry tomato maintained at the Department of Horticulture, SHUATS.

## **RESULTS AND DISCUSSION**

The analysis of variance of all characters of cherry tomato revealed presence of good extent of significant differences among all the treatments of applied. Henceforth, the data for all characters that showed sufficient amount of significant differences were subjected to further statistical analysis. The data on growth parameters, yield parameters and quality parameters of different treatment of cherry tomato are presented below. It is evident from the table that there were significant differences among various treatment of cherry tomato at maturity time.

### **PLANT HEIGHT (cm) 30 DAT**

The data on Plant Height are presented in Table1 It is evident from the table that there were significant differences among various treatment of cherry tomato.

Findings details are as follows: The highest plant height was recorded in treatment T<sub>4</sub> NPK (20:20:20) (33.11 cm) followed by T<sub>3</sub> NPK (20:20:20 cm) (31.56 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (25.78 cm).

### **PLANT HEIGHT (cm) 60 DAT**

Findings detail are as follows: The highest plant height was recorded in treatment T<sub>4</sub> NPK (20:20:20) (54.56 cm) followed by T<sub>3</sub> NPK (20:20:20) (53.89 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (48.33cm)

### **PLANT HEIGHT (cm) 90 DAT**

Findings detail are as follows: The highest plant height was recorded in treatment) T<sub>4</sub> NPK (20:20:20) (108.92 cm) followed by T<sub>3</sub> NPK (20:20:20) (107.66 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (48.33cm)

The probable reason for increasing the plant height in the best treatment 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.

#### **STEM GIRTH (cm) 30 DAT**

The data from Table1 reveals the mean plant stem girth at different stages of plant growth. A critical analysis of appendix ANOVA table shows that at all the successive stages stem girth was significantly affected by different treatments of water-soluble fertilizers.

#### **STEM GIRTH (cm) 30 DAT**

Findings details are as follows: The highest stem girth was recorded in treatment T<sub>4</sub> NPK (20:20:20) (2.37 cm) followed by T<sub>3</sub> NPK (20:20:20) (2.28 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (1.86 cm)

#### **STEM GIRTH (cm) 60 DAT**

Findings details are as follows: The highest stem girth was recorded in treatment T<sub>4</sub> NPK (20:20:20) (7.58 cm) followed by T<sub>3</sub> NPK (20:20:20) (7.26 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (5.71cm)

#### **STEM GIRTH (cm) 90 DAT**

Findings details are as follows: The highest stem girth was recorded in treatment T<sub>4</sub> NPK (20:20:20) (10.41 cm) followed by followed by T<sub>3</sub> NPK (20:20:20) (10.29 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (9.07 cm)

The increasing stem girth 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 Patel *et al.*,

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

Treatment no	Treatment	Plant height (cm)			Stem Girth (mm)		
		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
T <sub>1</sub>	NPK (20:20:20)1%	27.67	50.11	100.11	2.13	6.36	9.40
T <sub>2</sub>	NPK (20:20:20)5%	28.67	51.07	103	2.18	6.86	9.84
T <sub>3</sub>	NPK (20:20:20)10%	31.56	53.89	107.66	2.28	7.26	10.29
T <sub>4</sub>	NPK (20:20:20)15%	33.11	54.56	108.92	2.37	7.58	10.41
T <sub>5</sub>	NPK (19:19:19)1%	26.89	49.89	98.78	2.11	5.77	9.17

T <sub>6</sub>	NPK (19:19:19)5%	28.67	50.89	102.33	2.15	6.57	9.71
T <sub>7</sub>	NPK (19:19:19)10%	29.45	51.89	104.22	2.22	6.95	10.08
T <sub>8</sub>	NPK (19:19:19)15%	30.89	53.00	106.44	2.23	6.97	10.11
<b>F-Test</b>		<b>NS</b>	<b>NS</b>	<b>S</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>
<b>S.EM=</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>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>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>

### **YIELD PARAMETERS**

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

#### **No. of fruits per plant**

Findings details are as follows: The maximum no. of fruits per plant was recorded in treatment T<sub>4</sub> NPK (20:20:20) (183.27) followed by T<sub>3</sub> NPK (20:20:20) (165.64) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (94.94)

#### **Average fruit weight (g)**

Findings details are as follows: The average highest fruit weight was recorded in treatment T<sub>4</sub> NPK (20:20:20) (9.08 g) followed by T<sub>3</sub> NPK (20:20:20) (8.58 g) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (4.92).

#### **Polar diameter (cm)**

Findings details are as follows: The maximum polar diameter was recorded in treatment T<sub>4</sub> NPK (20:20:20) (3.73 cm) followed by T<sub>3</sub> NPK (20:20:20) (1.96 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (1.43 cm).

#### **Radial diameter (cm)**

Findings details are as follows: The maximum radial diameter was recorded in treatment T<sub>4</sub> NPK (20:20:20) (4.26 cm) followed by T<sub>3</sub> NPK (20:20:20) (3.83 cm) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (1.70 cm).

#### **Yield per plant (g)**

Findings details are as follows: The maximum yield per plant was recorded in treatment T<sub>4</sub> NPK (20:20:20) (1670.89 g) followed by T<sub>3</sub> NPK (20:20:20) (1427.37 g) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (469.54 g).

#### **Yield per 200m<sup>2</sup> (q)**

Findings details are as follows: The maximum yield per plant was recorded in treatment T<sub>4</sub> NPK (20:20:20) (12.36 q) followed by T<sub>3</sub> NPK (20:20:20) (10.56 q) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (3.47 q).

In this study, application of NPK fertilizer enhances growth of tomatoes. Tomato growth increases as expressed by the increases observed in plant height, crop dry weight, crop growth rate and relative growth rate. The higher response of tomato to the growth might be due to the availability of essential elements from inorganic fertilizer. This observation is in agreement with that of **Nafiu *et al.*** The result of this study demonstrated that highest yields of tomato were obtained from the plots treated with NPK fertilizer compared to the control.

**Table2 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>

**Table3 Quality parameters as affected by different concentration of WSF****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) (7.63) followed by T<sub>3</sub> NPK (20:20:20) (7.26) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (4.60).

**Acidity (%)**

Findings details are as follows: The maximum acidity was recorded in treatment T<sub>4</sub> NPK (20:20:20) (0.38 %) followed by T<sub>3</sub> NPK (20:20:20) (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) (43.48) followed by T<sub>3</sub> NPK (20:20:20) (41.45) and the minimum was recorded in treatment T<sub>0</sub> CONTROL (29.37).

The highest TSS value was observed for treatment T<sub>4</sub> NPK (20:20:20)15% the increase in total soluble solids with increasing nitrogen concentration in fruits due to N.P.K. 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.

**Table 3: Quality parameters of cherry tomato as affected by different concentration of WSF**

<b>Treatment no</b>	<b>Treatment</b>	<b>TSS (<sup>o</sup>Brix)</b>	<b>Acidity (%)</b>	<b>Vitamin-C (mg/100g)</b>
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>

### **CONCLUSION**

The results from the present investigation, it is concluded that the Cherry Tomato with treatment T<sub>4</sub> NPK (20:20:20)15% was identified as the superior treatment 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.

## References

- A.K. Nafiu; A.O. Togun, M.O. Abiodun and V.O. Chude (2011).** Effects of NPK fertilizer on growth, dry matter production and yield of eggplant in southwestern Nigeria. *Agriculture and Biology journal of North America*, vol. 2, no. 7, pp1117 -1125
- Ann; N.H., Jo, Y.S., Jo, J.R., Kim, Y.K., Lee, Y., Jee, H.J., Lee, S.M., Park, K.L., and Lee, B.M. (2012).** The survey of actual using conditions of farm-made liquid fertilizers for cultivating environment-friendly agricultural products. *Korean Journal of Organic Agriculture*, 20, 345-356.
- Batra, V.K., Singh, B., and Singh, V. (2002).** Response of brinjal to foliar feeding of water soluble fertilizers. *International conference on vegetables, 11-14 at Bangalore.*
- Chourasia. D., S. Mrigendra, Tripathi P.N. and., S. Alpana. (2020).** Performance evaluation of tomato crop under shade net house and open field conditions in the Shahdol district. *International Journal of Agricultural Engineering | Volume 13 | Issue 1 | April, 2020 | 48-5.*
- Heather, L.M., Hamid, A., & Majid, R.F. (2012).** Selective genotyping to identify late blight resistance genes in an accession of tomato wild species.
- J. Omprasad, P. Syam Sundar Reddy, C. Madhumathi and M. Balakrishna. (2018)** Evaluation of Cherry Tomatoes under Shade Net for Growth and Yield Attributes. *International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Special Issue-7 pp. 700-707.*
- Karpagam, R., M. Kannan, S. Natarajan and K. Srinivasan, 2004.** Studies on the efficacy of foliar feeding of water soluble fertilizers on growth parameters and yield of brinjal hybrid COBH.1. *South Indian Hort.*, 52(1-6): 139-142.
- K, Narayan., P, Dubey., Sharma, D., Katre, Vijay T. and Rajhansa, K.C. (2011).** Effect of foliar application of water soluble fertilizers on flowering, yield and quality attributes of tomato (*Lycopersicon esculentum* Mill.), *Asian J. Hort.*, 6 (1): 225-228.
- Murtic; s., oljaca, r., m. S., Vranac, a., Akagic, a. and Civic, h. (2018).** Cherry tomato productivity as influenced by liquid organic fertilizer under different growth conditions. *Journal of Central European Agriculture*, 2018, 19(3), p.503-516.
- Makabo; M. M. and Du Plooy, C. P. (2011).** Effect of plant population, fruit and stem pruning on yield and quality of hydroponically grown tomato. *African J. Agric. Res.*, 6 (22):5144-5148.
- Martin M. Maboko and Christian P. Du Plooy (2017)** Response of Hydroponically Grown Cherry and Fresh Market Tomatoes to Reduced Nutrient Concentration and Foliar Fertilizer Application under Shade net Conditions *HORTSCIENCE* 52(4):572–578.
- Makabo; M. M. and Du Plooy, C. P. (2009).** Effect of stem and fruit pruning on yield and quality of hydroponically grown tomato. *African crop Sci. Proc.*, 9: 27-29.
- N. Gruda., (2009)** Do soilless culture systems have an influence on product quality of vegetables Humboldt University of Berlin, Institute for Horticultural Sciences. *Journal of Applied Botany and Food*
- Premsekhar, M. and. Rajashree, V (2009).**, Performance of Hybrid Tomato as Influenced by Foliar Feeding of Water Soluble Fertilizers. *American-Eurasian Journal of Sustainable Agriculture*, 3(1): 33-36, 2009 ISSN 1995-0748P.

- K. Jena; Chinmaya., V., Divya., K., Mallikar., J. (2020).** Technology of tomato in green house. *ISBN 978-81-948993-2-7.*
- R. Punith., T.S., Nagaraja., M.S. Dhumgond., R., Prabhudev., Sgaranbhoopal and K.M. Shivkumar (2012).** Effect of foliar application of secondary and micronutrients on yield and quality of tomato. *Asian Journal Soil Science., 7(2): 194-199.*
- Thangam; M. and Thamburaj, S. (2008).** Comparative performance of tomato varieties and hybrids under shade and open conditions. *Indian J. Hort., 65 (4): 429-433.*
- SK., Malhotra., (2016).** Water soluble fertilizers in horticultural crops – An appraisal . *Indian Journal of Agricultural Sciences 86(10): 1245-56, October 2016.*
- S. N. S. Chourasia, K.P. Singh and Mathura Rai., (2005).** Effect of foliar application of water soluble fertilizers on growth, yield, and quality of tomato (*Lycopersicon esculentum L.*). *Sri Lankan J. Agric. Sci. Vol. 42 - 2005, 66 – 70.*
- T. Subramani., B. Gangaiah., V. Baskaran., and S. Swain (2020).** Effect of Soilless Growing Media on Yield and Quality of Tomato (*Solanum lycopersicum L.*) under Tropical Island condition. *International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Volume 9 Number 5 (2020).*