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# Effect of Different Sources of Nitrogen and Bio Fertilizers on Growth, Yield and Quality of Cherry Tomato [*Solanum lycopersicum* L.) Var. Cerasiforme] in Polyhouse Conditions

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***Authors' contributions***

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## ABSTRACT

The present investigation was carried out at Research Farm, Department of Horticulture, Naini Agricultural Institute, SHUATS, Naini, Prayagraj, Uttar Pradesh during the *Kharif*-2022 with a view to identify the effect of different sources of nitrogen and bio fertilizers on growth, yield and quality of cherry tomato" [*Solanum lycopersicum* L.) var. cerasiforme] in polyhouse conditions. The experiment was laid in Randomized block design (RBD) with 9 treatments and 3 replications with different combination in RDF and application of organic nutrition. Under this experiment, overall, 10 treatment were taken. From the above experimental finding it may be concluded that the treatment

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$T_9$ (75% N through urea + 25% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 Kg $ha^{-1}$) was found to be best in the terms of growth parameters like highest plant height (283.35 cm) at 120 DAT, maximum number of branches per plant (72.33 branches) at 120 DAT. In terms of earliness, it was found to have minimum days to attain 50% flowering (55.93 DAT). In terms of yield $T_9$ had highest number of fruits per cluster (5.57 fruits), and fruit yield per hectare (25.88 t $ha^{-1}$).

*Keywords: Cherry tomato; FYM; azotobacter; PSB; growth; quality; yield and economics.*

## 1. INTRODUCTION

"Cherry tomato (*Solanum lycopersicum* var. *cerasiforme* Mill.) is a highly priced culinary as well as ornamental vegetable. One of the most popular high value exotics, it is a favourite among chef's who cook for high profile restaurants and hotels. Nevertheless, it is becoming increasingly popular among common people, who are now interested in garnishing their dishes and diversifying their nutritional intake. Cherry tomatoes look not only attractive in kitchen gardens but are commercially valuable horticultural commodity and have impressive nutritional and pharmaceutical properties. According to the USDA nutritional information, one cup of cherry tomatoes (149 g) provides 26.8 calories, 1.3 g protein, 4.5 mg omega-3 fatty acids, 119 mg omega-6 fatty acids, 1241 IU of vitamin A, 18.9 mg vitamin C, 22.3 mcg folic acid, 11.8 mcg vitamin C, 353 mg potassium, 35.8 mg phosphorus and 14.9 mg calcium" [1].

"Farm manure is primarily made from cow dung, cow urine, straw, and other milk waste. A small amount of Nitrogen (N) is directly available to plants, but more N becomes available as FYM degrades. Mixing cow dung with urine gives plants a balanced diet. The availability of potassium and phosphorus from FYM is like that from inorganic sources. Applying FYM improves soil fertility. On an average well decomposed farmyard manure contains 0.5 per cent Nitrogen (N), 0.2 per cent Phosphate ($P_2O_5$) and .0.5 per cent Potassium ($K_2O$)" [2].

"Azotobacter in plant growth enhancement are as biofertilizer, bio stimulant, and bioprotectant. Nitrogen fixation by Azotobacter is the mechanism to provide available nitrogen for uptake by roots. Azotobacter stimulates plant growth through phytohormones synthesis; indole acetic acid, cytokinin, and gibberellins are detected in the liquid culture of Azotobacter" [3.]

"Urea contains 46.6% nitrogen and is taken up by plants through their roots as ammonium, which can be oxidized to nitrate by bacteria in some soils. Nitrogen (N) is an important macro-nutrient required for crop production and is considered an important commodity for agricultural systems. Urea is a vital source of N that is used widely across the globe to meet crop N requirements" [4]. It plays a vital role in forming chlorophyll, proetids and proteins, and other essential compounds like plant hormones; however, plants are inefficient in the acquisition and utilization of applied nitrogen [5].

## 2. MATERIALS AND METHODS

This experiment was laid out during the July 2023 to August 2023 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The horticulture research farm is situated at $25^0$ 39" 42" N latitude, $81^0$ 67" 56" E longitude and at an altitude of 98 m above mean sea level. The treatment consisted of $T_0$ - Control, $T_1$ - 100% N through urea+ 25 t $ha^{-1}$ FYM, $T_2$ - 75% N through urea + 25% N through FYM, $T_3$ - 50% N through urea + 50% N through FYM, $T_4$ - 75%N through urea + 25% N through FYM+ Azotobacter (4 Kg $ha^{-1}$), $T_5$ - 50% N through urea + 50% N through FYM + Azotobacter (4 Kg $ha^{-1}$), $T_6$ - 75% N through urea +25% N through FYM + PSB (4 Kg $ha^{-1}$), $T_7$ - 50% N through urea + 50% N through FYM + PSB (4 Kg $ha^{-1}$), $T_8$ - 75% N through urea + 25% N through FYM + Azotobacter (4 Kg $ha^{-1}$) + PSB (4 Kg $ha^{-1}$), $T_9$ - 50% N through urea + 50% N through FYM + Azotobacter (4 Kg $ha^{-1}$) + PSB (4 Kg $ha^{-1}$). The experiment was laid out in a Randomized Block Design with 10 treatments and replicated thrice. Data recorded on different aspects of fruit crop, *viz.,* growth, yield were subjected to statistically analysis by analysis of variance method. Gomez and Gomez, [6] and economic data analysis mathematical method.

## 3. RESULTS AND DISCUSSION

### 3.1 Growth Parameters

The results pertaining to the effect of organic and inorganic fertilizers on growth parameters of Cherry Tomato are presented in Table 1.

**Table 1. Effect of different sources of nitrogen and biofertilizers on growth and phenological of cherry tomato**

| Treatment Symbol | Treatment combinations | Plant height 120 DAT | Number of branches/plant | Days to first flowering | Days to 50% flowering |
|---|---|---|---|---|---|
| $T_0$ | Control | 210.67 | 63.27 | 42.90 | 64.26 |
| $T_1$ | 100% N through urea+ 25 t $ha^{-1}$ FYM | 222.47 | 66.20 | 40.40 | 62.93 |
| $T_2$ | 75% N through urea + 25% N through FYM | 226.40 | 65.47 | 35.73 | 57.33 |
| $T_3$ | 50% N through urea + 50% N through FYM | 218.27 | 66.20 | 34.54 | 57.53 |
| $T_4$ | 75%N through urea + 25% N through FYM+ Azotobacter (4 kg $ha^{-1}$) | 225.87 | 71.30 | 34.30 | 57.67 |
| $T_5$ | 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) | 226.33 | 70.80 | 35.40 | 57.47 |
| $T_6$ | 75% N through urea +25% N through FYM + PSB (4 kg $ha^{-1}$) | 231.47 | 70.07 | 35.07 | 58.27 |
| $T_7$ | 50% N through urea + 50% N through FYM + PSB (4 kg $ha^{-1}$) | 230.51 | 69.20 | 35.47 | 58.13 |
| $T_8$ | 75% N through urea + 25% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) | 232.27 | 71.60 | 34.14 | 56.88 |
| $T_9$ | 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) | 283.35 | 72.33 | 34.07 | 55.93 |
| | **F-test** | **S** | **S** | **S** | **S** |
| | SEm(±) | 0.82 | 0.72 | 0.59 | 0.98 |
| | CD (p=0.05) | 2.41 | 2.11 | 1.74 | 2.88 |

## 3.2 Plant Height (cm)

The height of plant at 120 DAT varied significantly among different treatment combinations. The maximum height of plant (283.35 cm) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). Minimum plant height (210.67 cm) was observed in $T_0$ (Control), while the remaining treatments were moderate in their growth habit.

The treatment combination of 50% N via urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) fosters superior plant height in cherry tomatoes by orchestrating a holistic nutrient symphony. The balanced nitrogen sources fuel robust foliage development, while Azotobacter's symbiotic nitrogen fixation enriches the soil, promoting extensive root growth. In contrast, Control treatment, lacked this synchronized nutrient blend, leading to comparatively limited plant stature. Findings were in accordance with Baba *et al.,* [7] and Verma *et al.,* [8] in Tomato.

## 3.3 Number of Branches Per Plant

It is evident that the number of branches per plant of plant was influenced by different different sources of nitrogen and biofertilizers applied for growth observed at different stages of growth. There was significant difference present among the treatments applied. The highest number of branches (72.33 branches) at 120 DAT respectively was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). Minimum plant height (63.27 branches) was observed in $T_0$ (Control) at 120 DAT.

The treatment combination of 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) orchestrates a thriving environment for cherry tomatoes, manifesting in an augmented number of branches per plant. This combination provides a balanced nitrogen supply for sustained growth, fostering abundant foliage. Azotobacter's nitrogen fixation enriches soil, encouraging robust root development, a precursor to lateral branching. In contrast, control treatment missed this balanced nutrient synergy, resulting in comparatively limited lateral growth and fewer branches per plant in cherry tomatoes. Similar findings were reported by Khan *et al.,* [9] and Olagnuju *et al.,* [10] in Cherry Tomato.

## 3.4 Phenological Parameters

The results related to phenological parameters are presented in Table 1.

### 3.4.1 Days to first flowering

Days to first flowering showed significant difference present among the treatments applied. The minimum days to first flowering (34.07 days) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). Maximum days to first flowering (42.90 days) was observed in $T_0$ (Control).

The treatment mix of 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) expedites the days to first flowering in cherry tomatoes by orchestrating an optimal growth environment. This balanced nitrogen blend fuels early vegetative vigour, crucial for triggering flower initiation. This combined approach cultivates an enriched soil ecosystem, fostering expedited vegetative growth stages and consequently, earlier flowering in cherry tomatoes. Conversely, control treatment did not have this balanced nutrient synergy, leading to delayed flowering due to inadequate nutritional support for the plant's early developmental stages. Similar findings were reported by Shafi *et al.,* [11] and Verma *et al.,* [8] in Tomato.

### 3.4.2 Days to 50% flowering

Days to 50% flowering showed significant difference present among the treatments applied. The minimum days to 50% flowering (55.93 days) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). Maximum days to 50% flowering (64.26 days) was observed in $T_0$ (Control). The results related to days to 50% flowering are presented in Table 1.

The treatment blend of 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) accelerates the days to reach 50% flowering in cherry tomatoes by orchestrating an optimal nutrient environment and soil symbiosis. This holistic approach creates a nutrient-rich, symbiotically balanced soil, expediting vegetative growth stages and subsequently hastening the onset of 50% flowering in cherry tomatoes. Conversely, control treatments lacked this synchronized nutrient blend, resulting in delayed flowering due to inadequate nutritional support during critical growth phases. Similar findings were reported by Nishant *et al.,* [12] and Olagunju *et al.,* [10] in Tomato.

## 3.5 Yield Parameters

The results related to yield parameters are presented in Table 2.

### 3.5.1 Number of flowers per cluster

Number of flowers per cluster showed significant difference present among the treatments applied. The highest number of flowers per cluster (11.33 flowers) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). $T_0$ (control) had lowest number of flowers per cluster (6.51 flowers). The results related to number of flowers per cluster are presented in Table 2.

The treatment blend of 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) fosters an increased number of flowers per cluster in cherry tomatoes due to a comprehensive nutrient amalgamation and soil enrichment. This balanced nitrogen composition sustains robust vegetative growth, pivotal for cluster initiation. Azotobacter's nitrogen-fixing ability enriches soil fertility, encouraging extensive root development, a crucial precursor to cluster formation. Khan *et al.,* [9] and Reddy *et al.,* [13] came up with similar conclusions in Tomato.

### 3.5.2 Number of fruits per cluster

Number of fruits per cluster showed significant difference present among the treatments applied. The highest number of fruits per cluster (5.57 fruits) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). $T_0$ (Control) had lowest number of fruits per cluster (3.32 fruits).

The treatment combination of 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) fosters an increased number of fruits sets per cluster in cherry tomatoes due to a holistic nutrient synergy and soil enhancement. This balanced nitrogen supply sustains robust vegetative growth, crucial for fruits set initiation within clusters. Poonia and Dhaka [14] and Saha *et al.,* [15] drew similar inferences in Tomato.

### 3.5.3 Number of clusters per plant

Number of clusters per plant showed significant difference present among the treatments applied. The highest number of clusters per plant (6.00 clusters) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). $T_0$ (Control) had lowest number of clusters per plant (2.39 clusters).

Through a balanced nutrient blend and enhanced soil vitality, the treatment mix of 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) encourages more clusters per plant in cherry tomatoes. This well-balanced combination of nitrogen maintains strong vegetative growth, which is necessary for copious flower production. Because of its ability to fix nitrogen, Azotobacter improves soil fertility and encourages extensive root development, which is a necessary step before flower initiation. Poonia and Dhaka [14] and Shafi *et al.,* [11] came up with similar conclusions in Tomato.

### 3.5.4 Fruit setting percent

Fruit setting percent showed significant difference present among the treatments applied. The highest fruit setting percent (80.59%) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). $T_0$ (control) had lowest fruit setting percent (51.07%).

The treatment blend of 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) fosters an increased number of fruits setting per cent in cherry tomatoes due to a holistic nutrient synergy and soil enhancement. Additionally, PSB's role in enhancing phosphorus uptake facilitates reproductive processes, encouraging multiple flower sets within clusters. This comprehensive approach creates an optimal soil environment, nurturing accelerated vegetative growth and reproductive phases, thereby encouraging more fruits set per cluster in cherry tomatoes. Saha *et al.,* [15] and Hariyadi *et al.,* [16] drew similar inferences in Tomato.

**Table 2. Effect of different sources of nitrogen and biofertilizers on yield of cherry tomato**

| Treatment Symbol | Treatment combinations | No of flowers per cluster | No of fruits per cluster | No of clusters per plant | Fruit setting percent (%) | Fruit yield per hectare (t $ha^{-1}$) |
|---|---|---|---|---|---|---|
| $T_0$ | Control | 6.51 | 3.32 | 2.39 | 51.07 | 11.75 |
| $T_1$ | 100% N through urea+ 25 t $ha^{-1}$ FYM | 8.47 | 5.00 | 2.97 | 59.42 | 14.22 |
| $T_2$ | 75% N through urea + 25% N through FYM | 8.59 | 4.87 | 3.40 | 56.92 | 17.22 |
| $T_3$ | 50% N through urea + 50% N through FYM | 7.00 | 5.47 | 3.23 | 78.06 | 19.10 |
| $T_4$ | 75%N through urea + 25% N through FYM+ Azotobacter (4 kg $ha^{-1}$) | 8.07 | 5.33 | 2.77 | 66.14 | 20.44 |
| $T_5$ | 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) | 8.33 | 5.33 | 5.50 | 64.07 | 19.10 |
| $T_6$ | 75% N through urea +25% N through FYM + PSB (4 kg $ha^{-1}$) | 7.67 | 5.23 | 5.00 | 68.87 | 19.77 |
| $T_7$ | 50% N through urea + 50% N through FYM + PSB (4 kg $ha^{-1}$) | 7.87 | 5.13 | 4.37 | 65.36 | 21.77 |
| $T_8$ | 75% N through urea + 25% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) | 8.80 | 5.47 | 5.60 | 80.32 | 21.99 |
| $T_9$ | 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) | 11.33 | 5.57 | 6.00 | 80.59 | 25.88 |
| | **F-test** | **S** | **S** | **S** | **S** | **S** |
| | SEm(±) | 0.34 | 0.24 | 0.14 | 3.71 | 0.62 |
| | CD (p=0.05) | 0.99 | 0.69 | 0.40 | 10.89 | 1.82 |

### 3.5.5 Fruit yield per hectare

Fruit yield per hectare showed significant difference present among the treatments applied. The maximum fruit yield per hectare (25.88 t $ha^{-1}$) was observed with treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$). Minimum fruit yield per hectare (11.75 t $ha^{-1}$) was observed in $T_0$ (Control).

By coordinating a balanced nutrient amalgamation and enhanced soil biology, the treatment combination 50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) fosters superior fruit yield per hectare in cherry tomatoes. Strong vegetative growth is maintained by this nutrient synergy, which is essential for the development of flowers and subsequent fruit set. Bilalis *et al.,* [17] and Pinkee *et al.,* (2023) concluded with similar results in Tomato.

## 4. CONCLUSION

From the above experimental finding it may be concluded that the treatment $T_9$ (50% N through urea + 50% N through FYM + Azotobacter (4 kg $ha^{-1}$) + PSB (4 kg $ha^{-1}$) was found to be best in the terms of growth and yield of Cherry Tomato.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Choudhary B. Vegetables-Cucurbits, Cucumber nutritional quality. National Book Trust India. Reprint edition. 2013; 142.
2. Singh V. Effect of nutrient management on yield uptake of nutrients and soil fertility under pearl millet (Pennisetum glaucum)-wheat (*Triticum aestivum*) crop sequence. Annals of Plant and Soil Research. 2019; 21(2):149-53.
3. Hindersah R, Kamaluddin NN, Samanta S, Banerjee S, Sarkar S. Role and perspective of Azotobacter in crop production. Journal of Soil Science and Agroclimatology. 2020;17(2):170-179.
4. Anas M, Liao F, Verma KK, Sarwar MA, Mahmood A, Chen ZL. Fate of nitrogen in agriculture and environment: agronomic, eco physiological and molecular approaches to improve nitrogen use efficiency. Biological Research. 2020;53:1–20.
5. Tiong J, Sharma N, Sampath R, MacKenzie N, Watanabe S, Metot C. Improving nitrogen use efficiency through overexpression of alanine aminotransferase in rice, wheat, and barley. Frontiers in Plant Sciences. 2021; 12:628521.
6. Gomez KA, Gomez AA. Statistical procedures for agriculture Research, 2nd Edition, John Wiley and Son, New York. 1976;680.
7. Baba ZA, Tahir S, Wani FS, Hamid B, Nazir M, Hamid B. Impact of Azotobacter and inorganic fertilizers on yield attributes of tomato. International Journal of Current Microbiology and Applied Sciences. 2018; 7(01):23-31.
8. Verma SB, Ramawat N, Yadav R. Impact of organic nutrients on yield and growth parameters of tomato. Progressive Agriculture. 2020;20(1) and (2):108-111.
9. Khan QU, Ahmad R, Jamil M, Sayal O, Latif A, Khakwani A, Khan G, Hashim MM, Rashid M. M, Parvez M. Assessment of various growth, yield and nutritional parameters of tomatoes as affected by farmyard manure fortified with potassium fertilizer. Pakistan Journal of Nutrition. 2013;12(12):1066-1069.
10. Olagunju SO, Sosanya OS, Oguntade OA, Adewusi KM, Soremi PAS, Joda AO, Nassir AL. Effect of NPK fertilizer on upper and basal stem diameters and implication on growth habit of tomato. Journal of the Saudi Society of Agricultural Sciences. 2023;8(3):215-221.
11. Shafi S, Asif M, Zargar MY, Maqbool S, Mir SA, Baba ZA, Dar ZM, Shayan, Ayman. Impact of microbial inoculants on growth and yield of tomato (*Solanum lycopersicon* L.) under temperate conditions. Journal of Pharmacognosy and Phytochemistry. 2019;8(1):1261-1264.
12. Nishant NJ, Biswas S, Mehedi MNH, Rakib A, Akter KT. Effect of nitrogen and phosphorus on growth, yield and quality of tomato. International Journal of Multidisciplinary Perspectives. 2021;02 (01):33-40.
13. Reddy S, Singh AK, Masih H, Benjamin JC, Ojha SK, Ramteke PW, Singla A. Effect of Azotobacter sp and Azospirillum sp on vegetative growth of Tomato (*Lycopersicon esculentum*). Journal of

Pharmacognosy and Phytochemistry. 2018;7(4):2130-2137.
14. Poonia MK, Dhaka BL. Effect of phosphorus solubilizing bacteria (PSB) on growth and yield in tomato. Journal of Horticultural Science. 2012;7(1):104-107.
15. Saha K, Kabir MY, Mondal C, Mannan MA. Growth and yield of tomato as affected by organic and inorganic fertilizers. Journal of Bangladesh Agricultural University. 2019; 17(4):500–506.
16. Hariyadi BW, Nizak F, Nurmalasari IR, Kogoya Y. Effect of dose and time of NPK fertilizer application on the growth and yield of tomato plants (*Lycopersicum esculentum* Mill). Journal of Agricultural Science and Agriculture Engineering. 2020;5(2):101-111.
17. Bilalis D, Krokida M, Roussis I, Papastylianou P, Travlos I, Cheimona N, Dede A. Effects of organic and inorganic fertilization on yield and quality of processing tomato (*Lycopersicon esculentum* Mill.). Folia Horticulturae. 2018;30(2):321-332.



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