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*Research Article*

# Economics of Effect of Calcium and Boron on Growth, Yield and Quality of Cherry Tomato (*Solanum lycopersicum* var. cerasiforme) Under Shade Net Condition

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**ABSTRACT**

*An investigation entitled "Effect of calcium and boron on growth, yield and quality of cherry tomato (Solanum lycopersicum var. cerasiforme) under shade net condition" was made to identify the effect of calcium and boron on yield and quality of cherry tomato and to find out suitable method in cherry tomato at VRF SHUATS, Naini (Prayagraj) India, during rabi season 2019-20. For this purpose, two factors each at four levels on cherry tomato hybrid were used to study under shade net condition during rabi, 2019-20 in factorial Randomized Block Design. The first factor was calcium at four levels viz., 0%, 0.2%, 0.4% and 0.6%. The second factor was Boron which was also at four levels viz., 0%, 0.2%, 0.4% and 0.6%. Thus there were 16 treatment combinations. The above treatment and treatment combinations were applied at 30, 60 and 90 days after transplanting of cherry tomato hybrid. The experiment was laid out in Factorial Randomized Block Design (Factorial RBD) with three replications under shed net during rabi 2019-20. It is concluded from the present investigation that foliar application with increasing levels of Ca and B from 0% to 0.6% exhibited significant increase in morphological characters as well as yield attributes of cherry tomato. The maximum net returns and (B: C) ratio was obtained in treatment fertilized with 0.6% of calcium + 0.6% of boron which resulted in higher yield and consequently maximum (B: C) ratio (3.45).*

***Keywords:*** *Cherry tomato, Calcium, Boron*

## INTRODUCTION

Tomato (*Solanum lycoperscion)* is the most important member of the family Solanaceacea. It is native of south America having chromosome number 2n=24. It is a herbeous annual which sexually propagated by seed. Plants are dicot and grow as a series of branching stem, with terminal bud at the tip. Veins are typically covered with fine short hairs, most plants have compound leaves which are long, odd-pinnate, with 5 to 9 leaflets on petioles.

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Yellow colored flowers appearing on the apical meristem have the anthers fused along edges, forming a column surrounding pistil is style. The tomato is classified as berry. Tomato is commonly called a "poor man's apple". It has a good source of vitamin A and C. All related wild species of tomato are native to the Andean region that includes part of Chile, Colombia, Ecuador, Bolivia and Peru. The most likely ancestor is the wild tomato (*Lycopersicum esculentum var. cerasiformae* (cherry tomato), which is indigenous throughout tropical and subtropical America. Linnaeus 1753 placed the tomato under the genus '*Solanum'* and gave *Solanum lycopersicon.* The ancestor of cultivated tomato is cherry type (*Lycopersicon esculenta var cerasiformae* – cherry tomato). Red colour Pigmentation in tomato is due to lycopene. Yellow colour is due to carotenoid and Tangerine is due to pro-lycopene. Cherry tomato (Solanum *esculentum 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. **Ca and B** are considered to be vital elements in the primary walls, cell membranes, fruit growth, and development of plant cells. Ca and B uptake and transportation from the soil to the plant shoots, leaves, and fruits are very limited and generally dependent on the loss of water through transpiration for uptake; thus, Ca and B are classified as immobile elements in plants. Because of these characteristics of Ca and B, shoot deficiency symptoms appear primarily in the upper leaves. Visual symptoms include deformed, strap-like leaves; chlorosis; and leaves that develop yellow-to-tan margins, eventually becoming necrotic. Low levels of Ca in fruit tissues can also cause blossom end rot, which is a physiological disorder that reduces the yield of many vegetables such as tomato (Tonetto de Freitas et al., 2011). Hence, there is need to different treatments for cherry tomato hybrid under shade house condition for maximising productivity and quality of the produce. Commercial hybrid is high yield potential up to 180 tonne per hectare from a crop of six months duration. Plants grown under shade exhibit better growth in terms of plant height and dry matter production compared to those in open field.

## MATERIALS AND METHODS

The present investigation of cherry tomato (S*olanum lycopersicum* var. cerasiforme) under shade net condition" was made to identify the effect of calcium and boron on yield and quality of cherry tomato and to find out suitable method in cherry tomato at VRF SHUATS, Naini (Prayagraj) India. The experiment was laid out in Factorial Randomized Block Design (Factorial RBD) with three replications under shed net during rabi 2019-20. Planting material were private hybrids of indeterminate type namely cherry tomato {hybrid}. For this purpose, two factors each at four levels on cherry tomato hybrid were used to study under shade net condition during rabi, 2019-20 in factorial Randomised Block Design. The first factor was calcium at four levels viz., 0%, 0.2%, 0.4% and 0.6%. The second factor was Boron which was also at four levels viz., 0%, 0.2%, 0.4% and 0.6%. Thus there were 16 treatment combinations.

**Treatment combination:**

| S. N | Treatmen No. | Treatment combination | Treatment descriptions |
|---|---|---|---|
| 1. | $T_1$ | Control | Control |
| 2. | $T_2$ | $Ca_1$ | 0.2% of calcium |
| 3. | $T_3$ | $Ca_2$ | 0.4% of calcium |
| 4. | $T_4$ | $Ca_3$ | 0.6%of calcium |
| 5. | $T_5$ | $B_1$ | 0.2% of boron |
| 6. | $T_6$ | $B_2$ | 0.4 %of boron |
| 7. | $T_7$ | $B_3$ | 0.6 %of boron |
| 8. | $T_8$ | $Ca_1 + B_1$ | 0.2% of calcium +0. 2% of boro |
| 9. | $T_9$ | $Ca_1 + B_2$ | 0.2% of calcium + 0.4% of boro |
| 10. | $T_{10}$ | $Ca_1 + B_3$ | 0.2% of calcium + 0.6% of boro |
| 11. | $T_{11}$ | $Ca_2 + B_1$ | 0.4% of calcium + 0.2% of boro |
| 12. | $T_{12}$ | $Ca_2 + B_2$ | 0.4% of calcium +0.4% of boro |
| 13. | $T_{13}$ | $Ca_2 + B_3$ | 0.4% of calcium + 0.6% of boro |
| 14. | $T_{14}$ | $Ca_3 + B_1$ | 0.6% of calcium +0. 2% of boro |
| 15. | $T_{15}$ | $Ca_3 + B_2$ | 0.6% of calcium + 0.4% of boro |
| 16. | $T_{16}$ | $Ca_3 + B_3$ | 0.6% of calcium + 0.6% of boro |

**Quantity of chemical fertilizers and boron and calcium applied:**

| S N | Types of nutrients/fertilizer | Doses (kg ha $^{-1}$ | Source | Doses / 86m$^2$ (g) | Time of application |
|---|---|---|---|---|---|
| 1. | FYM | 250 q/ha | - | 215kg/86m | Applied at time of field preparatio |
| 2. | Nitrogen | 100 | Urea | 1866g/86m | ½ basal , ½ at 25 DAT nd ½ at 40 DAT |
| 3. | Phosphorus | 60 | Single super phosphate | 3225g/86m | Applied at basal |
| 4. | Potash | 40 | Murate of Potash | 573.2g/86n | Applied at basal |
| 5. | Boron 4 levels | 0% | - | - | - |
| | | 0.2% | Di-sodium Tetraborate (Borax) | 2g/86m$^2$ | 30, 60 & 90 DAT |
| | | 0.4% | Di-sodium Tetraborate (Borax) | 4g/86m$^2$ | 30,60 & 90 DAT |
| | | 0.6% | Di-sodium Tetraborate (Borax) | 6g/86m$^2$ | 30, 60 & 90 DAT |
| 6. | Calcium 4levels | 0% | - | - | - |
| | | 0.2% | Calcium Carbonate | 2g/86m$^2$ | 30, 60 & 90 DAT |
| | | 0.4% | Calcium Carbonate | 4g/86m$^2$ | 30, 60 & 90 DAT |
| | | 0.6% | Calcium Carbonate | 6g/86m$^2$ | 30, 60 & 90 DAT |

The data were recorded for various morphological parameters, fruit characters and yield parameters from the randomly selected competitive plant for each treatment. Also the economics in terms of cost of cultivation (Rs), gross returns (Rs), net returns (Rs), and benefit cost ratio (B:C) was estimated.

## RESULTS AND DISCUSSION

**Analysis of variance for the experiment:**

Analysis of variance (Table-1) for the morphological data revealed that mean sum of squares due to treatments were significant for all morphological characters under study viz., Plant height (cm), Number of leaves per plant, Number of branches per plant, Length of internodes (cm), Number of nodes to first flowering, Days taken to first flowering, Days taken to 50% flowering, Days taken to first picking and Fruiting span which were highly significant at 1% level of significance indicating presence of good amount of variability among the treatments and treatment combinations of calcium and boron for these characters. The interaction effect of calcium and boron was also found significant for all these characters except plant height.

Analysis of variance (Table-2) for the yield data revealed that mean sum of squares due to treatments were significant for all yield characters under study viz., Fruit length (cm), Fruit diameter (cm), Fruit colour, Fruit weight (g), Number of fruits per plant and Yield per plant (g) which were highly significant at 1% level of significance indicating presence of good amount of variability among the treatments and treatment combinations of calcium and boron for these characters. The interaction effect of calcium and boron was also found significant for all these characters except No. of fruit per plant.

**2 Mean performances of treatments under shed net conditions:**

The mean values, the coefficient of variation (CV), standard error of mean (SEm), the critical difference (CD) at 5% and range (minimum and maximum) of 16 treatments for morphological and yield characters under shed net experiment are presented in Table-3 and 4 which revealed a wide range of variation for all traits studied. It is necessary to describe here the mean performance of different treatments with respect to different characters for drawing valid conclusion for future planning as well as selection of suitable method to improve tomato for economic importance. The mean performance of different treatments with respect to different characters is described as under.

**Effects of foliar spray of calcium and boron on economic and profitability of different treatments:** The net returns of marketable cherry tomato fruit were significantly increased with the foliar application of calcium and boron. The data presented in the table 5 revealed that maximum net returns and B:C ratio (Rs 705500ha$^{-1}$ and 3.45) was recorded in treatment fertilized with 0.6% of calcium + 0.6% of boron {T16 (Ca3B3)}followed by treatment with foliar application of 0.6% of calcium + 0.4% of boron which recorded the net returns and B:c ratio to the tune of Rs 641000ha$^{-1}$ and 3.14.The minimum net returns and B:C (Rs. 99000 ha$^{-1}$and 0.50) and was observed under the treatment without Ca and B application.

**Table 1: Mean sum of squares for morphological characters in Tomato (*Solanum lycoperscion* L.) under shed net conditions**

| | | Mean Sum of Squares | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Source of variation | df | Plant Height (cm) | Number of leaves per plant | Number of branches per plant | Length of internodes (cm) | Number of nodes to first flowering | Days taken to first flowering | Days taken to 50% flowering | Days taken to first picking | Fruiting span |
| Replication | 2 | 54.73 | 16.77 | 7.65 | 0.03 | 0.75 | 2.69 | 2.69 | 2.69 | 4.19 |
| Treat | 15 | 137.86** | 1189.44** | 34.91** | 0.1** | 15.98** | 7.88** | 7.88** | 7.88** | 61.98** |
| C Levels | 3 | 310.1** | 1805.17** | 57.8** | 0.03* | 12.06** | 13.63** | 13.63** | 13.63** | 156.69** |
| B levels | 3 | 256.16** | 3638.48** | 93.85** | 0.07** | 37.5** | 14.19** | 14.19** | 14.19** | 135.08** |
| CxB | 9 | 41.01 | 167.86** | 7.63 | 0.14** | 10.11** | 3.85** | 3.85** | 3.85** | 6.04** |
| Error | 30 | 27.22 | 10.98 | 4.25 | 0.01 | 0.53 | 0.98 | 0.98 | 0.98 | 1.74 |

***, ** significant at 5 and 1% level, respectively**

**Table 2: Mean sum of squares for yield characters in Tomato (*Solanum lycoperscion* L.) under shed net conditions**

| | | Mean Sum of Squares | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source of variation | df | Fruit length (cm) | Fruit diameter (cm) | Fruit colour | Fruit weight (g) | Number of fruits per plant | Yield per plant (g) | Yield per $M^2$ |
| Replication | 2 | 0.03 | 0.05 | 0.27 | 7.9 | 30.15 | 93261.27 | 0.85 |
| Treat | 15 | 1.27** | 3.52** | 3.79** | 123.99** | 221.19** | 1196516.97** | 10.76** |
| C Levels | 3 | 3.85** | 9.71** | 8.97** | 186.36** | 428.58** | 2113199.25** | 19.01** |
| B levels | 3 | 2.02** | 7.24** | 7.75** | 380.58** | 599.58** | 3491132.47** | 31.41** |
| CxB | 9 | 0.17** | 0.22** | 0.75** | 17.68** | 25.94 | 126084.38** | 1.13** |
| Error | 30 | 0.01 | 0.02 | 0.111 | 3.54 | 12.86 | 31500.89 | 0.28 |

***, ** significant at 5 and 1% level, respectively**

**Table 3: Mean performance for morphological characters in Tomato (*Solanum lycoperscion* L.) under shed net conditions**

| S.No. | Treat. No. | Treatment combinations | Plant height (cm) | Number of leaves per plant | Number of branches per plant | Length of internodes (cm) | Number of nodes to first flowering | Days taken to first flowering | Days taken to 50% flowering | Days taken to first picking | Fruiting span |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | T1 | Ca0+B0 | 42.22 | 50.10 | 8.00 | 4.20 | 9.0 | 38.33 | 45.33 | 65.33 | 54.67 |
| 2 | T2 | Ca1+B0 | 45.00 | 56.88 | 8.00 | 4.47 | 9.7 | 39.33 | 46.33 | 66.33 | 57.33 |
| 3 | T3 | Ca2+B0 | 53.55 | 62.43 | 9.83 | 4.57 | 10.7 | 40.33 | 47.33 | 67.33 | 57.33 |
| 4 | T4 | Ca3+B0 | 54.44 | 60.32 | 11.61 | 4.53 | 11.0 | 36.67 | 43.67 | 63.67 | 62.00 |
| 5 | T5 | Ca0+B1 | 45.00 | 67.77 | 11.20 | 4.37 | 11.0 | 37.67 | 44.67 | 64.67 | 60.00 |
| 6 | T6 | Ca0+B2 | 51.78 | 77.78 | 12.63 | 4.57 | 11.7 | 38.33 | 45.33 | 65.33 | 59.67 |
| 7 | T7 | Ca0+B3 | 55.89 | 74.33 | 13.44 | 4.57 | 15.0 | 38.00 | 45.00 | 65.00 | 60.67 |
| 8 | T8 | Ca1+B1 | 55.44 | 87.22 | 15.00 | 4.63 | 9.7 | 36.33 | 43.33 | 63.33 | 62.33 |
| 9 | T9 | Ca1+B2 | 55.00 | 88.56 | 8.89 | 4.43 | 13.3 | 36.00 | 43.00 | 63.00 | 63.67 |
| 10 | T10 | Ca1+B3 | 51.44 | 90.17 | 14.67 | 4.03 | 14.3 | 35.67 | 42.67 | 62.67 | 64.67 |
| 11 | T11 | Ca2+B1 | 48.11 | 92.33 | 16.22 | 4.07 | 9.7 | 36.00 | 43.00 | 63.00 | 64.67 |
| 12 | T12 | Ca2+B2 | 63.33 | 94.56 | 14.89 | 4.43 | 12.7 | 36.67 | 43.67 | 63.67 | 64.33 |
| 13 | T13 | Ca2+B3 | 59.22 | 95.67 | 16.33 | 4.27 | 14.3 | 37.67 | 44.67 | 64.67 | 63.67 |
| 14 | T14 | Ca3+B1 | 59.33 | 98.11 | 15.59 | 4.27 | 16.0 | 36.67 | 43.67 | 63.67 | 66.00 |
| 15 | T15 | Ca3+B2 | 64.00 | 105.00 | 17.44 | 4.27 | 15.7 | 35.67 | 42.67 | 62.67 | 69.33 |
| 16 | T16 | Ca3+B3 | 63.67 | 124.44 | 18.94 | 4.23 | 12.3 | 33.67 | 40.67 | 60.67 | 72.67 |
| | | Minimum | 42.22 | 50.10 | 8.00 | 4.03 | 9.00 | 33.67 | 40.67 | 60.67 | 54.67 |
| | | Maximum | 64.00 | 124.44 | 18.94 | 4.63 | 16.00 | 40.33 | 47.33 | 67.33 | 72.67 |
| | | GM | 54.21 | 82.85 | 13.29 | 4.37 | 12.25 | 37.06 | 44.06 | 64.06 | 62.69 |
| | | S.Em± | 3.01 | 1.91 | 1.19 | 0.06 | 0.46 | 0.57 | 0.57 | 0.57 | 0.76 |
| | | CD(5%) | 8.70 | 5.53 | 3.43 | 0.16 | 1.2 | 1.65 | 1.65 | 1.65 | 2.21 |
| | | CV | 9.62 | 4.00 | 15.51 | 2.29 | 6.46 | 2.67 | 2.25 | 1.55 | 2.1 |

**Table 4: Mean performance for yield characters in Tomato (*Solanum lycoperscion* L.) under shed net conditions**

| S.No. | Treat. No. | Treatment combinations | 1.Fruit length (cm) | 2. Fruit diameter (cm) | 3.Fruit colour | 4.Fruit weight (g) | 1.Number of fruits per plant | 2.Yield per plant (g) | 3.Yield per $m^2$ (kg) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **T1** | **Ca0+B0** | 3.84 | 3.90 | 5.17 | 24.00 | 41.67 | 998.00 | 2.99 |
| 2 | **T2** | **Ca1+B0** | 5.07 | 5.07 | 4.90 | 25.33 | 48.00 | 1210.33 | 3.63 |
| 3 | **T3** | **Ca2+B0** | 5.15 | 5.15 | 4.93 | 21.67 | 53.00 | 1155.00 | 3.47 |
| 4 | **T4** | **Ca3+B0** | 5.05 | 5.05 | 5.40 | 25.67 | 53.67 | 1379.67 | 4.14 |
| 5 | **T5** | **Ca0+B1** | 4.95 | 4.95 | 5.50 | 26.67 | 44.67 | 1195.00 | 3.59 |
| 6 | **T6** | **Ca0+B2** | 4.94 | 4.94 | 5.63 | 30.33 | 54.00 | 1638.33 | 4.92 |
| 7 | **T7** | **Ca0+B3** | 4.95 | 4.95 | 5.70 | 32.33 | 61.67 | 2013.67 | 6.04 |
| 8 | **T8** | **Ca1+B1** | 5.31 | 6.31 | 6.03 | 32.33 | 58.67 | 1898.33 | 5.69 |
| 9 | **T9** | **Ca1+B2** | 5.28 | 6.28 | 6.23 | 33.67 | 63.33 | 2133.00 | 6.40 |
| 10 | **T10** | **Ca1+B3** | 5.38 | 6.38 | 6.23 | 34.67 | 65.00 | 2253.33 | 6.76 |
| 11 | **T11** | **Ca2+B1** | 5.70 | 6.70 | 6.43 | 32.67 | 62.33 | 2038.33 | 6.12 |
| 12 | **T12** | **Ca2+B2** | 5.75 | 6.75 | 6.80 | 35.33 | 63.67 | 2250.00 | 6.75 |
| 13 | **T13** | **Ca2+B3** | 5.90 | 6.90 | 6.93 | 36.67 | 65.00 | 2382.67 | 7.15 |
| 14 | **T14** | **Ca3+B1** | 6.20 | 7.20 | 7.77 | 40.33 | 67.00 | 2701.00 | 8.10 |
| 15 | **T15** | **Ca3+B2** | 6.33 | 7.33 | 8.27 | 41.67 | 67.67 | 2818.00 | 8.45 |
| 16 | **T16** | **Ca3+B3** | 6.42 | 7.42 | 8.50 | 43.33 | 70.00 | 3032.00 | 9.10 |
| | | **Minimum** | 3.84 | 3.90 | 4.90 | 21.67 | 41.67 | 998.00 | 2.99 |
| | | **Maximum** | 6.42 | 7.42 | 8.50 | 43.33 | 70.00 | 3032.00 | 9.10 |
| | | **GM** | 5.39 | 5.96 | 6.28 | 32.29 | 58.71 | 1943.54 | 5.83 |
| | | **S.Em±** | 0.06 | 0.08 | 0.19 | 1.09 | 2.07 | 102.47 | 0.31 |
| | | **CD(5%)** | 0.16 | 0.25 | 0.55 | 3.15 | 5.98 | 295.97 | 0.88 |
| | | **CV** | 1.86 | 2.38 | 5.31 | 5.83 | 6.11 | 9.13 | 9.08 |

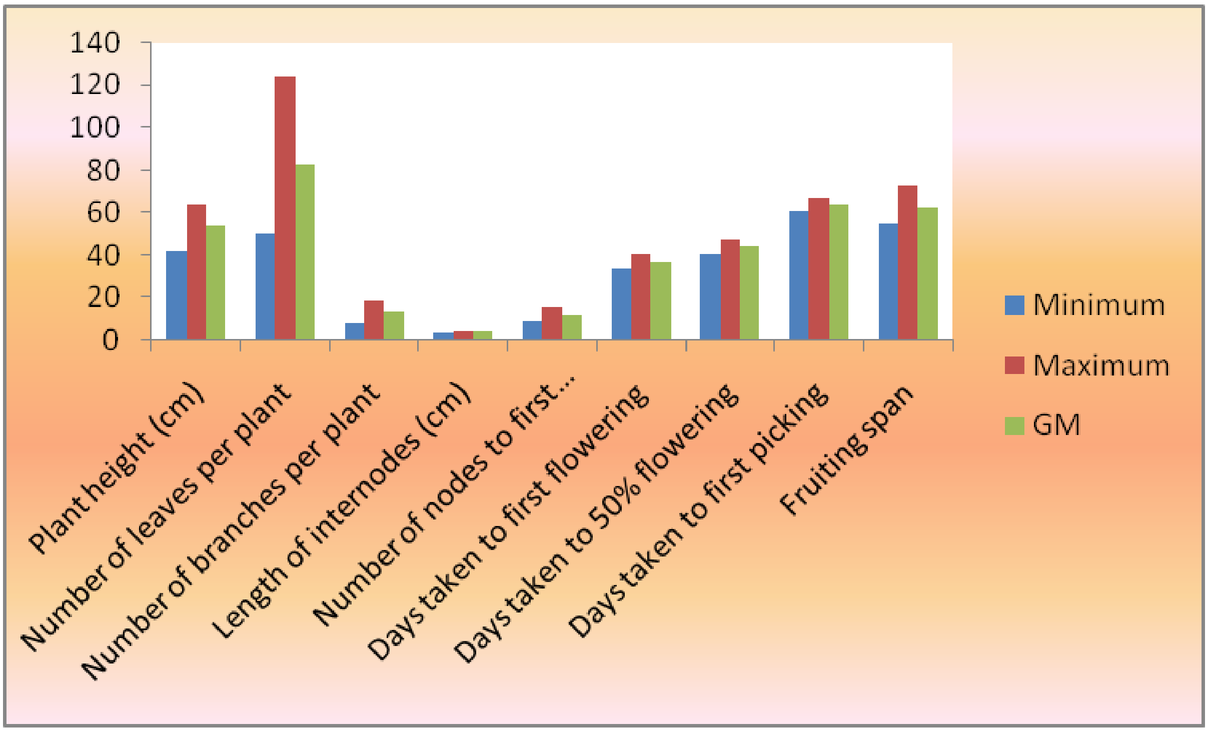


**Fig. 4.1 Bar diagram representing the mean, minimum and maximum range for various morphological characters under shed net ns**

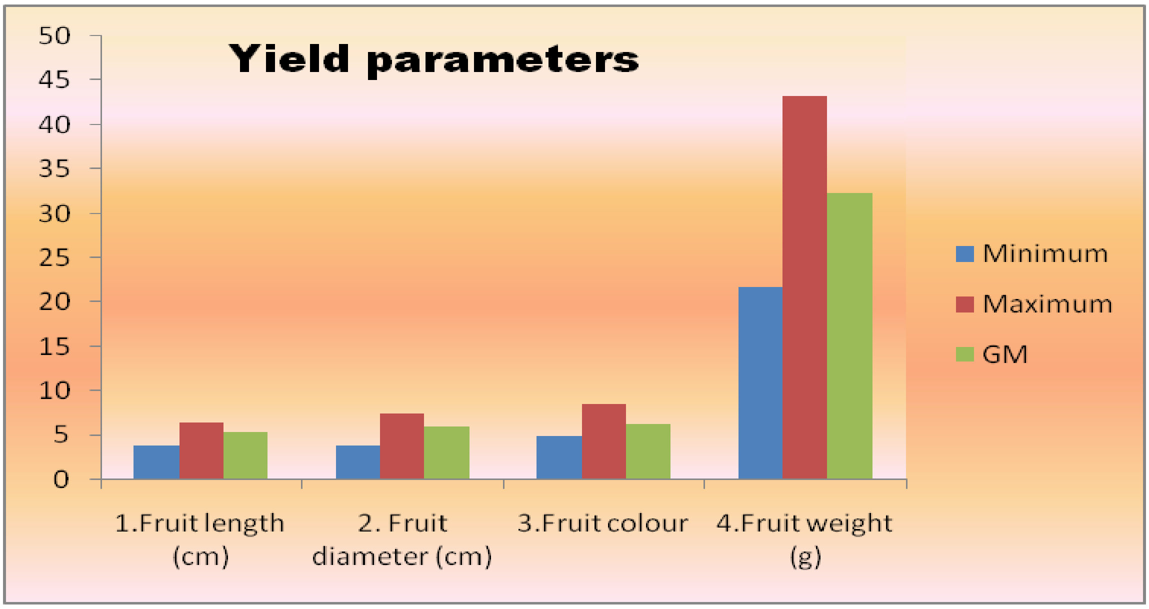


**Fig. 4.2 Bar diagram representing the mean, minimum and maximum range for yield parameters under shed net conditions**

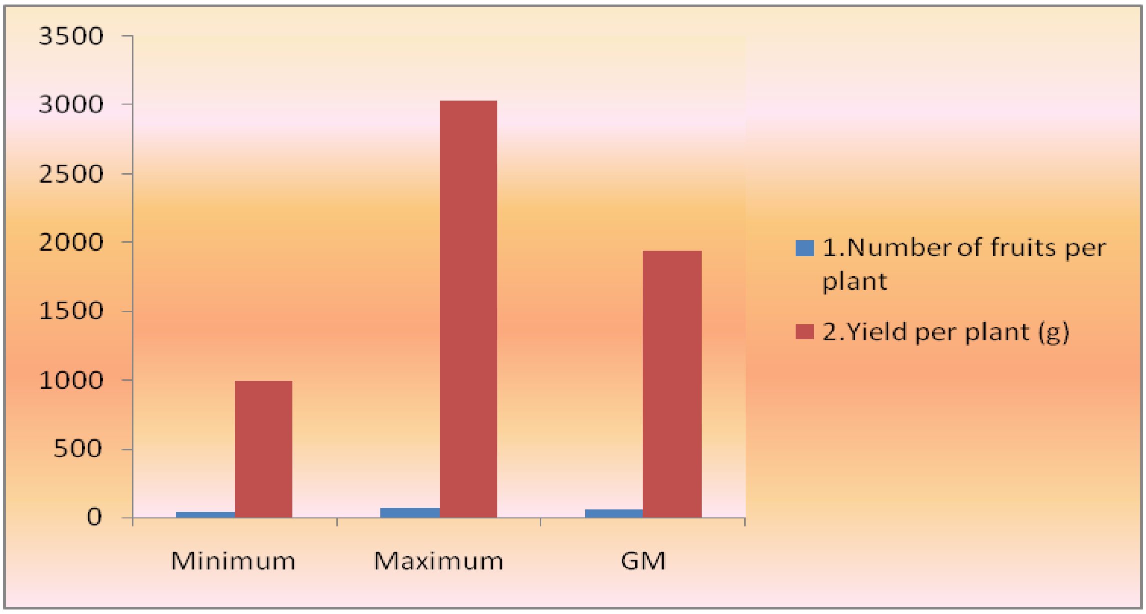


**Fig. 4.3 Bar diagram representing the mean, minimum and maximum range for yield characters under shed net conditions**

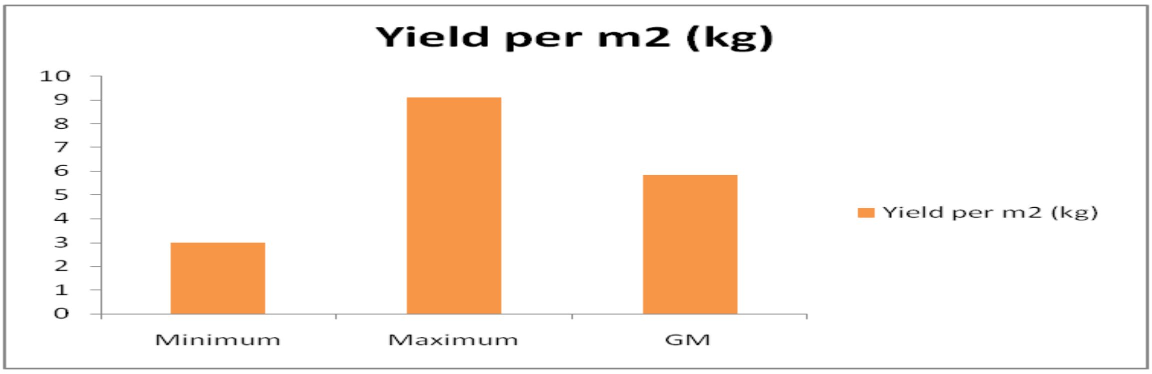


**Fig. 4.4 Bar diagram representing the mean, minimum and maximum range for yield characters under shed net conditions**

**Table 5: Effects of foliar spray of calcium and boron on economic of cherry tomato under different treatments**

| S.No. | Treatment | Cost of cultivation (Rs. $ha^{-1}$) | Gross returns (Rs. $ha^{-1}$) | Net Returns (Rs. $ha^{-1}$) | B:C ratio |
|---|---|---|---|---|---|
| 1 | T1 (Ca0+B0) (Control) | 200000 | 299000 | 99000 | 0.50 |
| 2 | T2 (Ca1+B0) (0.2% of calcium) | 201000 | 363000 | 162000 | 0.81 |
| 3 | T3 (Ca2+B0) (0.4% of calcium) | 202000 | 347000 | 145000 | 0.72 |
| 4 | T4 (Ca3+B0) (0.6%of calcium) | 203000 | 414000 | 211000 | 1.04 |
| 5 | T5 (Ca0+B1) (0.2% of boron) | 200500 | 359000 | 158500 | 0.79 |
| 6 | T6 (Ca0+B2) (0.4 %of boron) | 201000 | 492000 | 291000 | 1.45 |
| 7 | T7 (Ca0+B3) (0.6 %of boron) | 201500 | 569000 | 367500 | 1.82 |
| 8 | T8 (Ca1+B1) (0.2% of calcium +0. 2% of boron) | 201500 | 604000 | 402500 | 2.00 |
| 9 | T9 (Ca1+B2) (0.2% of calcium + 0.4% of boron) | 202000 | 640000 | 438000 | 2.17 |
| 10 | T10 (Ca1+B3) (0.2% of calcium + 0.6% of boron) | 202500 | 676000 | 473500 | 2.34 |
| 11 | T11 (Ca2+B1) (0.4% of calcium + 0.2% of boron) | 202500 | 612000 | 409500 | 2.02 |
| 12 | T12 (Ca2+B2) (0.4% of calcium +0.4% of boron) | 203000 | 675000 | 472000 | 2.33 |
| 13 | T13 (Ca2+B3) (0.4% of calcium + 0.6% of boron) | 203500 | 715000 | 511500 | 2.51 |
| 14 | T14 (Ca3+B1) (0.6% of calcium +0. 2% of boron) | 203500 | 810000 | 606500 | 2.98 |
| 15 | T15 (Ca3+B2) (0.6% of calcium + 0.4% of boron) | 204000 | 845000 | 641000 | 3.14 |
| 16 | T16 (Ca3+B3) (0.6% of calcium + 0.6% of boron) | 204500 | 910000 | 705500 | 3.45 |

Seed is the primary input, without which, the increase in production of any vegetable crop cannot be expected. Among inputs other than seed and fertilizers, foliar application of micronutrients at most appropriate concentration assumes special significance for the production of higher yield with better quality seed of any vegetable crop. Therefore, the application of micronutrients to sustain soil health and crop productivity besides maintaining the quality of crops is of profound importance.

Micronutrients are present in lower concentrations in soil than macronutrients but are equally significant in plant nutrition, since, plants grown in micronutrient-deficient soils show similar reductions in productivity as those grown in macronutrient-deficient soils. The prerequisite criteria for improved growth, yield and quality of cherry tomato is balanced fertilization. However, nutrients can be applied either by conventional methods or by foliar application but the major advantage of foliar application is the instant availability of nutrients to plants.

The improvement in growth characters with the application of boron may be attributed to the enhancement of photosynthetic and other metabolic activities which led to an increase in various metabolites responsible for cell division and cell elongation of roots and shoots. Improvement in growth characters are reflected the role of boron as an activator for many enzymes which promotes plant growth and flower production.

This improvement in above mentioned morphological characters with the application of calcium may be attributed to the role of Ca in cell elongation and cell elongation. Calcium is considered as second messenger in plant growth, development and adaptation to environment and results in better plant growth. The increase in yield characters with the application of calcium reflects the beneficial effects of calcium chloride to the physiological role of Ca which plays a binding role in the complex polysaccharides and proteins forming the cell wall.

The increase in with the application of boron in yield characters may be explained on the ground that boron is involved in the active photosynthesis which ultimately help towards increase in number of fruits and weight of fruits and hence increase the fruit yield. Increase in fruit size might be due to improved physiological activity like photosynthesis and translocation of food material. These results are conformity with the earlier findings of Rab and Haq, 2012 who reported that in tomato, foliar application of boron significantly increased the morphological and yield traits as well. Rab and Haq (2012) observed that foliar application of $CaCl_2$ (0.6%) and borax (0.2%) in combination resulted significantly increased the morphological and yield traits as attributes. Shoukat Sajad (2018) also reported effect of foliar application of Boron and Calcium on vegetative and reproductive attributes of tomato (*Solanum lycopersicum* L.). Ashraf et al. (2018) reported that (Boron (boric acid)=0.2%+calcium chloride=0.3% solution) proved better results in all parameters (vegetative growth characters, flowering traits, and yield components) while T0 (control) was found at the bottom among all treatments.

The maximum net returns and B: C ratio obtained in the present study due to foliar application of calcium and Boron might be due to improved growth characters and yield attributes which resulted in higher yield and consequently maximum net returns and (B: C) ratio. The current findings are in agreement with the earlier finding of Basavarajeshwari et al. (2008) who obtained maximum net returns and cost benefit ratio in tomato production with micronutrient combination of calcium and boron.

## CONCLUSION

It is concluded from the present investigation that foliar application with increasing levels of Ca and B from 0% to 0.6% exhibited significant increase in morphological characters as well as yield attributes of cherry tomato. The maximum net returns and (B: C) ratio was obtained in treatment fertilized with 0.6% of calcium + 0.6% of boron which resulted in higher yield and consequently maximum (B: C) ratio (3.45).

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