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Influence of Basal Application of Zinc and Boron on Growth, Yield and Quality of Cherry Tomato under Protected Cultivation (*Solanum lycopersicum* var. cerasiforme)

***[1]Arzoo Dhiman and [2]Dr. Devi Singh**

Department of Horticulture, Naini Agricultural Institute,
Sam Higginbottom University of Agriculture, Technology and Sciences,
Prayagraj 211 007, U.P., India

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ABSTRACT

A field experiment entitled 'Influence of Basal Application of Zinc and Boron on Growth, Yield and Quality of Cherry Tomato under Protected Cultivation (*Solanum lycopersicum* var.c erasiforme) at the Horticulture Research Farm, Department of Horticulture, Sam Higgin Botham University of Agriculture, Technology and Sciences, Prayagraj. The experiment was laid out in Randomized Block Design (RBD) with three replications and 09 treatments. The experiment consisted of Production of Cherry Tomato (Pusa Cherry 1). The Highest Yield (25.88 t/ha) of Cherry Tomato was obtained from Treatment (T8), i.e. (RDF +B@2 kg/ha +Zn@2kg/ha) followed by Treatment T7 (RDF+B@2 kg/ha +Zn@1kg/ha). Whereas the lowest in Treatment T0 (control). The Highest Yield is (25.88t/ha) while considering the experimental findings Treatment T8 (RDF + B@2kg/ha + Zn@2kg/ha) was found to be the most suitable combination for Higher production under Protected Cultivation in Prayagraj Agro climatic conditions.

***Key words**: Cherry Tomato, Basal Application, Zinc, Boron*

Introduction

Cherry tomato (*Solanum lycopersicum*var. *cerasiforme*) is a botanical variety of the cherry tomato. It is thought to be the ancestor of all cultivated tomatoes. It has become more popular all over the world because of a good source of vitamins A and C, solids content, good taste and fruit set even at high temperature (Najeema *et al*., 2018). Cherry tomatoes are widely cultivated in Central America and are distributed in California, Korea, Germany, Mexico and Florida. It is a warm season crop, reasonably tolerant to heat and drought and grows under wide range of soil and climatic conditions (Anon, 2009a). Cherry tomato is grown for its edible fruits; they are perfect for making processed products like sauce, soup, ketchup, puree, curries, paste, powder, rasam and sandwich. They also have good nutritional and antioxidant properties. Cherry tomato often called 'salad tomato'. The cherry tomato is also beneficial to human health because of its high content of antioxidant and phytochemical compounds including lycopene, ß- carotene, flavonoids, Vit C and many essential nutrients. Cherry tomato has good nutri-

([1]M.Sc. Research Scholar, [2]Associate Professor)

tional information being, total carbohydrate, sugars, protein, calcium, and iron. They are a great source of vitamin-C (13 mg/100 g), dietary fibre (2.0 g), vitamin A (25%) and vitamin K and also a good source of vitamin E (Alpha Tocopherol), thiamine, niacin, vitamin B6, foliate, phosphorus, copper, potassium and manganese (Anonymous, 2009).

Cherry tomatoes are scientifically called *Solanum lycopersicum*var. *cerasiforme* belongs to the family Solanaceae having 2n=24 chromosome number and are the direct ancestors of modern tomatoes and a wild cultivar in the Andean regions of South America (Rick, 1976). Cherry tomato improves immunity and functions as an antioxidant. It is also used in beauty ailments for both skin and hair. The pigment lycopene in the cherry tomatoes shields the skin from solar radiation and serves as a sunblock. Generally, in India, cherry tomatoes are grown for vegetable and salad purposes (Anonymous, 2017). Some micronutrients, such as zinc, boron, and copper can boost tomato production and quality (Chand and Prasad, 2018). Basal application is an appropriate method to feed the tomato crop to improve growth, blooming and marketability. Cherry tomato plant requires macro and micro nutrients for growth and development as well as to complete its life cycle. Essential nutrients are needed for optimum plant growth and development. Boron is another important micro nutrient required for good quality and high yield of crops. It is involved in the synthesis and integrity of cell wall, cell wall lignification, metabolism of RNA, carbohydrate, phenol and Indole Accetic Acid (IAA), respiration and cell membrane integrity. Boron increases the fruit set percentage by promoting pollen germination and elongation of pollen tube. Boron content also influences calcium metabolism and its deficiency declines the calcium associated with pectin constituents. Boron deficiency results in wilting and leaf drop and adversely affect the quality and yield of many vegetables especially tomato (Imtiaz *et al.*, 2010). Its requirements of plants can be satisfied by both foliar and soil application during growing season, especially during reproductive growth stage (Sajid, 2009). Zinc (Zn) is another important essential micronutrient.

Materials and Method

The experiment entitled "Influence of Basal Applicationo Zinc and Boronon Growth, Yield and Quality of Cherry Tomato Under Protected Condition (*Solanumly copersicon var. cerasiforme*)" was conducted at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (UP), during August, 2022 – March, 2023. All the facilities necessary for cultivation, including labours were provided by the Department.

Experimentalsite

The experiment was conducted during Rabi season of the year 2022–23 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom Universityof Agriculture, Technology and Sciences, Prayagraj. The area is situated in the South of Prayagraj on the right bank of Yamuna at Rewa road at a distance of about 6 km from Prayagraj city. It is situated at 25.45 ^{o}N latitude and 81.84 ^{o}E longitude on elevation of 98 meter from the sea level, with annual rainfall range of 1013.4 mm

Treatments details

There are 9 treatments in this research which are shown in Table 1.

Table 1. Details of Treatment Combination.

Treatment Symbol	Treatment Combinations
T_0	Control (Recommended)
T_1	RDF + B@1kg/ha
T_2	RDF + B@2kg/ha
T_3	RDF + Zn@1kg/ha
T_4	RDF + Zn@2kg/ha
T_5	RDF + B@1kg/ha + Zn@1kg/ha
T_6	RDF+ B@1kg/ha + Zn@2kg/ha
T_7	RDF+ B@2kg/ha + Zn@1kg/ha
T_8	RDF+ B@2kg/ha + Zn@2kg/ha

Results and Discussion

The results of the investigation, regarding the Study on growth, earliness, yield, quality parameters in Cherry Tomato.

Growth Parameters

Plant Height (cm)

Significantly maximum plant height of 31.16 cm at

30 days after sowing was recorded at T1 RDF+ B@1kg/ha followed by T2 RDF+ B@2kg/ha of 28.80 cm whereas minimum plant height of 23.40 cm was recorded in T7 RDF+ B@2kg/ha + Zn@1kg/ha.

Significantly maximum plant height of 99.66 cm at 60 days after transplanting was recorded at T8 RDF+ B@2kg/ha + Zn@2kg/ha followed by T7 RDF+ B@2kg/ha + Zn@1kg/ha of 95.23 cm whereas minimum plant height of 79.36 cm was recorded in T0 Control (Recommended). 60 days plant height values are found to be significant.

Significantly maximum plant height of 175.60 cm at 90 days after sowing was recorded at T8 RDF+ B@2kg/ha + Zn@2kg/ha followed by T7 RDF+ B@2kg/ha + Zn@1kg/ha of 174.13 cm whereas minimum plant height of 164.83 cm was recorded in T0 Control (Recommended).

Significantly maximum plant height of 268.23 cm at 120 days after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 266.90 cm whereas minimum plant height of 260.03 cm was recorded in T Control (Recommended).

Number of Primary Branches per Plant

Significantly maximum number of primary branches per plant of 13.23 at 30 days after sowing was recorded at T0 Control (Recommended) followed by T3 RDF + Zn@1kg/ha of 12.36 whereas minimum number of primary branches per plant of 9.06 was recorded in T8 RDF+ B@2kg/ha + Zn@2kg/ha.

Significantly maximum number of primary branches per plant of 18.67 at 60 days after transplanting was recorded at T8 RDF+ B@2kg/ha + Zn@2kg/ha followed by T7 RDF+ B@2kg/ha + Zn@1kg/ha of 17.63 whereas minimum number of primary branches per plant of 13.43 was recorded in T0 Control (Recommended). 60 days number of primary branches per plant values are found to be significant.

Significantly maximum number of primary branches per plant of 24.67 at 90 days after sowing was recorded at T8 RDF+ B@2kg/ha + Zn@2kg/ha followed by T7 RDF+ B@2kg/ha + Zn@1kg/ha of 23.03 whereas minimum number of primary branches per plant of 18.63 was recorded in T0 Control (Recommended).

Significantly maximum number of primary branches per plant of 30.50 at 120 days after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 29.50 whereas minimum number of primary branches per plant of 27.30 was recorded in T Control (Recommended).

Days to First Flowering of Cherry Tomato

Significantly minimum days to first flowering of 40.67 after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 41.63 whereas maximum days to first flowering of 44.70 was recorded in T Control (Recommended).

Days to 50% Flowering of Cherry Tomato

Significantly minimum days to 50% flowering of

Table 2. Data regarding Growth parameters

Treatment	Plant height at 30 days (cm)	Plant height at 60 days (cm)	Plant height at 90 days (cm)	Plant height at 120 days (cm)	No. of Primary Branches at 30 days	No. of Primary Branches at 60 days	No. of Primary Branches at 90 days	No. of Primary Branches at 120 days
T_0	27.56	79.36	164.833	260.033	13.23	13.433	18.633	27.300
T_1	31.16	83.46	167.300	262.33	11.23	14.633	20.400	28.533
T_2	28.80	86.13	168.567	260.80	10.46	15.600	21.600	27.567
T_3	26.20	83.96	167.567	262.66	12.36	14.700	20.667	28.433
T_4	28.26	86.43	169.367	263.83	10.93	15.667	21.633	27.600
T_5	28.63	89.73	172.633	265.56	10.10	16.567	22.967	28.633
T_6	28.53	93.80	173.900	266.53	12.10	17.433	23.400	29.233
T_7	23.40	95.23	174.133	266.90	10.50	17.633	23.033	29.500
T_8	25.93	99.66	175.600	268.23	9.06	18.667	24.667	30.500
CD at 5%	1.843	0.988	1.676	0.851	0.815	0.325	0.495	0.533
S.Ed(±)	0.862	0.462	0.784	0.398	0.38	0.152	0.231	0.24

53.77 after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 54.63 whereas maximum days to 50% flowering of 58.93 was recorded in T Control (Recommended).

Number of Flowers per Cluster

Significantly maximum number of flowers per clusters of 70.767 after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 69.667 whereas minimum number of flowers per clusters of 64.367 was recorded in T Control (Recommended).

Number of Clusters per Plant

Significantly maximum number of clusters per plant of 20.67 after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 19.63 whereas minimum number of clusters per plant of 14.63 was recorded in T Control (Recommended).

Number of Fruits per Plant

Significantly maximum number of fruits per plant of 85.60 after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 84.40 whereas minimum number of fruits per plant of 79.97 was recorded in T Control (Recommended).

Individual Fruit Weight (g)

Significantly maximum individual fruit weight of 9.47 g after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 8.67 g whereas minimum individual fruit weight of 5.27 g was recorded in T Control (Recommended).

Fruit Diameter (mm)

Significantly maximum fruit diameter of 19.50 mm after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@1kg/ha + Zn@2kg/ha of 16.20 mm whereas minimum fruit diameter of 8.87 mm was recorded in T Control (Recommended).

Average fruit yield per plant (g)

Significantly maximum average fruit yield per plant of 776.67 g after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@1kg/ha + Zn@2kg/ha of 660.00 g whereas mini-

Table 3. Data regarding Earliness, Yield and Quality Parameters

Treatment	Days to first flowering	Days of 50% flowering	No. of flowers per cluster	No. of flower clusters per plant	No. of fruits per plant	Individual fruit weight (g)	Average fruit weight (g)	Average fruit yield per plant (g)	Average fruit yield per plot (kg)	Total yield (t/ha)	Fruit diameter (mm)	TSS (pBrix)	Ascorbic Acid (mg/100g)
T_0	44.700	58.933	64.367	14.633	79.967	5.267	84.700	426.667	0.86	14.217	8.87	6.310	16.667
T_1	42.500	57.667	66.500	16.600	81.567	5.767	86.533	516.667	0.93	17.217	10.20	6.867	17.200
T_2	43.700	58.733	67.733	17.633	82.667	6.467	87.500	573.333	1.15	19.103	12.10	7.413	18.100
T_3	42.667	57.733	66.733	16.467	81.533	5.767	86.500	613.333	1.02	20.440	11.03	7.173	17.300
T_4	43.867	56.633	67.533	17.633	82.633	6.500	87.600	573.333	1.18	19.103	12.10	7.590	18.233
T_5	42.633	55.667	68.600	18.700	83.633	7.667	88.667	593.333	1.50	19.770	14.43	7.960	18.967
T_6	41.533	54.533	69.533	18.967	84.100	8.633	89.500	653.333	2.77	21.773	16.20	8.697	19.867
T_7	41.633	54.633	69.667	19.633	84.400	8.667	89.533	660.000	2.80	21.993	16.13	8.503	19.900
T_8	40.667	53.767	70.767	20.667	85.600	9.467	91.700	776.667	2.90	25.880	19.50	9.500	20.667
CD at 5%	0.358	0.578	0.260	0.527	0.660	0.382	0.275	59.155	0.32	1.972	1.08	0.777	0.887
S.Ed(±)	0.167	0.270	0.122	0.246	0.309	0.178	0.129	27.666	0.15	0.922	0.52	0.363	0.410

mum average fruit yield per plant of 426.67 g was recorded in T Control (Recommended).

Average fruit yield per plot (kg)

Significantly maximum average fruit yield per plot of 2.90 kg after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 2.80 kg whereas minimum average fruit yield per plot of 0.86 kg was recorded in T Control (Recommended).

Total Yield (t/ha)

Significantly maximum total yield of 25.88 t/ha after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 21.99 t/ha whereas minimum total yield of 14.21 t/ha was recorded in T Control (Recommended).

TSS (pBrix)

Significantly maximum TSS (pBrix) of 9.50 after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 8.50 whereas minimum TSS (pBrix) of 6.31 was recorded in T Control (Recommended).

Ascorbic Acid (mg/100g)

Significantly maximum ascorbic acid of 20.67 mg/100g after transplanting was recorded at T RDF+ B@2kg/ha + Zn@2kg/ha followed by T RDF+ B@2kg/ha + Zn@1kg/ha of 19.90 mg/100g whereas minimum ascorbic acid of 16.67 mg/100g was recorded in T Control (Recommended).

Conclusion

It is concluded from trial that the effect of different levels of Zinc and Boron played their significant role on growth, yield and Quality of Cherry Tomato Treatment T (RDF+ B @ 2 kg/ha+ Zn @ 2 kg/ha) was found to be best in all aspects of parameter.

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