

## EFFECT OF ZINC AND BORON ON VEGETATIVE GROWTH AND FLOWERING CHARACTERS OF TOMATO CV. NAMDHARI-4266 UNDER PROTECTED CONDITIONS

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Received-05.09.2022, Revised-14.09.2022, Accepted-26.09.2022

**Abstract:** The experiment was carried at Agriculture Farm, School of Agricultural Sciences & Technology, RIMT University, Mandi Gobindgarh, Punjab, India 2021-22 in Rabi season. The experiment was conducted in Complete randomized design with three replications and Seven treatment combinations i.e. T<sub>1</sub> (control), T<sub>2</sub> (Zn@ 100ppm), T<sub>3</sub> (Zn @ 150ppm), T<sub>4</sub> (B @ 100ppm), T<sub>5</sub> (B @ 150ppm), T<sub>6</sub> ( Zn @100 + B @ 100ppm) and T<sub>7</sub> ( Zn @ 150 ppm + B @ 150ppm) under protected conditions. The Maximum plant height (155.00 cm), stem diameter (2.86 cm), Number of branches/plant (21.66 cm), leaf length (9.88 cm), leaf width (8.10 cm), days to first flowering (43.77) and number of flowers/plant (51.19) were recorded in treatment (T<sub>6</sub>) Zinc @ 100 ppm + Boron @ 100 ppm.

**Keywords:** Flowers, Growth, Boron, Tomato, Zinc

### INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is one of the most important vegetable crop grown in the world which belongs to the family Solanaceae with chromosome number (2n=24). It is a self-pollinated crop and a day-neutral plant. The center of origin of tomato is Peru-Equator region. Tomato is a perennial herbaceous plant which is cultivated in tropical subtropical and temperate climates in open field or under greenhouse in temperate climate. Tomatoes can be cultivated on loam and sandy loam soil with a pH range of 6.0-6.8 which is good for its growth and production. In India, production of tomato is next to potato which covered an average area of 852 thousand hectares along with total production 21003 thousand MT in 2020-2021. There are some states in India where tomato production is mainly seen which are Bihar, Karnataka, Uttar Pradesh, Orissa, Andhra Pradesh, Maharashtra, Madhya Pradesh, Assam and Chhattisgarh. In Punjab state, Amritsar, Ropar, Jalandhar, Hoshiarpur are main tomato growing districts having total area under tomato cultivation is 9.01 thousand ha with total production of 224.26 thousand MT. Micronutrients are required by the plant in very small amounts but play an important role in growth and life cycle of the plant. Boron is also associated with the cell differentiation and development of cell wall that helps in plant growth and development (Basavarajeshwari *et al.*, 2008). Zinc also helps in various metabolic process, its

deficiency inhibits growth and development of plants (Gitte *et al.* (2005).

### MATERIALS AND METHODS

The experiment was conducted at Agriculture Poly-House, School of Agricultural Sciences and Technology, RIMT University, Mandi Gobindgarh, Punjab. Mandi Gobindgarh is situated between 30° 56' 11.90''N latitude and 76°18' 13.18''E longitudes and an altitude of 268 meters above sea level. The average annual rainfall of Mandi Gobindgarh is 730.2 mm, about three-fourth of which is contributed by the south-west monsoon and experiment was conducted at under Completely Randomized Design (CRD) replicate thrice, during October–April (2021-2022). The variety Namdhari-4266 was used during the experiment. The crop was sown with spacing of 40x40 cm inside the polyhouse and six plants were selected randomly from each row for taking observations. The data on plant height (cm), Stem diameter, Number of branches/plant, Leaf length, Leaf width, Days to first flowering, Number of flower/plant, Number of clusters /plant were collected and analysed.

### RESULTS AND DISCUSSION

#### Plant height

The results revealed in Table .1 that maximum plant height (155.00 cm) were recorded in treatment Zinc @ 100 ppm + Boron @ 100 ppm and control produced minimum plant height (118.33 cm) The increase in plant height was due to role of zinc in the synthesis of auxin (IAA). Auxin plays an important role in apical dominance and inhibits the growth of

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lateral buds thus increases the plant height. Similar results was reported by Basavarajeshwari *et al.* (2008).

#### Stem diameter

Data in Table .1 revealed that maximum stem diameter (2.86 cm) were recorded in treatment Zinc @ 100 ppm + Boron @ 100 ppm while minimum stem diameter recorded in control (1.65 cm). The increase in stem diameter may be attributed to the fact that zinc is involved in the synthesis of tryptophan which is a precursor of auxin. Auxin plays an important role in apical dominance which allows the apical meristem to grow and inhibits the growth of stem diameter. Also boron is associated with the cell differentiation that helps in shoot growth resulting in increased stem diameter. Similar results was reported by Gitte *et al.* (2005).

#### Number of branches/plant

Data in Table .1 showed that maximum Number of branches/plant (21.66) were recorded in treatment Zinc @ 100 ppm + Boron @ 100 ppm while minimum Number of branches/plant recorded in control (14.22 ). Number of branches/plant increased by application of boron (Basavarajeswari *et al.*, 2008) and zinc (Kiran *et al.*,2010). Reports showed that higher photosynthetic activity largely depends on increased number and size of leaf resulting from more number of branches which might indirectly contribute to improving growth and yield of tomato. A similar result was reported by Khondakar *et al.*, 2017.

#### Leaf length:

The maximum leaf length (9.88 cm) were recorded in treatment Zinc @ 100 ppm + Boron @ 100 ppm while minimum leaf length (7.22 cm) in control showed in Table.2 . The fact that boron plays an important role in promoting root growth enhances nutrient absorption. Boron nutrition facilitates movement of sugars by forming a boron-sugar complex that helps in carbohydrate degradation which may have resulted in increasing leaf length. Decrease in leaf length, may be attributed to the fact that zinc leads to apical dominance as a result leaf length is suppressed. Similar findings were also reported by Patil *et al.*, (2004) and Ranjit *et al.*, (2013) in tomato.

#### Leaf width:

The maximum leaf width (8.10 cm) were recorded in treatment Zinc @ 100 ppm + Boron @ 100 ppm while minimum leaf width were recorded in control (5.77 cm) Table.2 . The fact that accumulation of photosynthates is positively related to application of boron and zinc (Thalooth *et al.* 2006).

#### Days to first flowering:

In Table.2 the minimum days to first flowering (43.77) were recorded in treatment Zinc @ 100 ppm + Boron @ 100 ppm while maximum days to first flowering were recorded in control (49.10). Similar results have been reported by Jyolsana and Usha (2008) and Patil (2010).

**Table 1.** Effect of Zinc and Boron on Plant height, Stem Diameter & Number of brances/plant in Tomato cv. Namdhari-4266.

Treatments	Plant Height cm			Stem diameter cm			Branches/plant		
	20 DAT	40 DAT	60 DAT	20 DAT	40 DAT	60 DAT	20 DAT	40 DAT	60 DAT
T1	46.33	115.33	118.33	1.19	1.43	1.65	6.41	11.22	14.22
T2	52.00	122.00	136.66	1.31	1.77	2.07	7.41	14.22	18.33
T3	54.00	124.00	139.33	1.33	1.82	2.22	8.19	15.66	19.00
T4	52.33	121.00	136.33	1.24	1.80	2.19	7.77	14.36	18.44
T5	53.66	119.66	136.00	1.28	1.83	2.24	8.33	15.11	19.30
T6	65.33	135.66	155.00	1.40	2.13	2.86	11.28	17.33	21.66
T7	61.00	129.33	150.00	1.35	2.02	2.52	10.55	17.00	20.33
C.D	11.04	9.80	13.08	0.12	0.25	0.49	0.87	1.50	1.60

**Table 2.** Effect of Zinc and Boron on Leaf length, Leaf width Days to 1<sup>st</sup> flowering & Number of Flowers/plant in Tomato cv. Namdhari-4266.

Treatments	Leaf length			Leaf width			Days to 1 <sup>st</sup> flowering	Flowers /plant
	20 DAT	40 DAT	60 DAT	20 DAT	40 DAT	60 DAT		
T1	3.04	4.97	7.22	1.43	3.82	5.77	49.10	43.10
T2	3.81	5.38	8.52	1.96	4.30	6.81	46.44	46.33
T3	4.08	5.48	8.59	2.07	4.63	7.15	47.70	48.26
T4	3.90	5.41	8.55	1.86	4.26	6.86	45.22	46.55
T5	4.23	5.47	8.66	2.11	4.69	7.01	47.19	48.19
T6	4.92	6.19	9.88	2.55	5.15	8.10	43.77	51.19
T7	4.66	6.02	9.28	2.31	4.97	7.77	44.26	49.10
C.D	0.51	0.65	0.92	0.41	0.38	0.53	2.15	2.29

**Number of flowers/ plant :**

In Table.2 the maximum number of flowers/plant (51.19) were recorded in treatment Zinc @ 100 ppm + Boron @ 100 ppm while minimum number of flowers/plant were recorded in control (43.10). It is well established that boron regulates water absorption and carbohydrate metabolism (Haque *et al.* 2011) and Zinc is important in production of biomass, thus there is enhanced photosynthesis and accumulation of carbohydrates that aids in flowering . similar result were recorded by (Smit *et al.* 2005).

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