SHORT COMMUNICATION

IMPACT OF MICRO NUTRIENTS ON FLOWERING, FRUITING AND YIELD ATTRIBUTES OF TOMATO CV. HEEMSOHNA UNDER PROTECTED CONDITION

Babar Hussain, Kulveer Singh Yadav and Muneeb-Ul Rehman

School of Agricultural Sciences and Technology
RIMT University, Mandi Gobindghar, Punjab, India
Email: babarlone786@gmail.com

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Abstract: The experiment was carried at Agriculture Farm, School of Agricultural Sciences & Technology, RIMT University, Mandi Gobindgarh, Punjab, India. This investigation was done to study the effect of $ZnSO_4$ and B on growth, fruiting and yield parameters of tomato under protected structure during 2020-21. The experimental material for the study comprised of three micronutrients with three concentrations (Zn 25, 50 & 75 ppm; B 25, 50, 75 ppm) and one control. The experiment was conducted in Randomized Block Design with three replications. The Tomato variety Heemsohna was used. All the required parameters were recorded and analyzed statistically.

Keywords: Micro nutrients, $ZnSO_4$, B, Tomato and Heemsohna

INTRODUCTION

Vegetables are non woody herbaceous plant or part of the plant eaten as food by humans in whole or in part. A balanced diet contains adequate energy source (carbohydrates), vitamins, minerals, fat, fibre and protein rich in essential amino acids. An estimated two billion people in the world suffer from deficiency of vitamins and minerals. Tomato (*Solanum lycopersicum*) is one of the most widely consumed fresh vegetables in the world both for fresh market and for the processing industries. India is second largest producer of vegetable crop after China (Kays and Dias, 2010). A tomato belongs to the solanaceae family and it is native to the Peru, Mexico and is cultivated all over the country due to wider adaptability to soil and climate. It is a diploid species with 2n=24 chromosomes.. It is one of the most popular salad vegetables and is taken with great relish. It is widely employed in cannery and made into soups, conserves, pickles, ketchup, sauces, juices etc (Swetha *et al*., 2018). In India, at present the total area under vegetable is 10353 Tha with the production of 191769 TMT among them area under tomato cultivation is 812 Tha with production of 20573 TMT in 2019-20. In India, at present the total area under tomato cultivation is 799 Tha and production is 19542 TMT. The leading states for tomato production in India are Madhya Pradesh, Andhra Pradesh, Karnataka, Telangana, Gujarat, Orissa, West Bengal, Bihar, Maharashtra and Chhattisgarh (Anonymous, 2020). The nutrient elements which are required comparatively in small quantities are called as micro or minor nutrients or trace elements. Micronutrients are essentially as important as macronutrients to have better growth, yield and quality in plants (Yadav *et al*., 2018). The requirement of micronutrients (boron, iron, copper, zinc, manganese, chloride and molybdenum) is only in traces, which is partly met from the soil through chemical fertilizer or through other sources. Micronutrients improve the chemical composition and general condition of vegetable crops and are known to acts as catalyst in promoting various organic reactions in plants (Karthick *et al*., 2018). Boron involves in metabolism and transport of carbohydrates, nucleic acid synthesis, root elongation, photosynthetic activities and water absorption in plant parts. Boron increases the stability of plant cells and is involved in the reproductive phase of plants (Islam *et al*., 2018). Zinc is also a constituent of ribosomes and is essential for their structural integrity. It promotes starch formation, seed maturation, production, enhances seed viability and seedling vigor. Zinc is helpful in reproduction of certain plants and various enzymatic activities. It also plays a vital role in sulphur and nitrogen metabolism. Its deficiency causes interveinal chlorosis of older leaves then leaves turn grey-white and fall prematurely or die. Stunted growth, distortion in shape and clustering of leaves on short branches known as rosette. The crops like tomato, potato, beans and onion are highly sensitive to Zn deficiency (Pandav *et al*., 2016).

MATERIALS AND METHODS

This chapter deals with the concise description of the materials used and the techniques applied during the course investigation. The present research entitled "Effect of micro nutrients on growth, fruit and yield parameters of tomato cv. Heemsohna under protected condition" was conducted during December–March (2020-21) under completely

*Corresponding Author

Randomized Block Design (RBD) and replicate thrice. The experimental material for the study comprised of ZnSO4 and B with three concentrations each (25, 50 and 75 ppm) and one control. The experiment was conducted in Randomized Block Design with three replication and subjected to statistical analysis for further investigations.

RESULTS AND DISCUSSION

The data on growth, flowering and yield parameters are presented in table 1. Maximum number of flowers /plant (31.11) was recorded with the application of B @ 25 ppm and it was minimum (23.33) in ZnSO4 @ 25 ppm. The maximum number of flowers might be due to enhancement in the translocation of carbohydrates from the site of synthesis to the storage tissue in the tomato plant (Tamilselvi *et al*., 2005). Possible reason of more number of flowers is may be enhanced photosynthesis activity and increased production and accumulation of carbohydrates and favorable effect on vegetative growth and retention of flowers, which increased number of flowers per plant besides increasing the size (Mishra *et al*., 2012). B @ 75 ppm resulted more number of flowers/cluster (6.00) while, ZnSO4 @ 25 ppm resulted less number of flowers/cluster (4.00) The probable cause for it might be that the supply of borax led to absorption of water, synthesis and translocation of more metabolites, which resulted in increased number of flower cluster (Kiran *et al*., 2010). Highest number of cluster/plant (9.00) was resulted by B @ 25 ppm whereas, lowest number of cluster/plant (7.22) recorded with control. This might be due to the prevalence of micro climate with better environmental conditions with optimum temperature would helped in the better pollination and ultimately leads to more cluster set as revealed by Cheema *et al*. (2013). Micronutrients application may be attributed to enhanced photosynthesis activity and increased production and accumulation of carbohydrates and favorable effect on vegetative growth and retention of flowers and fruits, which increased number of cluster per plant besides increasing the size (Singh and Tiwari, 2013) B @ 75 ppm recorded for lesser number of days to flowering (59.11) whereas, control took long duration for flowering (69.89 days). The earliness to flowering might be due to the better spray of micronutrients to the aerial parts in tomato (Prativa and Bhattarai, 2011). Earliness in flowering might be because of better absorption of the nutrients which involved in the metabolic activity and also activated the hormone which influence the earliness in these treatments (Bhatt *et al*., 2006). The findings are also supported by Patil *et al*. (2008). ZnSO4 @ 75 ppm resulted maximum number of fruits/cluster (4.94) and number of fruit/plant (42.20) whereas, control recorded for minimum number of fruits/cluster (3.97) and number of fruit/plant (28.97). The present findings are accordance with the findings of Cheema *et al*. (2013). B @ 25 ppm recorded for lesser days to fruiting (86.78) and ZnSO4 @ 25 ppm taken highest days to fruiting (90.33). Earliness in flowering might be because of better absorption of the nutrients which involved in the metabolic activity and also activated the hormone which influence the earliness in these treatments (Naz *et al*., 2012 and Ali *et al*., 2013). Early fruiting in tomato and brinjal might be due to the increase in growth and flower attributes which in turns and leads to increase photosynthesis and dry matter production. Minimum number of fruits and yield in control might be due to non-availability of micronutrients during its development stage (Sugeet *et al*., 2011 and Singh and Tiwari, 2013). Highest average fruit weight (63.10 g), fruit yield/plant (2.65 kg), fruit yield/plot (16.42 kg) and fruit yield/ha (47.33 t) while, lowest average fruit weight (52.60 g), fruit yield/plant (1.52 kg), fruit yield/plot (8.53 kg) and fruit yield/ha (27.22 t). The improvement in this character may be because of better absorption of micronutrient which ultimately increase the accumulation of carbohydrate in the fruits and provide better environment for growth and developmental processes, thus, better results were obtained due to the availability of favourable conditions in these treatments (Rafique *et al*., 2004 and Bhatt *et al*., 2006). This may be attributed to greater photosynthetic activity, resulting the increased production and accumulation of carbohydrates and favourable effect on vegetative growth and increased number and weight of fruits (Sukanta *et al*., 2004). The possible reason is the shading net resulted in higher rate of photosynthesis, which might reflect on higher fruit weight in tomato (Choudhury and Bhuyan, 1992). The increase in yield per plant, is might be due to the increase in growth and flower attributes which in turns and lead to increase photosynthesis and dry matter production in tomato and brinjal (Rodge and Yadlod, 2009). This improvement in growth, and yield might be due to the availability of essential nutrients (Ca, Fe, B and Zn), and easiness of absorbing them via leaves that fulfill the optimal nutritive requirements of tomato plants (Patnaik *et al*., 2001).

Table 1. Impact of micro nutrients on flowering, fruiting and yield attributes of tomato.

S.N.	Treatments	Number of flowers /plant	Number of flowers /cluster	Number of cluster /plant	Days to flowering	Number of fruits /cluster	Number of fruit /plant	Days to fruiting	Average fruit weight (g)	Fruit yield /plant (kg)	Fruit yield /plot (kg)	Fruit yield /ha (t)
1.	Control	27.44	4.44	7.22	69.89	3.97	28.97	97.44	52.60	1.52	8.53	27.22
2.	ZnSO4 @ 25 ppm	23.33	4.00	7.89	63.11	4.33	34.32	90.33	56.33	1.93	11.88	34.54
3.	ZnSO4 @ 50 ppm	27.56	5.22	8.90	63.26	4.11	36.58	88.67	59.40	2.19	13.31	39.15
4.	ZnSO4 @ 75 ppm	31.11	5.89	8.53	58.32	4.94	42.20	88.33	63.10	2.65	16.42	47.33
5.	B @ 25 ppm	31.18	5.45	9.00	64.00	3.98	35.74	86.78	56.43	2.02	13.22	36.02
6.	B @ 50 ppm	29.33	5.44	7.83	63.00	4.89	38.05	89.04	59.20	2.25	13.88	40.25
7.	B @ 75 ppm	30.33	6.00	8.78	59.11	4.67	41.04	87.44	60.93	2.49	15.11	44.54
	SEM±	**0.88**	**0.35**	**0.39**	**1.40**	**0.22**	**2.40**	**1.61**	**2.23**	**0.23**	**1.05**	**2.95**
	C.D At 5%	**2.72**	**1.09**	**1.22**	**4.30**	**0.71**	**7.41**	**4.94**	**6.87**	**0.51**	**3.30**	**9.11**

CONCLUSION

It is that that application of micronutrients significantly increased growth, flowering, fruiting and yield of Tomato. It was found that effect of Zinc was the most effective at treatment T_4 (Zinc @ 75 ppm) maximum flowering, fruiting and yield was reported in same treatment.

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