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Effect of micronutrients on quality of fruit and seed in tomato, *Solanum lycopersicum* L

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ABSTRACT

A study was conducted to assess the effects of micronutrients viz boron, zinc, molybdenum, copper, iron, manganese, mixture of all and multiplex through foliar application on quality of fruit and seed in tomato. Three sprays of each at 100 ppm were applied at 10 days interval starting from 30 days after transplanting. Germination percentage, seedling length, speed of germination, vitamin C, total soluble solids and lycopene content showed significant variations. Foliar application of boron was found to be the best treatment for enhancing germination percentage whereas multiplex treatment was best for increasing seedling length. Total soluble solids, vitamin C and lycopene content in the fruit were enhanced by the application of copper, zinc and multiplex respectively.

Keywords: Foliar sprays, micronutrients, fruit quality, seed quality

INTRODUCTION

Tomato is one of the important vegetable crops grown all over the world. It is grown during summer months in Himachal Pradesh from April to September. Average fruit and seed yield per unit area under tomato in India is comparatively low as compared to other countries which can be enhanced by judicious use of macro and micronutrients, irrigation scheduling, application of hormones and control of weeds etc. Amongst these role of micronutrients seems to be one of the factors that may enhance fruit and seed yield. Though micronutrients are required in small quantities yet they play a significant role in modifying various physiological functions of the plant. They act as stimulants and catalysts in many metabolic processes of the plants. Some of them act as enzyme formers and are needed in small quantities. The micronutrients iron, copper, zinc, boron, molybdenum and manganese were tested under the present study.

MATERIAL AND METHODS

The present investigations were carried out at the vegetable research farm of the Department of Vegetable Science, Dr Y S Parmar University of Horticulture

and Forestry, Nauni, Solan in summer 2004. The experimental farm is located at an elevation of 1260 m above mean sea level which falls under mid hill zone of Himachal Pradesh.

The climate of Nauni is generally sub temperate to sub-tropical. Annual rainfall ranges from 1000-1300 mm of which 75 per cent occurs during June to September. The trial was laid out in Randomized Block Design with three replications. The treatments were as follows: boron, zinc, molybdenum, copper, iron, manganese, mixture of all (B+Zn+Mo+Cu+Fe+Mn) and commercially available product multiplex (S+Mg+Ca+Fe+Mn+Zn+ Cu+B+Mo). Three foliar applications of micronutrients were applied at the concentration of 100 ppm starting from 30 days after transplanting and repeated at 10 days interval. Nitrogen, phosphorus and potassium were applied at the rate of 100, 75 and 55 kg/ha to all treatments. Half dose of nitrogen and full dose of phosphorus and potassium were applied after first and second earthing up. One month old seedlings of tomato cv Solan Vajr were transplanted in summer 2004. Size of plot was 2.7 x 2.0 m. Observations were taken on ten randomly selected plants. Fully mature fruits were harvested and seeds were extracted from them. Observations were recorded on fruit quality characters like total soluble solids, ascorbic acid content and lycopene and seed characters like seed germination percentage, seedling length and speed of germination.

RESULTS AND DISCUSSION

Significant effects of micronutrients were observed on seed germination percentage (Table 1) and the germination percentage ranged from 61 to 95 per cent. Maximum germination percentage was obtained with the application of boron (95%) followed by iron (92%) and manganese (88%). Highest germination percentage by the application of boron was also reported by Sharma (1995) in tomato.

Maximum seedling length was obtained with the application of multiplex (15.75 cm) which could be due to the reason that it contained micronutrients in balanced form that might have improved the growth.

The application of micronutrients had significant influence on speed of germination. Maximum speed of germination was observed in manganese (16.36). Next best treatment was that of iron (15.44). Speed of germination of boron and zinc were 12.91 and 12.43 respectively as compared to 12.38 in control.

Variation in total soluble solids was significant. Maximum total soluble solids (4.52^0B) were observed with the treatment of copper. The possible reason for this may

Table 1. Effect of micronutrients application on quality of fruit and seed in tomato

Treatments	Seed germination percentage (%)	Seedling length (cm)	Speed of germination	Total soluble solids (^{0}B)	Ascorbic acid (mg/100 g)	Lycopene (mg/ 100 g)
Control	80	12.80	12.38	3.55	18.46	3.84
Plain water	82	13.64	13.66	3.31	19.72	3.80
Boron (100 ppm)	95	14.68	12.91	4.39	23.85	3.63
Zinc (100 ppm)	76	12.55	12.43	4.25	25.27	3.39
Molybdenum (100 ppm)	68	13.00	11.00	3.77	20.27	4.90
Copper (100 ppm)	61	14.20	11.68	4.52	24.43	4.49
Iron (100 ppm)	92	14.82	15.44	3.48	18.31	4.62
Manganese (100 ppm)	88	15.17	16.36	4.46	23.50	3.48
Mixture of All (100 ppm)	77	14.50	10.52	4.11	20.48	4.85
Multiplex(100 ppm)	84	15.75	10.65	3.93	21.29	4.93
SE	6.05	0.73	0.34	0.20	0.08	0.53
$CD_{0.05}$	12.70	1.50	0.71	0.42	0.17	1.11

be increase in dry matter content which turned into total solids. This is supported by the findings of Shcherbakov and Fedoseenko (1973) who have observed the similar results in tomato. Next best treatments were manganese (4.46^{0}B) and boron (4.39^{0}B).

Maximum increase in vitamin C content of tomato fruits (25.27 mg/100 g) was recorded with the application of zinc which accounted for an increase of 36.89 per cent as compared to 18.46 mg/100 g in control. These results are in conformity with those of Mallick and Muthukrishnan (1980) and Dube et al (2003). Next best treatment was of copper (24.43 mg/100 g) followed by boron (23.85 mg/100 g) and manganese (23.50 mg/100 g).

Significant results were shown by micronutrients on lycopene content. Highest lycopene content was observed in multiplex (4.93 mg/100 g) and results are in accordance with the findings of Gupta et al (2001). Next best treatment was of molybdenum (4.90 mg/100 g) followed by mixture of all (4.85 mg/100 g).

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