E-ISSN: 2663-1075
P-ISSN: 2663-1067
IJHFS 2019; 1(1): 10-12
Received: 10-11-2018
Accepted: 16-12-2018

Sant Kumar Namdev
Ph. D. Research Scholar, Department of Horticulture, Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, Madhya Pradesh, India

Kamlesh Ahirwar
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Krishi Vigyan Kendra Chhatarpur Madhya Pradesh, India

Rajiv Kumar Singh
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Krishi Vigyan Kendra Chhatarpur Madhya Pradesh, India

Uttam Kumar Tripathi
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Krishi Vigyan Kendra Chhatarpur Madhya Pradesh, India

Correspondence
Sant Kumar Namdev
Ph. D. Research Scholar, Department of Horticulture, Mahatma Gandhi Chitrakoot Gramodaya Vishwa Vidyalaya, Chitrakoot, Madhya Pradesh, India

Good parameters of tomato as influenced by micronutrients and some biofertilizers

Sant Kumar Namdev, Kamlesh Ahirwar, Rajiv Kumar Singh and Uttam Kumar Tripathi

Abstract
Maximum Vitamin ‘C’ content, total soluble solids shelf life of fruits and minimum cracking percentage was noticed under T_7 (mixture of all micronutrients) amongst treatments of micronutrients. Variations in vitamin ‘C’ content and cracking percentage were nonsignificant due to biofertilizers. However highest total soluble solids were noted for T_8 (Azotobacter @ 1 kg/ha as seedling treatment) whereas T_{10} (Azotobacter + Azospirillum @ 1 kg/ha each as seedling treatment) recorded the highest shelf life of fruits amongst treatments of biofertilizers. Treatments had no effect on fruit colour, fruit shape and stem end colour.

Keywords: Biofertilizers, micronutrients, quality parameters

Introduction
Tomato (*Lycopersicon esculentum* Mill.) is the important vegetable amongst the solanaceous group. It is said to be the native of tropical America. From where it was spread to other parts of the world in the 16^{th} century and become popular in India during last six decades. Tomato is liked by majority of people because of its high relishing mild acidic taste. It is rich in minerals, vitamins, proteins and iron content, besides being used as fresh vegetables. It is extensively used in making soups, ketchups, sauces, chutneys and pickles. As regard nutritive value of tomato fruit, it contains moisture (94.5 g), fat (0.01g), protein (1.0 g), carbohydrates (3.9g), phosphorus (0.02 g), iron (1.0 g), calorific value (21 Kcal), carotene (350 mg), vitamin-C (32 mg), thiamin (0.7 mg), niacin (0.04 mg), per 100 g of edible portion (National Horticulture Board Websites, Database, 2011-12). High yield is the ultimate goal in all crops with good qualities and tomato is no exception. Among the various yield increasing factor i.e. variety, time of planting, use of major and minor nutrients, the use of trace elements seems worthwhile to study in connection with tomato cultivation. The micronutrients play an important role as that of major nutrients for increasing production and quality of tomato. “Response of Micronutrients and Biofertilizers on Tomato (*Lycopersicon esculentum* Mill.) variety JT-99” was conducted in farmers field of Panagar, Jabalpur (M.P.). During rabi season 2008-09 and 2009-10.

Material and Method
Prior conducting the experiment the soil samples were collected randomly to know the present status of micronutrients of the experimental area. The experiment was laid out in randomized block design with eleven treatments including control. These treatments were in three replication in thirty three plots during 2008-09 and 2009-10.
The details of treatments are given below:

Table 1: Details of the treatments

S. No.	Symbol	Treatments
1.	T_0	Control
2.	T_1	Boric acid (B) @ 100 ppm as foliar spray
3.	T_2	Zinc sulphate (Zn) @ 100 ppm as foliar spray
4.	T_3	Ammonium molybdate (Mo) @ 50 ppm as foliar spray
5.	T_4	Copper sulphate (Cu) @ 100 ppm as foliar spray
6.	T_5	Ferrus sulphate (Fe) @ 100 ppm as foliar spray
7.	T_6	Manganese sulphate (Mn) @ 100 ppm as foliar spray
8.	T_7	Mixture of all
9.	T_8	Azotobacter @ 1 kg/ha as seedling treatment
10.	T_9	Azospirillum @ 1 kg/ha as seedling treatment
11.	T_{10}	Azotobacter + Azospirillum @ 1 kg/ha each as seedling treatment

Both biofertilizers applied as seedling root dipping before transplanting for 15 minute. Farm yard manure's was applied @ 200 quintal/ha before second harrowing while preparing the field. Nitrogen in the form of urea, phosphorus as single super phosphate and potash as murate of potash were applied @ 120 kg N_2, 60 kg P_2O_5 and 60 kg K_2O per hectare. Half of the nitrogen and full amount of the phosphorus and potash were given as basal dose at the time of planting, remaining half quantity of nitrogen in two split doses at 25 days and 50 days after transplanting were applied.100gm of biofertilizers dissolved in one liter of water and root was dipped for 15 minutes. The seedlings root were dipped before transplanting in both biofertilizer Azotobacter and Azospirillum separately as @ 1 kg/ha and in mixture of both biofertilizers (Azotobacter + Azospirillum) ½ parts of both biofertilizer were collected in separate open pan. Protective Sprays of insecticide and fungicide were given to keep the crop free from pest and diseases as and when required as under. At 15 day emidacloprid was applied to control sucking pest. And for late blight M-45 @1.5- 2gm/litre of water and chloropyriphos @1.5-2.00 ml/litre of water against for control of fruit borer. Spray of micronutrient was started from 30 days after transplanting and total three sprays were given at an interval of 10 days. In control no micronutrient and biofetilizers was applied. The observation on quality parameters viz. - stem end colour, fruit colour, fruit shape, Vitamin 'C' (Ascorbic acid), Total soluble solids (TSS) ^{o}Brix, Cracking (%) and Shelf-life of the fruits were recorded.

Result and Discussion

Remarkable changes were noticed in vitamin 'C' content due to micronutrients as compared to control. It was highest in T_7 (21.72 mg/100g) followed by T_3 (19.40 mg/100g). T_1 (19.26 mg/100g), T_2 (19.23 mg/100g) and T_6 (19.25 mg/100g) were found to be at par. Amongst the micronutrients copper exhibited the minimum (18.56 mg/100g) effect on vitamin 'C' content. Regarding the total soluble solids it was T_4 which recorded highest value (4.10 ^{0}Brix) followed by T_7 (3.24 ^{0}Brix), while T_1 showed the minimum effect on this parameter. Almost all treatments of micronutrients exhibited significantly less cracking as compared to control. The minimum cracking percentage was observed in T_1 (1.79%) followed by T_7 (1.94%) which was significantly less than noted under control (3.66%). A considerable increase was noted in shelf life of tomato due to application of micronutrients. Under control shelf life of fruits was noted 4.28 days which was significantly lower than all treatments of micronutrients. The maximum shelf life was noted under T_7 (7.46 days) followed by T_4 (6.41 days), T_6 (6.18 days) and T_3 (6.14 days). T_5 exhibited the minimum (5.36 days) effect on shelf life followed by T_2 (5.61 days) and T_1 (5.72 days).

Table 2: Effect of different treatments on quality parameters

Treatments		Quality parameters			
		Vitamin 'C' (mg/100 g)	Total Soluble Solids (^{0}Brix)	Cracking (%)	Shelf life (days)
T_0	Control	17.80	2.91	3.66	4.28
T_1	Boric acid (B) @ 100 ppm as foliar spray	19.26	3.09	1.79	5.72
T_2	Zinc sulphate (Zn) @ 100 ppm as foliar spray	19.23	3.15	2.46	5.61
T_3	Ammonium molybdate (Mo) @ 50 ppm as foliar spray	19.40	3.11	2.52	6.14
T_4	Copper sulphate (Cu) @ 100 ppm as foliar spray	18.56	4.10	2.31	6.41
T_5	Ferrus sulphate (Fe) @ 100 ppm as foliar spray	18.86	3.12	2.13	5.36
T_6	Manganese sulphate (Mn) @ 100 ppm as foliar spray	19.25	3.18	2.67	6.18
T_7	Mixture of all	21.72	3.24	1.94	7.46
T_8	Azotobacter @ 1 kg/ha as seedling treatment	20.61	3.31	2.20	6.41
T_9	Azospirillum @ 1 kg/ha as seedling treatment	20.60	3.11	2.25	6.26
T_{10}	Azotobacter + Azospirillum @ 1 kg/ha each as seedling treatment	20.57	3.28	2.25	6.65
	SEm±	0.07	0.03	0.04	0.05
	C.D. 5%	0.22	0.09	0.12	0.16

Results indicated that all the quality characters were with mixture of all micronutrients i.e. T_7. These improvements in quality parameters may be because boron improves the chemical composition of tomato fruits and increased the total soluble solids. The higher total soluble solids may be attributed to the role of copper in conversion of starch and polysaccharides in to sugar during the ripening process. Conversion of starch to sugar is aided by the enzymatic activities and it might be possible that copper act as catalyzing agent in these enzymatic reactions which might have hasten this reaction. The present findings confirms the earlier results reported by Kumaresan and Kalamani (2004) [4], Bhatt and Shrivastava (2005) [3], Alexander (2004) [1], Paithankar *et al.* (2004) [5], Barche *et al.* (2011) [2]. Fruit colour, fruit shape and stem end colour was not affected by different treatments of micronutrients it may be due to that the micronutrients could not change the genetic constitution of crop and variety.

It is obvious from the data presented in Table that all the treatments of biofertilizers influenced vitamin 'C' content of fruits significantly. However, amongst the treatments of biofertilizers the differences were nonsignificant. Regarding the total soluble solids it was T_8 which recorded highest total soluble solids (3.31 ^{0}Brix) followed by T_{10} (3.28 ^{0}Brix), while T_9 (3.11 ^{0}Brix) showed the minimum effect on this parameter. Cracking percentage reduced drastically due to biofertilizers as compared to control. However the magnitude of reduction in cracking percentage was almost equal in all the treatments of biofertilizers. Self-life of fruits increased from 4.28 days (control) to 6.65 days under T_{10} followed by T_8 (6.41days), while minimum increase was noted in T_9 (6.26 days).Increase in total soluble solids and ascorbic acid contents may be due to the enhanced nitrogen availability and utilization with the bioinoculant application. Subbiah (1990) also reported highest total soluble solids with Azospirillum followed by Azotobacter. Bhadoria *et al.* (2005) reported that the maximum ascorbic acid content, Total soluble solids and minimum percentage of fruit cracking were observed under the seedling treatment with Azotobacter culture. Prolonged self life due to biofertilizers application might be attributed to increased pericarp thickness. Sudhakar and Purushottam (2008) [6] also reported prolonged self-life with Azotobacter application.

References

1. Alexander M, Srikantha I, Yogesh Kumar M, Natesan S, Mithyantha MS. Effect of application of boron and calcium on yield and shelf life of tomato. IFA International Symposium on micronutrients. 23-25 February, New Delhi, India, 2004.
2. Barache S, Singh P, Mahasagar H, Singh D. Response of foliar application of micronutrient on tomato variety Rashmi. Indian J Hort. 2011; 68(2):278-279
3. Bhatt L, Shrivastava BK. Effect of foliar application of micronutrients on physical characteristics and quality attributes of tomato fruits. Indian J Agric. Sci. 2005; 75(9):591-592.
4. Kumarasen KR, Kalamani R. Effect of copper and iron on the yield and quality of tomato (var. PKM-1), IFA International symposium on micronutrients. 23-25 February, New Delhi, India, 2004.
5. Paithankar DH, Sadawarte KT, Mahorkar VK, Dipali Deo. Effect of foliar application of boron and DAP fertilization on quality of tomato. J soils crops. 2004; 14(1):46-49.
6. Sudhakar PS, Purushotham K. Studies on the effects of biofertilizers on growth, yield and quality of tomato, The Orissa J of Hort. 2008; 36(2):93-97.