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Effect of Micronutrients Spray on Flowering For Fruit Set and Yield Of Tomato, *(Lycopersicom esculentum* Mill.).

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ABSTRACT
A field experiment was conducted to find out the "Effect of micronutrients spray on flowering for fruit set and yield of tomato (Lycopersicom esculentum Mill.)" during 2012-13 and 2013-14 on tomato variety Pusa Rohini (DT – 39) at the vegetable research farm of the Department of Horticulture, Allahabad School of Agriculture, Sam Higgin Bottom University of Agriculture, Technology and Sciences, Allahabad. The results based on two years mean revealed that out of twenty seven different treatments, the combined application of Boron (100ppm) x Zn (100ppmm) x copper 100ppm resulted in early days taken to flower formation (56.11 and 54.73days), more number of flowers per plant, Number of flowers per inflorescences, Number of inflorescences per plant, Days taken to formation of fruit per plant, yield per plant and fruit yield q/ha, Followed by 100ppm Zn and Boron @ 100 ppm recording fruit yield differed significantly from the control as well as other treatments.
Key words: *Tomato, spray, micronutrients, flowering, fruit set & yields of Tomato.*

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INTRODUCTION

Tomato is one of the important vegetable crops grown all over the world. Average fruit and quality in crop plants greatly influence by both macro and micronutrients. Not only major nutrients, micronutrients also play a crucial role in seed production of tomato. Some micronutrients like Zinc, Iron, Manganese, Copper, Boron and Magnesium have an important role in the physiology of tomato crop and are required for plant activities such as aspiration, meristamatic development, chlorophyll formation, photosynthesis, gossypol, tannin and phenolic compounds development [1]. Tomato yield can be pushed up by the judicious use of recommended dose of major nutrients along with micronutrients. Boron, Copper, and zinc also play an important role in enhancing the production of tomato crop by providing resistance against certain diseases becomes imperative in cultivation of tomato crops for increasing the production. Applications of micronutrients using boron, zinc and copper have been reported in increasing seed yield in tomato. Vitamin C plays an important role in human health and it is found in fruits and vegetables in the form of ascorbic acid. Its main functions are in the prevention of scurvy and maintenance of skin and blood vessels [3]. The main objective of the paper is to study the effect of micronutrients *viz*., zinc, boron and copper application on flowering, fruit set for more yield of tomato fruit.

MATERIAL AND METHODS

The present investigations were carried out at the vegetable research farm of the Department of Horticulture, Allahabad School of Agriculture, Sam Higgin Bottom University of Agriculture, Technology and Sciences, Allahabad-211007 in winter seasons during the year 2012-13 and 2013-14 on tomato variety Pusa Rohini (DT – 39). Twenty seven micronutrient treatments consisting of i) Zinc ii) Boron iii) Copper each 0, 100 and 250 ppm and there in combination applied through foliar spray at two growth stages that is 10 and 20 days after transplanting. Boron as boric acid, Zinc as zinc sulphate, copper as copper sulphate was applied. The pH of the solution was adjusted to neutral before application. The trial was laid out in Random Block Design (RBD Factorial) with three replications. 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. Twenty five days old seedlings of tomato Pusa Rohini (DT – 39) were transplanted in both the years. Observations were taken on ten randomly selected plants. Fully mature fruits were harvested and seeds were extracted from them. The data on the flowering, fruit set and yield characters like Days taken to flowers formation (days), Number of flowers per plant, Number of flowers per inflorescences, Number of inflorescences per plant, Days taken to fruit formation per plant (days), yield per plant (kg), Yield (q/ha) as reported by Ali *et al.* [2]. The data was statistically analyzed following the methods as stated by Panse and Sukhatme [9] with analysis of variance at 5% level of significance.

RESULTS AND DISCUSSION

Results on days to flower formation as influenced by application of Boron, Zn and Copper are presented in Table-1 indicated that the application of Boron @ 250 ppm x Zn @ 250 ppm x Cu @ 100 ppm 69.13 days and application of Boron @ 250 ppm x Zn @ 250 ppm x Cu @ 250 ppm 67.13 days) delayed the flower formation followed by Boron @ 250 ppm x Zn @ 100 ppm x Cu @ 250 ppm 67.83 and application of Boron @ 250 ppm x Zn @ 250 ppm x Cu @ 100 ppm 67.13 days) whereas, control plants earliest flower formation in both the years.

Data on number of flower per plant as influenced by Boron, Zn and Copper are presented **in** Table-2 **t**he foliar application of Boron had significant effect on number of flower per plant in both the years. Boron @ 100 ppm x Zn @ 100 ppm x Cu @ 100 ppm produced highest number of flower per plant (125 and 122.40) followed by Boron @ 100 ppm Zn @ 0 ppm x Cu @ 100 ppm (106.40 and 104.73) and minimum number of flower per plant was recorded with control plants during 2012-13 and 2013-14, respectively.

Results presented in Table-3 indicated that number of flower per inflorescence significantly affected by Boron @ 100 ppm x Zn @ 100 ppm x Copper @ 100 ppm, concentration gave highest number of flower per inflorescence (6.67 and 6.20), followed by Boron @ 100 ppm x Zn @ 0 ppm x Copper @ 100 ppm, (6.27 and 5.40), respectively However, control plants noted minimum number of flower per inflorescence during both the year.

A significant variation was recorded among Boron concentration in both the years Table-4 observed highest number of inflorescences per plant by Boron @ 100 ppm x Zn @ 100 ppm x Copper @ 100 ppm, (47.80 and 44.73) followed by Boron @ 100 ppm x Zn @ 0 ppm x Copper @ 100 ppm (38.80 and 37.23) whereas control plants recorded minimum number of inflorescences per plant during 2012-13 and 2013-14, respectively.

Data on day's fruit formation as influenced by Boron x Zn x Cu have been set out in Table-5. Application of Zinc control found significant differences in fruit formation During both the years minimum days (65.13 and 63.77 days) required for fruit formation and maximum days (81.53 and 79.47 days) with application of Boron @ 250 ppm x Zn @ 250 ppm x Cu @ 250 ppm was recorded for fruit formation during 2012-13 and 2013-14, respectively.

The application of Boron, Copper, and Zn had significantly improved fruit yield per plant in both the years data presented in Table-6. Application of @ 100 ppm x Zn @ 100 ppm x Copper @ 100 ppm gave highest fruit yield per plant (3.04 and 2.98 kg) followed by (2.69 and 2.70) with application of Boron @ 100 ppm x Zn @ 0 ppm x Cu @ 100 ppm whereas, minimum fruit yield per plant was recorded with control plants during 2012-13 and 2013-14, respectively.

Observations recorded on yield per hectare as affected by Boron, Zn and Cu is presented in Table-7 that the fruit yield was significantly influenced by foliar application of copper in both the years. The maximum fruit yield (263.60 and 261.73 q/ha) was recorded with Boron @100 ppm x Zn @ 100 ppm x Cu @ 100 ppm followed by Boron @100 ppm x Zn @ 0 ppm x Cu @ 100 ppm (247.33 and 243.27 q/ha), while minimum fruit yield under control respectively.

Average Increased yield due to 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 the size. Similarly, the Mishra *et al.* [4], Patil *et al.* [6], Sivaiah *et al.* [8] and Sathya *et al.* [7], Ali *et al.* [2], Meena *et al.* [5] obtained higher yield and yield attributes with the application of micronutrient.

Table 1: Effect of Boron, Copper and Zinc on Days taken to flower initiation (days)

Treatments	2012-13				2013-14				Pooled			
Bo & Zn ppm ↓ / Cu ppm →	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean
B0 x Zn 0	53.87	57.00	59.33	56.73	51.87	55.00	58.93	55.27	52.87	56.00	59.13	56.00
B0 x Zn 100	59.13	56.07	60.13	58.44	57.13	54.07	58.13	56.44	58.13	55.07	59.13	57.44

B0 x Zn 250	58.87	61.73	59.33	59.98	56.67	59.53	57.23	57.81	57.77	60.63	58.28	58.89
Mean	57.29	58.27	59.60	58.39	55.22	56.20	58.10	56.51	56.26	57.23	58.85	57.45
B 100 x Zn 0	59.53	58.73	59.00	59.09	57.53	56.80	57.00	57.11	58.53	57.77	58.00	58.10
B 100 x Zn 100	64.50	58.37	61.87	61.58	62.40	56.40	58.53	59.11	63.45	57.38	60.20	60.34
B100 x Zn 250	58.03	54.27	52.03	54.78	56.27	52.80	50.33	53.13	57.15	53.53	51.18	53.96
Mean	60.69	57.12	57.63	58.48	58.73	55.33	55.29	56.45	59.71	56.23	56.46	57.47
B 250 x Zn 0	50.67	51.57	55.30	52.51	52.13	49.60	53.67	51.80	51.40	50.58	54.48	52.16
B 250 x Zn 100	52.50	61.03	67.83	60.46	50.33	59.07	65.80	58.40	51.42	60.05	66.82	59.43
B 250 x Zn 250	63.07	69.13	67.40	66.53	66.07	67.13	67.27	66.82	64.57	68.13	67.33	66.68
Mean	55.41	60.58	63.51	59.83	56.18	58.60	62.24	59.01	55.79	59.59	62.88	59.42
Over all mean	0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm	
B	58.39	58.48	59.83		56.51	56.45	59.01		57.45	57.47	59.42	
Zn	56.11	60.16	60.43		54.73	57.99	59.26		55.42	59.07	59.84	
Cu	57.80	58.66	60.25		56.71	56.71	58.54		57.25	57.68	59.40	
Factor	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test
Boron	0.717	1.015	NS	1.276	0.718	1.015	2.038	4.135	0.699	0.989	NS	2.63
Zinc	0.717	1.015	2.036	11.373	0.718	1.015	2.038	10.594	0.699	0.989	1.984	11.43
B x Zn	1.243	1.757	3.527	15.013	1.243	1.758	3.529	16.557	1.211	1.714	3.437	16.56
Copper	0.717	1.015	NS	3.010	0.718	1.015	NS	2.175	0.699	0.989	NS	2.63
B x Cu	1.243	1.757	3.527	5.582	1.243	1.758	3.529	3.884	1.211	1.714	3.437	4.85
Zn x Cu	1.243	1.757	NS	2.125	1.243	1.758	NS	1.892	1.211	1.714	NS	2.08
B x Zn x Cu	2.152	3.044	NS	1.225	2.154	3.046	NS	2.088	2.097	2.967	NS	1.70

Table 2: Effect of Boron, Copper and Zinc on Number of flower plant-1 (flowers)

Treatments	**2012-13**				**2013-14**				**Pooled**			
Bo & Zn ppm ↓ / Cu ppm →	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean
B0 x Zn 0	38.17	48.67	43.68	43.51	36.07	46.83	43.10	42.00	37.12	47.75	43.39	42.75
B0 x Zn 100	76.07	84.57	79.03	79.89	73.93	84.77	77.77	78.82	75.00	84.67	78.40	79.36
B0 x Zn 250	61.87	67.32	64.47	64.55	61.27	67.97	62.77	64.00	61.57	67.65	63.62	64.28
Mean	58.70	66.85	62.39	62.65	57.09	66.52	61.21	61.61	57.89	66.69	61.80	62.13
B 100 x Zn 0	74.40	106.40	85.18	88.66	73.33	104.73	85.00	87.69	73.87	105.57	85.09	88.18
B 100 x Zn 100	105.47	125.00	94.17	108.21	100.83	122.40	91.07	104.77	103.15	123.70	92.62	106.49
B100 x Zn 250	101.47	105.00	102.98	103.15	101.63	106.17	100.80	102.87	101.55	105.58	101.89	103.01
Mean	93.78	112.13	94.11	100.01	91.93	111.10	92.29	98.44	92.86	111.62	93.20	99.22
B 250 x Zn 0	65.83	113.13	65.10	81.36	62.15	109.60	62.57	78.10	63.99	111.37	63.83	79.73
B 250 x Zn 100	78.87	97.70	82.72	86.43	71.83	97.17	79.08	82.69	75.35	97.43	80.91	84.56
B 250 x Zn 250	51.44	61.03	55.73	56.07	49.23	60.17	53.47	54.29	50.34	60.60	54.60	55.18
Mean	65.38	90.62	67.85	74.62	61.07	88.98	65.04	71.70	63.23	89.80	66.45	73.16
Over all mean	0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm	
B	62.65	100.01	74.62		61.61	98.44	71.70		62.13	99.22	73.16	
Zn	71.17	91.51	74.59		69.26	88.76	73.72		70.22	90.14	74.15	
Cu	72.62	89.87	74.79		70.03	88.87	72.85		71.33	89.37	73.82	
Factor	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test
Boron	0.82	1.16	2.32	545.09	0.70	0.99	2.00	733.62	0.616	0.872	1.749	956.02
Zinc	0.82	1.16	2.32	177.61	0.70	0.99	2.00	211.34	0.616	0.872	1.749	293.13
B x Zn	1.42	2.00	4.02	86.21	1.22	1.72	3.46	118.21	1.067	1.510	3.029	152.56
Copper	0.82	1.16	2.32	132.24	0.70	0.99	2.00	209.03	0.616	0.872	1.749	251.86
B x Cu	1.42	2.00	4.02	13.91	1.22	1.72	3.46	20.54	1.067	1.510	3.029	25.53
Zn x Cu	1.42	2.00	4.02	22.59	1.22	1.72	3.46	24.85	1.067	1.510	3.029	35.66
B x Zn x Cu	2.45	3.47	6.96	8.80	2.11	2.98	5.98	11.36	1.848	2.615	5.246	15.08

Table 3: Effect of Boron, Copper and Zinc on number of flower inflorescences-1

Treatments	2012-13				2013-14				Pooled			
Bo & Zn ppm ↓ Cu ppm →	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean
B0 x Zn 0	4.87	6.00	5.60	5.49	4.27	4.73	4.43	4.48	4.57	5.37	5.02	4.98
B0 x Zn 100	5.50	6.53	5.33	5.79	4.60	4.93	4.73	4.76	5.05	5.73	5.03	5.27
B0 x Zn 250	5.47	6.00	5.87	5.78	4.07	4.33	3.87	4.09	4.77	5.17	4.87	4.93
Mean	5.28	6.18	5.60	5.69	4.31	4.67	4.34	4.44	4.79	5.42	4.97	5.06
B 100 x Zn 0	5.33	6.27	5.60	5.73	4.40	5.40	4.80	4.87	4.87	5.83	5.20	5.30
B 100 x Zn 100	5.80	6.67	5.73	6.07	5.20	6.20	5.27	5.56	5.50	6.43	5.50	5.81
B100 x Zn 250	5.13	5.67	5.33	5.38	4.33	4.80	4.53	4.56	4.73	5.23	4.93	4.97
Mean	5.42	6.20	5.56	5.73	4.64	5.47	4.87	4.99	5.03	5.83	5.21	5.36
B 250 x Zn 0	5.00	6.13	5.27	5.47	4.27	4.53	4.40	4.40	4.63	5.33	4.83	4.93
B 250 x Zn 100	5.33	6.27	5.53	5.71	4.73	5.73	4.53	5.00	5.03	6.00	5.03	5.36
B 250 x Zn 250	5.17	6.00	5.67	5.61	4.47	4.93	4.87	4.76	4.82	5.47	5.27	5.18
Mean	5.17	6.13	5.49	5.60	4.49	5.07	4.60	4.72	4.83	5.60	5.04	5.16
Over all mean	0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm	
B	5.69	5.73	5.60		4.44	4.99	4.72		5.06	5.36	5.16	
Zn	5.56	5.86	5.59		4.58	5.10	4.47		5.07	5.48	5.03	
Cu	5.29	6.17	5.55		4.48	5.07	4.60		4.89	5.62	5.08	
Factor	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test
Boron	0.079	0.112	NS	0.703	0.074	0.104	0.209	14.083	0.061	0.086	0.173	6.14
Zinc	0.079	0.112	0.224	4.196	0.074	0.104	0.209	21.325	0.061	0.086	0.173	16.61
B x Zn	0.137	0.194	NS	2.240	0.127	0.180	0.361	3.675	0.106	0.150	0.300	3.27
Copper	0.079	0.112	0.224	32.832	0.074	0.104	0.209	17.625	0.061	0.086	0.173	38.75
B x Cu	0.137	0.194	NS	0.200	0.127	0.180	NS	0.851	0.106	0.150	NS	0.25
Zn x Cu	0.137	0.194	NS	1.996	0.127	0.180	NS	1.288	0.106	0.150	NS	2.34
B x Zn x Cu	0.237	0.335	NS	0.352	0.221	0.312	NS	0.970	0.183	0.259	NS	0.25

Table 4: Effect of Boron, Copper and Zinc on number of inflorescences plant-1

Treatments	2012-13				2013-14				Pooled			
Bo & Zn ppm ↓ Cu ppm →	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean
B0 x Zn 0	18.73	22.67	20.40	20.60	15.33	19.50	17.00	17.28	17.03	21.08	18.70	18.94
B0 x Zn 100	24.93	35.87	26.67	29.16	22.20	29.23	22.67	24.70	23.57	32.55	24.67	26.93
B0 x Zn 250	22.60	26.83	23.33	24.26	21.60	25.80	21.33	22.91	22.10	26.32	22.33	23.58
Mean	22.09	28.46	23.47	24.67	19.71	24.84	20.33	21.63	20.90	26.65	21.90	23.15
B 100 x Zn 0	25.13	38.80	33.27	32.40	25.97	37.23	28.77	30.66	25.55	38.02	31.02	31.53
B 100 x Zn 100	39.13	47.80	43.13	43.36	36.23	44.73	34.83	38.60	37.68	46.27	38.98	40.98
B100 x Zn 250	28.40	37.13	29.67	31.73	21.93	31.60	24.33	25.96	25.17	34.37	27.00	28.84
Mean	30.89	41.24	35.36	35.83	28.04	37.86	29.31	31.74	29.47	39.55	32.33	33.78
B 250 x Zn 0	17.26	25.13	16.47	19.62	14.60	22.50	13.30	16.80	15.93	23.82	14.88	18.21
B 250 x Zn 100	17.53	33.70	23.33	24.86	15.47	30.50	20.17	22.04	16.50	32.10	21.75	23.45
B 250 x Zn 250	13.67	15.27	15.00	14.64	11.77	14.47	12.13	12.79	12.72	14.87	13.57	13.72
Mean	16.15	24.70	18.27	19.71	13.94	22.49	15.20	17.21	15.05	23.59	16.73	18.46
Over all mean	0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm	
B	24.67	35.83	19.71		21.63	31.74	17.21		23.15	33.78	18.46	
Zn	24.21	32.46	23.54		21.58	28.45	20.55		22.89	30.45	22.05	
Cu	23.04	31.47	25.70		20.57	28.40	21.61		21.81	29.93	23.66	
Factor	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test
Boron	0.346	0.490	0.983	568.036	0.434	0.614	1.233	294.034	0.299	0.423	0.847	691.71
Zinc	0.346	0.490	0.983	205.336	0.434	0.614	1.233	97.756	0.299	0.423	0.847	240.25
B x Zn	0.600	0.849	1.703	18.250	0.752	1.064	2.135	19.525	0.517	0.732	1.468	30.30
Copper	0.346	0.490	0.983	154.509	0.434	0.614	1.233	95.797	0.299	0.423	0.847	203.54
B x Cu	0.600	0.849	1.703	3.299	0.752	1.064	2.135	3.020	0.517	0.732	1.468	4.67
Zn x Cu	0.600	0.849	1.703	8.888	0.752	1.064	2.135	2.945	0.517	0.732	1.468	8.65
B x Zn x Cu	1.039	1.470	2.950	6.804	1.303	1.842	3.698	2.628	0.896	1.268	2.542	6.65

Table 5: Effect of Boron, Copper and Zinc on Days taken to fruit formation (days).

Treatments	2012-13				2013-14				Pooled			
Bo & Zn ppm ↓ / Cu ppm →	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean
B0 x Zn 0	65.13	69.00	72.93	69.02	63.77	66.83	71.00	67.20	64.45	67.92	71.97	68.11
B0 x Zn 100	70.80	68.10	72.07	70.32	68.83	66.10	70.00	68.31	69.82	67.10	71.03	69.32
B0 x Zn 250	68.27	73.37	71.17	70.93	66.23	71.27	69.07	68.86	67.25	72.32	70.12	69.89
Mean	68.07	70.16	72.06	70.09	66.28	68.07	70.02	68.12	67.17	69.11	71.04	69.11
B 100 x Zn 0	71.60	70.97	71.13	71.23	69.37	68.80	68.90	69.02	70.48	69.88	70.02	70.13
B 100 x Zn 100	72.67	70.33	69.17	70.72	74.20	68.47	70.50	71.06	73.43	69.40	69.83	70.89
B100 x Zn 250	70.33	66.97	64.70	67.33	68.37	64.73	62.13	65.08	69.35	65.85	63.42	66.21
Mean	71.53	69.42	68.33	69.76	70.64	67.33	67.18	68.39	71.09	68.38	67.76	69.07
B 250 x Zn 0	64.07	68.20	67.00	66.42	64.30	61.93	65.70	63.98	64.18	65.07	66.35	65.20
B 250 x Zn 100	65.53	68.40	79.77	71.23	59.07	71.10	77.70	69.29	62.30	69.75	78.73	70.26
B 250 x Zn 250	80.33	81.20	81.53	81.02	78.27	79.20	79.47	78.98	79.30	80.20	80.50	80.00
Mean	69.98	72.60	76.10	72.89	67.21	70.74	74.29	70.75	68.59	71.67	75.19	71.82
Over all mean	0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm	
B	70.09	69.76	72.89		68.12	68.39	70.75		69.11	69.07	71.82	
Zn	68.89	70.76	73.10		66.73	69.55	70.97		67.81	70.16	72.03	
Cu	69.86	70.73	72.16		68.04	68.71	70.50		68.95	69.72	71.33	
Factor	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test
Boron	0.857	1.212	2.433	4.029	0.802	1.135	2.277	3.248	0.773	1.094	2.195	4.16
Zinc	0.857	1.212	2.433	6.043	0.802	1.135	2.277	7.225	0.773	1.094	2.195	7.48
B x Zn	1.484	2.099	4.213	10.775	1.390	1.965	3.944	13.942	1.340	1.896	3.802	14.02
Copper	0.857	1.212	NS	1.846	0.802	1.135	NS	2.493	0.773	1.094	NS	2.47
B x Cu	1.484	2.099	4.213	2.722	1.390	1.965	3.944	3.897	1.340	1.896	3.802	3.72
Zn x Cu	1.484	2.099	NS	1.362	1.390	1.965	NS	1.588	1.340	1.896	NS	1.52
B x Zn x Cu	2.571	3.636	NS	1.232	2.407	3.404	6.832	2.468	2.320	3.283	NS	1.77

Table 6: Effect of Boron, Copper and Zinc on Weight of fruit per plant (Kg)

Treatments	2012-13				2013-14				Pooled			
Bo & Zn ppm ↓ / Cu ppm →	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean
B0 x Zn 0	1.52	2.52	1.70	1.91	1.50	2.43	1.77	1.90	1.51	2.48	1.74	1.91
B0 x Zn 100	2.11	2.75	2.35	2.40	2.10	2.60	2.22	2.31	2.11	2.67	2.29	2.36
B0 x Zn 250	1.77	2.31	2.11	2.06	1.74	2.31	2.05	2.04	1.76	2.32	2.09	2.05
Mean	1.80	2.53	2.06	2.13	1.78	2.44	2.01	2.08	1.79	2.49	2.04	2.11
B 100 x Zn 0	1.98	2.69	2.08	2.25	1.89	2.70	2.07	2.22	1.94	2.69	2.08	2.24
B 100 x Zn 100	2.66	3.04	2.56	2.75	2.65	2.98	2.44	2.69	2.66	3.01	2.50	2.72
B100 x Zn 250	2.26	2.54	2.28	2.36	2.17	2.51	2.18	2.29	2.21	2.53	2.23	2.33
Mean	2.30	2.76	2.31	2.45	2.24	2.73	2.23	2.40	2.27	2.74	2.27	2.43
B 250 x Zn 0	1.63	2.63	1.98	2.08	1.57	2.45	1.92	1.98	1.60	2.54	1.95	2.03
B 250 x Zn 100	2.16	2.63	2.19	2.33	2.05	2.44	2.02	2.17	2.11	2.54	2.11	2.25
B 250 x Zn 250	1.95	2.45	2.18	2.19	1.91	2.34	2.12	2.12	1.93	2.40	2.15	2.16
Mean	1.91	2.57	2.12	2.20	1.84	2.41	2.02	2.09	1.88	2.49	2.07	2.15
Over all mean	0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm	
B	2.13	2.45	2.20		2.08	2.40	2.09		2.11	2.43	2.15	
Zn	2.08	2.49	2.21		2.03	2.39	2.15		2.06	2.44	2.18	
Cu	2.00	2.62	2.16		1.95	2.53	2.09		1.98	2.58	2.13	

Factor	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test
Boron	0.026	0.036	0.073	44.721	0.021	0.030	0.060	72.274	0.018	0.025	0.050	97.19
Zinc	0.026	0.036	0.073	67.725	0.021	0.030	0.060	73.425	0.018	0.025	0.050	122.62
B x Zn	0.044	0.063	0.126	3.399	0.037	0.052	0.104	6.637	0.031	0.044	0.087	8.06
Copper	0.026	0.036	0.073	154.204	0.021	0.030	0.060	199.995	0.018	0.025	0.050	303.39
B x Cu	0.044	0.063	0.126	3.210	0.037	0.052	0.104	3.144	0.031	0.044	0.087	5.20
Zn x Cu	0.044	0.063	0.126	10.326	0.037	0.052	0.104	14.974	0.031	0.044	0.087	20.88
B x Zn x Cu	0.077	0.109	NS	0.620	0.064	0.090	NS	0.350	0.053	0.075	NS	0.79

Table 7: Effect of Boron, Copper and Zinc on Yield hectare-1 (q)

Treatments	2012-13				2013-14				Pooled			
Bo & Zn ppm / Cu ppm	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean	Cu 0	Cu 100	Cu 250	Mean
B0 x Zn 0	143.63	236.07	172.10	183.93	141.20	232.00	169.37	180.86	142.42	234.03	170.73	182.39
B0 x Zn 100	198.60	250.67	201.60	216.96	193.83	247.77	198.73	213.44	196.22	249.22	200.17	215.20
B0 x Zn 250	171.67	221.30	197.40	196.79	169.57	218.93	196.00	194.83	170.62	220.12	196.70	195.81
Mean	171.30	236.01	190.37	199.23	168.20	232.90	188.03	196.38	169.75	234.46	189.20	197.80
B 100 x Zn 0	182.73	247.33	185.03	205.03	179.67	243.27	181.63	201.52	181.20	245.30	183.33	203.28
B 100 x Zn 100	235.43	263.60	244.30	247.78	233.67	261.73	241.70	245.70	234.55	262.67	243.00	246.74
B100 x Zn 250	211.10	232.13	213.07	218.77	207.63	230.50	210.70	216.28	209.37	231.32	211.88	217.52
Mean	209.76	247.69	214.13	223.86	206.99	245.17	211.34	221.17	208.37	246.43	212.74	222.51
B 250 x Zn 0	153.87	243.40	181.97	193.08	151.30	241.13	177.10	189.84	152.58	242.27	179.53	191.46
B 250 x Zn 100	212.07	263.17	236.00	237.08	208.83	258.30	233.67	233.60	210.45	260.73	234.83	235.34
B 250 x Zn 250	178.97	231.30	206.97	205.74	176.50	228.23	203.87	202.87	177.73	229.77	205.42	204.31
Mean	181.63	245.96	208.31	211.97	178.88	242.56	204.88	208.77	180.26	244.26	206.59	210.37
Over all mean	0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm		0 ppm	100 ppm	250 ppm	
B	199.23	223.86	211.97		196.38	221.17	208.77		197.80	222.51	210.37	
Zn	194.01	233.94	207.10		190.74	230.91	204.66		192.38	232.43	205.88	
Cu	187.56	243.22	204.27		184.69	240.21	201.42		186.13	241.71	202.84	
Factor	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test	SE(m)	SE(d)	C.D. at 5%	F test
Boron	0.627	0.887	1.779	386.165	0.733	1.037	2.080	285.940	0.633	0.896	1.796	381.55
Zinc	0.627	0.887	1.779	1053.977	0.733	1.037	2.080	774.672	0.633	0.896	1.796	1037.38
B x Zn	1.086	1.536	3.082	10.057	1.269	1.795	3.603	9.136	1.096	1.551	3.110	10.95
Copper	0.627	0.887	1.779	2075.363	0.733	1.037	2.080	1509.891	0.633	0.896	1.796	2032.42
B x Cu	1.086	1.536	3.082	56.819	1.269	1.795	3.603	39.474	1.096	1.551	3.110	54.31
Zn x Cu	1.086	1.536	3.082	139.648	1.269	1.795	3.603	100.138	1.096	1.551	3.110	135.69
B x Zn x Cu	1.881	2.660	5.338	7.303	2.199	3.110	6.241	5.263	1.898	2.686	5.387	7.05

CONCLUSION

From the above discussion, it may be concluded that combination of Boron, Copper sulphate and Zinc sulphate with recommended dose of NPK. Earliness days taken to flower formation Boron @ 250 ppm x Zn @ 250 ppm x Cu @ 100 ppm and produced highest number of flower per plant highest number of inflorescences per plant, Earliness days taken to fruit formation, highest number of flower per inflorescence, Yield per plant with spray Boron x Zn x Cu @ 100 ppm may be suggested for flower, fruit set and better yield of Tomato.

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