

Full Length Research Paper

Effect of micronutrients foliar application on seed yield in tomato (*Lycopersicon esculentum* mill)

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A field experiment was conducted during *spring* of 2010 to find out the response of foliar application of micronutrients on vegetative and reproductive growth attributes, in two varieties of tomato viz- Utkal Kumari and Utkal Raja. The treatments consisted of boron, zinc, molybdenum, copper, iron, manganese, mixture of all and control and the experiment was laid out in RBD with three replications. All the Micronutrients except manganese (at 50ppm) were applied at 100ppm in three sprays at an interval of ten days starting from 30 days after transplanting. All the treatments resulted in improvement of seed yield characteristics viz. recovery percentage, 100 seed weight, seed yield per plant and seed yield per hectare in both the varieties out of which application of micronutrients mixture showed the maximum effect. Highest seed recovery rates of 0.53 and 0.55 percent recorded in the varieties Utkal Kumari and Utkal Raja, respectively by application of micronutrients mixture. The highest seed weight was observed with application of micro-nutrients mixture (Utkal Raja) and boron (Utkal Kumari). In both varieties, application of micronutrients mixture reached the maximum seed yield followed by boron treatment; in respect both the parameters, while the lowest yield was obtained in the control.

Key words: Tomato, Micronutrients, Foliar application, Seed yield, Seed variety.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill, 2n=24), a popular solanaceous vegetable crop, is cultivated throughout the world. It occupies prime place amongst the processed vegetables. The tomato is one of the important *spring* / summer vegetable crops, being grown widely throughout the country. The crop is quite remunerative and farmers are getting rich dividends by its cultivation. Although the fruit yields are very high in this vegetable crop, seed yield per unit area is very low (Sharma *et al.*, 1983). Also non-availability of adequate quantities of quality seed is an important constraint for its limited cultivation in India. Seed yield 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 (Anon., 1995). 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, meristematic development, chlorophyll formation, photosynthesis, gossypol, tannin and phenolic compounds development (Anon., 1995). For harnessing the higher yield potential, supplementation of micronutrients is essential. Applications of micronutrients using zinc and boron have been reported in increasing seed yield in tomato. However no information is available as regards to the effect of other micro-nutrients on seed yield and yield components of tomato. The main objective of the paper is to study the effect of different micro nutrients viz., zinc, boron, molybdenum, copper, iron and manganese and its application on tomato seed yield and yield contributing parameters.

MATERIAL AND METHODS

A field experiment was conducted during *spring*, 2010 to find out the response of foliar application of micronutri-

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Table 1. Effect of foliar application of micronutrients on seed yield characteristics of tomato.

Treatments	cv. <i>Utkalkumari</i>				cv. <i>Utkal Raja</i>				
	Seed recovery (%)	100 (fresh) weight (g)	Seed weight	Fresh Seed yield/plant (g)	Seed yield/ha (kg)	Seed recovery (%)	100 Seed weight(g)	Seed yield/plant (g)	Seed yield/ha (kg)
Control	0.39	0.309		5.21	105.30	0.44	0.328	6.60	127.16
B	0.50	0.356		8.75	174.50	0.54	0.383	9.50	193.32
Zn	0.48	0.336		7.82	156.00	0.52	0.388	8.76	169.00
Mo	0.46	0.314		7.22	135.23	0.50	0.359	8.03	155.00
Cu	0.43	0.324		6.06	121.23	0.46	0.331	7.16	137.76
Fe	0.40	0.305		5.61	112.00	0.47	0.327	6.69	128.72
Mn	0.42	0.321		6.37	127.26	0.49	0.333	7.57	146.02
Mixture	0.53	0.352		9.57	181.05	0.55	0.394	10.91	205.70
SEM(±)	0.0075	0.0038		0.147	3.87	0.0056	0.0041	0.118	3.19
C.D (0.05)	0.0023	0.013		0.448	11.754	0.017	0.014	0.358	9.702
C.V (%)	2.93	1.73		3.61	4.83	1.93	1.66	2.51	3.51

ients on reproductive growth parameters, in two varieties of tomato viz- UtkalKumari and Utkal Raja at Vegetable Research Station, Orissa University of Agriculture and Technology, Bhubaneswar. The treatments consisted of boron, zinc, molybdenum, copper, iron, manganese, mixture of all and control and the experiment was laid in RBD with three replications. 30 days old seedlings of each variety were transplanted in a four-row plot of 7.0 m² area (2.8 m x 2.5 m) with a spacing of 70 cm x 50 cm. The soil was well drained loamy and fertilizers were applied at 110kg N, 60kg P₂O₅ and 80 kg K₂O per hectare.

Micronutrients Application

There were eight treatments involving six micronutrients (Zn, Mo, B, Cu, Mn and Fe), applied through foliar spray individually or in the full combination along with a control at 100 ppm each except Mn (at 50 ppm). All the micronutrients were applied as foliar spray starting from 30 days after transplanting. A total of three sprays were given at an interval of 10 days.

Observations Recorded

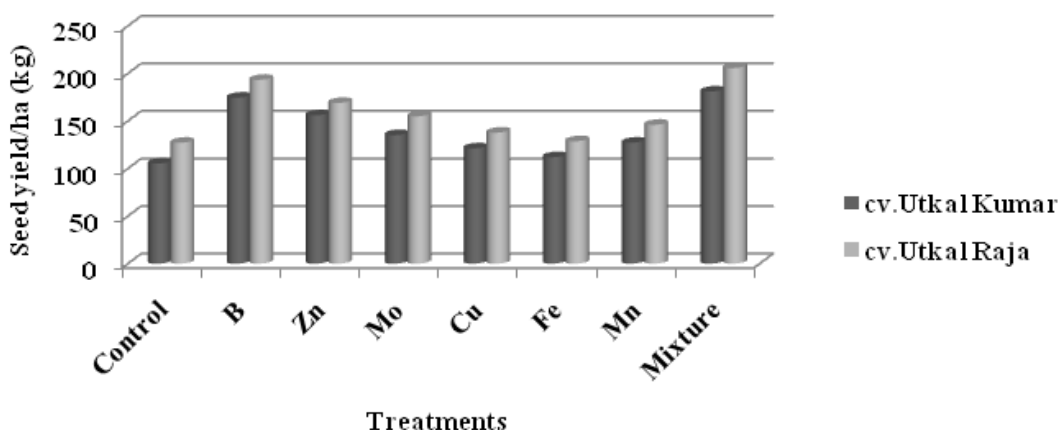
The observations on various yield and yield contributing characteristics were recorded on five randomly selected plants for each treatment in each replication of both the varieties. The observations thus recorded were averaged for computation on per plant basis. Seed extraction was done by fermentation method (Agrawal, 2003). From the extracted seeds, observations like 100-seed weight, seed

yield per plant, seed yield per hectare and seed recovery (%) were recorded and were subjected to statistical analysis following the principles and procedures outlined by Panse and Sukhatme, (1978).

RESULTS AND DISCUSSION

The results presented in (Table 1) indicated the presence of significant variation among the micronutrient treatments in both varieties. All the treatments resulted in improvement of seed recovery. Highest seed recovery rates of 0.53 % and 0.55 % were recorded in the varieties Utkal Kumari and Utkal Raja, respectively by application of micronutrients mixture. This was followed by the Boron application with 0.50 % and 0.54 % recovery rates. Increase in seed recovery rates by application of micronutrients has been reported by Bajpai *et al.* (2001), Hamsaveni *et al.*, (2002) in tomato and Kiran *et al.* (2010) in brinjal .The micronutrients might have enhancing role in seed setting that resulted in improvement in seed recovery.

Seed weight is an important quality attribute. Although this character is genetically controlled, the growing conditions exert considerable influence on its expression. In the present investigation, significant variation was observed for 100-seed weight (Table 1) in both varieties. The values ranged from 0.309 g to 0.356 g in Utkal Kumari and 0.327 g to 0.394 g Utkal Raja. Maximum seed weight was observed with the application of micronutrient mixture (Utkal Raja) and boron (Utkal Kumari). Greater mobilization of photosynthesis to the developing seeds by application of micronutrients might be the reason for increase in seed weight. Application of

Figure 1.Effect of foliar application of micronutrients on seed yield of tomato.

Mg, Zn, B and Mo along with recommended nitrogen, phosphorous, potassium and sulphur containing fertilizers produced more seed yield in tomato than the latter alone. While the application of B alone increased 1000 seed weight but no such effect was found in case of using Zn and Mo (Rahman *et al.*, 1996). Hamsaveni *et al.*, (2002) studied the effect of foliar application of boron on yield and yield attributes in tomato cv.L-15 (Megha) and found that application of 0.5 % B produced 1000 seed weight (2.94 g). Davis *et al.*, (2003) also reported similar effects on B application (both foliar and soil) on improved seed weight and shelf life of tomato fruits.

Bajpai *et al.* (2001) examined the effect of Zn (2.5, 5 and 10 mg/kg), Mn (5, 10 and 25 mg/kg) and B (0.5, 1, 2 mg/kg) on okra cv. Panchali in pot experiment and they recorded high seed weight (3.670g) in plants treated with 10.0 mg Zn/kg soil. Deka and Shadeque (1991) studied the response of French bean cv. Pusa Parvati to foliar application of B, Mo and Zn (0.1 & 0.2 %) either singly or in combinations. They observed that number of pods per plant, pod length and yield increased from 5.33, 10.2 cm and 3.95 t/ha respectively in untreated to 9.40, 15.05 cm and 6.96 t/ha, respectively with combined application of B, Mo, and Zn at 0.05 %. Among individual micronutrients, Zn proved the best.

Seed yield is an important consideration in any study relating to seed production of a crop. Seed yield potential of tomato with different micronutrient treatments in the present study has been assessed in terms of both plant and plot basis. Seed yield per plant depends on the number of mature fruits per plant, seed recovery rate and average seed weight which are considered to be the important components of yield. The effect of any factor on yield character are integrated and expressed in seed yield. Both the tomato varieties showed significant variation among treatments in respect of both the yield parameters *viz.* seed yield per plant and seed yield per hectare (Table 1). The values ranged from 5.210 g to 9.567 g and 105.30 kg to 181.05 kg for seed yield per

plant and per hectare, respectively in Utkal Kumari while the values ranged from 6.600 g to 10.912 g and 127.16 kg to 205.70 kg, respectively in Utkal Raja (Figure 1). In both varieties, application of micronutrients mixture gave maximum seed yield followed by boron treatment, in respect both the parameters, while the lowest yield was obtained in the control. The results indicated that all the micronutrients, either singly or in combination, have enhanced effects on seed yield. Increase in seed yield may be due to higher seed yield attributing components such as fruit set, number of fruits per plant, fruit size and weight, fruit yield, number of seeds per fruit and seed weight. In a field experiment to study the effect of fertilizers, bio fertilizers and micronutrients on yield and quality of brinjal, Kiran *et al.*, (2010) indicated that application of ZnSO₄ at 0.2 % along with recommended doses of NPK, Azospirillum and PSB, recorded increased fruit yield (27.06t/ha) and seed yield (633 kg/ha).

CONCLUSION

Both the tomato varieties under investigation showed significant variation among treatments in regard to both yield parameters *viz.* seed yield per plant and per hectare. Application of micro-nutrients mixture gave the maximum seed yield followed by boron treatment, while the lowest yield was obtained in the control.

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