ISSN: 2230-9926

*Available online at http://www.journalijdr.com*

IJDR

*International Journal of Development Research*
*Vol. 3, Issue, 11, pp.191-195, November, 2013*

International Journal of
DEVELOPMENT RESEARCH

## *Full Length Research Article*

# INFLUENCE OF MICRONUTRIENTS APPLICATION ON GROWTH AND SEED YIELD IN TOMATO (*Lycopersicon esculentum* MILL.)

**[1,*]Naga Sivaiah, K., [1]Swain, S. K., [2]Raju, B. and [3]Sandeep Varma, V.**

[1]Department of Seed Science and Technology, College of Agriculture, OUAT, Bhubaneswar, 751003, India
[2]Department of Soil Science and Agricultural Chemistry, College of Agriculture, Rajendranagar, Hyderabad-500030, India
[3]Department of Seed Science and Technology, College of Agriculture, Rajendranagar, Hyderabad-500030, India

**ARTICLE INFO**

***Article History:***
Received 02nd August, 2013
Received in revised form
08th September, 2013
Accepted 23rd October, 2013
Published online 20th November, 2013

***Key words:***
Tomato,
Micro nutrients,
Foliar application,
Growth and seed yield.

**ABSTRACT**

A field experiment was conducted during *rabi*-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 our in RBD with three replications. All the Micronutrients except manganese (@ 50ppm) were applied @100ppm in three sprays at an interval of ten days starting from 30 days after transplanting. All the treatments resulted in improvement of plant growth characteristics viz. plant height, number of primary branches, compound leaves, tender and mature fruits per plant and seed yield characteristics like 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. In tomato cv. Utkal Kumari, maximum growth rate (85.7 %) was observed with application of zinc, followed by application of micronutrients mixture (78.2 %) and boron (77.5 %). Tomato cv. Utkal Raja, maximum increase in branches per plant was observed with the application of manganese (148.7 %) followed by micronutrient combination (144.1 %). 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 gave maximum seed yield followed by boron treatment, in respect both the parameters, while the lowest yield was obtained in the control.



## INTRODUCTION

Tomato is an important mineral and vitamin rich vegetable crop playing a vital role in Indian economy by virtue of its various uses as vegetable and processed forms as well as industrial product. It occupies prime place amongst the processed vegetables. 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). Seed yield and quality in crop plants greatly influence by both macro and micro nutrients. One way of overcoming micronutrient deficiency in a crop instantly is foliar application of micronutrients. Apart from major nutrients, micronutrients also play an important role in seed production (Anon., 1995). Essential micronutrients like Zinc, Iron, Manganese, Copper, Boron and Magnesium play an important role in physiology of tomato crop and these are being a part of enzyme system or catalyst in enzymatic reactions. They are required for plant activities such as aspiration, meristamatic development, chlorophyll formation, photosynthesis, energy system, protein and oil synthesis, gossypol, tannin and phenolic compounds development (Anon., 1995). Applications of micro- nutrients *i.e*. zinc and boron have been reported in increasing seed yield and quality in tomato. For harnessing the higher yield potential, supplementation of micronutrients is essential.

***Corresponding author:** Naga Sivaiah, K.*
*Department of Seed Science and Technology, College of Agriculture, OUAT, Bhubaneswar, 751003, India*

Applications of micro- nutrients *i.e.* zinc and boron have been reported in increasing growth and seed yield in tomato. However no information is available as regards to the effect of other micro- nutrients vegetative, reproductive growth, seed yield and yield components of tomato. In order to study the effect of different micro nutrients *viz*., zinc, boron, molybdenum, copper, iron and manganese, application on tomato on growth, seed yield and yield contributing parameters, the present investigation was initiated.

## MATERIAL AND METHODS

A field experiment was conducted during *rabi,* 2010 to find out the response of foliar application of micronutrients on vegetative and reproductive growth parameters, in two varieties of tomato *viz*- Utkal Kumari 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 3 replications. Seedlings of each variety were transplanted in a 4-row plot of 7.0 $m^2$ area (2.8 m x 2.5 m) with a spacing of 70 cm x 50cm.

### Micro-nutrients application

There were eight treatments involving six micronutrients (Zn, Mo, B, Cu, Mn and Fe), applied through foliar spray individually or in full combination along with a control @ 100 ppm each except Mn (@ 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 growth characteristics like various vegetative and reproductive growth parameters like plant height (cm), number of primary branches per plant, number of compound leaves per plant, number of tender fruits per plant, number of mature fruits per plant, per fruit weight, fruit yield per plant and fruit yield per hectare were recorded on five randomly selected plants for each treatment in each replication of both the verities. The observations thus recorded were averaged for computation on per plant basis. The seeds were extracted and yield components *i.e* 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

### Vegetative growth

The analysis of variance for main shoot length measured at 30,40,50,60 and 70 days after transplanting revealed significant differences among the treatments in both the tomato varieties. As evident from the mean values of both the varieties (Table 1) the maximum plant height was recorded with the spray of micronutrients mixtures in both varieties which was equal to (Utkal Kumari) or at pars with (Utkal Raja) the application of zinc and boron, respectively. In tomato cv. Utkal Kumari, maximum growth rate (85.7 %) was observed with application of zinc, followed by application of micronutrients mixture (78.2 %) and boron (77.5 %). While in tomato cv. Utkal Raja, growth rate was maximum (74.4 %) with application of micronutrients mixture followed by zinc (72.2 %) and copper (72 %). Application of zinc, boron, and micronutrient mixture has been reported in increasing plant height of tomato (Hatwar *et al*., 2003). Increase in plant height may be attributed to the role of zinc in auxin synthesis and association of boron with development of cell wall and cell differentiation that help of root and shoot growth of plants (Basavarajeswari *et al*., 2008). According to Das and Mahapotra (1974) and Das and Sahoo (1975) foliar application of boron @ 0.5 and 105 ppm to potato and brinjal crops, respectively gave significant increase in plant height,, number of branches and leaves and main stem thickness. Similarly Popushoi and Shatrova (1976) reported that treatment of egg plants with boron @ 0.15% stimulated growth and development.

Numbers of primary branches per plant were more in mixture of micronutrients closely followed by treatments with boron and manganese. The rate of increase in number of primary branches per plant at different growth stages after application of micronutrients (Fig 1 and 2) indicated maximum response of micronutrient mixture (156.7 %) at 70 days after transplanting in tomato cv. Utkal Kumari. However, in tomato cv. Utkal Raja, maximum increase was observed with the application of manganese (148.7 %) followed by micronutrient combination (144.1 %). Significant increase in number of branches per plant has been reported by application of boron (Basavarajeswari *et al*., 2008), Zinc (Kiran *et al*., 2010) and micronutrient mixture (Hatwar *et al*., 2003). Combined application of Zn, Fe, B @ 1.0 % as foliar spray was found effective in respect of number of branches per plant (11.2), stem diameter (1.54) and spread of plant (53.54) in chilly (Hatwar *et al*., 2003). At the final growth stage (70 DAT), the maximum number of leaves (108.4 and 106.0) was observed in micronutrient mixture followed by application of boron (106.6 and 105.0) in tomato varieties Utkal Kumari and Utkal Raja, respectively. The rate of increase in number of leaves per plant at different stages of growth after application of micronutrients (Table 2) showed similar effect in both the varieties. Application of micronutrient mixture resulted in maximum increase in the number of leaves (216.9 %) in Utkal Kumari and 220.2 per cent in Utkal Raja at the final growth stage. Application of boron also showed significant effect next to micronutrient mixture with 213.5 per cent and 207 per cent increase in Utkal Kumari and in Utkal Raja, respectively. Influence of boron either singly or in combination with other micronutrients have been reported in increasing number of leaves per plant in several crops (Medhi and Kakati, 1994).

### Reproductive growth

Total numbers of developing tender fruits on the sampled plants were recorded at three different stages of plant growth (50, 60 and 70 DAT) after application of micronutrients. The results (Table 3) indicated significant variation among the treatments at three growth stages except on 50 DAT in tomato cv. Utkal Raja. Application of micronutrients mixture resulted in maximum number of tender fruits at all three growth stages in both the varieties. Application of boron was also found effective next to micronutrients combination in increasing fruit set and fruit development. Since the quality of seed largely

**Table 1. Effect of foliar application of micronutrients on plant height (cm) at different growth stages of tomato varieties**

| Treatment | cv. Utkal Kumari | | | | | cv. Utkal Raja | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 DAT | 40 DAT | 50 DAT | 60 DAT | 70 DAT | 30 DAT | 40 DAT | 50 DAT | 60 DAT | 70 DAT |
| Control | 37.5 | 39.4 | 49.3 | 58.7 | 61.9 | 42.8 | 45.5 | 57.2 | 66.8 | 70.8 |
| B | 38.7 | 41.6 | 53.4 | 65.1 | 68.7 | 42.7 | 47.8 | 59.8 | 69.8 | 72.9 |
| Zn | 38.0 | 42.7 | 55.1 | 67.4 | 70.6 | 41.9 | 47.1 | 58.0 | 69.0 | 72.1 |
| Mo | 36.8 | 39.8 | 50.3 | 59.7 | 62.3 | 42.7 | 47.7 | 58.5 | 68.6 | 71.6 |
| Cu | 37.5 | 38.8 | 50.1 | 59.7 | 62.1 | 41.8 | 46.0 | 57.9 | 68.3 | 72.0 |
| Fe | 37.5 | 39.5 | 48.9 | 57.8 | 62.6 | 42.7 | 44.3 | 54.9 | 65.8 | 70.5 |
| Mn | 38.3 | 40.5 | 52.2 | 63.2 | 64.4 | 42.5 | 46.0 | 59.0 | 68.0 | 72.6 |
| Mixture | 39.6 | 42.8 | 55.8 | 67.2 | 70.6 | 42.7 | 48.6 | 60.7 | 71.0 | 74.5 |
| SEM (±) | 1.11 | 1.07 | 0.799 | 1.134 | 0.993 | 0.893 | 0.806 | 0.962 | 0.963 | 0.621 |
| C.D (0.05) | NS | NS | 2.426 | 3.440 | 3.013 | NS | 2.445 | 2.920 | 2.923 | 1.884 |
| C.V (%) | 5.07 | 4.58 | 2.67 | 3.15 | 2.63 | 3.64 | 2.99 | 2.86 | 2.44 | 1.49 |

**Table 2.Effect of foliar application of micronutrients on number of compound leaves per plant at different stages of growth of tomato**

| Treatments | cv. Utkal Kumari | | | | | cv. Utkal Raja | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 DAT | 40 DAT | 50 DAT | 60 DAT | 70 DAT | 30 DAT | 40 DAT | 50 DAT | 60 DAT | 70 DAT |
| Control | 33.70 | 50.80 | 68.60 | 83.30 | 99.1 | 33.20 | 49.90 | 66.80 | 84.90 | 100.50 |
| B | 34.00 | 54.90 | 71.30 | 91.20 | 106.6 | 34.20 | 53.20 | 70.50 | 91.10 | 105.00 |
| Zn | 33.50 | 54.00 | 70.50 | 88.00 | 104.8 | 32.90 | 49.50 | 67.80 | 84.00 | 100.50 |
| Mo | 34.00 | 52.00 | 68.90 | 84.20 | 100.8 | 33.90 | 50.90 | 67.10 | 84.20 | 99.00 |
| Cu | 35.00 | 53.10 | 68.20 | 84.00 | 101.1 | 34.70 | 53.10 | 67.30 | 83.40 | 102.60 |
| Fe | 33.70 | 53.40 | 68.30 | 83.10 | 101.7 | 33.20 | 52.20 | 67.40 | 83.20 | 101.90 |
| Mn | 34.70 | 53.30 | 69.70 | 84.90 | 102.2 | 33.60 | 53.30 | 67.00 | 83.20 | 103.00 |
| Mixture | 34.20 | 56.33 | 72.50 | 92.60 | 108.4 | 33.10 | 55.50 | 72.80 | 93.00 | 106.00 |
| SEM (±) | 0.925 | 1.19 | 0.920 | 0.946 | 0.996 | 1.18 | 1.15 | 1.07 | 0.980 | 0.858 |
| C.D (0.05) | NS | NS | 2.79 | 2.872 | 2.963 | NS | 3.507 | 3.260 | 2.973 | 2.593 |
| C.V (%) | 4.70 | 3.86 | 2.29 | 1.90 | 1.64 | 6.10 | 3.84 | 2.72 | 1.98 | 1.45 |

**Table 3. Effect of foliar application of micronutrients on number of tender and mature fruits per plant in tomato**

| Treatments | Utkal Kumari | | | | Utkal Raja | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of Tender fruits | | | No of mature fruits/plant | Number of Tender fruits | | | No of mature fruits/plant |
| | 50 DAT | 60 DAT | 70DAT | | 50 DAT | 60 DAT | 70DAT | |
| Control | 24.340 | 26.80 | 29.70 | 22.27(25.0) | 24.70 | 26.60 | 32.8 | 24.60(25.0) |
| B | 28.90 | 33.40 | 36.50 | 28.467(22.0) | 29.80 | 32.50 | 37.20 | 29.380(21.0) |
| Zn | 26.40 | 29.30 | 33.067 | 26.050(21.2) | 27.80 | 32.10 | 34.30 | 26.75(22.0) |
| Mo | 25.60 | 27.60 | 31.70 | 24.11(23.9) | 26.63 | 30.50 | 33.60 | 25.53(24.0) |
| Cu | 26.30 | 27.50 | 31.30 | 24.120(22.9) | 25.70 | 30.70 | 33.40 | 25.38(24.0) |
| Fe | 24.40 | 26.50 | 31.30 | 23.780(24.0) | 24.60 | 27.20 | 32.40 | 24.30(25.0) |
| Mn | 26.10 | 29.60 | 33.20 | 24.90(25.0) | 25.90 | 30.00 | 33.90 | 25.76(24.0) |
| Mixture | 30.067 | 33.90 | 37.50 | 24.09(22.4) | 30.40 | 32.80 | 39.20 | 30.57(22.0) |
| SEM (±) | 0.907 | 0.887 | 1.11 | 1.074 | 1.54 | 1.219 | 1.28 | 1.656 |
| C.D (0.05) | 2.753 | 2.692 | 3.386 | 3.258 | NS | 3.70 | 3.89 | 5.025 |
| C.V (%) | 5.93 | 5.24 | 5.85 | 7.34 | 9.92 | 6.97 | 6.43 | 10.81 |

Figures in the parenthesis are percentage rejection of fruits

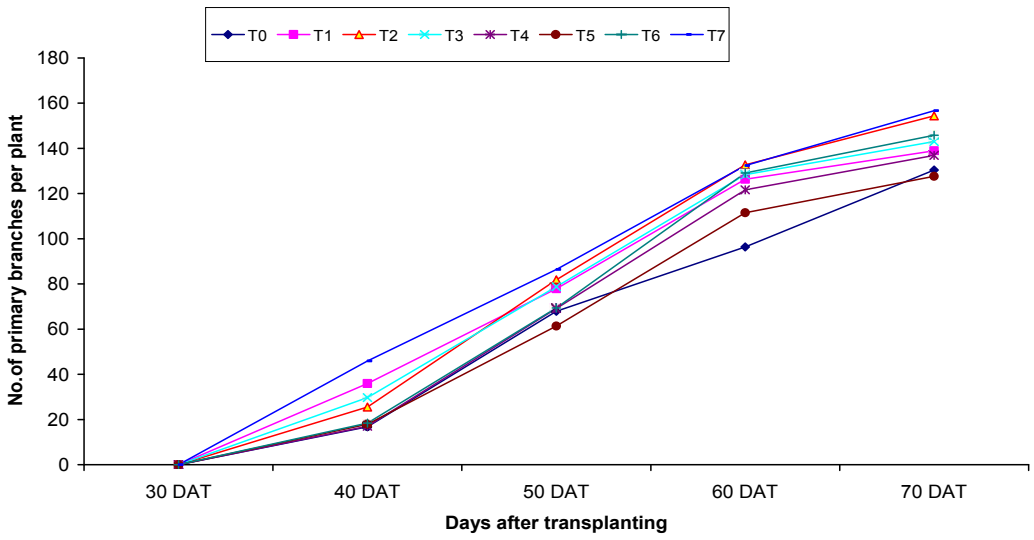


**Fig. 1: Percentage increase no. of primary branches per plant of tomato at cv. Utkal Kumari at different growth stages following application of micro nutrients**

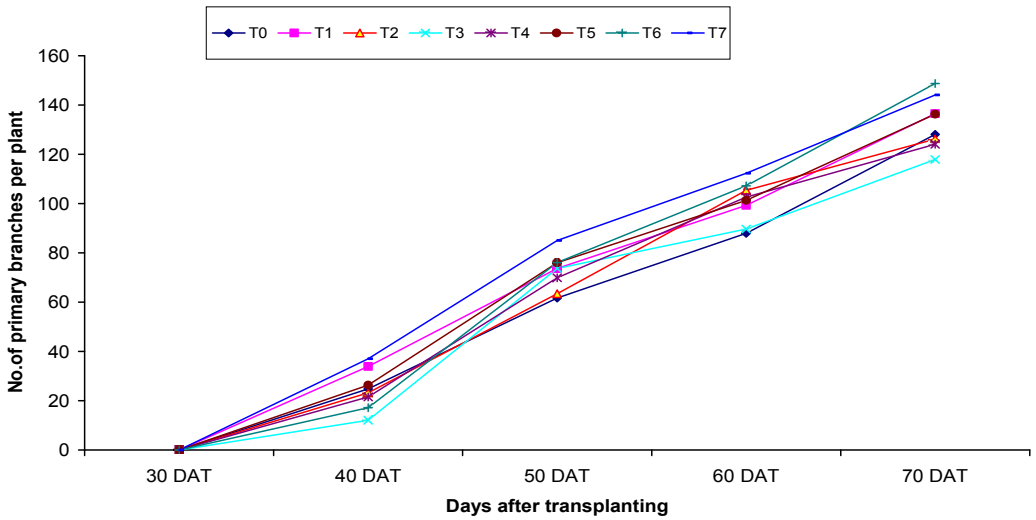


**Fig 2: Percentage increase no. of primary branches per plant of tomato at cv. Utkal Raja at different growth stages following application of micro nutrients**

**Table 4. Effect of foliar application of micronutrients on fruit yield characteristics of tomato varieties**

| Treatments | Per fruit weight (g) | | Fruit yield/plant (kg) | | Fruit yield /ha (tons) | |
|---|---|---|---|---|---|---|
| | Utkal Raja | Utkal Kumari | Utkal Raja | Utkal Kumari | Utkal Raja | Utkal Kumari |
| Control | 61.00 | 60.00 | 1.500 | 1.336 | 28.90 | 27.00 |
| B | 65.00 | 65.00 | 1.757 | 1.750 | 35.80 | 34.90 |
| Zn | 63.00 | 62.00 | 1.683 | 1.627 | 32.50 | 32.50 |
| Mo | 59.00 | 61.00 | 1.627 | 1.570 | 31.00 | 29.40 |
| Cu | 60.00 | 58.00 | 1.523 | 1.408 | 29.63 | 28.20 |
| Fe | 58.00 | 59.00 | 1.409 | 1.403 | 27.633 | 28.00 |
| Mn | 60.00 | 61.00 | 1.533 | 1.518 | 29.80 | 30.30 |
| Mixture | 65.00 | 64.00 | 1.967 | 1.867 | 37.40 | 35.50 |
| SEM (±) | 5.35 | 5.690 | 0.102 | 0.102 | 0.804 | 0.939 |
| C.D (0.05) | NS | NS | 0.322 | 0.311 | NS | 2.848 |
| C.V (%) | 15.10 | 16.09 | 11.33 | 11.39 | 4.97 | 5.29 |

**Table 5. Effect of foliar application of micronutrients on seed yield characteristics of tomato**

| Treatments | cv. Utkal kumari | | | | cv. Utkal Raja | | | |
|---|---|---|---|---|---|---|---|---|
| | Seed recovery (%) | 100 Seed weight (g) | 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 |

depends upon the fruit quality, in this experiment only good quality mature and ripe fruits were plucked for extraction of seed. Total number of mature fruits (Tables 3) differed significantly among treatments in both varieties. In Utkal Kumari, the numbers ranged from 22.27 to 29.09 and in Utkal Raja, from 24.30 to 30.50. The maximum numbers of mature fruits were obtained with combined application of micronutrients in both varieties. However percentage rejection of fruits calculated on the ratio of total number of mature and tender fruits, were minimum in Zinc and Boron in varieties Utkal Kumari and Utkal Raja, respectively. Increases in the number of mature fruits per plant in tomato have been reported by application of zinc and /or boron by several workers (Yadav *et al*., 2001). Among the micro nutrients, only application of boron and mixture of micronutrients enhanced the fruit weight while other micro-nutrients did not show any positive effect. The increase in fruit weight might be due to better mineral utilization of plants accompanied with enhancement of photosynthesis, other metabolic activity and greater diversion of food material to fruits. Increase in fruit size and weight by application of micronutrients have been reported by Bajpai *et al*. (2001). Fruit yield calculated on per plant and per hectare basis, was significantly affected by micronutrient treatments as depicted by analysis of variance and mean values in both the tomato varieties (Table 4). In Utkal Kumari, the fruit yield per plant ranged from 1.336 kg to 1.867 and in Utkal Raja, it ranged from 1.500 kg to 1.967 kg. Similarly, fruit yield per hectare ranged from 27.00 t to 35.5 t, 27.1 t to 37.4 t in Utkal Kumari and Utkal Raja, respectively. In both the varieties, combined Application of micronutrients

produced the maximum fruit yield followed by application of boron and zinc. Increased yield due to micronutrient Application may be attributed to enhanced photosynthesis activity, resulting into the increased production and accumulation of carbohydrates and favorable effect on vegetative growth and retaintion of flowers and fruits, which might have increased number and weight of fruits. Increased yield in response to micronutrients (B, Zn and mixture) have been reported by Davis *et al.* (2003) and Basavarajeswari *et al*. (2008) in different vegetable crops.

**Seed yield**

The results presented in (Table 5) indicated 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 percent and 0.55 percent 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, respectively. 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 of seed recovery. Significant variation was observed for 100-seed weight (Table 5) 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 application of micronutrients mixture (Utkal Raja) and boron (Utkal Kumari). Greater mobilization of photosynthates to the developing seeds by application of micronutrients might be reason for increase in seed weight. Application of Mg, Zn, B and Mo along with recommended NPK and S containing fertilizers produced more seed yield in tomato than the latter alone. While application of B alone increased 1000 seed weight but no such effect was found in case of Zn and Mo (Rahman *et al*, 1996). Hamsaveni *et al.* (2002) studied that 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 effect of B application (both foliar and soil) on improved seed weight and shelf life of tomato fruits. Bajpai *et al.* (2001) studied 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.

Seed yield potential of tomato with different micronutrient treatments has been assessed in terms of both plant and plot basis. Seed yield per plant depends on 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 hectare (Table 5). 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. 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. This indicated that all the micronutrients, either singly or in combination, have enhancing 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 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 @ 0.2 % along with recommended doses of NPK, Azospirillum and PSB, recorded increased fruit yield (27.06t/ha), number of seeds per fruit (1852) and seed yield (633 kg/ha).

**Conclusion**

It was concluded that foliar application of micronutrients either alone or in combination, enhanced most of the plant growth characterstics.viz; plant height, number of primary branches and compound leaves. Both the tomato varieties showed significant variation among treatments in respect 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.

## REFERENCES

Anonymous, 1995, Hybrid Cotton Production Technology, National Level Training Manual. Agricultural Research Station, Dharwad, pp. 4-47.

Bajpai, S. Chouhan, S.V.S and Bajpai, S. 2001. Effect of zinc, boron and manganese on yield of okra *(Abelmoschus esculentum)*. *Indian Journal of Agricultural Sciences*. 71(5):332-333.

Davis, T.M, Sanders, D.C, Nelson, P.V., Lengnick, L and Sperry, W.J. 2003. Boron improves growth, yield, quality and nutrient content of tomato. *Journal of American Society for Horticultural Science*, 128(3):441-446.

Kiran J., Vyakaranchal, B.S., Raikar, S.D., Ravikumar, G.H and Deshpande, V.K. 2010. Seed yield and quality of brinjal as influenced by crop nutrition. *Indian Journal of Agricultural Research* 44(1):1-7.

Panse, V.G and Sukhatme, P.V. 1985. Statistical methods for Agricultural workers, ICAR, New Delhi: 145-152.

Sharma, H.L., Thakur, R.C. and Sharma, M.P. 1983. Effect of micronutrients application on potato. *Indian Journal of Agronomy*.29 (1):11-14.

Rahman, M., Farid, A.T.M., Shahidullah, M and Sultana, W. 1997. Improving seed yield and quality of tomato by integrated nutrient management and liming. *Seed Research*. 24(1):34-37.

Deka, B.C. Shadeque, A. 1991. Influence of micronutrient on growth and yield of French bean var. PusaParvati. *Seeds and Farms***.** 17 **(**11-12): 17-18.

*******