Effect of zinc and boron application on yield of brinjal (*Solanum melongena* L.) in Bharuch District of Gujarat

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ABSTRACT

The field experiment was carried out as on farm trial in the year 2016-17 to know effect of zinc and boron on yield of brinjal. Total 10 farmers were selected from three tribal blocks namely Netrang, Zhagadia and Valia of Bharuch District. Farmers are not getting good fruit yield of brinjal. The production of brinjal crop continues to be quite low. The objectives were to find out the nutritional requirement of the crop and for making fertilizer recommendation based on soil test for brinjal crop. Soil samples were collected from the selected field. The collected samples were analyzed to evaluate the fertility condition of field. After analysis of soil result is deficient of Zinc and Boron. The fruit yield of brinjal crop can be increased by the application of Zinc and Boron in soil as well as foliar spray. The plant height, average fruit weight, number of fruit per plant, yield per hacter, gross returns, net returns and B: C ratio recorded was highest in soil application of zinc and boron as compared farmer's practices.

Key Words: On farm testing (OFT), Zinc, Boron, Brinjal, Yield and Economics

1. INTRODUCTION

Brinjal (*Solanum melongena* L.), or egg plant is one of the most common, popular and major vegetable crop grown in India and other parts of the world. The brinjal is of much important in the warm areas of Far East, being grown extensively in India and other Asian countries like Bangladesh, Pakistan, and Philippines. Other major brinjal producing countries are China, Turkey, Japan, Egypt, Indonesia, Iraq, Italy, Syria and Spain. The cultivated brinjal is of Indian origin and has been in cultivation from long time (Thompson and Kelly, 1957). Brinjal (*Solanum melongena* L.) belongs to the family Solanaceae.

Micronutrients like, copper and zinc also play a positive role for increasing fruit as well as seed yield in brinjal. Micronutrients are those elements that are essential for plant growth, but which was required in smaller amount. If these elements are not available sufficiently, plants will suffer from physiological stresses caused by inefficiency of several enzymatic systems and other related metabolic functions. Various responses were observed in growth and yield in crops species and in cultivars to trace elements deficiency (Fageria, 2009).

But brinjal grower farmers do not have the suitable techniques to increase the fruit yield of brinjal. Due to lack of awareness regarding soil testing and balanced fertilizer application farmers are facing low crop yield. By conducting farmer's field visit, it was observed that one of the important factors for low productivity of brinjal was not applying micronutrients, wilting problem and infestation of shoot & fruit borer. It was with this objective in view, the present study was initiated.

2. MATERIAL AND METHODOLGY

The present experiment was conducted during the Rabi season (2016-17) with ten replications in five villages under supervision of Krishi Vigyan Kendra, Bharuch, on different farmer's fields in Bharuch district of Gujarat. These farmers were selected for the On Farm Testing of zinc and boron application on their area and production.The demonstration of improved technology was taken in area of 0.4 ha of each farmer. The trial plot of farmer was equally divided for three treatments. The soil and foliar application of zinc and boron along with RDF of NPK (100:50:50 kg NPK /ha) was compared against farmer practices. The soil application of zinc (10 kg per acre) and boron (4 kg per acre) was done along with basal dose, however the foliar spray of 0.5% zinc and 0.2% boron was made at the flowering and fruiting stage. Nitrogen was applied in at basal and at flowering stage. The growth parameters observed were plant height, average fruit weight (gm), number of fruits per plant and total yield of each experimental plot as well as farmer's practices.

The primary data on output of brinjal yield were collected from the selected brinjal farmers plots, qualitative data was converted in to quantitative form and expressed in term of percent increased yield was calculated by the using formula. The soil of the plot was sandy medium black in texture having good fertility properly leveled and well drained. Analysis of soil sampled from the experimental land of farmer's field showed pH, EC (dS/m), organic carbon (%), available N (kg/ha), available P_2O5 (kg/ha) and available K_2O (kg/ha), available zinc and boron (Table 1). The yield data were collected from demonstrated and farmer's practices.

$$\text{Percentage increased yield} = \frac{\text{Demonstration yield} - \text{Local check yield}}{\text{Local Check yield}} \times 100$$

Benefit cost ratio calculated by the formula given below

$$\text{B: C Ratio} = \frac{\text{Gross Return}}{\text{Cost of cultivation}} \times 100$$

Table 1: Soil test results of plots before conducting on farm testing.

Treatment	pH	E.C. (dS/m)	Organic Carbon (%)	Available N (kg/ha)	Available P_2O_5 (kg/ha)	Available K_2O (kg/ha)	Available Zinc (ppm)	Available Boron (ppm)
Field -1	6.54	1.05	0.75	270.51	38.90	160.80	0.10	0.38
Field -2	6.81	1.10	0.75	224.67	37.40	155.10	0.49	0.53
Field -3	6.75	1.01	0.44	320.52	41.19	282.50	0.55	0.39
Field -4	6.87	1.03	0.71	275.31	35.56	145.23	0.48	0.43
Field -5	7.30	1.07	0.64	186.90	83.48	144.34	0.45	0.32
Field -6	7.21	1.01	1.01	235.21	32.13	87.09	0.41	0.45
Field -7	6.93	1.05	0.83	295.75	134.69	180.60	0.44	0.51
Field -8	6.68	1.00	0.62	203.21	38.96	86.41	0.52	0.40
Field -9	7.12	1.04	0.68	370.36	75.48	141.30	0.35	0.48
Field -10	7.24	1.03	0.83	219.40	69.20	246.70	0.41	0.37

3. RESULT AND DISCUSSION

The differences between on farm testing and farmer's practice are shown in table 2. The farmers practices include are no seed treatment, imbalance fertilizer application, no use of micronutrient and no adoption of plant protection measures. All these collectively resulted in low yield of brinjal in the district. However, in on farm testing plots, all the improved package of practices of brinjal was demonstrated.

Table 2: Details of brinjal growing under on farm testing and existing farmer's practices.

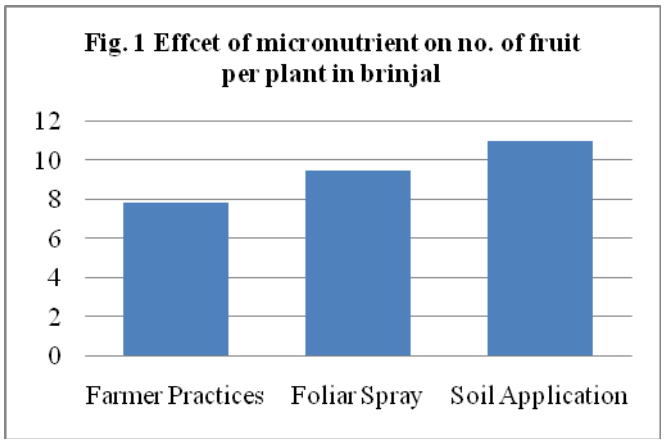
Operation	Existing practices	Improved Practices of Demonstrated
Variety Use	Surti Gulabi	Surti Gulabi
Seed treatment	No seed treatment	Seed treatment with Biofertilizer (20ml/kg seed) & *Trichoderma viride* 3gm/kg seed.
Sapling root treatment	No sapling root treatment	Sapling root treatment with Imidacloprid 5ml/10 liter water for 30 minutes
Spacing	80 cm x 60 cm	90 cm X 90 cm
Fertilizer application & Soil testing	Imbalance application of fertilizer & no soil test	Application of recommendation dose of fertilizer: FYM 10 t/ha and 100:50:50 kg NPK /ha and application of zinc and boron.
Plant protection measure	Non adoption of IPM practices	Spraying of Imidacloprid 5ml/10 liter water for sucking pest & Carbendazim 20 gm/10 liter water for fungus diseases.

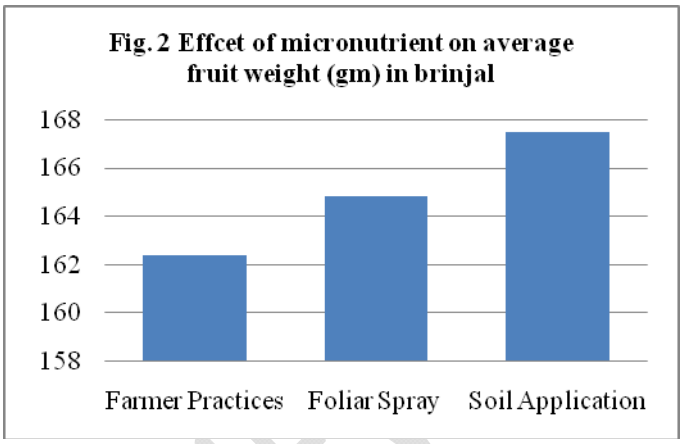
3.1 PERFORMANCE OF ON FARM TESTING

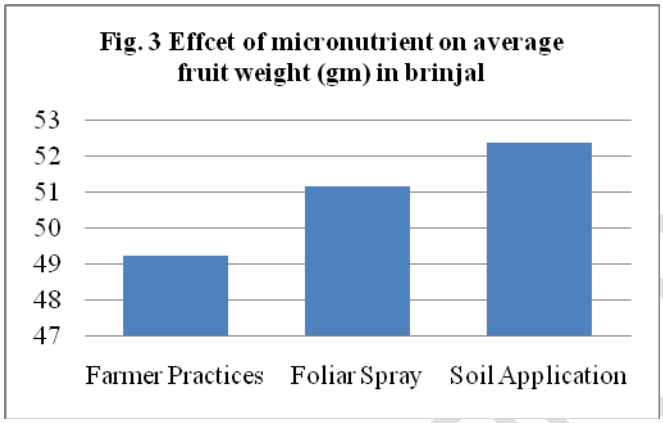
Soil application along with RDF significant effect on the yield, plant height, average fruit weight and number of fruits per plant attributes of brinjal in both the years (Table 3). Soil application of zinc & boron in addition to RDF recorded significantly higher plant height (52.39 cm), average fruit weight (167.49 g), highest number of fruits per plant (11.02) and maximum yield per hectare (33.73 tonne) compared to farmer's practices (fig. 1-4). This was followed by treatment RDF along with foliar spray application of zinc and boron. The plant height (51.17 cm), average fruit weight (164.8 g), highest number of fruits per plant (9.52) and yield per hectare (29.14 tonne) was recorded in RDF along with foliar spray application of zinc and boron. These results were in conformity with those of Pandav *et al.* (2016), Sliman *et al.* (1999) and Acharya *et al.* (2015).

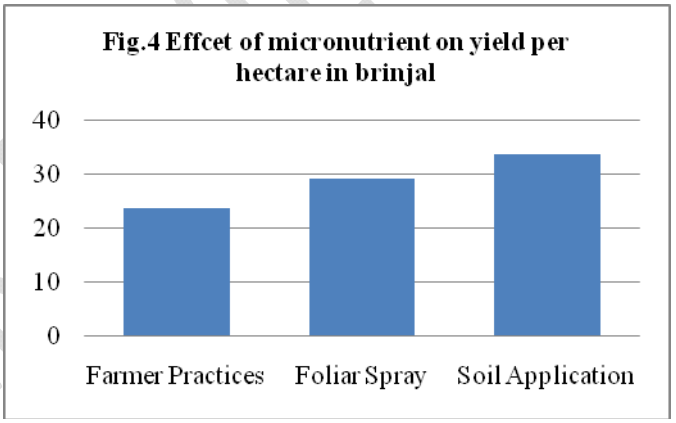
Table 3: Effect of different treatments of soil application & foliar sprays of micronutrients on growth and yield parameters of brinjal

Treatment	Plant Height (cm)	Average fruit weight (gm)	No. of fruit per plant	Yield per ha (tonne)
Farmer's Practices	49.21	162.37	7.84	23.81
RDF + Foliar Spray	51.17	164.81	9.52	29.14
RDF + Soil Application	52.39	167.49	11.02	33.73
C.D.5 %	1.73	3.95	0.59	2.40
CV	2.91	2.06	5.39	7.15









3.2 ECONOMIC RETURN

The inputs and outputs prices of commodities prevailed during the study of demonstration were taken for calculating net return and benefit: cost ratio (Table 4). The cost of cultivation is comparatively more in recommended dose of fertilizers along with soil application of zinc and boron (Rs 49320 per ha) as well as in foliar application of zinc and boron (Rs 48500 per ha) as compared to farmer's practices (Rs 41600 per ha). The cultivation of brinjal under RDF along with soil application of zinc and boron gave higher net return of Rs. 119180/- per hectare followed by RDF along with foliar spray of zinc and boron Rs. 97200/- per ha as compared to farmer's practices. The benefit cost ratio of brinjal cultivation under soil application of zinc and boron practices were 3.41 against 2.86 under farmer's practice. This may be due to higher yield obtained under improved technologies compared to farmer's practice.

Table 4: Economic Impact of soil application & foliar sprays of micronutrients of brinjal

Economics of demonstration (Rs/ha)								Economics of farmer practices (Rs/ha)			
RDF + Soil Application				RDF + Foliar Spray							
Gross cost	Gross Income (Rs./ha)	Net Return (Rs./ha)	BCR	Gross cost	Gross Income (Rs./ha)	Net Return (Rs./ha)	BCR	Gross cost	Gross Income (Rs./ha)	Net Return (Rs./ha)	BCR
49320	168500	119180	3.41	48500	145700	97200	3.0	41600	119050	77450	2.86

4. CONCUSION

The soil application of zinc and boron in addition to recommended doses of NPK can be effective practice to deal with low productivity of the brinjal due to zinc and boron deficiency. Farmers were very much satisfied with average fruit weight and no of fruits per plants & yield and higher benefit cost ratio that was better in soil application as compare to routine practices. However horizontal spread of recommended and improved technologies may be achieved by the successful implementation of results of on farm trials (OFT) and various extensions activities like training programmes, Kisan gosthi, and farmers meeting etc.

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