Effect of Zinc and Boron application on yield of ~~Brinjal~~ brinjal in Bharuch District of Gujarat

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~~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 ~~farmers~~farmer's practices.

Key Words: 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~~ 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 improved cultivation practices farmers are facing heavy infestation of disease and insect pest in the crop causing low yield. By conducting farmer's field visit, it was observed that one of the important factors for low productivity of brinjal was not application of micronutrient, wilting problem and infestation of shoot & fruit borer. It was with this objective in view that the present study was initiated. Keeping the facts in view, importance of OFT, the KVK Bharuch.

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2. MATERIAL AND METHODOLGY

The present experiment was 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~~ zinc and ~~Boron~~ 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 (10 kg per acre) and boron (4 kg per acre) along with RDF of NPK (50:37.5: 37.5kg NPK /ha) was compared against farmer practices. Foliar spray of ~~Zinc~~ zinc @ 0.5%, ~~Boron~~ boron @ 0.2% at flowering and fruiting stage. Nitrogen was split applied at 35 DAS of brinjal sapling. At the time of experiment growth parameters observed were like plant height, Average fruit weight (gm), number of Fruits per plant and yield.

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The primary data on output of brinjal yield were collected from the selected brinjal farmers OFT 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, E.C. (Desi/m), organic carbon (%), total N, available P_2O5 (kg/ha) and total K_2O (kg/ha), ~~Zinc~~ zinc and ~~Boron~~ boron (Table 2). The experiment was laid out through randomized block design. The yield data were collected for with the two demonstrated and one control plots (farmer practice).

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

~~Percentage increased yield = (Demonstration yield – Local check yield) / Local Check yield x 100~~

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Benefit cost ratio calculated by the formula given below

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

~~B: C Ratio = Net Return / Cost of cultivation x 100~~

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3. RESULT AND DISCUSSION

The differences between on farm testing and farmers existing practice is shown in table 1. The farmers practices include are no use of micronutrient, no seed treatment, imbalance fertilizer application and no adoption of plant protection measure. All these collectively resulted in low yield of brinjal in the district. However, in OFTs all the improved package of practices of brinjal bean was demonstrated.

Table 1. Details of Indian bean growing under FLD and Existing practices.

Sr. No	Operation	Existing practices	Improved Practices of Demonstrated
1	Variety Use	Surti Gulabi	Surti Gulabi
2	Seed treatment	No seed treatment	Seed treatment with Biofertilizer (20ml/kg seed) & *Trichoderma viride* 3gm/kg seed.
3	Sapling root treatment	No sapling root treatment	Sapling root treatment with Imidacloprid 5ml/10 liter water for 30 minutes
4	Spacing	80cm x 40 cm	60 cm X 60 cm
5	Fertilizer application & Soil testing	Imbalance application of fertilizer & no soil test	Application of recommendation dose of fertilizer: FYM 10 t/ha NPK@ 50:37.5: 37.5 kg NPK /ha
6	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.
7	B:C ratio	Not calculated.	Calculations done

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Table.2 Soil test results of Demonstrated plot on farmer's field

Treatment	pH	E.C. (dS/m)	Organic Carbon (%)	Available N(kg/ha)	Available P_2O_5 (kg/ha)	Potash K_2O (kg/ha)	Zinc (ppm)	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

3.1 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~~ zinc & ~~Boron~~ boron significantly improved plant height (52.39 cm), average fruit weight (167.49g), highest number of fruits plant^{-1} (11.02) and maximum yield per hacter (33.73 t ha^{-1}) along with B: C ratio of 3.41 compared to against only recommended dose of NPK. These results were in conformity with those of Pandav *et al.* (2016), Sliman *et al.* (1999) and Acharya *et al.* (2015). Followed by foliar spray application of ~~Zinc~~zinc, ~~Boron~~ boron & along with RDF, significantly improved plant height (51.17 cm), average fruit weight (164.8 g), highest number of fruits plant^{-1} (9.52) and yield per hacter (29.14 t ha^{-1}) along with B: C ratio of 3.0.

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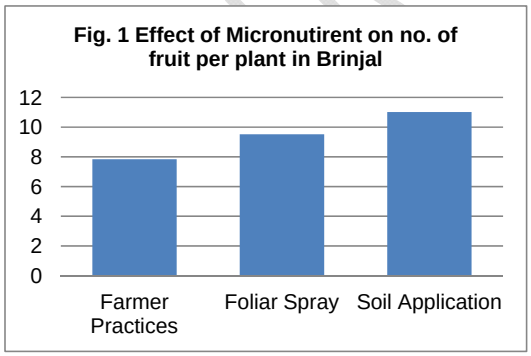
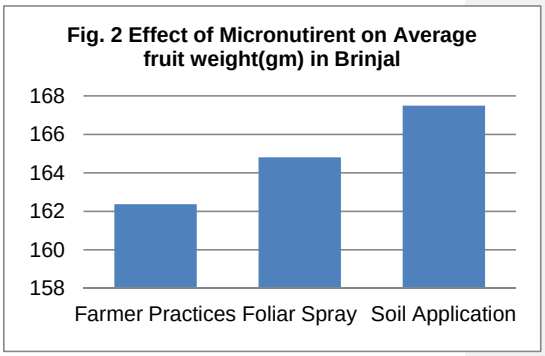
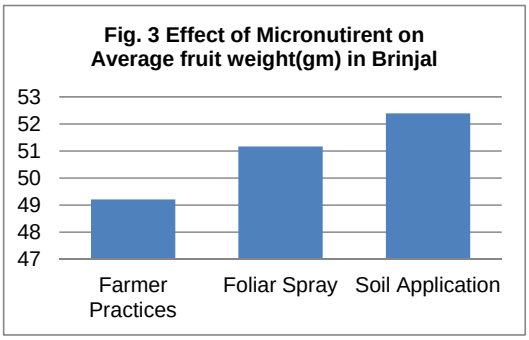
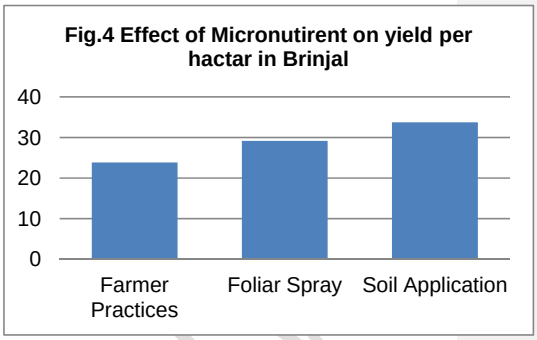
Table 3: Effect of different treatments of soil application & foliar sprays of micronutrients on growth and yield parameters of brinjal

Treatment	Plant Height(cm)	Average fruit weight(gm)	No. of fruit per plant	Yield per ha (tone)
RDF	49.21	162.37	7.84	23.81
Foliar Spray	51.17	164.81	9.52	29.14
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 cultivation of brinjal under improved technologies gave higher net return Rs. 119180/- in soil application followed foliar spray per Rs. 97200/- ha in 2016-17 as compared to farmers practices. The benefit cost ratio of brinjal cultivation under improved cultivation practices were 3.41 as compared to 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 demonstration (Rs/ha)				Economics of farmer practices (Rs/ha)			
Soil Application				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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