"To study about foliar application of micronutrients on yield attributes and yield of Brinjal (*Solanum melongena* L.)"

ABSTRACT

The present investigation entitled **"To study about foliar application of micronutrients on yield attributes and yield of Brinjal (*Solanum melongena* L.)"**was conducted at Research and Instructional Farm, Department of Horticulture, BTC College of Agriculture and Research Station, Bilaspur (C.G.) during *Rabi* Season of 2022.

The experiment was carried out in RBD design with three replications. Ten treatments were created by different doses of micronutrients in Brinjal variety BR-112 (Black beauty). The treatment were Control plot (T_1), RDF (T_2), RDF+$ZnSO_4$(0.4%) (T_3), RDF+$ZnSO_4$ (0.5%) (T_4), RDF+Borax (0.4%) (T_5), RDF+Borax (0.5%) (T_6), RDF+$CuSO_4$ (0.4%) (T_7), RDF+$CuSO_4$ (0.5%) (T_8), RDF+$FeSO_4$ (0.4%) (T_9), RDF+$FeSO_4$ (0.5%) (T_{10}). The recommended package of practices in Brinjal were followed as per requirement.

Yield and yield attributing characters such as highest number of flowers plant^{-1} (42), highest number of fruits plant^{-1} (32.68), maximum fruit diameter (9.35cm), highest fruit length (15.53cm), highest fruit weight (78.20g), minimum days required for first flower initiation (38.60), earliest days to first fruit harvest (57.54) was observed in treatment T_4 (RDF+$ZnSO_4$ 0.5%). Total number of harvest (picking) did not differ significantly due to effect of different micronutrients. Highest fruit yield (422.55 q ha^{-1}) was observed in treatment T_4 (RDF+$ZnSO_4$ 0.5%).

Keywords: Brinjal, *Solanum melongena* L.micronutrient, treatment, yield, fertilizer.

INTRODUCTION

Brinjal (*Solanum melongena* L.) often known as eggplant, guinea squash or aubergine is a plant in the Solanaceae family (Souza *et al*., 2018). In many nations in the subtropics, tropics and Mediterranean region including Egypt,India, Middle East, France, and the United States Brinjal is a traditionaland well-known vegetable cash crop that is widely grown (Yousafi*et al*., 2013). It has phosphorus and many vitamins especially B-complex. Fruits from Brinjal plants are a good source of minerals, vitamins (B_1, B_6, C), dietary fibre, folate, proteins, carbohydrates and antioxidants. They are also low in calories which supports human health (El-Nemr *et al*., 2012).

Brinjal (*Solanum melongena* L.) is grown extensively (1.86 m ha) throughout the globe with an annual production of 54.08 million tonnes, worth over US$10 billion. Out of the total Brinjal production, nearly 84% is confined to China (61%) and India (23%) (Anonymous, 2021). The area under Brinjal cultivation in India is 711.3 thousand hectares with estimated annual production of 13,557.8 thousand metric tonnes with a productivity of 19.1 metric tonnes ha^{-1} (Anonymous, 2019). In Chhattisgarh, Brinjal is grown in an area of 35,173 hectare with an annual production of 6,42,335 metric tonnes and productivity of 18.26 metric tonnes of fruits ha^{-1} which is less than the national average (Anonymous, 2020).

For a higher yield and better quality of Brinjal, plants must receive the proper nourishment. There is a dare need to adopt balanced use of both macro and micronutrients as micronutrient play vital role in different metabolic processes in plants. Use of micronutrients coupled with wise nutrient use (RDF) will increase productivity as well as overall production and fertilizer usage effectiveness in the Brinjal crop. Hence, foliar sprays of micronutrient encourage efficient nutrient uptake through leaves and the results of this can become evident immediately. The benefit of foliar application of micronutrient is that they are four to thirty times more effective and there is no chance of ground water contamination. Micronutrients including iron, zinc, manganese, copper and boron are significant minerals with major physiological roles in plants that are needed in small amounts for healthy growth and development of plants. Zinc is an essential component of a number of enzymes*i.e.*, dehydrogenase, aldolase, isomerases, proteinase, peptidase and phosphohydrolase (Mousavi, 2011). It is directly involved in the synthesis of Indol acetic acid (IAA) and proteins. Boron aids in the metabolism of carbohydrates and the absorption of water (Haque *et al*., 2011). In the meristematic tissues, the cambium cells undergo hypertrophy, degeneration, and disintegration as a result of lack of boron.

Iron is necessary for the synthesis of chlorophyll, though it actually does not enter into its composition. Plants use iron for a variety of metabolic processes, including the oxidation-reduction cycle, catalytic activities, and the synthesis of chlorophyll. Iron is also necessary for protein synthesis and glucose metabolism. In plants, copper is essential for controlling a variety of metabolic processes (Tripathi *et al*., 2015). It controls numerous metabolic and physiological processes of plants by functioning as a stable co-factor of different enzymes and proteins. It facilitates the use of iron during the synthesis of chlorophyll (Harris, 2016).

Application of micronutrients will not only enhance productivity, but will also increase the production and the efficiency of fertilizer used in brinjal crop (Kumar *et al*., 2016.)

MATERIAL AND METHOD

The present investigation entitled **"To study about foliar application of micronutrients on yield attributes and yield of Brinjal *(Solanum melongena* L.)"**was conducted at Research and Instructional Farm, Department of Horticulture BTC College of Agriculture and Research Station, Bilaspur (C.G.) during *Rabi* season of 2022. This chapter deals with a concise description of the materials adopted and methodology used during the course of investigation.The experiment was carried out in RBD design with three replications. Ten treatments were created by different doses of micronutrients in Brinjal variety BR-112 (Black beauty). The treatment were Control plot (T_1), RDF (T_2), RDF+$ZnSO_4$(0.4%) (T_3), RDF+$ZnSO_4$ (0.5%) (T_4), RDF+Borax (0.4%) (T_5), RDF+Borax (0.5%) (T_6), RDF+$CuSO_4$ (0.4%) (T_7), RDF+$CuSO_4$ (0.5%) (T_8), RDF+$FeSO_4$ (0.4%) (T_9), RDF+$FeSO_4$ (0.5%) (T_{10}). The recommended package of practices in Brinjal were followed as per requirement.

RESULT AND DISCUSSION

1. Yield and yield attributes

1.1 Number of flowers plant^{-1}

The highest number of flowers plant^{-1} (42.65) was recorded in treatment T_4 (RDF+$ZnSO_4$ 0.5%) at 30 DAT which was at par with T_3 (RDF+$ZnSO_4$ 0.4%)(42.00), T_6 (RDF+Borax 0.5%)(40.23), T_5 (RDF+Borax 0.4%) (39.73) and T_{10} (RDF+$FeSO_4$ 0.4%)(38.95).

1.2 Number of fruits plant^{-1}

The highest number of fruits plant^{-1} (32.68) was recorded in treatment T_4 (RDF+$ZnSO_4$ 0.5%) which was at par with T_3 (RDF+$ZnSO_4$ 0.4%)(32.60), T_6 (RDF+Borax 0.5%)(31.27), T_5 (RDF+Borax 0.4%) (30.80) and T_{10} (RDF+$FeSO_4$ 0.4%)(29.96).

1.3 Fruit diameter

Maximum Fruit diameter (9.35) was observed in treatment T_4 (RDF+ZnSO4 0.4%) which was at par with T_3 (RDF+$ZnSO_4$ 0.4%)(9.10), T_6 (RDF+Borax 0.5%)(8.86), T_5 (RDF+Borax (0.4%)(8.70) and T_{10} (RDF+FeSO4 0.5%) (8.40). Significantly minimum fruit diameter (6.84) was observed in treatment T_1 (Control).

1.4 Length of fruit (cm)

The highest length of fruit(15.53) was recorded in treatment T_4 (RDF+$ZnSO_4$ 0.5%) which was at par with T_3 (RDF+$ZnSO_4$ 0.4%)(15.03), T_6 (RDF+Borax 0.5%)(14.90), T_5 (RDF+Borax 0.4%) (14.50) and T_{10} (RDF+$FeSO_4$ 0.4%)(14.40).

1.5 Fruit weight (g)

The highest fruit weight (78.20) was recorded in treatment T_4 (RDF+$ZnSO_4$ 0.5%) which was at par with T_3 (RDF+$ZnSO_4$ 0.4%)(76.94), T_6 (RDF+Borax 0.5%)(72.63), T_5 (RDF+Borax 0.4%) (72.52) and T_{10} (RDF+$FeSO_4$ 0.4%)(72.33).

1.6 Days of first flower initiation

The maximum number of days required for first flower initiation (45.19) was observed in treatment T_1 (control) which was at par with T_2 (RDF), T_7 (RDF+$CuSO_4$0.4%), T_8 (RDF+$CuSO_4$ (0.5%) and T_9(RDF+$FeSO_4$ (0.4%). Significantly minimum days required for first flower initiation (38.60) was observed in treatment T_4(RDF+$ZnSO_4$0.5%).

1.7 Days taken to first fruit harvest

Highest number of days taken to first fruit harvest (68.92) was observed in treatment T_1 (control) which was at par with T_2 (RDF)(66.48), T_7 (RDF+$CuSO_4$ 0.4%)(65.87), T_8 (RDF+$CuSO_4$ 0.5%)(64.98) and T_9 (RDF+$FeSO_4$ 0.4%) (64.58). Significantly lowest number of days taken to first fruit harvest (57.54) was observed in treatment T_4 (RDF+Zinc sulfate 0.5%).

1.8 Fruityield (q ha^{-1})

The highest fruit yield (422.55) was recorded in treatment T_4 (RDF+$ZnSO_4$ 0.5%) which was at par with T_3 (RDF+$ZnSO_4$ 0.4%)(410.93), T_6 (RDF+Borax 0.5%)(404.99), T_5 (RDF+Borax 0.4%)(400.74) and T_{10} (RDF+$FeSO_4$ 0.4%)(390.74). Significantly lowest fruit yield (118.31)was observed in treatment T_1 (control)(118.31).

Table 1: Effect of micronutrients on yield attributes of Brinjal

Treatments	Treatments details	Number of flowers plant^{-1}	Number of fruits plant^{-1}	Fruit diameter (cm)	Length of fruit (cm)
T_1	Control	30.00	24.33	6.84	9.18
T_2	RDF (120:60:80 NPK kg ha^{-1})	32.10	26.44	7.69	11.27
T_3	RDF+$ZnSO_4$ (0.4%)	42.00	32.60	9.10	15.03
T_4	RDF+$ZnSO_4$ (0.5%)	42.65	32.68	9.35	15.53
T_5	RDF+Borax (0.4%)	39.73	30.80	8.70	14.50
T_6	RDF+Borax(0.5%)	40.23	31.27	8.86	14.90
T_7	RDF+$CuSO_4$ (0.4%)	34.80	28.60	7.92	12.22
T_8	RDF+$CuSO_4$ (0.5%)	35.67	28.97	8.09	12.30
T_9	RDF+$FeSO_4$ (0.4%)	36.54	29.52	8.25	13.48
T_{10}	RDF+$FeSO_4$ (0.5%)	38.95	29.96	8.40	14.40
	Mean	**37.26**	**29.51**	**8.32**	**13.28**
	SEm+-	**1.27**	**1.00**	**0.28**	**0.45**
	CD (0.05%)	**3.78**	**2.98**	**0.84**	**1.35**

Table 2: Effect of micronutrients on yield and yield attributes of Brinjal

Treatments	Treatments details	Fruit weight (g)	Days of first flower initiation	Days taken to first fruit harvest	Fruit yield (q ha^{-1})
T_1	Control	46.37	45.19	68.92	118.31
T_2	RDF (120:60:80 NPK kg ha^{-1})	54.71	43.65	66.48	332.48
T_3	RDF+$ZnSO_4$ (0.4%)	76.94	38.95	58.64	410.93
T_4	RDF+$ZnSO_4$ (0.5%)	78.20	38.60	57.54	422.55
T_5	RDF+Borax (0.4%)	72.52	39.83	60.23	400.74
T_6	RDF+Borax(0.5%)	72.63	39.00	59.43	404.99
T_7	RDF+$CuSO_4$ (0.4%)	59.23	43.24	65.87	357.55
T_8	RDF+$CuSO_4$ (0.5%)	62.34	42.95	64.98	366.81
T_9	RDF+$FeSO_4$ (0.4%)	67.33	42.65	64.58	377.59
T_{10}	RDF+$FeSO_4$ (0.5%)	72.33	40.94	61.25	390.74
	Mean	**66.26**	**41.50**	**62.79**	**358.26**
	SEm+-	**2.28**	**1.36**	**2.13**	**14.81**

	CD (0.05%)	**6.77**	**4.05**	**6.35**	**44.00**

Conclusion

On the basis of results of present investigation, it is concluded that foliar application of micronutrients coupled with RDFenhanced most of the yield attributes and yield of Brinjal cv BR- 112 (Black beauty). The crop should be sprayed thrice at 30, 60,90 DAT with RDF+$ZnSO_4$ 0.5%.

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