International Journal of Plant & Soil Science

Volume 35, Issue 22, Page 41-45, 2023; Article no.IJPSS.108631
ISSN: 2320-7035

Assessment of Foliar Application of Micronutrients on Yield Attributes and Yield of Brinjal (*Solanum melongena* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2023/v35i224112

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/108631

Original Research Article

Received: 02/09/2023
Accepted: 08/11/2023
Published: 16/11/2023

ABSTRACT

The present investigation entitled "Assessment of 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 2022-2023. The experiment was carried out in RBD design with three replications. Ten treatments were created by different doses of micronutrients in Brinjal

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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.

Keywords: Brinjal; RDF (Recommended dose of fertilizer); micronutrient, treatment; yield; fertilizer.

1. INTRODUCTION

Brinjal (*Solanum melongena* L.) often known as eggplant, guinea squash or aubergine is a plant in the Solanaceae family. 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 [1].

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%) [2]. 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} [3]. 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 [4].

Zinc is an essential component of a number of enzymes *i.e*., dehydrogenase, aldolase, isomerases, proteinase, peptidase and phosphohydrolase [5]. Boron aids in the metabolism of carbohydrates and the absorption of water [6].

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 [7]. It facilitates the use of iron during the synthesis of chlorophyll [8].

The main aim of this experiment was to observe the effect of two different micronutrient concentrations (0.4&0.5%) on growth and yield of Brinjal. Application of micronutrients will not only enhance productivity, but will also increase the production and the efficiency of fertilizer used in Brinjal crop [9,10].

2. MATERIAL AND METHODS

The present investigation entitled “Assessment of 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 2022-23. 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 Randomized Block 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.

3. RESULTS AND DISCUSSION

3.1 Yield and Yield Attributes

3.1.1 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) (Table 1).

Table 1. Effect of micronutrients on yield attributes of Brinjal at harvest

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 at harvest

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**

3.1.2 Number of fruits plant^{-1}

The highest number of fruits plant^{-1} (32.68) Table 1, 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).

3.1.3 Fruit diameter(cm)

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) (Table 1).

3.1.4 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) (Table 1).

3.1.5 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) (Table 2).

3.1.6 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%) (Table 2).

3.1.7 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%) (Table 2).

3.1.8 Fruit yield (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 2).

4. CONCLUSION

On the basis of results of present investigation, it is concluded that foliar application of micronutrients coupled with RDF enhanced most of the yield attributes and yield of Brinjal cv BR-112 (Black beauty). The crop should be sprayed thrice with RDF+ZnSO4 0.5%.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/108631