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Effect of micro-nutrients and organic fertilizer on plant growth, yield and quality of Broccoli (*Brassica Oleracea* L. var. *Italica*)

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Abstract

A field experiment was conducted at Horticulture Research Farm, Lovely Professional University, Phagwara, Punjab from October 2021 to January 2022. The experiment laid out in a FRBD with 10 treatments and three replications. Highest observation in terms of growth parameters i.e., plant height (21.10cm, 27.100cm and 30.83cm), number of leaves (7.33, 11.40 and 13.20), stem diameter (2.86cm). Yield parameter i.e., diameter of curd (12.27cm), curd weight (301.33g), total yield per hectare (147.66q/ha). Quality parameters i.e., dry matter content (12.48%), ascorbic acid content (35.31mg/100g). Highest observation was recorded in T9 (spray of Borax @ 15kg/ha + Recommended dose of NPK+ 50% of FYM) in all the parameters.

Keywords: Broccoli, growth, yield, nutrients, boron application, FYM

Introduction

Broccoli (*Brassica Oleracea* L. var. *Italica*) is an important Cole crop belonging to the Brassicaceae family. Broccoli word derived from the Latin word brachium and the Italian term Brocco, both of which imply "arm" or "branch." broccoli is a novel crop in India that is high in vitamins and minerals and is nutritious among Cole crops (Ouda & Mahadeen, 2008) ^[5]. Broccoli is an Italian vegetable native to the Mediterranean region that was first planted in ancient Rome and then in England around 1720. In the United States, however, it initially emerged in 1806, although commercial broccoli cultivation began around 1923 (Decoteau, 2000) ^[2]. Broccoli is a low-sodium, fat-free, calorie-free vegetable that is high in vitamin C and a good source of vitamin A, B1, B2, and calcium. Broccoli is gaining popularity these days due to its numerous applications and high nutritional content (Singh *et al.*, 2015) ^[6]. Broccoli referred to as the "Crown of Jewel Nutrition" because of its high. Vitamin and mineral content. High fiber content also believed to be of benefit in case of diabetes. It has as much calcium as milk, and is therefore an important source of nutrition for those with osteoporosis or calcium deficiencies. Higher quantities of dry matter, total nitrogen, vitamin C, chlorophyll, beta-carotene, and carotenoids, as well as smaller levels of nutrients, were found in the primary inflorescence. Per 100gm of edible part, it is high in vita. A (2500mg), VIT. C (113mg), protein (3.6g), carbs (5.9g), and minerals such as Ca (102mg), Fe (1mg), P (78mg), K (382mg), and Na (15mg). After the curd has been harvested, the green leaves are a valuable source of many nutrients and green fodder, which is in low supply throughout the winter season (Kumar *et al.*, 2007).

The research work was conducted in broccoli by using micro nutrients and organic fertilizer in the Punjab region to find out the response of different fertilizers on the growth, yield and quality of broccoli.

Materials and methods

The study was conducted at Horticulture Research Farm, Lovely Professional University, Phagwara, Punjab during October to March, 2022 in a Factorial Randomized Block Design with three replications. Seeds were disinfected by using thiram @ 3g/l. Portrays were filled with rooting media coco peat @ 3kg, vermicompost @ 1kg and perlite @ 1kg per tray. In portray each cell one seed per cell was sown and covered with media and put in nursery. Seedling had been watered daily. Foliar applications of water-soluble fertilizers at a rate of 3g/l on 20 DAS intervals promoted the growth of the seedlings. Following that, irrigation was discontinued 4-5 days before transplanting; this helped the plants harden.

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After 25 to 30 days, the seedlings were prepared for transplanting. Healthy seedlings (10–15cm) of consistent size and shape were planted in the main field. Each plot has dimensions of 3.15m by 0.9m. The spacing between seedlings during transplantation was 45cm. After transplanting the seedlings, 20 days later, the land was treated with borax and boron with recommended dose of NPK + 100% of FYM. Five plants were selected randomly from each treatment and tagged to record the data on growth, yield and quality attributes. Harvesting was done when the flower buds became compact and firm and before the buds start to open. The observations were recorded for plant height at 30 DAT, 60 DAT and at harvest, number of leaves at 30 DAT, 60 DAT and at harvest, stem diameter, curd diameter, weight of curd, total yield, ascorbic acid content and dry matter. The statistical analysis was carried out for each observed character by using OPSTAT.

Results and discussion

Maximum plant height at 30 DAT, 60 DAT and at harvest were observed in T9 - Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM i.e., 21.10cm, 27.100cm and 30.83cm respectively, which was *at par* with T8 - (Spray of Borax @ 12.5kg/ha + Recommended dose of NPK + 50% of FYM) 20.60cm, 26.87cm and 30.47cm while the minimum values were observed in control. Maximum number of leaves at 30 DAT, 60 DAT and at harvest were observed under T9 - Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM i.e., 7.33, 11.40 and 13.20 respectively, which was *at par* with T8 - (Spray of Borax @ 12.5kg/ha + Recommended dose of NPK + 50% of FYM) i.e., 6.93, 10.77 and 12.80 while the minimum values were observed in control. Maximum stem diameter was observed in T9 - (Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM) that is 2.86cm, which was *at par* with T8 - (Spray of Borax @ 12.5 kg/ha + Recommended dose of NPK + 50% of FYM) that is 2.57cm, while the minimum Stem diameter of broccoli at harvest was recorded in (T0 - Control Recommended dose of NPK) that is 1.32cm. It might be because micronutrients are vital plant nutrients that are available in trace levels in tissue yet are crucial for plant growth and development. Micronutrients are directly related to plant growth. It is caused by boron, and borax aids in the development of firm stems and rapid plant growth. Similar findings have also been obtained by Meena *et al.*

(2016), Singh *et al.* (2016) and Dhotra *et al.* (2018).

The results indicated positive effect of micro-nutrients and organic fertilizer on curd diameter, weight of curd and total yield. Maximum curd diameter was observed in T9 - (Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM) that is 12.27cm, which was *at par* with T8 - (Spray of Borax @ 12.5kg/ha + Recommended dose of NPK + 50% of FYM) that is 11.67cm, while the minimum curd diameter was recorded in control. Maximum weight of curd was observed in T9 - (Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM) that is 301.33g, which was *at par* with T8 - (Spray of Borax @ 12.5kg/ha + Recommended dose of NPK + 50% of FYM) 284.00g, while the minimum weight of curd was recorded in control. Maximum total yield per hectare was observed in T9 - (Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM) that is 147.66q/ha, which was *at par* with T8 - (Spray of Borax @ 12.5kg/ha + Recommended dose of NPK + 50% of FYM) that is 138.27q/ha, while the minimum total yield per hectare was recorded in control. It's possible that the use of optimal B boosted the intake of important nutrients, leading to higher photosynthesis in plants and larger, heavier curds. The transport of carbohydrates from leaves to reproductive regions in the curd may be enhanced by B, which could contribute to this. It might be the result of B enhanced intercellular CO₂ concentration, net photosynthesis, transpiration rate, stomatal opening, and leaf water potential, all of which ultimately boost yield. Similar findings have also been obtained by Chander *et al.* (2009), Choudhury *et al.* (2022) [1] and Islam *et al.* (2015).

Maximum dry matter content (%) was observed in T9 - (Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM) that is 12.48%, which was *at par* with T8 - (Spray of Borax @ 12.5kg/ha + Recommended dose of NPK + 50% of FYM) that is 11.67%, while the minimum dry matter content was recorded in control. Maximum ascorbic acid was observed in T9 - (Spray of Borax @ 15kg/ha + Recommended dose of NPK + 50% of FYM) that is 35.31mg/100g, while the minimum ascorbic acid was recorded in control. It might be because the soil retains moisture better, allowing for maximal nutrient absorption. It's possible that it's because there was increased nutritional intake. Similar findings have also been obtained by Jawad *et al.*, 2019 [8].

Table 1: Shows the treatments of plants heights, harvest, number of leaves, stem diameter and curd diameter

SL. No	Treatments	Plant height (30 DAT) (cm)	Plant height (60 DAT) (cm)	Plant height at harvest (cm)	Number of leaves (30 DAT)	Number of leaves (60 DAT)	Number of leaves at harvest	Stem Diameter (cm)	Curd Diameter (cm)
1.	T1	18.23	23.20	28.27	5.33	7.63	9.03	1.32	8.03
2.	T2	18.43	23.30	28.67	6.03	11.03	11.33	1.87	9.58
3.	T3	19.63	25.20	30.00	5.97	10.23	12.17	2.26	10.04
4.	T4	19.23	24.53	28.57	5.63	10.03	12.13	2.05	10.13
5.	T5	19.57	24.67	29.10	5.97	9.57	11.57	2.05	10.00
6.	T6	19.10	24.60	29.17	5.87	9.70	11.73	2.34	10.26
7.	T7	19.27	24.27	29.77	5.73	9.83	11.53	2.06	10.76
8.	T8	19.87	25.83	28.60	6.23	10.00	12.13	1.54	8.90
9.	T9	20.60	26.87	30.47	6.93	10.77	12.80	2.57	11.67
10.	T10	21.10	27.10	30.83	7.33	11.40	13.20	2.86	12.27
S.Em.±		0.17	0.16	0.15	0.30	0.42	0.35	0.15	0.42
CD at 5%		0.51	0.48	0.46	0.90	1.27	1.05	0.44	1.24
CV (%)		1.51	1.10	0.91	8.51	7.31	5.16	12.04	7.08

Table 1: Shows treatments weight of curd yield dry matter ascorbic acid

Sl. No.	Treatments	Weight of curd (g)	Yield (q/ha)	Dry matter (%)	Ascorbic acid (mg/100g)
1.	T1	223.00	110.29	8.18	30.82
2.	T2	250.67	119.34	9.21	32.36
3.	T3	252.33	132.18	9.92	32.27
4.	T4	259.67	123.45	9.13	33.41
5.	T5	249.00	123.13	9.20	32.07
6.	T6	244.67	126.26	8.96	32.92
7.	T7	250.33	126.42	9.19	33.32
8.	T8	271.33	132.18	10.85	31.07
9.	T9	284.00	138.27	11.67	32.88
10.	T10	301.33	147.66	12.48	35.31
S.Em. \pm		6.73	3.42	0.34	0.46
CD at 5 %		20.16	10.24	1.03	1.38
CV (%)		4.51	4.63	6.002	0.65

Conclusion

As per the results obtained in the present study, it can be concluded that by using optimal treatment combination, which included applying 15kg/ha of borax together with the recommended dose of NPK and 50% of FYM which showed better results over control. It showed great impact on all the parameters i.e., growth, yield and quality of broccoli. It helped in intake of more nutrients which are essential for plant growth and development. The productivity and quality of broccoli are ultimately improved by their increased soil moisture retention, increased intercellular CO₂ concentration, net photosynthesis, transpiration rate, stomatal opening, and leaf water potential. This leads to the conclusion that using this treatment combination will boost broccoli yield and quality.

References

1. Choudhury R, Sarangthem I, Singh AH, Devi KN, Singh No. Studies on the yield of broccoli (*Brassica oleracea* var. *Italica*) as influenced by boron application in acid soil, 2022.
2. Decoteau D. Vegetable crops, upper revert company; calcium, magnesium, and potassium interrelationships affecting cabbage production. *Journal of American Society for Agronomy*. 2000;106:500-503.
3. Dhotra B, Sharma KR, Sharma MK, Chopra S. Effect of micronutrient and organic fertilizer on plant growth and yield of broccoli (*Brassica Oleracea* var. *Italica*) cv. Palam Samridhi.
4. Meena K, Ram R, Meena M, Meena J, Meena D. Effect of organic manures and bio-fertilizers on growth, yield and quality of broccoli (*Brassica Oleracea* var. *Italica* Plenck.) cv. KTS-1. *Chemical Science Review and Letters*. 2017;6(24):2153- 2158.
5. Ouda BA, Mahadeen AY. Effect of fertilizers on growth, yield, yield components, quality and certain nutrient contents in broccoli (*Brassica Oleracea*). *International Journal of Agriculture and biology*. 2008;10(6):627-632.
6. Singh MK, Chand T, Kumar M, Singh K, Lodhi S, Singh V, *et al.* Response of different doses of NPK and boron on growth and yield of broccoli (*Brassicaoleracea* L. var. *Italica*). *International Journal of Bio-resource and Stress Management*. 2015;6(1):108-112.
7. Sanjay Kumar, Pradeep Kumar, Meena ML, Rajeev Kumar, Ranjeet Rawat, Yadav S. Influence of varieties and spacing on growth characters of sprouting broccoli (*Brassica Oleracea* L.). *Annals of Plant and Soil Research*. 2021;23(1):99-103.
8. Almosawy AN, Jawad NN, Kalaf IT. Influence of foliar application of boron and times of spraying on yield of maize (*Zea mays* L.). *Plant Archives*. 2019;19(2):307-309.
9. Chandra S, Roychoudhury A. Role of selenium and manganese in mitigating oxidative damages. *Protective chemical agents in the amelioration of plant abiotic stress: Biochemical and Molecular Perspectives*, 2020, 597-621.
10. Choudhary S, Soni AK, Jat NK. Effect of organic and inorganic sources of nutrients on growth, yield and quality of sprouting broccoli cv. CBH – Indian, *Journal of Horticulture*. 2012;69(4):550-554.