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Study on integrated nutrient management in broccoli (*Brassica oleracea* L. var. *Italica* Plenck) for better growth and curd quality

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Abstract

Field experiment was conducted during Rabi season, 2019-20 to study the effect of Integrated Nutrient Management in Broccoli (*Brassica oleracea* L. var. *Italica* Plenck) for better growth and curd quality parameters. The test crop broccoli (cv. Diccico) received 10 different treatments consisted of control (RDF), FYM, Vermicompost, PSB, Azotobacter. Each treatment was replicated three times and imposed over a statistically laid out field in randomized block design. Results revealed that the treatment T₇ (FYM 5t/ha+Vermicompost @1.25t/ha+50%PSB) recorded maximum values for plant height (50.45cm), plant spread N-S (53.12cm), plant spread E-W (51.46cm), number of leaves per plant (22.50), leaf length (38.18cm), leaf width (21.15cm), terminal head weight (512.60g), Vitamin C (80.24mg/100g), T.S.S. (11.37°Brix) were recorded in treatment T₇ followed by treatment T₈ (FYM 5t/ha+ Vermicompost @ 1.25t/ha +50% Azotobacter).

Keywords: Broccoli, integrated nutrient management, growth, quality

Introduction

Broccoli (*Brassica oleracea* L. var. *italica*) belongs to family Brassicaceae (Cruciferae). It is biennial and herbaceous winter vegetable crop. This crop is considered as commercial crop in India [4]. In India, broccoli is grown over an area of 4 lakh hectares with annual production 85 lakh metric tons. Area under broccoli is about 13 lakh hectares in the world with annual production of about 20 million metric tons [1]. The use of biofertilizers in combination with chemical fertilizers and organic manures offers a great opportunity to increase the production as well as quality of broccoli [12]. The incorporation of organic nutrients in the form of vermicompost, farmyard manure and biofertilizer is known to influence favorably the physico-chemical and biological properties of the soil resulting in enhanced uptake of nutrients from soil [3].

Integrated nutrient management having chemical fertilizers applied along with organic sources of nutrients is an effective method for economization of production cost as well as maintenance of soil fertility [2]. The crops grown with integrated nutrient management techniques are nutritionally and environmentally superior to those fertilized with inorganic forms of nutrients. Thus, the use of all forms of sources in a combined ways i.e. integrated nutrient management practices is the only answer for the production of good quality produce without any ill effect on environment. Therefore, keeping in view the above facts in mind, an attempt has been made in the present investigation to study the effect of integrated nutrient management on growth and curd quality of broccoli (*Brassica oleracea* L. var. *italica*).

Method and Material

Broccoli (*Brassica oleracea* L. var. *italic* Plenck) was used for present study. The plot size was 1.5m×1m and a spacing of 60cm×45cm. Recommended crop production and protection practices were followed to grow the crop. The experiment was laid out in a randomized block design with three replications. The treatments consisted of control (T₀), FYM @ 20 t/ha+VC@2.5t/ha (T₁), FYM @ 10ton/ha+50%PSB (T₂), FYM @ 10ton/ha+50%Azotobacter (T₃), Vermicompost@1.25t/ha+75%PSB (T₄), Vermicompost @1.25t/ha+75% Azotobacter (T₅), 50% PSB + 50%Azotobacter (T₆), FYM @5t/ha + Vermicompost @1.25t/ha + 50%PSB (T₇), FYM 5t/ha + Vermicompost @1.25t/ha + 50% Azotobacter (T₈), FYM @5t/ha + Vermicompost @1.25t/ha+25% PSB+25% Azotobacter (T₉). Observations were recorded on randomly selected plants with different characters *i.e.*

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plant height, number of leaf per plant, leaf length, leaf width, plant spread, stem diameter, terminal head weight, ascorbic acid and T.S.S and the data was subjected to statistical analysis as suggested by [13].

Results and Discussion

Growth parameter

The mean performance of the treatments for growth parameters like plant height, numbers of leaves per plant, leaf length, leaf width, plant spread and curd diameter have been presented in table no.1 showing significant differences for growth parameters. Vigorous maximum plant height (50.45cm), maximum No. of leaves per plant (22.50), leaf length (38.18cm), leaf width (21.15cm), plant spread N-S

(53.12cm), plant spread E-W (51.46cm)and stem diameter (9.18cm)was noted in treatment T₇ (25% FYM + 25% Vermicompost + 50%PSB) and followed by T₈ (25% FYM +25% Vermicompost + 50% Azotobacter) in terms of plant height (49.38cm), No. of leaves per plant (20.50), leaf length (37.80cm), leaf width (20.10 cm),plant spread N-S (49.15cm), plant spread E-W (48.98cm)and stem diameter (8.16cm), while the control recorded minimum values for these growth parameters. The remaining treatments recorded significantly medium growth. A balanced use of organic manure and biofertilizers enhances the soil microbial activity and readily available nutrients to the plant. Due to this fact the growth of plant was significantly enhanced and similar results reported by [10, 11, 5, 9, 6].

Table 1: Effect of Integrated Nutrient Management of Broccoli for better growth

Treatments No.	Plant height (cm)	Number of leaves	Leaf length (cm)	Leaf width (cm)	Plant spread (cm)		Stem diameter (cm)
					E-W	N-S	
T ₀	37.15	13.85	25.10	13.38	38.16	39.12	4.90
T ₁	40.30	16.40	27.20	15.30	40.46	41.18	5.48
T ₂	45.90	17.78	34.52	16.80	43.48	43.38	7.10
T ₃	43.95	17.20	33.15	16.20	43.25	42.48	6.86
T ₄	48.56	19.17	37.20	18.10	47.26	48.40	8.00
T ₅	47.00	18.90	36.10	17.65	44.98	46.47	7.69
T ₆	46.17	18.75	35.90	17.30	44.25	46.16	7.36
T ₇	50.45	22.50	38.18	21.15	51.46	53.12	9.18
T ₈	49.38	20.50	37.80	20.10	48.98	49.15	8.16
T ₉	42.20	16.86	30.10	15.85	42.46	41.35	6.20
F-test	S	S	S	S	S	S	S
C.D. (5%)	2.11	0.85	1.57	0.80	2.08	2.11	0.33
S.Ed (±)	1.00	0.41	0.75	0.38	0.99	1.00	0.16

Curd quality parameter

The mean performance of the treatments for curd quality parameter like curd weight (g), ascorbic acid (mg/100g), T.S.S.(⁰Brix) have been presented in table 2 given below showing significant differences for curd quality parameter. Maximum curd weight (512.60g), Ascorbic acid

(80.24mg/100g) and T.S.S. (11.37⁰Brix) was observed in treatment T₇ (25% FYM +25% Vermicompost+50%PSB) followed by treatment T₈ (25% FYM +25% Vermicompost + 50% Azotobacter), while the control recorded poor values for these parameters. The results are closely related to the reports given by [7, 8].

Table 2: Effect of Integrated Nutrient Management of Broccoli for better curd quality.

Treatments No.	Treatment details	Curd weight (g)	Ascorbic Acid (mg/100g)	T.S.S.(⁰ Brix)
T ₀	Control (RDF)	288.60	65.28	7.40
T ₁	50% FYM+50% VC	343.13	70.76	8.63
T ₂	50% FYM+50% PSB	411.73	73.86	9.58
T ₃	50% FYM+50% Azotobacter	404.80	72.24	9.36
T ₄	25% VC+75% PSB	455.27	77.90	10.42
T ₅	25% VC+75% Azotobacter	434.33	76.44	10.14
T ₆	50% PSB+50% Azotobacter	415.40	75.40	9.78
T ₇	25% FYM+25% VC+50% PSB	512.60	80.24	11.37
T ₈	25% FYM+25% VC+50% Azotobacter	461.07	79.47	10.82
T ₉	25% FYM+25% VC+25% PSB+25% Azotobacter	358.67	71.48	8.84
F-test		S	S	S
C.D. (5%)		2.58	2.85	0.45
S.Ed (±)		1.23	1.36	0.21

Conclusion

The present investigation resulted that integrated application of bio-fertilizer(PSB) and vermicompost along with FYM proved significantly better over the recommended practice (100% RDF), whereas remaining treatments resulted in significant reduction for various growth and quality parameters. Among all the treatments, application of (T₇) FYM @5t/hac+ Vermicompost @1.25t/ha+50%PSB in sprouting broccoli was found to be the best for obtaining better growth and good quality curd produce.

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