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Effect of integrated nutrient management on growth, yield and quality of broccoli (*Brassica oleracea* var. *italica*) cv.TSX-0788

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Abstract

Broccoli is one of the most popular exotic vegetable grown throughout the world. It belongs to the Brassicaceae family. It is a rich source of Vitamin A, Vitamin C, foliate and supplies about 15 Kcal Energy. The present investigation is entitled "Effect of Integrated Nutrient Management on Growth, Yield and Quality of Broccoli (*Brassica oleracea* var. *italica*)" was undertaken at Department of Horticulture, SHIATS, Allahabad, during the year 2012-2013. The experiment was laid out in simple R.B.D. with three replications and nine treatments separately. Studies showed that, significant effect on the height of plant (43.47cm), spread of plant (48.47cm), number of leaves (16.87), stem diameter (2.50), minimum no. of days to first Harvest (69.33), curd diameter (10.13 cm), number of freuds per curd of broccoli (15.67), total weight of plant without roots (962.33g), fresh weight of curd (403.67g), dry weight of curd (57.53g), high yield (21.53t /ha), and quality [T.S.S (4.33⁰ Brix) and vitamin C (115.93 mg / 100g of edible portion)], PH (4.07), maximum gross return (258,347.00 Rs. ha⁻¹), net return (175,508.00 Rs. ha⁻¹) and Benefit: cost ratio (3.12) was observed maximum in treatment with (T₅) 75% NPK+25% vermicompost + Azospirillum.

Keywords: Broccoli, integrated nutrient management, growth, yield and quality

Introduction

Broccoli is one of the rare vegetable grown on a small scale. Broccoli (*Brassica oleracea* var. *italica*) is a Cole crop from the family cruciferae. Broccoli is known as the "Crown of Jewel nutrition" because it is rich in vitamins and minerals. It contains vitamin A, B and B₂ and is a good source of potassium, iron and fiber. It has about 130 times more vitamin A contents than cauliflower and 22 times more than cabbage. It contains a few important phytochemicals, beta-carotene, indoles and isothiocynates. Phytochemical prevent Carcinogens (Cancer causing substances). It also contains Sulforphane, which block growth of tumours and reduce the risk of cancer.

Materials and Methods

The present study was carried out at vegetable science, Department of Horticulture, SHIATS during the year 2012-13. The objective of study was to evaluate the Effect of Integrated Nutrient Management on growth, yield and quality of broccoli (*Brassica oleracea* var *italica*.) The experimental area had sandy loam soil with pH of 6.5, the soil was moderately fertile. The experiment was laid in Randomized Block Design with 9 treatments, each replicated three times, thus making a total 27 plots. The unit plot size was 1.5 m². The plants were spaced at 60 cm between the rows and 45 cm between the plants. There were total of 8 plants in each plot the fertilizers viz., urea for nitrogen, single super phosphate for phosphorus and muriate of potash for potassium were weighed as per the calculated quantities according to each of the treatment combinations mentioned above. Full dose of phosphorus and potassium along with half dose of nitrogen was applied basally to each specified plot. The remaining half dose was given at 30 days after transplanting. Pre and post harvest parameters, viz. plant height, plant spread, number of leaves per plant, plant spread, stem diameter, days to first harvest, weight of plant without root, no. of freuds per curd, diameter of curd, fresh weight of curd,(g) dry weight of curd(g),curd yield/plot (kg), curd yield t/hac and quality parameters, viz. T.S.S (⁰Brix),pH of curd and ascorbic acid (mg / 100 g edible portion) were recorded. A total fifteen observations at 15, 30, 45, and 60 DAS were recorded during the experiment.

The data recorded on each character were analysed by the ANOVA technique. The critical difference values were calculated at 5 per cent level of significance.

Result and Discussion

The statistically analysed data on variable parameters are given in table 1. The data clearly reveal that there are significant difference among the treatment for all the parameters.

The maximum plant height at 60 days (43.47cm), maximum no of leaves (16.87), maximum plant spread (48.47cm), maximum stem diameter (2.50cm), was observed in treatment (T₅) with 75% NPK +25% Vermi compost +Azospirillum and found to be significantly affected compared to all other treatments followed by treatment (T₆) with 50%NPK+50%Vermicompost+Azospirillum (41.87), (16.33), (45.53 cm),(2.3) Which was better than control (36.60 cm) (13.13), (33.80), (1.53cm) respectively. Combine use of vermicompost and NPK increase vegetative growth of Broccoli these result are in close conformity with the finding of Devi *et al.* (2003)^[3].

There is significant effect with respect days to first harvest due to the effect of INM at 60DAS (T₅) with75%NPK +25% Vermi compost + Azospirillum took minimum number of days (69.33cm), followed by the treatment (T₆) with 50% NPK+50% Vermicompost + Azospirillum (71.53). Which was better than control (81.27).

The post harvest parameters was significantly influence by INM, maximum total weight of plant without roots (962.33g), Maximum number of frouds per curd of broccoli (15.67), maximum curd diameter (10.13cm), maximum fresh weight of curd (403.67g), maximum dry weight of curd (57.53g), highest curd yield of per plot (3.23kg), maximum yield of curd per hectare (21.53) t/hac was observed in treatment (T₅) with 75%NPK +25% Vermi compost + Azospirillum followed by treat ment (T₆) with 50%NPK+50% Vermicom post + Azospirillum. Minimum was found to be in treatment

(T₀) with Control (405.33g) (14.67), (07.47 cm) (142.97g), (20.40g), (1.14 kg), (7.62) t/hac respectively.

Yeld was increase due to combine and judious use of NPK+ vermicompost + azospirillum. The increased seed yield was obtained in biofertilizers application (Azospirillum) could be attributed to the effect of growth hormones like IAA and cytokinin produced by Azospirillum which stimulated root morphology. This in turn, would have improved assimilation of nutrients and thus seed yield and Vermicompost is a rich mixture of major and minor plant nutrients. It increase total microbial population of nitrogen fixing bacteria, actinomycetes and symbiotic association of mycorrhiza on plant root system, Nkoa *et al.* (2002)^[5] found that using mineral fertilizer (N, P and K) increasing Broccoli vegetative growth, yield and quality.

Maximum total soluble solid (4.33⁰Brix), Maximum ascorbic acid (115.93 mg / 100g of edible portion) was obtained with treatment (T₅) 75%NPK +25% Vermicompost + Azospirillum followed by (4.07⁰Brix), (113.87 mg / 100g of edible portion),treatment (T₆) with 50%NPK +50%Vermicompost+Azospirillum and the minimum (3.07⁰Brix), (104.67 mg / 100g of edible portion) was recorded with (T₀) control. Upadhvav *et al.* (2012) also find more or less similar result.

Minimum PH (4.07) was obtained with treatment (T₅)75%NPK+25% Vermicompost + Azospirillum followed by (4.27) treatment (T₆) with 50%NPK+50% Vermicompost + Azospirillum and the maximum (5.13) was recorded with (T₀) control.

Treatment (T₅)75%NPK+25% Vermicompost + Azospirillum recorded maximum gross return (258,347.00 Rs. ha⁻¹), net return (175,508.00 Rs. ha⁻¹) and Benefit: cost ratio (3.12). Treatment (T₀) control recorded the minimum gross return (91,499/ha), minimum net return (19,593.00 Rs. ha⁻¹), minimum Benefit: cost ratio (1.27). Due to use of INM we find best result Dubey *et al.* (2009)^[4] discuss like a similar result

Table 1: Effect of integrated nutrient management on growth, yield and quality of broccoli

Treatment	Plant height (cm) 60 DAT	Number of leaves per plant60 DAT	Plant spread (cm) 60 DAT	Stem diameter (cm) 60 DAT	Days to first harvest	Weight of plant without root (g)	Number of frauds per curd	Diameter of curd (cm)	Fresh weight of curd (g)	Dry weight of curd (g)	Curd yield per plot (kg)	Curd yield (t ha ⁻¹)	Total Soluble Solid (T.S.S.) (°Brix) in curd	pH of curd	Ascorbic acid (mg / 100 g edible portion) in curd
T ₀	36.60	13.13	33.80	1.53	81.27	405.33	8.60	7.47	142.97	20.40	1.14	7.62	3.07	5.13	104.67
T ₁	41.47	16.27	44.73	2.27	72.53	811.33	14.27	9.53	323.80	46.20	2.59	17.27	3.93	4.33	113.33
T ₂	41.27	16.07	44.13	2.13	73.73	774.00	13.13	9.27	298.07	42.47	2.38	15.90	3.80	4.47	112.27
T ₃	40.80	15.80	42.80	2.00	76.33	621.33	12.13	8.87	255.20	36.40	2.04	13.61	3.53	4.67	109.73
T ₄	39.53	15.53	42.07	1.73	78.87	481.33	11.33	8.33	198.93	28.33	1.59	10.61	3.27	5.07	108.73
T ₅	43.47	16.87	48.47	2.50	69.33	962.33	15.67	10.13	403.67	57.53	3.23	21.53	4.33	4.07	115.93
T ₆	41.87	16.33	45.53	2.33	71.53	926.67	14.67	9.73	361.20	51.47	2.89	19.26	4.07	4.27	113.87
T ₇	40.93	15.93	43.60	2.07	75.07	691.67	12.47	9.07	278.27	39.67	2.23	14.84	3.67	4.60	111.33
T ₈	40.43	15.67	42.53	1.87	77.53	543.00	11.67	8.53	224.60	32.07	1.80	11.98	3.47	4.80	109.33
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S. Ed. (±)	0.16	0.06	0.22	0.06	0.56	28.38	0.22	0.09	11.99	1.70	0.10	0.64	0.06	0.06	0.28
C. D. (P = 0.05)	0.33	0.13	0.46	0.13	1.20	60.16	0.47	0.19	25.43	3.61	0.20	1.36	0.13	0.12	0.60

Conclusion

In view of experimental results obtained during the present investigation, treatment T₅ (75% NPK +25% Vermi compost+ Azospirillum) emerged as best over all other treatment, in relation to growth, yield attributes, yield, quality and gross return (258, 347) Rs/hac with highest BCR (3.12) of Broccoli under the agro- climatic condition of Allahabad However this is based on one – season experiment, further trails may be needed to substantiate the results.

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