Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.7126

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (5):** 1338-1342 (2018)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Effect of Organic Manures and Inorganic Fertilizers on Plant Growth, Yield and Flower Bud Quality of Broccoli (*Brassica oleracea* var. Italica) cv- Green Magic

Gurvinder Singh[1], S. Sarvanan[2], Anita Kerketta[3*] and J. Rajesh[4]

[1]M.Sc. (Ag.) [2]Associate Professor, [3]Ph.D. Scholar, [4]M.Sc. (Ag.)

Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture and Sciences, Allahabad, UP.

*Corresponding Author E-mail: anitadgn1@gmail.com

Received: 14.08.2018 | Revised: 20.09.2018 | Accepted: 27.09.2018

ABSTRACT

An investigation was carried out to study the effect of different organic manures and inorganic fertilizers on plant growth, yield and flower bud quality of Broccoli cv. Green magic under open conditions on Experimental field, department of Horticulture, Sam Higginbottom University of Agriculture, Technology & Science, Allahabad, during Rabi season of 2015. The treatment consisted of different combinations of organic manures and inorganic fertilizers which were tested in RBD with three replications and 10 treatments with following combination of which was different organic manures like FYM, Poultry manure and vermicompost T_0 Control, T_1 (RDF), T_2 (25% RDF + 75% FYM), T_3 (50% RDF + 50% FYM), T_4 (25% RDF + 75% VC), T_5 (50% RDF + 50% PM), T_6 (25% RDF + 75% PM), T_7 (50% RDF + 50% PM), T_8 (25% RDF + 75% SM), T_9 (50% RDF + 50% SM), T10 (25% RDF +25% FYM + 25 %VC + 25% PM) were used in the investigation. The treatment T_5 (50% RDF + 50% VC) recorded maximum plant height (51.11 cm), maximum number of leaves per plant (27.87), diameter of curd (19.91 cm), maximum weight of trimmed curd (465.33g), maximum curd yield per plot (3.72 kg), curd yield per hectare (20.68 t/hac) and maximum T.S.S (^{0}Brix). The treatment T_6 (25% RDF + 75% PM) recorded maximum plant spread (57.77 cm), maximum weight of plant without root (1630.42g) found in T_3 (50% RDF + 50% FYM) and the maximum vitamin C mg/100gm (103.97) found in T_4 (25% RDF + 75% VC).

Key words: *Broccoli, FYM, VC, PM, Yield, Plant growth, Flower bud quality.*

INTRODUCTION

Broccoli (*Brassica olerasia* L. var. Italica) is a cool season vegetable of family cruciferous. Broccoli commonly known as harigobi or broccoli in hindi is gaining popularity in India also. It is either consumed raw as salad or cooked to prepare curries, soup and pickles. In the world market about 40 percent is marketed as fresh and remaining 60 percent as frozen. Broccoli is of two types, heading and sprouting, sprouting broccoli is more popular in India. It was a rare cole crop in India but now it is gaining popularity in metropolitan's cities, reputed hotels and restaurants[7].

Cite this article: Singh, G., Sarvanan, S., Kerketta, A., and Rajesh, J., Effect of Organic Manures and Inorganic Fertilizers on Plant Growth, Yield and Flower Bud Quality of Broccoli (*Brassica oleracea* var. Italica) cv- Green Magic, *Int. J. Pure App. Biosci.* **6(5):** 1338-1342 (2018). doi: http://dx.doi.org/10.18782/2320-7051.7126

Broccoli has anticarcinogenic properties and recude the risk of prostate cancer by up to 45 percent**.** Broccoli is a rich source of vitamins, minerals, proteins etc. It has about 130 times more Vitamin A contents than cauliflower and 22 times more than cabbage[13].

To increase the yield, plenty of chemical fertilizers along with a small quantity of organic once are being used by different workers which ultimately affects the health of soil as well as human[8]**.** Due to excess use of chemical fertilizers a decline pattern is observed in soil fertility, therefore integrated nutrient management is an important demand of present era[2].

Organic manure play a direct role in plant growth as a source of all necessary macro and micronutrient in available forms during mineralization and impoving physical and chemical properties of soils[4]**.** Therefore, utilization of locally produced manures by vegetable production operations may increase crop yield with less use of chemical fertilizer. In recent times, consumers are demanding higher quality and safe food vegetables.

Considering the above factors, the present experiment was undertaken to determine the best inorganic and organic fertilizer combination for plant growth and bud yield in broccoli.

MATERIAL AND METHOD

The present experiment was carried out during winter season of 2014-15 at the Vegetable Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh. The experiment was laid out in randomized block design with ten treatments and three replications. Broccoli cultivar Green Magic was taken as test crop. The treatments included T_0 : Control T_1 : Recommended dose of NPK (150:100:100 kg /ha), T_2 (25% RDF + 75% FYM), T_3 (50% RDF + 50% FYM), T_4 (25% RDF + 75% VC), T_5 (50% RDF + 50% PM), T_6 (25% RDF + 75% PM), T_7 (50% RDF + 50% PM), T_8 (25% RDF + 75% SM), T_9 (50% RDF + 50% SM), T10 (25% RDF +25% FYM + 25 %VC + 25% PM) were used in the investigation. The crop was raised with a spacing of 60 cm × 45 cm and plot size of 2 m × 1 m. Standard cultural practices recommended for Broccoli was followed uniformly for all the experimental plots. According to treatment details, organic manures (FYM, Vermicompost, Poultry Manure and sheep Manure) were applied in plots one month before the transplanting of seedlings. Nitrogen, phosphorous and potassium were applied in the form of Urea, Diammonium Phosphate and Muriate of Potas. Before transplanting, half of nitrogen and full doses of phosphorous and potassium were applied in the plots and the crop was top dressed with remaining half dose of nitrogen in two splits after 4^{th} and 6^{th} week of transplanting. The like diameter of curd (cm), weight of curd (g), curd yield per plot (kg) and curd yield (tonnes/ha) were recorded. Economics of the experiment was worked out on the basis of prevailing market prices of inputs and outputs. The data of the trial obtained were subjected to statistical analysis and the results were documented, analyzed and presented in tabular form.

RESULT AND DISCUSSION

The presented data in table 1 is concerning with the yield attributes of broccoli as affected by different organic and inorganic fertilizers either alone or in combinations. Plant height (cm) 60 DAT, The treatment T_5 (50% RDF + 50% PM) was recorded maximum height (51.11cm) followed by T_9 (50% RDF + 50% SM) with 49.01 and the minimum (33.10cm) was recorded with the T_0 (Control). This varations might be due to the availability of nutrients could be due to the organic manure enhances soil aggregation, aeration, water holding capacity and inorganic fertilizers give more available form of nutrients. So, the combinations of organic and inorganic fertilizers give better response. Devi *et al*.[5], also noted the similar findings growth in broccoli.

Diameter of curd Treatment T_5 (50% RDF + 50% PM) recorded maximum diameter of curd (19.91cm) followed by 18.21cm with T_{10} (25% RDF +25% FYM + 25 %VC + 25% PM) and the minimum value (9.79) was recorded with T_0 (Control). The result reveal, as expected and as mentioned by Chaterjee *et al.*[4], and Wani *et al.*[14].

Weight of trimmed curd (g) Treatment T_5 (50% RDF + 50% PM) was recorded maximum weight of trimmed curd (465.00gm) followed by 401.00gm with T_7 (50% RDF + 50% PM) and the minimum (115.67 gm) was recorded with T_0 (control). These results are in finding closely Stewart et al. (2005). The increase in curd weight might be due to the more photosynthesis from a larger area of the leaves and the translocation of photosynthetic to the sink which is ultimately the curd. The increase in the curd weight at this level might also be due to the increase in the length and width of the leaves, plant spread, curd diameter and curd depth. Shree *et al.*[9], in cauliflower reported that maximum curd weight was observed in various combinations of organic and inorganic fertilizers.

Curd yield per plot (kg) Treatment T_5 (50% RDF + 50% PM) was recorded maximum curd yield per plot (3.72kg) followed by 3.12kg with T_7 (50% RDF + 50% PM) and the minimum (0.930kg) was recorded with T_0 (control). Positive effect of organic manures and inorganic fertilizers on head diameter may be due to the better availability of soil nutrient that produced healthy plants with large vegetable growth, which reflected head diameter and improved soil chemical and physical properties by using organic manure. These results are closely found by Stewart *et al.*[11], Singh *et al.*[10], and Maurya *et al.*[7].

Curd yield per hectare (tones) Treatment T_5 (50% RDF + 50% PM) was recorded maximum curd yield per hectare (20.68 t) followed by 17.83 t with T_7 (50% RDF + 50% PM) and the minimum (5.14t.) was recorded with T_0 control. These results are close conformity with of the finding Basel *et al.*[3], Wani *et al.*[14], reported that excessive amount of organic and in organic fertilizer is used to achieve a higher yield and maximum value of growth.

TSS The maximum TSS value found in T_5 (50% RDF + 50% PM) 8.29. and the lowest TSS value was recorded in T_0 Control (6.65). The result are finding by Husain *et al.*,

Vitamin 'C' The maximum vitamin C mg/100gm recorded (103.97mg) in value found in T_4 (25% RDF + 75% VC) followed by T_6 (25% RDF + 75% PM) 100.91mg. The lowest vitamin was found in case of T_0 (Control) 78.56mg these results are finding by Chatterjee[4] and Ali Husain *et al.*[1].

The economics of different treatments *viz.*, yield (t/ha), cost of cultivation, gross return and benefit cost ratio has been woeked out and presented in table. Maximum gross return (496,320 ha) followed by Rs, 427,920 ha with T_7 (50% RDF + 50% PM) , maximum net return Rs. 420063 ha followed by Rs. 360,663 ha with T_7 (50% RDF + 50% PM) wherease the cost benefit ratio of treatment T_5 (50% RDF + 50% PM) i.e. (1:6.50) was also found to be the best treatment combinations terms of economics returns.

CONCLUSION

In conclusion, study revealed that the integration of organic and inorganic fertilizers had shown a effect in enhancing yields as well as productivity of broccoli with maximum net returns. On the basis of results, it could be concluded that the application of (50% RDF + 50% PM) T_5 was found to be the best treatment combination in terms of plant growth, yield , quality of broccoli and also found to be the cost benefit ratio or economic returns.

Table 1- Mean Performance of Effect of organic manure and inorganic fertilizers on broccoli for different Characters (cont…)

Treatment No	Treatment combination	Plant Height (cm)	Curd Diameter (mm)	Weight of trimmed curd (g)	TSS (^{0} Brix)	Vitamin C (100mg/100g)	Curd yield per plot (Kg)	Curd yield tones / ha
T_0	Control	33.10	9.79	115.67	6.65	78.56	0.930	5.14
T_1	RDF (150:100:100)	46.33	15.16	346.67	7.03	89.87	2.77	15.38
T_2	25% RDF+ 75% FYM	42.24	14.48	295.33	6.73	84.68	2.36	13.11
T_3	50% RDF + 50% FYM	47.45	17.20	360.67	7.59	83.93	2.88	16.00
T_4	25% RDF + 75% Vermicompost	42.13	15.57	305.33	7.21	103.97	2.44	13.55
T_5	50% RDF + 50% Vermicompost	51.11	19.91	465.33	8.29	91.38	3.72	20.68
T_6	25% RDF + 75% Poultry Manure	44.07	15.24	309.67	7.31	100.91	2.47	13.74
T_7	50% RDF + 50% Poultry Manure	49.45	17.07	401.67	7.73	97.55	3.12	17.83
T_8	25% RDF + 25% FYM + 50% Sheep Manure	43.85	16.75	321.00	7.03	100.40	2.56	14.24
T_9	50% RDF + 50 % Sheep Manure	49.01	17.71	370.67	8.11	99.74	2.96	16.47
T_{10}	25% RDF + 25% FYM + 25% Poultry manure + 25% Vermicompost	45.67	18.21	349.67	7.23	94.57	2.79	15.51

Table 1- Mean Performance of Effect of organic manure and inorganic fertilizers on broccoli for different Characters

Treatment No	Treatment combination	Yield t ha	Selling Rate	Gross Return	Cost of Cultivation	Net Return	Benefit Cost ratio
T_0	Control	5.14	24,000	123,360	47,030	76,330	2.62
T_1	RDF (150:100:100)	15.38	24,000	369,120	57,485	311,635	6.42
T_2	25% RDF+ 75% FYM	13.11	24,000	314,640	68,390	246,250	4.60
T_3	50% RDF + 50% FYM	16.00	24,000	384,000	64,757	319,243	5.92
T_4	25% RDF + 75% Vermicompost	13.55	24,000	325,200	85,640	239,560	3.79
T_5	50% RDF + 50% Vermicompost	20.68	24,000	496,320	76,257	420,063	6.50
T_6	25% RDF + 75% Poultry Manure	13.74	24,000	329,760	72,140	257,620	4.57
T_7	50% RDF + 50% Poultry Manure	17.83	24,000	427,920	67,257	360,663	6.36
T_8	25% RDF + 25% FYM + 50% Sheep Manure	14.24	24,000	341,760	72,140	269,620	4.73
T_9	50% RDF + 50 % Sheep Manure	18.07	24,000	395,280	62,257	333,023	6.34
T_{10}	25% RDF + 25% FYM + 25% Poultry manure + 25% Vermicompost	15.51	24,000	372,240	87,390	284,850	4.25

REFERENCES

1. Jasim, A. H. and Wassan, M., Abu Al-Timmen., The effect of mulch and fertilizers on broccoli (*Brassica oleracea* L. var. Italica) oxidants and antioxidants. *J. of Agri. Sci*. **2(4):** Pp. 124-130 (2014).
2. Attigah, A.S., Asiedu, E.K., Agyarko, K. and Dapaah, H.K., Growth and yield of okra (Abelmoschus esculentus L.) as affected by organic and inorganic fertilizers. ARPN*: J. Agri. Biol. Sci.*, **8(12):** 766-770 (2013).
3. Basel, A., Ouda and Atif, Y. M., Effect of fertilizers on growth, yield, yield components, quality and certain nutrients contents in broccoli. *Int. J. of Agr. & Bio*. **10:** 627–32 (2008).
4. Chaterjee, B., Ghanti, P., Thapa, U. and Tripathy, P., Effect of organic nutrition in sprouting broccoli. *Vegetable Science*., **33(1):** 51-54 (2005).
5. Devi, H.J., Maity and Paria, N.C., Effect of different sources of nitrogen on yield and economics of cabbage. *Environ. Ecol.*, **21(4):** 878-880 (2003).
6. Kohli, U.K.., Vikram Amit., Kumar, M. and Dohroo, N.P., ExoticVegetables, Westville Publishing House New Delhi, pp 19 (2010).
7. Maurya, A.K., Singh, M.P., Srivastava, B.K., Singh, Y.V., Singh, S. and Singh, P.K.,Effect of organic manures and inorganic fertilizers on growth characters, yield and economics of sprouting broccoli cv. Fiesta. *Indian J. Horticulture*, **65(1):** 116-118 (2008).
8. Meena, V.K., Dubey, A.K., Jain, V.K, Tiwari, A. and Negi, P., Effect of plant growth promoters on flowering and fruiting attributes of okra (*Abelmoschus esculentus* L.) *Crop Res*., **52(1,2 & 3):** 37-40 (2017).
9. Shree, S., Singh, V.K., and Kumar, R., Effect of integreated nutrient management on yield and quality of cauliflower (*Brassica oleracea* var. botrytis L.). *The Bioscan*, **9(3):** 1053-1058 (2014).
10. Singh, P.K. and pandey, M., Study the effect of integrated nutrient management on yield and nutrient uptake in cabbage. *Indian J. Hill Farming*, **23(2):** 39-41 (2010).
11. Stewart, M.W., Dibb, W.D., Johnston, E.A. and Smyth, J.T., The Contribution of Commercial Fertilizer Nutrients to Food Production. *Agron. J*., **97:** 1–6 (2005).
12. Swarup, V., Vegetable Science and Technology in India. Kalayani Publishers, New Delhi, pp 370-371 (2012).
13. Thamburaj, S. and Singh, N., Vegetables, Tubercrops and Spices, Directorate of knowledge Management in Agriculture ICAR New Delhi, pp122-123 (2014).
14. Wani, A.J., Raj Narayan, Ahmed, N., Singh, A.K., Chattoo, M.A., and Narayan, S., Influence of organic and inorganic sources of Nutrients on growth, yield and quality of cauliflower (*Brassica oleracea* var *botrytis* L.). *Environ. Ecol.*, **29(4):** 1941-1947 (2011).
15. Yoldas, F., Ceylan, S., Yagmur, B. and Mordogan, N., Effects of nitrogen fertilizer on yield quality and nutrient content in broccoli. *J. Plant Nutri.,* **31(7):** 1333-1343 (2008).