



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(4): 3193-3195

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Received: 23-05-2020

Accepted: 25-06-2020

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Effect to standardize the best treatment combination of organic and inorganic source for better growth and yield of Brinjal (*Solanum melongena* L.)

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DOI: <https://doi.org/10.22271/chemi.2020.v8.i4am.10143>

Abstract

The present experiment was carried out during 2018 to 2020 in Departmental Research Field of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design (RBD), with ten treatments and each replicated thrice. The treatments were T0:Control, T1:100% N@ Poultry manure, T2:100% N @ Vermicompost, T3:100% N @ FYM (Kg), T4:50% N + 50% P @ Poultry manure, T5:50% N + 50% P @ Vermicompost, T6:50% N + 50% P @ FYM, T7:25% RDF + 100% @ Poultry manure, T8:25% RDF + 100% @ Vermicompost and T9:25% RDF + 100% @ FYM. On the basis of present investigation it is concluded that the treatment T7 25% RDF + 100% @ Poultry manure is proved as a best combination of different organic and inorganic fertilizer for the improvement of brinjal cultivation through organically; where treatment T7 25% RDF + 100% @ Poultry manure significantly enhances the growth, flowering, fruit yield and quality traits of brinjal. The maximum benefit cost ratio (1:3.85) was found in T8.

Keywords: Brinjal, organic, inorganic fertilizer, vermicompost, FYM, poultry manure and RDF

Introduction

Brinjal (*Solanum melongena* L.) of Solanaceae family is one of the widely used vegetable crop by most of the people and is popular in many countries viz., central, south and south east Asia, some part of Africa and central America. It is an important vegetable due to its nutritive value, consisting of minerals like iron, phosphorus, calcium and vitamins like A, B and C. Unripe fruits are used primarily as vegetable in the country.

Brinjal is named as "poor man's vegetable" because of its low cost of production, ease of culture and availability throughout the year. Brinjal (*Solanum melongena* L.) belongs to family Solanaceae. Light well-drained sandy-loam soils with a pH range of 6.0 to 7.5 are preferred by this crop. In world, brinjal occupies an area of 1.128 million ha with a production of 1.74 million tonnes with an average productivity of 15, 434 tonnes per ha.

In India, brinjal is grown throughout the year in almost all parts of country except at higher altitude and liked by both poor and rich alike and it is a major vegetable crop of plains, the actual area under brinjal cultivation in India is not available due to its seasonal nature of cultivation. However, it occupies an area of 728 ha with an annual production of 12666 metric tonnes in India Area and Production of Horticulture Crops

(NHB-2018-2019) [7]. In India, brinjal is grown throughout the year in almost all parts of country except at higher altitude and liked by both poor and rich alike and it is a major vegetable crop of plains.

The organics are the indigenous source of nutrients which can help in increasing production and productivity along with improvement in soil physical conditions. Use of such organic materials, which are being wasted in large amounts without proper use can help in reducing cost of cultivation, increasing productivity and improving soil as well as human and livestock health. Various organic manures so far recognized in this group are green manures, rural/urban compost, farmyard manure, vermicompost and liquid organic manures etc.

In India, all the organic manures together have the potential to supply approximately 33 million tonnes of N, P and K per year (Gaur *et al.*, 1992) [4].

Among organic manures vermicompost is widely accepted by farmers and is produced due to the activity of earthworms. It is rich in all plant nutrients, beneficial microorganisms like N-fixers, biologically active metabolites, particularly gibberellins, cytokinins, auxins and group B vitamins and several enzymes like lipase, cellulose, chitinase, urease, dehydrogenase and nitrogenase (Bano *et al.*, 1987) [1]. The vermicompost can be applied alone or in combination with inorganic fertilizers to get better yield and quality of diverse crops.

Materials and Methods

The experiment was carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. The experiment was conducted in Randomized Block Design having 10 various treatments (T0 Control, T1 100% N + 100% Poultry manure, T2 100% N + 100% Vermicompost, T3 100% N + 100% FYM, T4 50% N + 50%

Poultry manure, T5 50% N + 50% Vermicompost, T6 50% N + 50% FYM, T7 25% RDF + 100% Poultry manure, T8 25% RDF + 100% Vermicompost, T9 25% RDF + 100% FYM) in three replications. The allocation of treatments of the individual plots using random number in each replication. Prayagraj is situated at an elevation of 78 meters above sea level at 25.87 degree North latitude and 81.15 degree E longitude. Brinjal cv pusa purple long used for studies. It has average yield potential of 20-30 tonnes per hectare in kharif and 20-25 tonnes per hectare in rabi season with duration of 100-110 days. plot length size is 2m x 2m and net plot size of treatment is 4.1m² respectively. Bund size of plot is 25cm. One main irrigation channel of 1.0 m² width and two sub irrigational channel of 50cm were prepared in the experiment filed. Light raking of the soil followed by earthing up twice at 30 to 60 days after planting had significant beneficial effect on brinjal yield. One irrigation one the day of planting and next two irrigation at 5 days interval were given for the establishment of crop. There after 7 irrigations were given at 10-15 days of interval depend upon soil and weather conditions.

Result and Discussion

The maximum plant height was recorded in T7 25% RDF + 100% @ Poultry manure which is (63.5033 cm) while the minimum plant height was recorded in the treatment T0 Control (40.64cm). The increase in growth parameters such as plant height, may be due to the combined application of organic and inorganic which provided continuous supply of nutrients along with production of phytohormones which enhanced higher carbohydrates production. These results are in accordance with the findings of

Chatterjee *et al.*, (2014) [2] in tomato and Vasuniya (2012) [9] in chilly and Kumar (2018) [6] in brinjal.

Number of primary branches per plant is maximum in T7 25% RDF + 100% @ Poultry manure which is (5.65) while the minimum primary branches per plant was recorded in the treatment T0 Control (2.43). The increase in growth parameters such as number of primary branches may be due to the combined application of organic and inorganic which provided continuous supply of nutrients along with production of phytohormones which enhanced higher carbohydrates production. These results are in accordance with the findings of Chithesh (2005) [3] in tomato and

Vasuniya (2012) [9] in chilly and Kumar (2018) [6] in brinjal. According to Kale *et al.*, (1987) [5] vermicompost acts as a good medium for the growth and yield, and increases in the soil and make the nutrients available for uptake by plants.

Days to flower bud appearance is minimum in T7 25% RDF + 100% @ Poultry manure which is (49.75) while the maximum Days to flower bud appearance was recorded in the treatment T0 Control (57.53). The increase in growth parameters such as days to flower bud appearance may be due to the combined application of organic and inorganic which provided continuous supply of nutrients along with production of phytohormones which enhanced higher carbohydrates production. These results are in accordance with the findings of Chatterjee *et al.*, (2014) [2] in tomato and Vasuniya (2012) [9] in chilly and Kumar (2018) [6] in brinjal. According to Kale *et al.*, (1987) [5] vermicompost acts as a good medium for the growth and yield, and increases in the soil and make the nutrients available for uptake by plants.

The maximum Length fruit was recorded in the T7 25% RDF + 100% @ Poultry manure (27.94cm) which was significantly superior over all other treatments. The statistically lowest fruit length was observed in the treatment T0 Control (14.63cm). According to Kale *et al.*, (1987) [5] vermicompost acts as a good medium for the growth and yield, and increases in the soil and make the nutrients available for uptake by plants.

Significant differences in respect of total yield per hectare were reported in different treatments which is clearly showed that highest yield per hectare is found in T7 25% RDF + 100% @ Poultry manure which is (67.38 t ha⁻¹) and the lowest fruit yield per hectare is found in T0 (control) which is found to be (13.97q/ha). This might be due to positive effects of inorganic fertilizers with organic manures which could have induced higher vegetative growth ultimately helped in the synthesis of greater amount of food material which were later translocated into the developing fruits, resulting in an increase in fruits yield t ha⁻¹ and ultimately yield. The results of the present investigation are in conformity with the findings of Kumar (2018) [6] in brinjal, Chatterjee *et al.*, (2014) [2] in tomato, fruit yield per plant and fruit yield per hectare and Vasuniya (2012) [9] in chilly.

It was significantly recorded that the fruits in treatments T7 25% RDF + 100% @ Poultry manure produced highest Vitamin -C which is (16.08). The lowest Vitamin -C of fruit was observed in the treatment T0 (Control) which is (11.63). It was significantly recorded that the fruits in treatments T7 25% RDF + 100% @ Poultry manure produced highest Vitamin -C which is (16.08) followed by other treatments T8, T4, T5 and T6. The lowest Vitamin -C of fruit was observed in the treatment T0 (Control) which is (11.63). The treatment receiving only liquid organic manures recorded fruit quality in the fruits of brinjal. This might be due to the standard nutrients content and their addition to the soil causing starvation of plants for nutrients. These results corroborate with the findings of

Patil *et al.* (2004) [8]. The highest TSS(0Brix) is noticed in treatment T7 25% RDF + 100% @ Poultry manure which is (9.38) which is superior over the other treatments like T8, T4 T5 and T6. The lowest TSS(0Brix) is found in T0 (control) which is (5.26) as compared to control. The treatment receiving only liquid organic manures recorded fruit quality in the fruits of brinjal. This might be due to the standard nutrients content and their addition to the soil causing starvation of plants for nutrients. These results corroborate with the findings of Patil *et al.* (2004) [8].

Table 1: Effect of different organic and inorganic fertilizer combination on Plant height, number of primary branches plant⁻¹ and Days to flower bud appearance of Brinjal (*Solanum melongena* L.) cv. Pusa purple long.

Treatment Symbol	Treatment combinations	Plant height (cm)	Number of primary branches plant- 1	Days to flower bud appearance
T0	Control	40.6467	2.43	57.53
T1	100% N@ Poultry manure	52.4433	3.77	52.18
T2	100% N @ Vermicompost	51.6267	3.48	52.45
T3	100% N @ FYM	45.7233	3.11	54.27
T4	50% N + 50% P @ Poultry manure	58.4767	4.84	50.35
T5	50% N + 50% P @ Vermicompost	56.81	4.56	50.85
T6	50% N + 50% P @ FYM	54.6	4.10	51.66
T7	25% RDF + 100% @ Poultry manure	63.5033	5.65	49.75
T8	25% RDF + 100% @ Vermicompost	60.21	5.20	50.20
T9	25% RDF + 100% @ FYM	49.5833	3.22	53.20
	F-test	S	S	S
	C.D. at 0.5%	0.076	0.06	0.13
	S.Ed. (+)	0.036	0.03	0.06

Table 2: Effect of different organic and inorganic fertilizer combination on Fruit yield (t ha⁻¹), Vitamin C content and TSS (OBrix) of Brinjal (*Solanum melongena* L.) cv. Pusa purple long.

Treatment Symbol	Treatment combinations	Fruit yield (t ha-1)	Vitamin C content	TSS(OBrix)
T0	Control	13.97	11.63	5.26
T1	100% N@ Poultry manure	39.45	13.32	7.30
T2	100% N @ Vermicompost	35.62	12.65	6.87
T3	100% N @ FYM	28.74	12.15	6.39
T4	50% N + 50% P @ Poultry manure	50.67	14.86	8.43
T5	50% N + 50% P @ Vermicompost	46.87	14.63	8.37
T6	50% N + 50% P @ FYM	43.64	14.48	7.63
T7	25% RDF + 100% @ Poultry manure	67.38	16.08	9.38
T8	25% RDF + 100% @ Vermicompost	61.68	15.06	8.63
T9	25% RDF + 100% @ FYM	30.85	12.44	6.42
	F-test	S	S	S
	C.D. at 0.5%	0.55	0.31	0.24
	S.Ed. (+)	0.26	0.15	0.12

Conclusion

On the basis of present investigation it is concluded that the treatment T7 25% RDF + 100% @ Poultry manure is proved as a best combination of different organic and inorganic fertilizer for the improvement of brinjal cultivation through organically; where treatment T7 25% RDF + 100% @ Poultry manure significantly enhances the growth, flowering, fruit yield and quality traits of brinjal.

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