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Effect of organic, inorganic and biofertilizer on growth, yield and quality attribute on brinjal crop

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Abstract
A field study was conducted during the *Kharif* season of 2019-20 at Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj to study about the "Effect of organic, inorganic and bio-fertilizer on growth, yield and quality attributing characters of Brinjal (*Solanum melongena* L.) cv. Pusa Kranti". The experiment was laid out in a randomized block design with 10 treatments replicated thrice. Bio-fertilizers and manures *viz.*, PSB (Phosphorous solubilizing bacteria), VAM (Vesicular Arbuscular Mycorrhiza), FYM and Vermi compost, were used alone and in different combinations with chemical fertilizers. All the bio-fertilizers are applied as soil application method in which 200g of each bio-fertilizers are mixed in soil. Among all the treatments, it is noticed that the growth, yield and quality attributing parameters like plant height, number of primary branches, number of secondary branches, fruit length, fruit width, total number of fruits/ plot and fruit yield were found maximum with the application of 75% FYM + PSB + VAM+ 25% NPK and the minimum being recorded in control in which no bio-fertilizers and chemical fertilizers were used. So based on the results it could be concluded that the application of VAM and PSB in combination with 75% N, P & K favourably influenced the growth, yield and yield attributing characters in brinjal cv. Pusa Kranti.

Keywords: Brinjal, biofertilizer, VAM, PSB, FYM, vermi compost

Introduction
Solanum is a large and important genus of the family Solanaceae. The eggplant or brinjal or aubergine (*Solanum melongena* L.) represents the non-tuberous group of Solanum species (Narasimha Rao, 1979). Brinjal is the most common, popular and widely grown vegetable crop of both tropics and sub-tropics of the world. It is being grown extensively in India, Bangladesh, Pakistan, China, Philippines, France, Italy and United States. Brinjal is highly productive and usually finds its place as the poor man's vegetable (Som and Maity, 2002) [9]. Except in higher altitudes, it can be grown in almost all parts of India, all the year round. Large number of cultivars are grown throughout the country depending upon the consumers preference for the colour, size, shape and the yield. Consumers preference for shape and colour are specific which changes with region.

According to Zeven and Zhukovsky (1975), It is originated in India, but has a secondary centre of variation in China. Though, it is being cultivated extensively in some of the Asian countries *viz* Pakistan, China, Phillippines and Bangladesh however it is also popular in France, Italy and United States. The brinjal is staple vegetable in almost all tropical countries in the world and liked by both poor and rich. Since there is a common belief that it is not good vegetable. However, it is quite high in nutritive value and can well be compared with tomato (Choudhary 1976) [2].

A large indigenous biodiversity exists in eggplant with variation in plant type, stem color, leaf size, leaf tip, midrib color, fruit size, fruit shape, fruit color, fruit yield, fruit quality, cooking quality, and tolerance to pests and diseases (Ullah *et al.* 2014) [10]. Improvement in eggplant can also be achieved by exploiting available sources of variability (Prabakaran, 2010) [8]. Since, its demand is increasing day by day hence, it is necessary to increase its production. Improved varieties suitable for particular area will play a key role in this regard.

There are several varieties of brinjal grown in India. Earlier most of the varieties became popular among the growers and consumers in different agro-climatic regions depending upon their adaptability

Materials and Method

The present study of "Effect of organic, inorganic and biofertilizer on growth, yield and quality attributes of Brinjal (*Solanum melongena* l.) var Pusa Kranti" was carried out at farm area, Horticultural Research Farm, SHUATS, Prayagraj 211007, (U.P.), India during the year 2019-2020. Further details of the materials used and methods adopted during the execution of the experiment are described in the following headings and sub headings. The variety taken was Pusa Kranti which is round fruited and shining purple in colour. Prior to the experiment, the mechanical and chemical analysis of the soil of the experimental field was done. 10 treatments were taken which were replicated thrice. The treatments were, T_0 Control, T_1 100% recommended dose of fertilizers (NPK), T_2 75% FYM + 25% NPK, T_3 75% Vermicompost + 25% NPK, T_4 75% FYM + VAM + PSB + 25% NPK, T_5 75% Vermicompost + VAM + PSB + 25% NPK, T_6 50% FYM + 50% NPK, T_7 50% Vermicompost + 50% NPK, T_8 50% FYM + VAM + PSB + 50% NPK, T_9 50% Vermicompost + VAM + PSB + 50% NPK. The soil samples were collected randomly from experimental field with the help of soil augur from the surface to 12-18 cm depth. These soil samples were mixed together, air dried, powdered and thoroughly mixed again and passed through 2 mm sieve. Then a representative soil sample of 5 g was taken for each mechanical and chemical analysis. The recommended dose of N: P: K for the growth and cultivation of brinjal is 50:50:50 in irrigation. The organic manure used in the experiment were farmyard manure and vermicompost. Intercultural practices were carried out time to time for maintaining a healthy plant. Fruits were collected after their satisfactory growth. Crop performance data on survival percent, plant height, number of leaves, number of branches and weight of single fresh fruit were recorded and statistically analyzed.

Result and Discussion

Effect of bio-fertilizers on plant height

Statistical analysis revealed that treatment T_4 (75% Vermi compost + VAM + PSB + 25% NPK) recorded maximum plant height (58.75 cm) which is significantly higher over the rest of treatments. The treatment T_4 has maximum height followed by T_2 and T_6 over control T_0 which showed the minimum plant height (52.87 cm).

Effect of bio-fertilizers on number of branches

Statistical analysis showed that treatment T_4 (75% Vermi compost + VAM + PSB + 25% NPK) recorded more number of branches (12.70) which is significantly higher over the rest of treatments and it is followed by T_2 and T_3 over control T_0 which showed the lowest number of primary branches (9.00).

Effect of bio-fertilizers on fruit length (cm)

Statistical analysis revealed that treatment T_4 (75% Vermi compost + VAM + PSB + 25% NPK) recorded maximum fruit length (17.60 cm) which is higher over rest of the treatments and is followed by T_2 and T_5 and the lowest fruit length found in control T_0 (14.73 cm).

Effect of bio-fertilizers on fruit width (cm)

Statistical analysis showed that treatment T_4 (75% Vermi compost + VAM + PSB + 25% NPK) has increased fruit width (6.76 cm) which is significantly higher over rest of the treatments. T_4 has maximum fruit width followed by T_2 and T_6 over the control T_0 which showed lowest fruit width (3.56 cm).

Effect of bio-fertilizers on number of fruits per plot

Statistical analysis revealed that treatment T_4 (75% Vermi compost + VAM + PSB + 25% NPK) has increased total number of fruits per plot (14.60) which is significantly higher over rest of the treatments. T_4 has maximum number of fruits per plot followed by T_2 and T_6 over the control T_0 which showed minimum number of fruits per plot (11.73).

Effect of bio-fertilizers fruit yield (t/ha)

Statistical analysis revealed that treatment T_4 (75% Vermi compost + VAM + PSB + 25% NPK) possessed the highest fruit yield (38.42 t/ha) which is significantly higher over the rest of the treatments. It is followed by T_2 and T_6 over the control. The lowest yield recorded in the treatment T_0 (12.76 t/ha).

Table 1: Effect of organic, inorganic and biofertilizer on growth, yield and quality attribute on brinjal crop

Treatment	Plant Height (cm)	No. of Branches/ Plant	No. of Leaves/ Plant	Fruit Length (cm)	Fruit Width (cm)	Total no. of fruits/ plant	Fruit Yield (Tons/hec)
To	52.87	9.00	67.33	14.73	3.56	11.73	12.76
T_1	56.43	10.00	68.20	15.13	3.99	12.16	17.34
T_2	58.06	12.60	79.03	16.60	6.64	13.60	31.25
T_3	53.70	11.90	73.40	15.80	4.03	12.80	22.56
T_4	58.75	12.70	79.33	17.60	6.76	14.60	38.42
T_5	55.12	11.60	72.33	16.07	4.64	13.07	23.86
T_6	57.69	11.70	77.67	16.13	5.32	13.16	27.71
T_7	57.00	11.10	76.40	15.47	4.25	12.47	24.61
T_8	56.60	10.67	76.53	15.33	5.28	12.33	22.11
T_9	57.53	10.70	71.80	15.33	4.14	12.33	25.27
C.D	3.411	1.812	2.544	1.506	1.113	1.137	2.423

Effect of organic, inorganic and biofertilizer on Plant height (cm) of brinjal (*Solanum melongena* l.) var Pusa Kranti

The inorganic fertilizer source increased the metabolic activity, which could have led to an increase in cell division and elongation in the regions of axillary buds. The results of the present investigation are akin to the findings of Nanthakumar and Veeragavathatham, (2000) [7].

Lata *et al.* (2013) [5] studied that impact of integrated nutrient management practices on the vegetative growth parameters of crops. The maximum growth in terms of height of the plant, number of leaves per plant, length of leaves and width of

leaves were recorded in the treatment of T_4[75% Vermicompost + VAM + PSB + 25% NPK]

Vermicompost is stable granular organic matter, when added to clay soils loosen the soil, provides the passage for the fast entry of air and water. The mucus, associated with earthworm cast being hygroscopic in nature absorbs water, prevents water logging and improves water- holding capacity too. There is abundant evidence that concentration of exchangeable calcium, sodium, magnesium, potassium, phosphorus and molybdenum are higher in earthworm casts then in surrounding soil. Hidalgo *et al.* (2002) [3].

Effect of organic, inorganic and biofertilizer on yield (t/ ha) of brinjal (*Solanum melongena* l.) var Pusa Kranti

The reasons for increased fruit yield per hectare by the application of nitrogen, phosphorus and potassium with farmyard manure and poultry manure leading to increased uptake of nitrogen, phosphorus and potassium. The results are in agreement with the findings of Kumaran *et al*., (1998) who recorded an increase in fruit yield by the application of nitrogen, phosphorus and potassium with farmyard manure and poultry manure. Naeem *et al.*, (2002) [6] reported that different dozes of nitrogen phosphorus and potassium behaved significantly different for total yield. Likewise, Jilni *et al*., (2008) [4] reported that nitrogen application @100 kg ha significantly increase birinjal yield.

Anburani and Manivannan (2002) [1] reported that, FYM at 25 tonnes ha^{-1} along with 100 per cent NPK + biofertilizers (Azospirillum + Phosphate solubilizing bacteria) recorded the highest fruit set, number of fruits and estimated fruit yield in brinjal cv. Annamalai. Jayathilke *et al*. (2002) reported considerable increase in onion bulb yield after the application of Azotobacter + vermicompost + chemical fertilizers.

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