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Ankit Paswan
Department of Horticulture (Vegetable Science), Sardar Patel University, Balaghat, Madhya Pradesh, India

AS Choudhary
Department of Horticulture (Vegetable Science), Sardar Patel University, Balaghat, Madhya Pradesh, India

Shani Raj
Department of Horticulture (Vegetable Science), Sardar Patel University, Balaghat, Madhya Pradesh, India

Pooja Sonloi
Department of Horticulture (Vegetable Science), Sardar Patel University, Balaghat, Madhya Pradesh, India

Aaradhana Sonwani
Department of Horticulture (Vegetable Science), Sardar Patel University, Balaghat, Madhya Pradesh, India

Corresponding Author:
Ankit Paswan
Department of Horticulture (Vegetable Science), Sardar Patel University, Balaghat, Madhya Pradesh, India

Effect of integrated nutrient management on yield of Brinjal

Ankit Paswan, AS Choudhary, Shani Raj, Pooja Sonloi and Aaradhana Sonwani

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Abstract
A field experiment was conducted at the Instructional Farm of Sardar Patel University, Balaghat (M.P.), during *kharif* season of 2020-21, To evaluate the influence of "Effect of Integrated Nutrient Management in Brinjal (*Solanum melongena* L)" Totally 08 different treatments consisting of alone fertilizer and different integrated nutrient management practices both combination have been tried. Among the different integrated nutrient management practices, The yield parameters *like* number of fruit per plant, length of fruit (cm), diameter of fruit (cm), weight of fruit (g), fruit yield per hectare (q) were significantly superior in the treatment T_6 (100% NPK + 25% N through Vermicompost). Significantly lowest yield parameters were observed in treatment T_8 (Local control). Among various integrated nutrient management practices of brinjal. On other hand the cost of cultivation was higher in T_5 (50% NPK + 50% N through Vermicompost + Azotobacter + PSB). On the basis of above findings, treatment T_6 (100% NPK + 25% N through Vermicompost) stand first in position and T_7 (100% NPK + 25% N through FYM) stand in second order of preference. However, treatment T_1 comes in next in order. There for it may be concluded that treatment T_6 (100% NPK + 25% N through Vermicompost) may be prefer for higher growth and yield in Brinjal.

Keywords: Integrated, nutrient, yield of Brinjal

Introduction
Brinjal (*Solanum melongena*. L) Belonging to family Solanaceae, is one of the most important subtropical and tropical vegetable crop grown worldwide with erect or semi spreading habbit, growing to a height of 40 to 150 cm. It is a versatile crop adapted to different climatic conditions with high productivity per unit area. It is rich in vitamins and minerals such as iron, sodium, copper, potassium, sulphur, calcium, magnesium and phosphorus but low in calories and fats. It mostly contains water, protein, fibers and carbohydrates.

Vermi-compost is the rich mixture of major and minor plant nutrients. The earthworm consume large quantities of organic matter and excrete soil as casts. On an average vermin-compost contains 3% Nitrogen, 1% Phosphorus and 1.5% Potash. Vermi-compost supplies nutrients in the readily available form to be taken by the plants like nitrates, exchangeable phosphorus, soluble potassium, calcium and magnesium (Edward and Burrows 1988) [2]. Both FYM and Vermi-compost are bulky organic products and helps in increasing soil microbial population, increase soil organic matter content, improve soil physical properties and are considered as slow releasers of both major and micro nutrients. They enhance crop yield per unit of applied nutrients by providing a better physical, chemical and microbial environment. In recent years bio-fertilizers have emerged as an important component of integrated nutrient supply system and hold a great promise to improve crop yield through better nutrient supplies (Hegde *et al.*, 1999) [11].

Bio-fertilizers or microbial fertilizers or micro inoculants are preparation containing live or 3 latent cells of efficient strains of nitrogen fixing, phosphorus solubilising and cellulose decomposing microorganisms, used as seed, soil and seedling treatment with the objective of increasing their number to accelerate microbial processes for augmentation of the availability of nutrients in a form which can be easily assimilated by plants.

Application of biofertilizers would reduce the dependence on inorganic fertilizers. Bio-fertilizers are agriculturally important beneficial microorganisms which have got the ability to mobilize the essential elements from unavailable to available form through biological processes. Among the bio-fertilizers Azotobacter and Phosphorus solubilising Bacteria (PSB) occupies a prominent place. Azotobacter, heterotrophic free living (non-symbiotic) nitrogen fixing bacteria, grow on decomposing soil organic matter and produce nitrogenous compounds for their own growth and development, besides that they have large amount of nitrogen in surroundings.

India is the second largest producer of vegetable with 1,05,63,000 tones production after China with production of 2,45,01,936 tones (Anonymous, 2017) [1]. The area under Brinjal cultivation in India is 711.3 thousand hectares with estimated annual production of 13,557.8 thousand metric tonnes with a productivity of 19.1 metric tonnes per hectare (Anonymous, 2017) [1]. In Madhya Pradesh, Brinjal is grown in an area of 35,173 hectare, with an annual production of 6, 42, 335 metric tonnes and productivity of 18.26 metric tonnes of fruits per hectare which is less than the national average (Anonymous, 2017) [1]. Majority of Indians are vegetarian, with a per capita consumption of 135 g per day as against the recommended 300 g vegetable per day. It is still very less than recommended diet level (Dhandapani *et al*. 2003) [12].

Materials and Methods

A field experiment was conducted at the Research Area, Sardar Patel University, Balaghat (M.P.). Balaghat District is located in the southern part of Jabalpur Division. It occupies the south eastern portion of the Satpura Range and the upper valley of the Wainganga River. The district extends from 21°19' to 22°24' north latitude and 79°31' to 81°3' east longitude. The total area of the district is 9,245 km2. Climatologically Balaghat is characterized as slightly moist hot and humid subtropical climate zone. An average annual rainfall of 1100.6 mm is generally appeared and mostly concentrated during the period from June to September. The major portion of the rainfall is received by South-Western monsoon. The May and December is the hottest and coolest month of the year respectively. In general, weekly maximum temperature goes upto 47 ℃ during the summer season and minimum temperature falls upto 10 °C during the winter season.

The experiment consisted of 8 treatments *viz*. T_1: 100% NPK (Recommended dose i.e.100:60:30 NPK/ha), T_2: 75% NPK + 25% N through FYM, T_3: 75% NPK + 25% N through Vermicompost, T_4: 50% NPK + 50% N through FYM + Azotobacter + PSB, T_5: 50% NPK + 50% N through Vermicompost + Azotobacter +PSB, T_6: 100% NPK + 25% N through Vermicompost, T_7: 100% NPK + 25% N through FYM and T_8: Local control which was arranged in Randomized Block Design with three replications. The recommended fertilizer dose of 100:60:30 kg NPK ha^{-1} was applied to the brinjal crop. The full dose of FYM, Vermicompost, P, K and half dose of N at the time of transplanting and the remaining half dose of N according to the treatments. Nitrogen was supplied through urea containing 46 percent nitrogen, while phosphorus and potash were supplied through single super phosphate and murate of potash containing 16 percent P2O5 and 60 percent K_2O, respectively. Transplanting of seedlings was done by wet method when seedlings were of four weeks old with 10-15 cm in height. Seedlings before transplanting were dipped in fungicidal solution of Bavistin @ 10 g per 10 liter of water for 15 minutes and then roots of seedlings were dipped in Azotobacter and PSB @ (250 g/10 liter) for all treatments except T_8 (control). To control the pest and diseases, necessary plant protection measures were taken as and when required. To control fruit and shoot borer (*Leucinodes orbonalis*) Carbaryl was sprayed @ 3-4 g per litre at 15 days interval for 3 times. to protect the crop form fungal disease as Fusurium root rot, fungicide Mancozeb @ 2.0 g/liter of water was sprayed at fifteen days interval during the entire experimental period.

Results and Discussion yield attributes

Number of fruit per plant, Length of fruit (cm) and Diameter of fruit (cm)

The data on various yield attributes *viz*. number of fruits per plant, length of fruit (cm) and diameter of fruit (cm) as influenced by the nutrient management practices were recorded and presented in Table 1 and figure 1, 2 and 3. Significantly highest number of fruit/plant (20.52) was observed in treatment T_6 (100% NPK + 25% N through Vermicompost), which remained at par with treatment T_7 (100% NPK + 25% N through FYM) and T_1 (100% NPK (Recommended dose i.e.100:60:30 NPK/ha)). Significantly lowest number of fruit/plant (16.05) was observed in treatment T_8 (Local control).

Results corroborate the finding of Solanki *et al.* (2010) [13] and Meenakumari *et al*. (2012) [14]. Significantly highest length of fruit (10.80 cm) was observed in treatment T_6 (100% NPK + 25% N through Vermicompost), which remained at par with treatment T_7 (100% NPK + 25% N through FYM) and T_1 (100% NPK (Recommended dose i.e.100:60:30 NPK/ha)). Significantly lowest length of fruit (6.87 cm) was observed in treatment T_8 (Local control).

The results are accordance with the finding of Hassan *et al.* (2012) [15] and 4.Gayatri K *et al.* (2013) [4]. Significantly highest diameter of fruit (9.49 cm) was observed in treatment T_6 (100% NPK + 25% N through Vermicompost), which remained at par with treatment T_7 (100% NPK + 25% N through FYM) and T_1 (100% NPK (Recommended dose i.e.100:60:30 NPK/ha)). Significantly lowest diameter of fruit (6.25 cm) was observed Sin treatment T_8 (Local control). Finding is accordance with the results of Ullah *et al.* (2008) [16] and Rehman *et al.* (2015) [17].

Weight of fruit (cm) and Fruit yield per hectare (q)

The data on various yield attributes *viz*. weight of fruit (cm) fruit yield per hectare (q) as influenced by the nutrient management practices were recorded and presented in Table 2 and figure 4 and 5. Significantly highest weight of fruit (146.19 g) was observed in treatment T_6 (100% NPK + 25% N through Vermicompost), which remained at par with treatment T_7 (100% NPK + 25% N through FYM) and T_1 (100% NPK (Recommended dose i.e.100:60:30 NPK/ha)). Significantly lowest weight of fruit (130.75 g) was observed in treatment T_8 (Local control). Similar result was observed by Zainub *et al*. (2019) [18] & Premsekhar and Rajashree *et al.* (2009) [19]. Significantly highest fruit yield/hectare (478.00 q) was observed in treatment T_6 (100% NPK + 25% N through Vermicompost), which remained at par with treatment T_7 (100% NPK + 25% N through FYM) and T_1 (100% NPK (Recommended dose i.e.100:60:30 NPK/ha).

Significantly lowest fruit yield/hectare (181.00 q) was observed in treatment T_8 (Local control).

The results obtained in the present studies are support by the Kumar and Gowda *et al.* (2010) [20], Aminifard *et al.* (2010) [21], Patel *et al.* (2011) [22], Kumar V. *et al.* (2016) [23] and Patidar, P. *et al.* (2017) [24].

Table 1: Yield attributes (number of fruit per plant, length of fruit (cm) and diameter of fruit (cm)

Yield attributes and yield				
Tr. No.	**Treatment Details**	**Number of fruit per plant**	**Length of fruit (cm)**	**Diameter of fruit (cm)**
T_1	100% NPK (Recommended dose i.e.100:60:30 NPK/ha)	19.08	9.30	8.69
T_2	75% NPK + 25% N through FYM	18.04	8.22	7.64
T_3	75% NPK + 25% N through Vermicompost	18.64	8.90	8.24
T_4	50% NPK + 50% N through FYM + Azotobacter + PSB	16.51	7.00	6.84
T_5	50% NPK + 50% N through Vermicompost + Azotobacter + PSB	17.49	7.54	7.04
T_6	100% NPK + 25% N through Vermicompost	20.52	10.80	9.49
T_7	100% NPK + 25% N through FYM	19.78	10.15	9.14
T_8	Local control	16.05	6.87	6.25
	S.Em (±)	0.93	0.49	0.51
	CD (5%) =	2.83	1.51	1.55
	CV (%) =	8.83	10.04	11.21

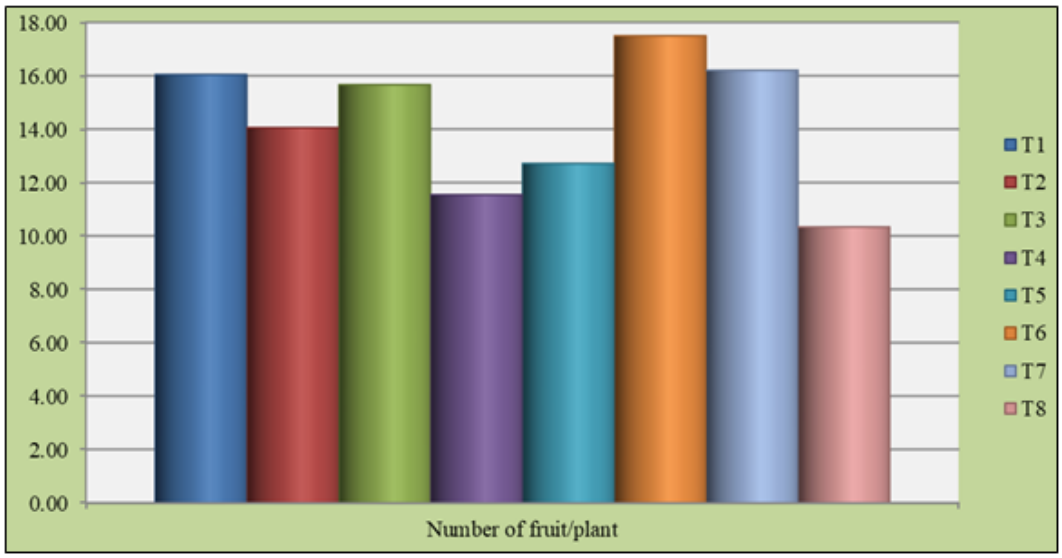

Fig 1: Number of fruit/plant

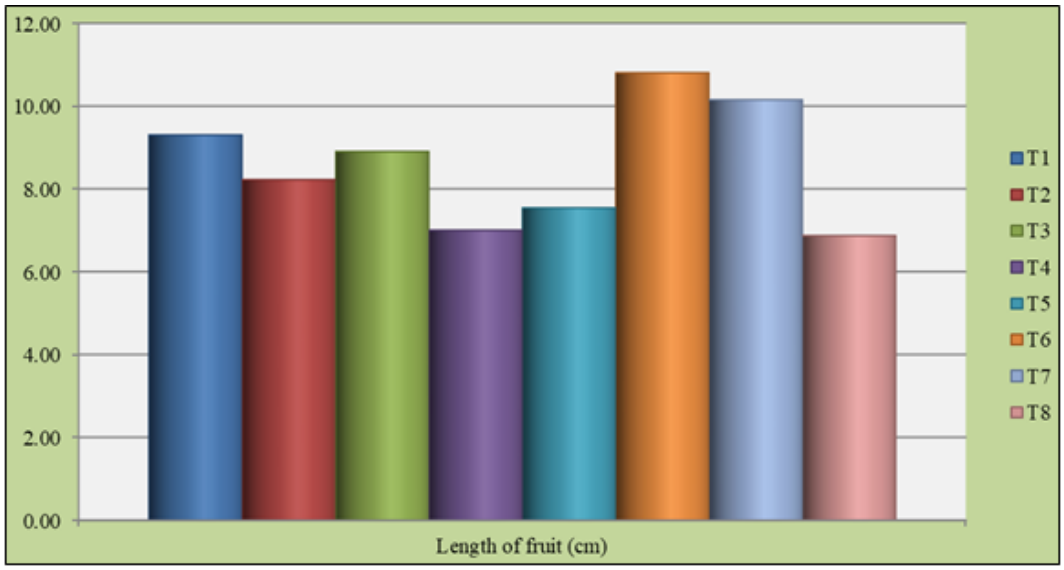

Fig 2: Length of fruit (cm)

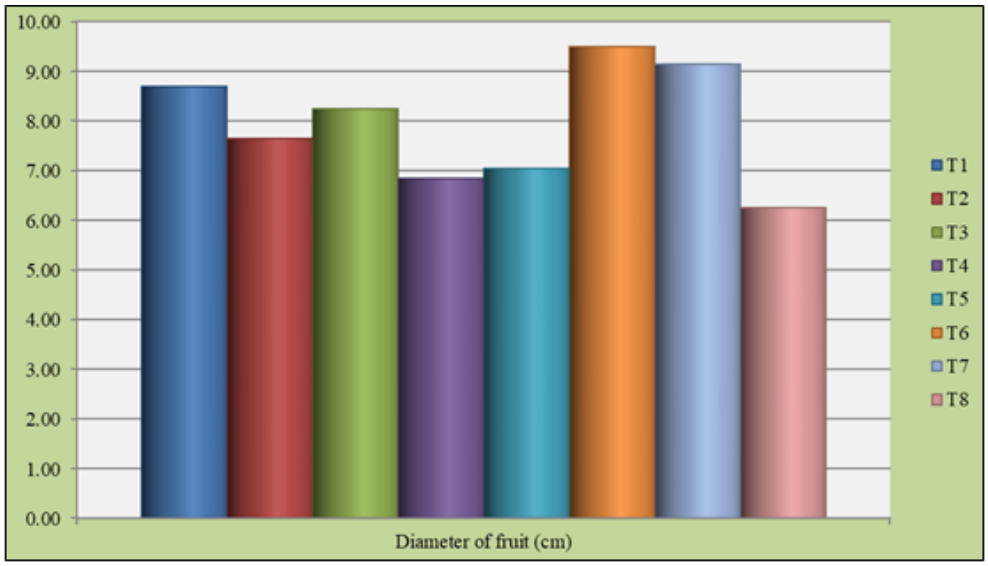

Fig 3: Diameter of fruit (cm)

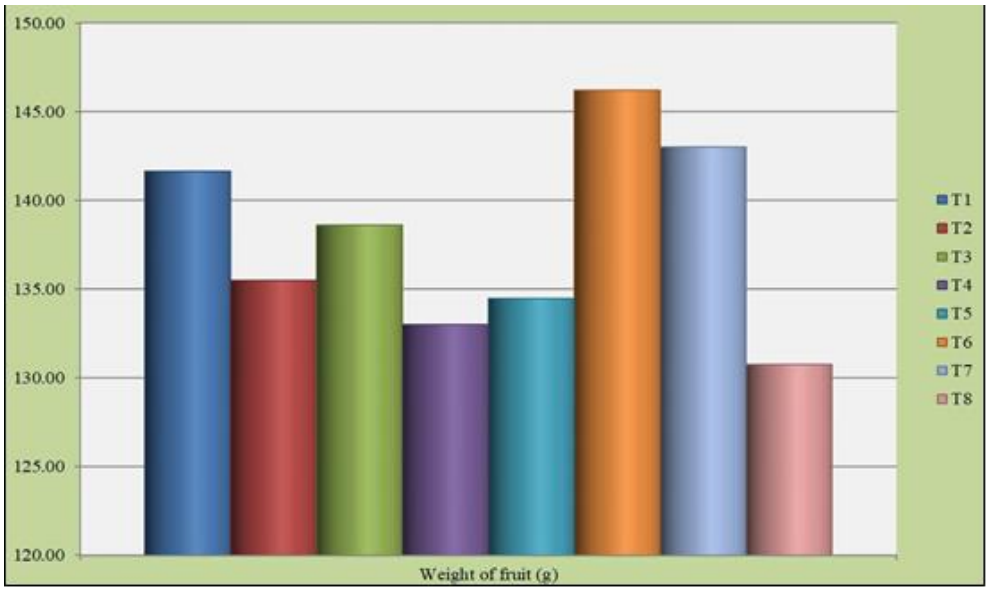

Fig 4: Weight of fruit (g)

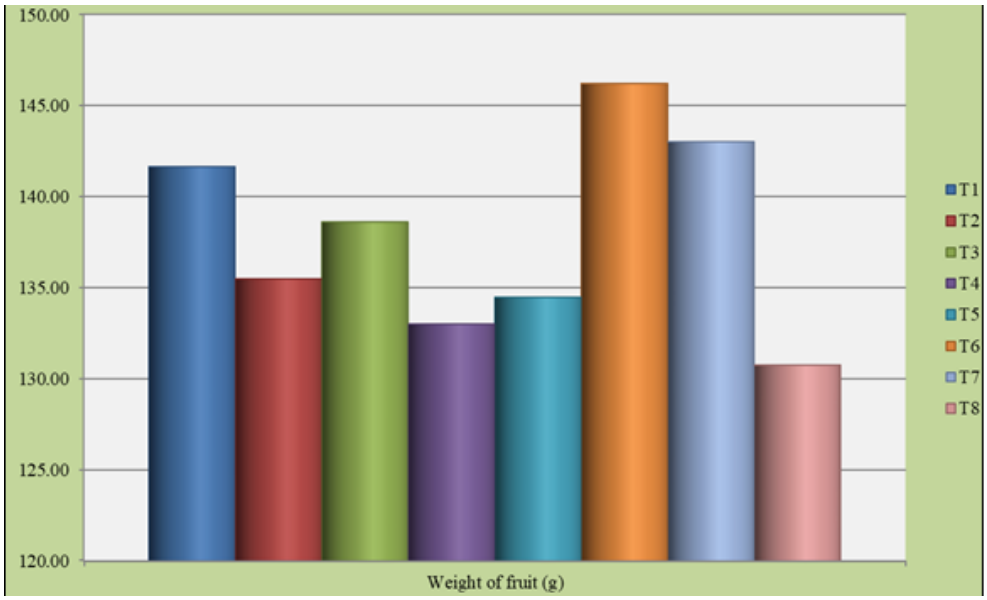

Fig 5: Fruit yield/hectare (q)

Table 2: Yield attributes (Weight of fruit (g) and Fruit yield per hectare (q)

Tr. No.	Treatment Details	Weight of fruit (g)	Fruit yield per hectare (q)
T_1	100% NPK (Recommended dose i.e.100:60:30 NPK/ha)	141.63	380.00
T_2	75% NPK + 25% N through FYM	135.48	330.00
T_3	75% NPK + 25% N through Vermicompost	138.60	379.00
T_4	50% NPK + 50% N through FYM + Azotobacter + PSB	133.00	266.00
T_5	50% NPK + 50% N through Vermicompost + Azotobacter + PSB	134.47	329.00
T_6	100% NPK + 25% N through Vermicompost	146.19	478.00
T_7	100% NPK + 25% N through FYM	143.00	421.00
T_8	Local control	130.75	181.00
	S.Em (±)	3.20	20.44
	CD (5%) =	9.71	62.02
	CV (%) =	4.02	10.25

Conclusion

On the basis of above findings, treatment T_6 (100% NPK + 25% N through Vermicompost) stand first in position and T_7 (100% NPK + 25% N through FYM) stand in second order of preference. However, treatment T_1 comes in next in order. There for it may be concluded that treatment T_6 (100% NPK + 25% N through Vermicompost) may be prefer for higher growth and yield in brinjal.

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