Yield and quality of brinjal *(Solanum melongena* L. var. Pusa uttam*)* as influenced by organic manures and micronutrients

ABSTRACT

A field study was conducted on **e**ffect of organic manures and micronutrients on yield and quality of brinjal *(Solanum melongena* L. var. Pusa Uttam*)* at farm of S.K.N. Agriculture University, Jobner (Jaipur) during *kharif* season 2018. The treatments included organic manures (control, FYM @ 40 t /ha), vermicompost @ 6.6 t /ha and poultry manure @ 6.6 t /ha,) and micronutrients (control, Zn @ 0.5%, Fe @ 0.5% and B @ 0.3%). The application of vermicompost @ 6.6 t/ha non significantly affected TSS content and significantly increased the ascorbic acid content, protein content, fruit yield per plot and fruit yield per hectare which was statistically at par with poultry manure @ 6.6 t /ha and micronutrients also non significantly affected TSS content and significantly increased the ascorbic acid content, protein content, fruit yield per plot and fruit yield per hectare as compared to control in brnjal.

Key Words – micronutrients, organic manures, TSS, protein content, yield

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INTRODUCTION

Brinjal (*Solanum melongena* L.) is cultivated as one of the leading vegetable crops grown in India. It is popularly known as eggplant belongs to family solanaceae and India is it's center of origin and diversity (Saravaiya *et al.,* 2010). It is highly productive and usually finds a place as "poor man's crop". It is a good source of minerals like phosphorus, iron and vitamins especially the B complex.

Brinjal is also valued for its medicinal properties and has got decholesterolizing property, primarily due to the presence of 65.1% linoleic and lenolenic poly-unsaturated fatty acids present in flesh and seeds. Presence of magnesium and potassium salts in fruits also impact of decholesterolizing action (Bhat, 2011).

FYM consist of partially rotted straw of plants, urine and feces. It improves soil physical properties such as water holding capacity, erosion stability and gas exchange (Nyangani, 2010). FYM not only supplies a lot of macro and micro nutrients to the soil, but also improve the soil physical, chemical and biological properties. Conventional FYM contains about 0.73% N, 0.18% P and 0.71% K (Tolessa and Friesen, 2001).

Vermicompost increases the surface area provides strong absorbability and retention of, nutrients as well and retains more nutrients for a longer period of time. vermicompost enhance the nutrient uptake by the plants by increasing the permeability of root cell membrane, stimulating root growth and increasing proliferation of root hairs (Pramanik *et al*., 2007). Vermicompost being a stable fine granular organic matter was done based on plant requirements once a week. When added to clay soil loosens the soil and improves the passage to the enter of air for increase the fruit yield. The increase in nitrogen as found in poultry manure has its profound effect on the vegetative development of plants and ensures healthy and vigorous growth (Aliyu, 2000). Similarly Dauda *et al*. (2005) reported that the application of nitrogen, a major component of poultry manure has been reported to improve the yield of egg plant.

Zinc is an essential component of a number of enzymes *i.e.*, dehydrogenase, aldolase, isomerases, proteinase, peptidase and phosphohydrolase (Mousavi, 2011). It is directly involved in the synthesis of indol acetic acid (IAA) and proteins. The principal function is a metal activator of enzymes in plants. Zinc deficiency may be related to weather conditions, as it increases in cold and wet weather, which might be due to the limited root growth in cool soils, or reduced activity of microorganisms and release of zinc from organic materials (Alam *et al*., 2010 and Abdou *et al*., 2011).

Boron helps in the absorption of water and carbohydrate metabolism translocation of carbohydrates in plants, DNA synthesis in meristem, cell division and elongation, active salt absorption, fertilization, water relation and photosynthesis and involves indirectly in metabolism of nitrogen, phosphorous, fat and hormones (Haque *et al*., 2011). Due to the lack of boron, there is hypertrophy, degeneration and disintegration of cambium cells in the meristematic tissues. Its deficiency may cause sterility, small fruit size, and poor yield (Davis *et al*., 2003) and affects translocation of sugar, starches, nitrogen and phosphorus, synthesis of amino acids and proteins. Iron is indispensable for chlorophyll synthesis. It acts as an oxygen carrier and is a constituent of certain enzymes and proteins. It has an important role in carotenoid synthesis in brinjal indirectly improving the quality of brinjal.

MATERIALS AND METHODS

The experiment was laid out at Horticulture Farm, S.K.N. College of Agriculture, Jobner during *Kharif* season 2018 under Agro-Climatic Zone-IIIA (Semi-Arid Eastern Plains). Geographically, Jobner is situated in Jaipur district of Rajasthan at 26^0 $05'$ North latitude, 75^0 $58'$ East longitudes and an altitude of 427 metres above mean sea level. The experiment was carried out in randomized block design with 8 treatments and each replicated thrice.

Table 1: Details of treatments used in the study

Treatments	Symbols
A. Organic Manure	
(i) Control	M_0
(ii) Fym (40 t/ ha)	M_1
(iii) Vermicompost (6.6 t /ha)	M_2
(iv) Poultry (6.6 t /ha)	M_3
B. Micronutrient	
(i) Control	N_0
(ii) Zn (0.5%) foliar spray	N_1
(iii) Fe (0.5%) folar spray	N_2
(iv) B (0.3%) foliar spray	N_3

The plot size was 2.25 m × 2.40 m and spacing followed was 60 cm × 45 cm. The treatments were organic manures [control, FYM (40 t/ha), vermicompost (6.6 t/ha), poultry manure (6.6 t/ha)] and micronutrients [control, Zn (0.5%), Fe (0.5%) and B (0.3%) foliar spray]. Four weeks old healthy seedlings were transplanted on 21 July, 2018. Light irrigation was given after transplanting. All cultural practices were followed regularly during crop growth. The observations were recorded on TSS, ascorbic acid, protein content, fruit yield per plot and fruit yield per hectare. The data on the growth and yield were statistically analysed according to the method suggested by Fisher and Yates (1959).

Table 2: Physico-chemical characteristics of the experimental soil

S. No.	Parameters	Value	Method adopted
A.	**Mechanical analysis**		
1.	Coarse sand (%)	26.5	International pipette method (Piper, 1950)
2.	Fine sand (%)	58.4	-do-
3.	Silt (%)	9.4	-do-
4.	Clay (%)	8.3	-do-
5.	Textural class	Loamy sand	USDA, Triangle (Soil survey Piper, 1950)

B.	**Physical analysis (%)**		
1.	Field capacity (%)	10.8	Method No. 33, USDA Hand Book No. 60 (Richards, 1954)
2.	Particle density (Mg /m^3)	2.65	Method No. 39, USDA Hand Book No. 60 (Richards, 1954)
3.	Permanent wilting point (%)	3.4	Method No. 31, USDA Hand Book No. 60 (Richards, 1954)
4.	Bulk density (Mg /m^3)	1.50	Method No.31, USDA Hand Book No. 60 (Richards, 1954)
5.	Porosity (%)	42.59	Method No.31, USDA Hand Book No. 60 (Richards, 1954)
C.	**Chemical analysis**		
1.	Organic carbon (%)	0.16	Walkely and Black rapid titration method (Piper,1950)
2.	Available Nitrogen (Kg /ha)	146.64	Alkaline permagnate method (Subhiah and Asija, 1956)
3.	Available Phosphorus (Kg /ha)	18.52	Olsen's method (Olsen's *et al.*, 1954)
4.	Available Potassium (Kg /ha)	155.54	Flame photometer method (Metson, 1956)
5.	Available Sulphur (Mg /kg)	8.42	Turbidemetric method (Chesnin and Yien,1951)
6.	ECe of saturation extract of soil at 25^0 C (ds /m)	0.90	Method No. 4, USDA Hand Book No. 60 (Richards, 1954)
7.	pH (1:2 soil water suspension)	8.2	Method No. 21(b), USDA Hand Book No. 60 (Richards, 1954)

Result and discussion

The results of the present investigation revealed that the response of organic manures and micronutrients were non significantly affected the TSS content of fruit. The maximum ascorbic acid (7.18 mg /100 g) and protein content (1.31%) were found under treatment vermicompost @ 6.6 t /ha (M_2), which was statistically at par with the treatment poultry manure @ 6.6 t /ha (M_3). This might be due to improved nutrient availability environment in the root zone and soil plant system. These results are in accordance with the results reported by Patil *et al.* (2004), Choudhary *et al.* (2007), Kashyap *et al.* (2014), and Kumar, (2016).

Micronutrients also significantly affected the ascorbic acid content and protein content. The maximum ascorbic acid content (7.27 mg /100 g) and protein content (1.33%) were recorded under treatment Zn @ 0.5 per cent (N_1). This might be due to accelerated activity of ascorbic acid oxidase enzyme in presence of these micronutrients (Fe, Zn). The role of Zinc in enhancement of ascorbic acid content may be due the ability of Cu uptake, which forms part of the enzyme ascorbic acid oxidase. These results are in agreement with the results obtained by Selvi *et al.* (2004), Savitha *et al.* (2010) and Singh *et al.* (2014a).

The maximum fruit yield per plot (17.13 kg /plot) and fruit yield (317.20 q /ha) were recorded under the treatment vermicompost @ 6.6 t /ha (M_2), which was statistically at par with poultry manure @ 6.6 t /ha (M_3), while, minimum fruit yield per plot (11.52 kg /plot) and fruit yield (213.40 q /ha) were observed in treatment M_0 (control). Increase in yield with application of organic manures was due to accelerated mobility of photosynthates from the source to the sink, released or synthesized due to the organic sources of fertilizers. These results are in accordance with the results reported by Ullal *et al*. (2008), Chumei *et al.* (2014) and Kashyap *et al.* (2014).

Table 3: Effect of organic manures and micronutrients on yield and quality of brinjal.

Treatments	TSS (%)	Ascorbic acid (mg /100g)	Protein content (%)	Fruit yield per plot (kg/plot)	Fruit yield (q/ha)
Organic Manures					
M_0 -Control	4.29	6.08	1.12	11.52	213.40
M_1- FYM (40 t /ha)	4.65	6.57	1.22	14.36	265.87
M_2- Vermicompost @ 6.6 t /ha	5.19	7.18	1.31	17.13	317.20
M_3- Poultry Manure @ 6.6 t /ha	5.02	6.97	1.29	16.05	297.21
SEm$\pm$	0.10	0.19	0.03	0.38	7.09
CD (P= 0.05)	0.30	0.55	0.08	1.11	20.47
Micronutrients					
N_0 - Control	4.37	6.19	1.15	12.02	222.59
N_1- Zn (0.5%) foliar spray	5.24	7.27	1.33	17.39	321.99
N_2- Fe (0.5%) foliar spray	4.85	6.71	1.24	15.00	277.84
N_3- B (0.3%) foliar spray	4.69	6.62	1.22	14.65	271.25
SEm$\pm$	0.10	0.19	0.03	0.38	7.09
CD (P= 0.05)	0.30	0.55	0.08	1.11	20.47

Application of micronutrients significantly increased fruit yield and yield attributes and the maximum fruit yield/plot (17.39 kg /plot), fruit yield (321.99 q/ha) recorded under the treatment Zn @ 0.5 per cent (N_1), which was significantly superior to other treatments.

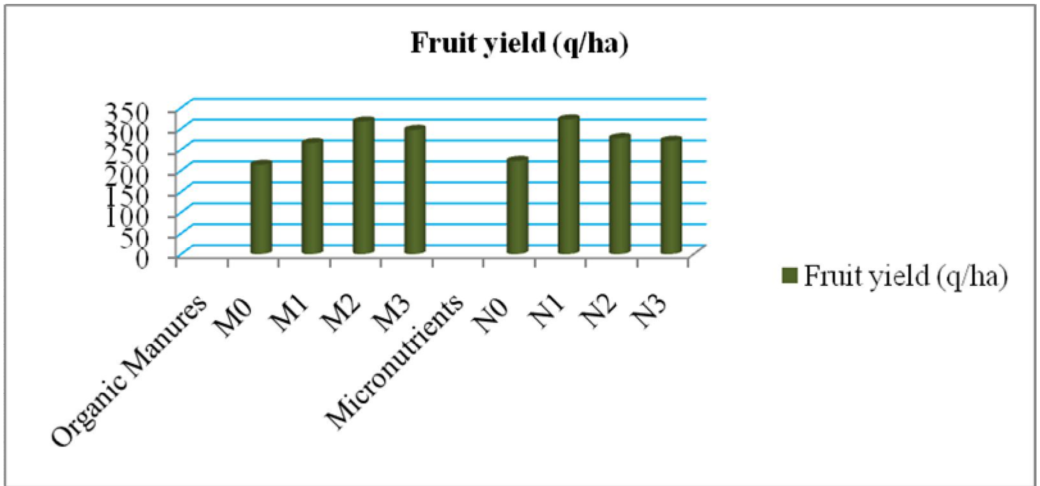

Figure 1: fruit yield per hectare for different treatments in brijal

While, the minimum fruit yield/plot (12.02 kg /plot) fruit yield (222.59 q /ha) were observed in treatment (N_0) control. This might be attributed due to enhanced photosynthetic activity, resulting in increased production and accumulation of carbohydrates and favorable effect on vegetative growth and retention of flowers and fruits, which might have increased number and weight of fruits ultimately increased fruit yield per hectare Tawab *et al.* (2015), Kadari, *et al.* (2015), Pandav *et al.* (2016) and Swetha *et al.* (2018).

CONCLUSION

From the above findings it is concluded that the use of vermicompost @ 6.6 t/ha and micronutrient Zn @ 0.5 % resulted in increased yield and quality of brinjal as compared to the control in brinjal under Agro-Climatic Zone-IIIA (Semi-Arid Eastern Plains).

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