

Original Research Article

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## Performance of NPK with Vermicompost and Boron on Growth and Quality Attributes of Brinjal (*Solanum melongena* L.)

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### ABSTRACT

#### Keywords

NPK, Boron,  
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A field experiment was conducted to study “Performance of NPK with Vermicompost & Boron on Growth and Quality attributes of Brinjal (*Solanum melongena* L.)” during rainy season 2017-18 at Horticulture Farm, S.K.N. College of Agriculture, Jobner (Jaipur). The total 18 treatment combinations were tested in randomized block design with three replications. The application of 50% NPK + 50% VC significantly increased chlorophyll content (mg/g), number of primary branches plant<sup>-1</sup>, leaf area (cm<sup>2</sup>), K content in fruit (%), boron (mg/100 g) and ascorbic acid content in fruit (mg/100 g), as compared to control but statistically at par with 25% NPK + 75% VC. The application of boron (200 ppm) significantly increased the number of primary branches plant<sup>-1</sup>, leaf area (cm<sup>2</sup>), K content in fruit (%), boron and ascorbic acid content in fruit (mg/100 g), as compared to control and boron (100 ppm).

### Introduction

Brinjal (*Solanum melongena* L.) is also known as egg plant or aubergine. The green leaves of plant are the main source of the supply of anti-ascorbic acid (vitamin- C). It is used in Ayurveda as appetizer, “cardiotonic” and aphrodisiac and fruit exhibits laxative property and provides relief from inflammation. It has got much potential as raw material in pickle making and dehydration industry. The white

brinjal is said to be good for diabetic patients. It can also cure toothache and liver complains (Chouhan, 1981). Brinjal is also used for the treatment of bronchitis, asthma, dysentery, etc. it is also helpful for decreasing the level of blood cholesterol. Brinjal is low in energy (30 kcal/100g), protein (1.4%) and vitamin C (5mg/100g), but is a very good source of dietary fiber, potassium, calcium, manganese, copper and vitamin A and B also possess antioxidant ability (Anonymous, 2012). The

yield potential and quality of fruits could be improved by maintaining proper fertilizer appliance. Nitrogen is considered as building stone in the manufacture of protein and chief ingredient of protoplasm. Increasing the nitrogen significantly delayed flowering of eggplant and increased the number of days taken to fruit setting of eggplant (Sat and Saimbhi, 2003). Among the nutrients essential for the crop, nitrogen is found to be deficient in most of the Indian soil (Arakeri *et al.*, 1956). Phosphorus participates in the skeleton of plasma membrane, nucleic acids, many coenzymes, organic molecules and other phosphorylated products, carbohydrates synthesis and nutrient contents like Ca, Mg, N, K and S (Badiger *et al.*, 2006), which are of great importance in the transformation of energy within the plant system. Potassium increased vigour and disease resistance to plant, it also regulates water condition within the plant cell and water loss from the plant by maintaining the balance between anabolism, respiration and transpiration. Potassium activates the fat producing enzymes and enhances the oil content (Mandal and Chatterjee, 1973). Application of N.P.K. through inorganic fertilizer can enhance the growth and quality to a considerable extent but soil fertility and productivity cannot be retained for longer period. Therefore, it is important to supplement the recommended fertilizers. The integrated nutrient management helps to restore and sustain fertility and crop productivity. The use of vermicompost has been advocated in integrated nutrient management (INM) system in vegetable crops. Its uses as a resource of organic manure in supplementing chemical fertilizer is becoming popular among the farmers of the country, increase in crop yield and nutrient uptake was reported by Bhawalkar and Bhawalkar, 1993 due to relevance of Vermicompost. Vermicompost is also useful as it increases soil porosity, aeration and water holding capacity. The

advantage of integrated use of inorganic and organic sources generally superior over use of each component individually (Saravaiya *et al.*, 2010). Micronutrients such as boron had great influence on plant growth and development. Boron deficiency caused delay in pollen germination and pollen tube development and ultimately it halts flowering and fruit setting (Halfacre and Barden, 1979). Boron deficiency may cause sterility *i.e* less fruits per plant attributing lower yield (Islam and Anwar, 1994). This emphasizes the need for a judicious use of B fertilizer. Keeping this in view, the present investigation was planned to study the performance of NPK with vermicompost & boron on growth and quality attributes of brinjal (*Solanum melongena L.*)

### **Materials and Methods**

A field experiment to study the “Performance of NPK with Vermicompost & Boron on Growth and Quality attributes of Brinjal (*Solanum melongena L.*)” was conducted at Horticulture farm, Department of Horticulture, S.K.N. College of Agriculture, Jobner (Jaipur) during July to December 2017-18. The climate of this region is typically semi-arid, characterized by extremes of temperatures during both summer and winter. During summer, the temperature may go as high as 48<sup>0</sup>C while in winters, it may fall as low as 1<sup>0</sup>C. The long term average annual rainfall of the region ranges between 400-500 mm, most of which is received in July and August but the amount has declined over the recent years. The details of the experimental techniques, material used and criteria adopted for the assessment of treatments during the course of investigation are being presented in this paper. The soil of the experimental field was loamy sand in texture, slightly alkaline in reaction, poor in organic carbon, low available nitrogen (135.05 kg ha<sup>-1</sup>), phosphorus (16.67 kg ha<sup>-1</sup>) and medium in potassium content (150.83 kg ha<sup>-1</sup>). 18 treatments combination which

consisted of six levels of INM & Vermicompost ( $N_0$ = Control,  $N_1$ =100 per cent RD of NPK through inorganic fertilizers,  $N_2$ =75 per cent RD of NPK through inorganic fertilizers + 25 per cent through VC,  $N_3$ =50 per cent RD of NPK through inorganic fertilizers + 50 per cent through VC,  $N_4$ =25 per cent RD of NPK through inorganic fertilizers + 75 per cent through VC,  $N_5$ =100% RD of NPK through vermicompost) and three levels of Boron ( $B_0$ = Control,  $B_1$ = 100 ppm,  $B_2$ = 200 ppm) were replicated three times. The experiment was laid out in a Randomized Block Design (RBD) with 18 treatments combination. Thirty days old seedlings of Pant Rituraj variety were transplanted at the spacing of 60 cm  $\times$  45 cm in *Kharif*, 2017-18. Harvesting was done during month of January 2018. Data were collected from five randomly selected plants for each plot and the recorded parameters were Number of primary branches, Leaf area (cm<sup>2</sup>), Potassium content in fruit (%), Ascorbic acid content in fruit (mg/100 g), Boron content in fruit (mg/100 g).

## Results and Discussion

### Number of primary branches

The result showed that the application of  $N_3$  treatments (50% NPK + 50% VC) significantly increase the number of primary branches (7.64) rather than control ( $N_0$ ) and at par with  $N_4$  (25% NPK + 75% VC) treatment (9.46). The number of primary branches under the treatment  $N_3$  (50% NPK + 50% VC) was found 25.19 per cent more as compared to control. This might be due to the better nutritional environment in the root zone for growth and development of the plant by the application of NPK with vermicompost (Abusaleha and Shanmulagavelu, 1988).

The effect of vermicompost on physico-chemical properties imparts favourable soil structure for root growth which influenced

better plant growth. These results are in conformity with findings of Anburani and Manivannan, (2002) in brinjal, Kumar *et al.*, (2013) in tomato, Vitakar *et al.*, (2007) in chilli. The increasing levels of boron also significantly increased the number of primary branches (9.41) in treatment  $B_2$  (200 ppm) and minimum (8.32) was observed under control. The number of primary branches under the treatment  $B_2$  (200 ppm) was recorded 13.10 per cent more than control. Number of leaves increased may be due to promotive effects of macro and micronutrients on vegetative growth which ultimately lead to more photosynthetic activities. The findings is also in agreement with the findings of Das and sahu in potato, (1975), Basavarajeswari *et al.*, in tomato, (2008), Patil *et al.*, in tomato, (2008), Dubey *et al.*, in bellpeper (2013).

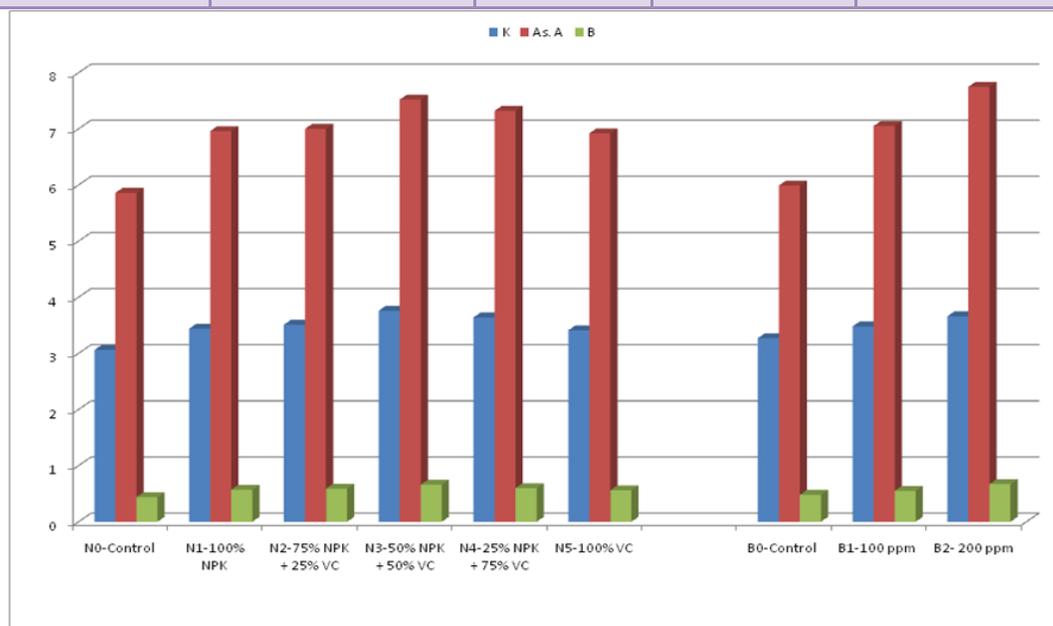
### Leaf area

The application of treatment  $N_3$  (50% NPK + 50% VC) was found maximum leaf area (2341.49 cm<sup>2</sup>), which was statistically at par with application of treatment  $N_4$  (25% NPK + 75% VC). Whereas, minimum leaf area (1907.76 cm<sup>2</sup>) was observed under control.

The leaf area under the treatment  $N_3$  (50% NPK + 50% VC) was found 22.73 per cent more as compared to control. The NPK are considered as one of the major nutrients required for proper growth and development of the plant. These results are in conformity with findings of Rao and Sankar, (2001) in brinjal, Arancon *et al.*, (2003) in pepper. The application of boron at  $B_1$  (100 ppm) and  $B_2$  (200 ppm) were found significantly superior to control. The maximum Leaf area (2263.69 cm<sup>2</sup>) was recorded in treatment  $B_2$  (200 ppm). However it was found minimum (2061.54 cm<sup>2</sup>) under control. Application of treatment  $B_2$  (200 ppm) registered an increase of 9.80 percent higher leaf area over control.

**Table.1** Effect of NPK with vermicompost and boron on Number of primary branches, Leaf area (cm<sup>2</sup>), Potassium content in (%), ascorbic acid (mg/100g) and boron content (mg/100g) of brinjal fruits.

Treatments	Number of primary branches	Leaf area (cm <sup>2</sup> )	Potassium content in fruits (%)	Ascorbic acid (mg/100g)	Boron (mg/100g)
<b>INM levels</b>					
<b>N<sub>0</sub>.Control</b>	7.70	1907.76	3.06	5.86	0.44
<b>N<sub>1</sub>.100% NPK</b>	8.87	2157.66	3.44	6.96	0.57
<b>N<sub>2</sub>.75% NPK + 25% VC</b>	8.93	2178.35	3.51	7.00	0.59
<b>N<sub>3</sub>.50% NPK + 50% VC</b>	9.64	2341.49	3.76	7.52	0.66
<b>N<sub>4</sub>.25% NPK + 75% VC</b>	9.46	2263.91	3.64	7.32	0.60
<b>N<sub>5</sub>.100% VC</b>	8.84	2139.19	3.41	6.92	0.56
<b>SEm<sub>±</sub></b>	<b>0.24</b>	<b>43.81</b>	<b>0.07</b>	<b>0.22</b>	<b>0.02</b>
<b>CD (P=0.05)</b>	<b>0.69</b>	<b>125.90</b>	<b>0.21</b>	<b>0.62</b>	<b>0.05</b>
<b>Boron levels</b>					
<b>B<sub>0</sub>.Control</b>	8.32	2061.54	3.27	5.99	0.48
<b>B<sub>1</sub>.100 ppm</b>	8.99	2168.95	3.48	7.05	0.55
<b>B<sub>2</sub>. 200 ppm</b>	9.41	2263.69	3.66	7.75	0.67
<b>SEm<sub>±</sub></b>	<b>0.17</b>	<b>30.98</b>	<b>0.05</b>	<b>0.15</b>	<b>0.01</b>
<b>CD (P=0.05)</b>	<b>0.49</b>	<b>89.03</b>	<b>0.15</b>	<b>0.44</b>	<b>0.03</b>
<b>CV (%)</b>	8.09	6.07	6.47	9.39	8.50



**Fig. 1** Effect of NPK with vermicompost and boron on K, Ascorbic acid and Boron content in fruit of brinjal

Foliar sprays of Boron increased the nitrogen content of the leaves. Leaf area index was significantly increased by nitrogen, possibly because nitrogen helps in greater assimilation of food material by the plant which resulted in greater meristematic activities of cells and consequently the number of leaves, length and width of leaf of plant. The findings is also in agreement with the findings of Solanki *et al.*, in brinjal, (2017), Patil *et al.*, in tomato, (2008).

### **Potassium content in fruit**

The maximum potassium content in fruit (3.76 %) was observed under the treatment N<sub>3</sub> (50% NPK + 50% VC), followed by N<sub>4</sub> (25% NPK + 75% VC). Whereas, minimum potassium content (3.06 %) was observed under control. These results are also in close conformity with the finding of Choudhary *et al.*, (2007) in brinjal, Anwar *et al.*, (2017) in tomato and significantly maximum potassium content in fruit (3.66 %) was recorded in treatment B<sub>2</sub> (200 ppm), and minimum (3.27 %) was observed under control.

The per cent increase potassium content in fruit under the treatment B<sub>2</sub> (200 ppm) was found to be 11.92 per cent over control. Similar quality parameters were also reported by Selvi *et al.*, (2004) and Salam *et al.*, (2011).

### **Ascorbic acid content in fruit**

The maximum ascorbic acid content in fruit (7.52 mg/100 g) was observed under the treatment 50% NPK + 50% VC (N<sub>3</sub>), which was statistically at par with treatment N<sub>4</sub> (25% NPK + 75% VC). Whereas, minimum ascorbic acid content in fruit (5.86 mg/100 g) was observed under control (N<sub>0</sub>). The per cent increase ascorbic acid content in fruit under the treatment N<sub>3</sub> (50% NPK + 50% VC) was found to be 28.32 per cent over control. These results are also in close conformity with the

finding of Chumei *et al.*, (2014) in brinjal, Laxmi *et al.*, (2015) in tomato, Anwar *et al.*, (2017) in tomato. Boron also had significant effect on ascorbic acid content in fruit as compared to control. The maximum ascorbic acid content in fruit (7.75 mg/100 g) was recorded under treatment B<sub>2</sub> (200 ppm), and minimum (5.99 mg/100 g) was observed under control. Similar quality parameters were also reported by Selvi *et al.*, (2004) in brinjal and Salam *et al.*, (2011) in tomato, Singh *et al.*, (2014) in chilli.

### **Boron content in fruit**

The maximum boron content in fruit (0.64 mg/100 g) was observed under the treatment N<sub>3</sub> (50% NPK + 50% VC), which was statistically at par with application of treatment N<sub>4</sub> (25% NPK + 75% VC). While is was minimum boron content in fruit (0.44 mg/100 g) were observed under control. These results are also in close conformity with the finding of Selvi *et al.*, (2004) in brinjal. There was a significant influence on boron content in fruit as compared to control. The maximum boron content in fruit (0.67 mg/100 g) was recorded in treatment B<sub>2</sub> (200 ppm), and minimum (0.48 mg/100 g) was observed under control. Similar quality parameters were also reported by Singaram and Prabha (1999) in tomato, Salam *et al.*, (2011) in tomato.

On the basis of experimental results, it may be concluded that the application of 50 % NPK + 50 % VC and 200 ppm boron was found significantly better in terms of growth, and quality compared to other treatment. Thus, application of 50 % NPK + 50 % VC or 200 ppm boron are recommended for improve the growth and quality of brinjal.

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