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Effect of Organic Manures and Bio-fertilizers on Vegetative and Yield Parameters of Brinjal (*Solanum melongena*) cv. Pant Rituraj

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ABSTRACT

A field experiment was conducted to determine the effect of organic manures and bio-fertilizers on vegetative and yield parameters of brinjal (*Solanum melongena*) cv. Pant Rituraj at Crop Cafeteria, Galgotias University, Grater Noida. The experimental field was laid out in randomized block design (RBD) with three replications. The experimental treatments comprised of three organic manures *viz.* Farmyard Manure, Vermicompost and poultry manure in combination with two bio-fertilizers, namely Azospirillumand Phosphate Solubilizing Bacteria (PSB). All variable parameters regarding vegetative and yield were significantly influenced by different combinations of organic manures and bio-fertilizers. Result indicated that a combined application of organic manure and bio-fertilizers *i.e.*Vermicompost (50%) + Poultry manure (50%) + Azospirillumgave the significantly better response in respect to vegetative parameters and yield parameters and maximum plant height, number of branches per plant, number of leaves per plant, number of fruits per plant, fruit length, fruit diameter, fruit weight and yield were recorded under the same treatment.

Figure : 00 References : 15 Table : 01
KEY WORDS : Bio-fertilisers, Brinjal, Organic manures

Introduction

Brinjal (*Solanum melongena*) is one of the important crops of the Solanaceae family. It is grown in all parts of India throughout the year except at higher altitudes. Brinjal is also known as “Eggplant” and in Hindi called “*Baingan*”. Brinjal is a high productivity crop with wide climatic adaptation. In India, it is grown in an area of 730 thousand hectares with an annual production of 12801 thousand tones and productivity of 17.53 tones of green fruits per hectare[1]. In India, West Bengal, Odisha, and Gujarat rank first, second and third respectively in brinjal production. The other important brinjal growing states in India are Bihar, Madhya Pradesh, Chhattisgarh, Maharashtra, Karnataka, Uttar Pradesh, *etc*.

The edible part of the brinjal plant is its fruits which have different colors and shapes. The fruit of brinjal is botanically classified as a berry, white fleshwith a meaty texture. The fruit contains many seeds that though edible but have little bitter in taste because contain nicotinoid alkaloids. The purple skin colour of brinjal fruits is due to anthocyanin pigments. It is used as a vegetable after cooking or boiling and used for preparing various dishes like aalu-baingan, Bharta, Sambar *etc.* Beside this, it has good nutrition properties. Brinjal fruits are good source of calcium, phosphorus, iron and vitamin B. Purple coloured brinjal contain more vitamin C and copper than green one.

The continuous and imbalance use of high level of chemical fertilizers lead to decrease the nutrient uptake efficiency of plants, resulting in either stagnation or decrease in yield and also causing environmental pollution[14]. Therefore farmers are in need of searching alternative to replace the chemical fertilizers. In recent days, the use of organic manure and bio-fertilizers is becoming popular world wide. The concept of organic farming aim is to use different organic manures, green manures and bio-fertilizers for providing all major nutrients to the plants so as to get maximum economic yield without any deleterious effect on physiological & biochemical properties of soil and produce chemical free fruits and vegetable. Organic manures not only supply the plant nutrients but also improve soil health. Moreover, the amount of micronutrients present in organic manures may be sufficient to meet the requirement of crop production[6].

Organic manures such as farmyard manure, vermicompost and poultry manure are available in plenty amount in the locality and can be efficiently utilized for

vegetable production. Application of bio-fertilizers inoculation in vegetable crops has been of much significant as Azospirillum for atmospheric nitrogen, also known for synthesis of biologically growth promoting substances. Phosphate-solubilizing bacteria, having the potential for phosphatase catalysis, can solubilize phosphate and serve as prospective supplier of soluble phosphorous for plants.

Materials and Methods

The experiment was conducted during 2020-21 with the commercial cultivar "Pant Rituraj" of brinjal at Crop Cafeteria, Galgotias University, Grater Noida. The experiments were designed in randomized block design (RBD) with three replications. A total number of ten treatments (including control) were used for the experimental study. The soil of the experimental area was analyzed in laboratory to find out the actual nutrient status and property of the soil. The treatments comprised of three organic manures *viz.* farmyard manure, vermicompost and poultry manure and two bio-fertilizers, namely Azospirillumand PSB in different combinations viz. Farmyard Manure (100%), Vermicompost (100%), Poultry Manure (100%), Farmyard Manure (50%) + Vermicompost (50%) + Azospirillum, Farmyard Manure (50%) + Vermicompost (50%) + PSB, Farmyard Manure (50%) + Poultry Manure (50%) + Azospirillum, Farmyard Manure (50%) + Poultry Manure (50%) + PSB, Vermicompost (50%) + Poultry Manure (50%) +Azospirillum, Vermicompost (50%) + Poultry Manure (50%) + PSB and control. Seeds were sown in the nursery and 35 days old seedlings were subjected to transplanting in the main field. Saplings were transplanted at 60×60 cm spacing. Farmyard manure was applied 10 days before seedling transplanting while, vermicompost and poultry manure were applied three days before transplanting. Azospirillum and PSB were cultured in respective treatment organic manure and applied at the time of transplanting. All other cultural practices were followed as per recommendations.The data related to vegetative growth and yield parameters were recorded from the randomly selected five tagged plants. The data recorded during the course of investigation were statistically analyzed by using analysis of variance (ANOVA) technique.

Result and Discussion

Vegetative growth of brinjal were significantly and promotive influenced by the application of different levels of organic manures and bio-fertilizers as compared to control treatment (Table-1). Experimental findings clearly revealed that maximum plant height (59.99 cm) was recorded under the treatment T_8 (Vermicompost (50%) + Poultry Manure (50%) +Azospirillum) which found statistically similar with T_4 (Farmyard Manure (50%) + Vermicompost (50%) + Azospirillum) and T_7 (Farmyard Manure (50%) + Poultry Manure (50%) + PSB). Similarly, maximum number of branches per plant (5.95) were found under the treatment T_8 (Vermicompost (50%) + Poultry Manure (50%) +Azospirillum) which were found statistically similar with T_4 (Farmyard Manure (50%) + Vermicompost (50%) + Azospirillum) and T_7 (Farmyard Manure (50%) + Poultry Manure (50%) + PSB). Maximum number of leaves per plant (71.16) were recorded under the treatment T_8 (Vermicompost (50%) + Poultry Manure (50%) +Azospirillum) which found statistically higher than all other treatments. Similar findings were also reported by others[4,11,15]. This might be due to the stimulating activities likewise cell elongation, quick multiplication and synthesis of more food materials in the plant. Proper growth of any plant depends on the plenty availability of all essential nutrients, water and climatic conditions. Organic manures specially vermicompost and farm yard manure provide most of essential nutrients as well as increase soil health for better performance of beneficial microorganisms such as azospirillum , azotobacter, PSB etc. Some workers[3] reported that, vermicompost is one of the best which contains growth regulators like hormones which increase the growth and yield of crops. Similarly bio-fertilizers such as azospirillum and PSB fixed atmospheric nitrogen and convert insoluble form of phosphorus in soluble form, respectively. Azospirillum increased the vegetative growth of plant may be due to of its direct role in nitrogen fixation and production of phytohormones like substances which stimulated growth and nutrient assimilation[2].

Different combinations of organic manures and bio-fertilizers had profound influence yield and yield attributing characters. On the basis of experimental data analysis, the maximum number of fruits per plant (14.29) was recorded underT_8 treatment in which Vermicompost (50%) + Poultry Manure (50%) applied with Azospirillum. Maximum fruit length (23.79cm) and fruit diameter (5.95 cm) were recorded under T_8 (Vermicompost (50%) + Poultry Manure (50%) + Azospirillum) which is found statistically similar with T_6 and T_4. While, maximum fruit weight (198.36 g) and yield (35.43 q/ha) were recorded under treatment Vermicompost (50%) + Poultry Manure (50%) + Azospirillum (T8) which was found significantly higher than all other treatments. The minimum yield and its attributing characters were recorded under control (T_{10}) treatment. These results findings are in close conformity with the previous findings in brinjal[9,15], in tomato[5], in bottle gourd[10]. The significant increase in yield of brinjal under Vermicompost (50%) + Poultry Manure (50%) + Azospirillum might be due to vigorous vegetative growth which helps in more food synthesis in presence of sunlight

TABLE-1 : Effect of organic manures and bio-fertilizers on vegetative growth and yield parameters of Brinjal *(Solanum melongena)* Rituraj

Nota-tions	Treatments	Plant height (cm)	Number of branches per plant	Number of leaves per plant	Number of fruit per plant	Fruit length (cm)	Fruit diameter (cm)	Fruit weight	Yield (q/ha)
T_1	Farmyard Manure (100%)	50.83	5.04	60.29	12.11	20.15	5.04	168.07	25.44
T_2	Vermicompost (100%)	52.31	5.19	62.05	12.46	20.74	5.19	172.97	26.94
T_3	Poultry Manure (100%)	52.60	5.21	62.40	12.53	20.86	5.21	173.94	27.24
T_4	Farmyard Manure (50%) + Vermicompost (50%) + Azospirillum	57.68	5.72	68.42	13.74	22.87	5.72	190.72	32.76
T_5	Farmyard Manure (50%) + Vermicompost (50%) + PSB	54.91	5.44	65.14	13.08	21.77	5.44	181.58	29.69
T_6	Farmyard Manure (50%) + Poultry Manure (50%) + Azospirillum	58.82	5.83	69.77	14.01	23.32	5.83	194.49	34.06
T_7	Farmyard Manure (50%) + Poultry Manure (50%) + PSB	56.49	5.60	67.01	13.46	22.40	5.60	186.79	31.42
T_8	Vermicompost (50%) + Poultry Manure (50%) +Azospirillum	59.99	5.95	71.16	14.29	23.79	5.95	198.36	35.43
T_9	Vermicompost (50%) + Poultry Manure (50%) + PSB	57.03	5.65	67.65	13.59	22.61	5.65	188.57	32.02
T_{10}	Control	39.96	3.96	47.40	9.52	15.85	3.96	132.13	15.72
	SEm ±	0.82	0.12	1.00	0.09	0.35	0.07	1.67	0.54
	C.D. at 5% level	2.42	0.37	2.97	0.28	1.04	0.22	4.95	1.59

and ultimately increased yield attributing character performance. Vermicompost and poultry manure helps in increasing the organic matter content of the soil, in maintaining soil natural productivity[8] and azospirillum fixed atmospheric nitrogen which helps in increasing metabolic and photosynthetic activity of plant[12]. FYM and PSB also significantly increase yield of brinjal as compared to control. The increase in yield and yield attributing characters under FYM might be due its direct role in improving soil activity and enhance the mobilization of soil nutrients. Similarly PSB increase phosphorus solubilization by producing organic acids which enhanced cell division and cell elongation and thus increase in metabolic activity.

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