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Influence of humic acid, vermicompost and panchakavya in growth and yield of Brinjal (*Solanum melongena* L.)

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Abstract

The studies on growth and yield of Brinjal (*Solanum melongena*_L.*)* The experiment was carried out in the Department of Horticulture, Faculty of Agriculture, Thanthai Roever Institute of Agriculture and Rural Development, Perambalur, Tamilnadu. The three different organic inputs with eight combinations taken as treatments *viz.*, farm yard manure, vermicompost and humic acid as soil application and foliar spray at different concentrations. Significantly the effects of vermicompost and humic acid as foliar spray were found increasing the growth and yield attributes of Brinjal. Maximum influence was seen with the application of vermicompost with humic acid foliar spray. The nutrient uptake was markedly increased by the application of vermicompost along with foliar spray of humic acid. Hence from the results of growth, yield and plant uptake, application of vermicompost with humic acid foliar spray plant^{-1} was found to be the best than other combinations for enhancing the plant growth and fruit yield of Brinjal. The application of vermicompost and humic acid significantly influenced all the growth and yield attributes. In respect of number of leaves, fruit length, leaf size, fruit yield, and fruit weight, signficant increase was found in the treatment T_8.

Keywords: *Solanum melongena* L, FYM and foliar spary

Introduction

Brinjal (*Solanum melongena* L.) -Egg plant of Solanceae family is one of the widely used vegetable crop by most of the people and is popular in many countries *viz.*, central, south and south east Asia, some part of Africa and central America(Grubban,1977). It is used in ayurvedic medicine for curing diabetes and also as a good appetizer. It is good aphrodisiac, cardiotonic, laxative, mutant and reliever of inflammation. In world, brinjal occupies an area of 1.128 million ha with a production of 1.74 million tonnes with an average productivity of 15, 434 tonnes per ha (Anon., 1997). In India, brinjal is grown throughout the year in almost all parts of country except at higher altitude and liked by both poor and rich alike and it is a major vegetable crop of plains (Premanatha *et al*., 1987). The present farming system totally depends on use of chemical fertilizers, pesticides and growth regulators for enhancing crop productivity which gradually culminated in a situation where there is a need to reconsider the alternative to chemical agriculture developed in the western world. The organically cultivated food crops have greater export potential, growing at 10-15 per cent per year. The sustainable agriculture practice can effectively prevent the entry of pesticides and toxicants in the food chain and prevent soil water pollution and health hazards. Foliar application of plant growth regulators has been increase the yield in brinjal (patil and ballal 1980). It is an important vegetable due to its nutritive value, consisting of minerals like iron, phosphorus,

calcium and vitamins like A, B and C. Unripe fruits are used primarily as vegetable in the country. It is also used as raw material in pickle making and dehydration industries (Singh *et al.*, 1992) and is an excellent remedy for those suffering from liver complaints. The objects of environment, social and economic sustainability lie at the heart of organic farming and are among the major factor determining the acceptability or otherwise of specific production practices. Generally, solanaceous vegetables require large quantity of major nutrients like nitrogen, phosphorus and potassium, in addition to secondary nutrients such as calcium and sulphur for better growth, fruit and seed yield. The cost of inorganic fertilizer has been enormously increasing to an extent that they are out of reach of the small and marginal farmers. Although insecticidal control is one of the effective means against the fruit borer, many of the insecticides applied are not effective for the satisfactory control of these pests. Brinjal being vegetable crop, use of chemical insecticides will have considerable toxic residue in the fruits besides this, sole dependence on insecticides for the control of these pests has led to insecticidal resistance by the pest hence use of organic amendments with IPM modules can be the novel approaches in the recent past to manage the pest. Hence, keeping the above points in view, present investigation has been undertaken with to study the effect of organic nutrient management practices on growth and yield parameters of brinjal.

Materials and Methods

The present study on the effect of soil application of different organic nutrients on the growth and yield characters in (*Solanam melangena*) was carried out in the Department of Horticulture, Thanthai Roever Institute of Agriculture And Rural development, Vallapuram. The details of the materials used and the methods adopted for the experiments are given below.

Location

The experimental site is located at Vallapuram 1 km east longitude and at an altitude of ± 133.3 m above the mean sea level. The maximum temperature of the location ranges from 30.2°C to 39.5°C (With a mean of 33.7°C), while the minimum temperature ranges from 16.5°C to 24.9°C (With a mean of 22.4°C). The mean annual rainfall is 861 mm of which 67 percent is received during the north east monsoon (Oct – Dec) twenty four percent during south west monsoon (June – Sep) and nine percent during summer showers.

General view of the experimental field Brinjal (*Solanum melongena*.L)

Preparation of planting material

The seeds are sowned in nursery bed and after 45 days the seedlings are planted.

Details of the experiment

Design: Randomised block design;
No. of treatments : 9;
No. of replications: 3;
No. of plants per replication: 4

Treatment details

T_1 - FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.2 % plant^{-1} FS
T_2 - FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.3 %plant^{-1} FS
T_3 - FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.2 % FS
T_4 - FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.3 % FS
T_5 - Vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.2 % plant^{-1} FS
T_6 - Vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.3%g plant^{-1} FS
T_7 - Vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.2 % FS
T_8 - Vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.3 % FS
T_9 - Control

Application of FYM

FYM at the rate of 1.0 kg Per plant is thoroughly mixed with soil and applied around the plants.

Vermicompost

Vermicompost used in this study was obtained from the organic horticulture division and it was used for the soil application. Vermicompost at the rate of 0.5kg is thoroughly mixed with soil and applied around the plants.

Humic acid

Humic acid was obtained in the liquid form from the laboratories, Perambalur. The humic acid was applied by foliar spray at different concentration .0.2 % and 0.3 % of humic acid was dissolved in one litre of water and then sprayed at 60,90,105 days interval with the help of hand sprayer.

Observations recorded on growth and yield parameters

The following observations were recorded in the plants in each replication and the mean value was calculated. Observations on morphological variations namely plant height per plant, number of leaves per plant, number of flowers per plant.

Plant height per plant (cm)

The plant height was recorded at 60, 90, 105 days after planting.

Number of leaves per plant

The number of fully expanded leaves produced in a plant was counted at 60, 90, 105 days interval starting from 45 days after planting.

Number of flowers per plant

The number of flowers was counted at 60, 90, 105 days interval starting from 45 days after planting.

Experimental Results

Growth characters

Plant height^{-1}

A wide range of variation (from 63.66cm to 78.33cm) (Table.1.) was observed for this character among the treatments at 90 DAP and it was also significant. The treatment T_6 recorded the highest number of leaves plant^{-1} (42.66, 59.00 and 78.33 cm at 30, 60, and 90 DAP respectively) while the lowest number of leaves plant^{-1} (31.33, 53.33 and 63.66 cm at 30, 60 and 90 DAP respectively) was recorded in T_9.

Table.1.Studies on organic Brinjal Production on Plant height^{-1}(cm)

Treatments	Plant height^{-1} (cm)		
	30 DAP	60 DAP	90 DAP*
T_1 – FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.2% plant^{-1}F S	40.00	57.66	77.66
T_2 – FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.3% plant^{-1} FS	38.66	56.66	75.33
T_3 – FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.2 % FS	34.33	54.33	67.33
T_4 – FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.3 % FS	33.66	53.33	64.66
T_5 – vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.2% plant^{-1} FS	41.00	58.33	78.00
T_6 – vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.3% plant^{-1} FS	42.66	59.00	78.33
T_7 – vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.2 % FS	37.66	55.33	73.66
T_8 – vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.3 % FS	36	54.33	69.66
T_9 – Control	31.33	53.33	63.66
S.Ed	4.32	2.97	3.71
CD (p = 0.05)	8.67	5.43	6.80

Number of leaves plant^{-1}

A wide range of variation (from 72.33 to 104.66) (Table.2) was observed for this character among the treatments at 90 DAP and it was also significant. The treatment T_6 recorded the highest number of leaves plant^{-1} (39.33, 75.00 and 104.66 at 30, 60, and 90 DAP respectively) while the lowest number of leaves plant^{-1} (26.33, 44.66 and 72.33 at 30, 60 and 90 DAP respectively) was recorded in T_9.

Table.2 Studies on Organic Brinjal Production on Number of Leaves Plant^{-1}

Treatments	Number of leaves plant^{-1}		
	30 DAP	60 DAP	90 DAP*
T_1 – FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.2% plant^{-1}F S	37.66	68.66	96.33
T_2 – FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.3% plant^{-1} FS	34.66	63.33	93.66
T_3 – FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.2 % FS	29.66	53.33	79.00
T_4 – FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.3 % FS	27.66	46.66	75.33
T_5 – vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.2% plant^{-1} FS	37.66	73.33	101.33
T_6 – vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.3% plant^{-1} FS	39.33	75.00	104.66
T_7 – vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.2 % FS	33.66	60.66	89.00
T_8 – vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.3 % FS	30.66	57.33	84.66
T_9 – Control	26.33	44.66	72.33
S.Ed	7.40	3.48	5.46
CD (p = 0.05)	14.86	6.38	10.01

Number of flowers

A wide range of variation (from 19.66 to 31.33) (Table.3) was observed for this character among the treatments at 90 DAP and it was also significant. The treatment T_6 recorded the highest number of leaves plant^{-1} (10.00, 21.00 and 31.33 at 30, 60, and 90 DAP respectively) while the lowest number of leaves plant^{-1} (5.33, 10.66 and 19.66 at 30, 60 and 90 DAP respectively) was recorded in T_9.

Table.3 Studies on organic Brinjal Production on No. of Flowers Plant^{-1}

Treatments	Number of Flowers plant^{-1}		
	30 DAP	60 DAP	90 DAP*
T_1 – FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.2% plant^{-1}F S	9.00	18.66	8.33
T_2 – FYM @ 1.0 kg plant^{-1} + Humic acid @ 0.3% plant^{-1} FS	8.66	17.00	26.00
T_3 – FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.2 % FS	6.33	11.33	21.33
T_4 – FYM @ 1.0 kg plant^{-1} + Panchakavya @ 0.3 % FS	6.66	20.33	20.00
T_5 – vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.2% plant^{-1} FS	9.00	20.00	30.66
T_6 – vermicompost @ 0.5 kg plant^{-1} + Humic acid @ 0.3% plant^{-1} FS	10.00	21.00	31.33
T_7 – vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.2 % FS	6.66	15.66	24.66
T_8 – vermicompost @ 0.5 kg plant^{-1} + Panchakavya @ 0.3 % FS	8.00	13.33	23.00
T_9 – Control	5.33	10.66	19.66
S.Ed	**3.58**	**1.12**	**1.34**
CD (p = 0.05)	**7.18**	**2.05**	**2.47**

Discussion

Growth characters

Among the various treatments tested, the treatment which received the received the application of vermicompost @ 0.5 kg plant^{-1} + humic acid 0.3 percent plant^{-1} as foliar spray increased the plant height up to 79 (cm) at 90 DAP. This was followed by the application of vermicompost @ 0.5 kg plant^{-1} + humic acid 0.2 % plant^{-1} foliar spray increased the plant height up to 78 (cm) at 90 DAP whereas the plant height was least in control. According to Bano et al. (1987), vermicompost is a rich source of plant macro nutrient (N, P_2O_5 and K_2O), secondary elements (C ,Mg) and vital micro nutrients like Fe, B, Zn and Mo. and he reported that addition of humic substances increased the plant height. Addition of vermicompost and humic substances improved the vegetative growth characters of the plant as reported by Kale *et al*., (1987).The treatment which received the application of vermicompost @ 0.5 kg plant^{-1}+ humic acid @ 0.3 % plant^{-1} foliar spray recorded the maximum number of branches 25 at 90 DAP **.** This was followed by the application of vermicompost @ 0.5 kg plant^{-1} + humic acid 0.2 % plant^{-1} foliar spray which recorded the maximum number of branches up to 24 at 90 DAP whereas the least number of branches 16 was recorded in the control . (Grappelli *et al*., 1985) reported that addition of vermicompost increased the number of branches plant^{-1}.

The treatment which received the application of vermicompost @ 0.5 kg plant^{-1} + 0.3 percent humic acid as foliar spray increased the number of leaves up to 104 leaves at 90 DAP. This was followed by the application of vermicompost @ 0.5 kg plant^{-1} + humic acid 0.2 % plant^{-1} foliar spray increased the number of leaves up to 101 leaves at 90 DAP whereas the number of leaves was least in control Addition of humic substances tends to increase the respiration rate, metabolism and growth of plant as reported by Schnitzer (1991). In brinjal Nanthakumar and Veeraraghathatam (1996) reported that addition of humic substances increased the number of leaves plant^{-1}.

The treatment which received the application of vermicompost @ 0.5 kg plant^{-1}+ humic acid @ 0.3 % plant^{-1} foliar spray recorded the maximum number of flowers up to 28 at 90 DAP **.** This was followed by the application of vermicompost @ 0.5 kg plant^{-1} humic acid 0.2 % plant^{-1} foliar spray increased the number of flowers up to 26 at 90 DAP whereas the number of flowers was least in control

Yield attributes

Yield and yield components are the important characters which may decide the yield. Eventhough they are genetically controlled, also influenced by the availability of nutrients to the crop. The treatment which received the application of vermicompost @ 0.5 kg plant^{-1}+ humic acid @ 0.3 % plant^{-1} foliar spray recorded the maximum number of fruit per plant up to 31 at 90 DAP **.** This was followed by the application of vermicompost @ 0.5 kg plant^{-1} + humic acid 0.2 % plant^{-1} foliar spray increased the number of

fruits per plant up to 30 leaves at 90 DAP whereas the number of flowers was least in control Vermicompost can be used as an alternative source of nutrition in crop production. Vermicompost, owing to its surplus nutritive content enhances beneficial soil micro flora and it increases plant growth. Since it is cost effective, it can be recommended to farmers as best organic manures for the medicinal crop. Many experiments have shown that worm casts enhance plant root nintiation, develop and increase root biomass, enhance plant growth, increase crop yield and plant productivity (Grappelli *et al*., 1985).The treatment which received the application of vermicompost @ 0.5 kg plant^{-1}+ humic acid @ 0.3 % plant^{-1} foliar spray recorded the maximum number of fruit weight per plant up to 91 g at 90 DAP**.** This was followed by the application of vermicompost @ 0.5 kg plant^{-1} + humic acid 0.2 % plant^{-1} foliar spray increased the number of fruit weight per plant up to 86 g at 90 DAP whereas the number of flowers was least in control noticed that maximum yields were consistently maintained with humic acid application of 0.45 g pot $^{-1}$ than the foliar spary in tomato. Padem and Ocal (1997) reported that addition of humic substances increased the fruit weight in brinjal. Higher levels of vermicompost and humic acid had recorded higher potassium uptake. Potassium uptake was positively influenced by higher levels of nutrients. Humic acid 0.1 percent foliar spray increased the potassium uptake in many crops. Hence it has been confirmed that the brinjal plant, can be cultivated through organic means for the benefit of the farming community for higher yield and revenue.

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