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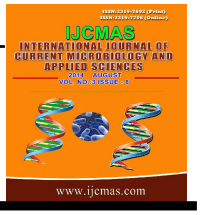

Original Research Article

Study Effects of Microbial and Chemical Fertilizer on Yield Components in Brinjal (*Solanum melongena Linn.*) C.*Var* CO-2

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A B S T R A C T

To study the influence of organic and inorganic on quality and yield components in brinjal to boost the productivity potential combined application microbial and chemical fertilizers had a great influence at all the growth stages of the crop. Significant differences in all parameters like, plant height, number of leaves, leaf area and number of branches due to the combined application of microbial fertilizer and chemical fertilizer. Maximum plant height (94cm) were observed in Treatmet10 containing urea, super phosphate, Murate of potash, Azospirillum, Phosphobacteria and potassium mobilizer (each 5g / pot). The maximum number of flowers (36/plant) per plant was produced in T10 treatment and the maximum number of pods (28/plant). The highest number of branches per plant (12nos) was recorded in treatment T10. Highest pod weight was observed in T10 was (1133.3 mg) Total number of leaf observed 33 per plant was observed in T-10, and leaf area fairly gives a good idea of photosynthetic capacity of the plant. Significant differences were noticed with regard to leaf area index among the treatments at all growth stages.

Keywords

Azospirillum, Phosphobacteria, Chemical fertilizer, treatments and egg plant.

Introduction

Brinjal (*Solanum melongena Linn.)* belongs to the family Solanaceae. Plant is herbaceous, annual with erect or semi-spreading in habit. It also behaves like a perennial herb. Brinjal is popular vegetable and is native of India. It can be grown throughout the year in almost all the states of India except at higher altitudes. The important brinjal growing countries in the world are India, Bangladesh, Pakistan, China, Cyprus, Egypt, Japan, Philippines, Syria and Western Europe (Anon 2001). In India, major brinjal producing states are Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh (Anonymous, 2004). The varieties of *Solanum melongena* L. show a wide range of fruit shapes and colors, ranging from oval or egg-shaped to long club shaped; and from white, yellow, green through degrees of purple pigmentation to

almost black. It is quite high in nutritive value and can be well compared with tomato.

Materials and Methods

Experimental materials

Present works was carried out in a Randomized Complete Block Design (RCBD) at the Government Arts College Coimbatore. The mechanical compositions, physical and chemical properties of experimental soil, which was used for pot culture study. The soil physical and chemical properties such as p^H, Nitrogen (Jackson, 1958), Phosphorus (Jackson, 1958) and potassium (Peach and Tracey, 1956) contents were analyzed. Micronutrients such as Zn, Fe, Cu, and Mn were analyzed. Seed material of Brinjal variety- CO2 were obtained from Tamilnadu Agricultural University, Coimbatore. The raised seed bed of 2x2m size was prepared, and Brinjal seeds were soaked in one centimeter depth in the rows spaced at 5 to 6 cm and covered with thin layer of soil. 30 days seedlings were transplanted to the trial pot.

The treatments, were T-1 Urea (5g / pot),T-2 Super phosphate (5g / pot), T-3Murate of potash (5g / pot),T-4 Azospirillum (5g / pot), T-5 Phosphobacteria (5g / pot), T-6 Potassium mobilize (5g / pot), T-7 Urea, super phosphate, Murate of potash (each 5g / pot), T-8 Azospirillum, Phosphobacteria and potassium mobilizer (each 5g / pot), T-9 VAM alone (5g / pot), T-10 Urea, super phosphate, Murate of potash, Azospirillum, Phosphobacteria and potassium mobilizer (each 5g / pot) and T-11 Control. The N, P and K contents of the manures were tested in the laboratory and according to the results, the doses of manures were set in such a way that all the treatments contain same amount of N, P and K. Five plants were selected randomly from each unit plot to record yield contributing characters. All practical managements included; mulching, weeding and other agronomic treatments were done mechanically. Irrigation was done based on plant requirements. In maturity time, fruit yield, number of fruits per plant, total plant height, shoot length, root length, number of branches per plant, number of leaves and leaf area per plant, fruit length and fruit width were measured. The collected data were analyzed statistically by F-test to examine the treatment effects and the mean differences were adjudged by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

Results and Discussion

The present study was observed that the application of microbial and chemical fertilizers solely or combined application had a great influence at all the growth stages of the crop. Significant differences in all parameters like, plant height, number of leaves, leaf area and number of branches due to the combined application of microbial fertilizer and chemical fertilizer. Maximum plant height (94cm) were observed in T10 (Table 1). The data on shoot length (70cm), and root length (23.9cm) as influenced by the combination of biofertilizers and chemical fertilizers showed significant differences among the treatments at all the stages. The highest number of branches per plant (12nos) was recorded in treatment T10 (Fig 1). Highest pod weight was observed in T10 was (1133.3 mg) Total number of leaf observed 33 per plant was observed in T-10, and leaf area fairly gives a good idea of photosynthetic capacity of the plant. Significant differences were noticed with regard to leaf area index among the treatments at all growth stages. The treatment 10 showed significantly higher leaf area index (64 cm). The increase in leaf area index could be attributed to increased cell division and

elongation resulting in increased leaf expansion, more number of leaves due to beneficial influence of biofertilizers which release growth promoting substances and enhances the availability of nitrogen. From the data it appeared that flowering and fruiting of brinjal were positively influenced by sources of nutrients applied. The maximum number of flowers (36/plant) per plant was produced in T10 treatment and the maximum number of pods (28/plant).

Similar results were also reported by Naidu et al., (1999) revealed that the morphological parameters were affected significantly due to the application of different combination of organics, chemicals and biofertilizers. Nitrogen fertilizer use has played a significant role in increase of crop yield (Modhej et al., 2008). Significant increase in plant height, number of leaves, number of branches and number of fruits due to influenced by environmental conditions and management practices. Prabhu et al., (2003) their studies indicated that plant height is increased by the application of organics and biofertilizers, attributed to the increased uptake of nutrients in the plants leading to enhanced chlorophyll content and carbohydrate synthesis and increased activity of hormones produced by *Azospirillum* and phosphate solubilizing bacteria.

The Phosphobacteria increased phosphate availability in soils which in turn helped better proliferation of root growth and uptake of other nutrients to the greater extent. So that the enlargement in cell size and cell division, which might have helped in plant height, number of leaves, branches number of fruits per plant. These results are in agreement with those reports of Nanthakumar and Veeraraghavathatham (2000), Anburani and Manivannan (2002), and Wange and Kale (2004) in brinjal.

Fundamentally, K+ is very water soluble and highly mobile and transported in the plants' xylem (Lack and Evans, 2005). Membrane transport of potassium can be mediates either by potassium channels, utilizing the membrane potential to facilitate transport of potassium down its electrochemical gradient, or by secondary transporters'. In plants, potassium act as regulator since it is constituent of 60 different enzyme systems of drought tolerance and water-use efficiency. In addition, current study has showed that to optimum growth, crops need more potassium than needed (Simonsson et al., 2007)

Aminifard et al., (2010) with study responses of eggplant to different rates of nitrogen under field conditions were reported that fertilization with 100 Kg/ha nitrogen resulted in the highest average fruit weight and fruit yield. Pal et al., (2002) were reported that eggplant fruit yield increased with increase in nitrogen up to187.5 kg/ha. Only microbial treated plants could not increase the vegetative growth of plants and the reason may be that they released nutrients at a slower rate. On the other hand, the only application of inorganic fertilizer was also less effective than the combined application. These results were in conformity with the findings of Rahman et al. (1998) found that the vegetative growth and yield of berry was the highest with the combined application of manures and fertilizers. For eggplant, the integrated use of urea and poultry manure also resulted in a higher nutrient uptake Jose et al., (1988).

The use of synthetic fertilizers causes a great impact on the environment and the cost of these fertilizers is increasing over the years. The farmers need to raise the crops by organic farming that will reduce the costs and will decrease the impact on the environment.

Table.1 The morphological effect of microbial and chemical fertilizer on brinjal plant. C.var.co-2

Treatments	Root length (cm)	Shoot length (cm)	Total plant height (cm)	Number of flower per plant	Number of pods per plant	Pod weight per plant (mg)	Leaf area per plant (cm)	Number of leaves per plant	Number of branches per plant
T-1	19.0000d	55.0000d	74.0000 f	33.0000 b	22.0000 c	0914.0 cd	55.0000 c	24.0000e	10.0000 bc
T-2	18.0000e	50.0000e	68.0000g	28.0000 d	20.0000 d	0880.3 de	51.0000 d	18.0000h	09.0000 cd
T-3	19.0000d	48.0000f	67.0000h	27.0000 d	19.0000 d	0894.7 cd	45.0000 e	20.0000g	08.0000 de
T-4	20.0000c	55.0000d	75.0000e	20.0000 d	14.0000 f	0913.3 cd	47.0000 e	22.0000f	09.0000 cd
T-5	18.0000e	50.0000e	78.0000d	20.0000 d	15.0000 f	0980.0 b	58.0000 b	25.0000de	09.0000 cd
T-6	18.0000e	45.0000g	63.0000i	19.0000 f	12.0000 g	0940.0 bc	52.0000 d	26.0000 d	08.0000 de
T-7	**22.0000b**	**68.0000b**	**90.0000b**	35.0000 a	25.0000 b	1100.0 a	60.0000 b	30.0000 b	11.0000 ab
T-8	20.0000c	62.0000c	82.0000c	30.0000 c	22.0000 c	0903.3 cd	60.0000 b	28.0000 c	10.0000 bc
T-9	17.0000f	45.0000g	62.0000j	24.0000 e	17.0000 e	0880.0 de	44.0000 e	20.0000 g	09.0000 cd
T-10	**23.9000a**	**70.6667a**	**94.0000a**	**36.0000 a**	**28.0000 a**	**1133.3 a**	**64.0000 a**	**33.0000a**	**12.0000 a**
T-11	14.0000g	40.0000h	54.0000 k	16.0000 g	10.0000 h	0840.0 e	36.0000 f	17.0000h	07.3333 e
MEAN	**18.9909**	**53.5152**		**26,1818**	**18.5455**	**0943.5**	**52.0000**	**23.9091**	**09.3030**

Means followed by a common letter are not significantly different at the 5% level by DMRT

PLATE-1The morphological effect of microbial and chemical fertilizer on brinjal plant. C.var.co-2 -Plant height (cm)

T-7 Chemical fertilizer NPK

T– 8 -Microbial fertilizer (Azospirillum +Phosphobacteria+ potassium mobilizer

T-11 Control

T-10 Chemical fertilizer and Bio fertilizer

In addition, organic farming will reduce the additional burden of environmental pollution that is caused while manufacturing these synthetic fertilizers at the source (Rathier and Frink, 1989). Now it is a well-established fact that organic fertilizers provide enough requirements for proper growth of the crop plant and may enhance the uptake of nutrients, increase the assimilation capacity and will stimulate the hormonal activity as well (Tomati et al., 1990). The use of biofertilizers useful as it increases soil porosity, aeration and water holding capacity, therefore a practically paying proposal. Azospirillum, a nitrogen fixing organism has been reported to be beneficial and economical on several crops. They improve the growth and yield as well as productivity of the crop. Vanangamudi et al., (1989) also reported similar increase in per cent germination and shoot length of chilli with increase in nitrogen application (0 – 150 kg/ha). Prabhu et al. (2003) reported that increased N and P rates increased the plant height, branch number per plant in brinjal phosphate solubilizing Bacteria (PSB) are a group of beneficial bacteria capable of hydrolysing organic and inorganic phosphorus from insoluble compounds. Chen et al., (2006) P-solubilization ability of the microorganisms is considered to be one of the most important traits associated with plant phosphate nutrition P-solubilizers are biofertilizers which solubilizes the fixed phosphorus in soil and makes it available for plants. The microbes, *Fraturia aurantia* belonging to the family *Pseudomonaceae*, is a beneficial bacteria capable of mobilizing potash to plants in all types of soil especially, low K Content soil. Such bacterial population in the soil form can increase the availability of potash to the plants. Wange and Kale (2004) reported that, the results revealed significant improvement in vegetative characters such as plant height and number of leaves per plant in brinjal over the recommended biofertilizer with combine chemical fertilizer. The information on the role of organics on morpho-physiological traits in brinjal is meager. Hence, there is a need to study the influence of organic and inorganic on quality and yield components in brinjal to boost the productivity potential.

The cost of inorganic fertilizers has been enormously increasing to an extent that they are out of reach of the poor, small and marginal farmers. It has become impractical to apply such costly inputs for a crop of marginal returns. The use of biofertilizers in such situation is therefore a practically paying proposal. Based on the above results, it was concluded that, the application of microbial and chemical fertilizers was found more beneficial and significantly improved morpho-physiological traits, growth parameters, and yield components in brinjal. The benefit cost ratio was found lesser in using both biofertilizer and chemical fertilizer compared to using chemical fertilizer alone in brinjal crop cultivation.

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