



RESEARCH PAPER

Effect of bio- fertilizers on morpho - anatomical and productivity of brinjal (*Solanum melongena* L.)

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Abstract : The influence of biofertilizer inoculation, viz., *Panchagavya* and *Jeevamruta* with different combinations with recommended doses on Brinjal (*Solanum melongena* L.). The crop was tested during January to May of 2021 at agriculture field of Hindu College, Guntur. The results revealed the significant improvement in growth characters such as height of plant, number of functional leaves, number of functional flowers and similarly, number of fruits picked per plant and yield of fruits was more in inoculated plants. And also the leaf and fruit anatomical characters are showing more significant to inoculated plants.

Key Words : Brinjal, Antomy, *Panchagavya*, *Jeevamruta*

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INTRODUCTION

The Solanaceae family comprises about 98 genera and 2,700 species with a wide distribution, mainly in the tropical and subtropical regions of the world (Olmstead and Bobs, 2007). *Solanum melongena* belong to the family Solanaceae (order-Solanales) is dicotyledonous plants bearing berries with numerous seeds. According to Hunziker (1979) *Solanum* species are herbs, leaves are simple, pinnate and alternate. Flowers are radically or rarely bilaterally symmetrical, with hypogenous discs; sepals are usually coalescent for almost their full length, the calyx is persistent often enlarging in fruits, corolla ovate to tubular, carpel 2, the style 1, and the ovary usually 2 chambered or sometimes 3-5 through irregularities of the placenta, parental-axile, ovules numerous in each

carpel, fruit berry.

Solanum species have indigenous medicinal uses which range from weight reduction to treatment of several ailments including asthma, skin infections and constipation. The objective of this study is to elevate the growth, flowering, branching and productivity and nutrition and also to find out the anatomical variations in egg plant using biofertilisers as *Jeevamruta* and *Panchagavya* application.

India is regarded as a horticultural paradise (Saravaiya and Patel, 2005), with a vast array of vegetables being cultivated in our country, brinjal is considered as one of the leading and the second major vegetable crops next to tomato. It is highly productive and usually finds a place as “poor man’s crop”.

The productivity of brinjal can be increased by using several techniques *viz.*, organic farming, integrated nutrient management and good hybrid seeds. Bio fertilizers improve the quantitative and qualitative features of many plants (Yousefi *et al.*, 2011). Keeping in view the present investigation was carried out to study the effect of integrated nutrient management on the nutrient status and uptake of brinjal (*Solanum melongena* L.).

MATERIAL AND METHODS

Sources of materials:

Samples of *S. melongena* were collected from Agricultural Department, ARS, Amaravathi, Andhra Pradesh.

Anatomical analysis :

Anatomy follows the methods of (Kadiri and Adeniran, 2016) with some modification. The root, stem, leaf and fruit were sectioned using Microtome blade and the thin slices obtained were kept in water before transferring onto a glass slide where a few drops of 99% ethyl alcohol were added for tissue hardening and then 2 drop of safranin solutions. Excess stain was washed off with water before a drop of glycerin was added. Slides were covered with cover slips and ringed with nail lacquer. However, all preparations were observed with an Olympus microscope and photographs were taken with a digitized camera (Nikkon).

Jeevamrutha :

Jeevamrutha was prepared by mixing 10 kg of cow dung, 10 litre of cow urine, 2 kg of local jiggery, 2 kg of pigeon pea flour and hand full of soil collected from farm. All these were put in 200 litre capacity plastic drum and mixed thoroughly and volume was made upto 200 litre. The mixture was stirred well in clock wise direction and kept in shade covered with wet jute bag. The solution was regularly stirred clockwise in the morning, afternoon and in the evening continuously for 10 days and it was used for soil application. Jeevamrutha and was applied when the soil was wet near the root zone of the crop as per the treatments.

Panchagavya:

Panchagavya was prepared by mixing 7 kg fresh cow dung and 1 kg *ghee* and incubated in a plastic drum for 2 days and it was mixed daily once. On third day, 10 litres cow urine and 10 litres of water were added and

mixed thoroughly and incubated for fermentation for 13 days. Then, 3 litres milk, 2 litres curd, 100 gram yeast, 3 litres tender coconut water, 3 kg jiggery and 12 ripened Cavendish banana were added and contents were incubated for 6 days and the mixture was stirred thoroughly thrice a day. Plastic drum with all the contents was kept in shade and it was covered with wet jute bag. After 21 days of formentation, mixture was filtered through a cotton cloth and used according to treatments schedule. Bothliquid manures-jeevamrutha and *panchagavya* were applied to *S. melongena* crop at 20, 40 and 60 days after sowing. short duration (80-90 days) variety of *Solanum melongena*.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Morphology:

The application of biofertilisers has given significant flowering ranging from 10-20 task (Table 1). The number of fruits are more with the treated plot showing larger number (Table 2). The fruit size is showing prominent change in size 10-12 cms. The plot treated with bio-fertilizer is showing good branches and wider area with larger canopy covering more number of fruits with larger size and healthy (Table 3).

Anatomy:

In the leaf anatomy of *S. melongena* (untreated) showing less trichomes, the collenchymas is also less in number (Fig. 1A). On the other hand, the primary growth parenchyma, collenchymas and hypodermis occupy larger in number of treated plant leaf (Fig. 1B). the treated plot showing fruit anatomy with prominent vascular bundle and larger cortical cells and more number of layers.

In the anatomy of *S. melongena*, the mid-rib showed stellate trichomes in the epidermis made of a layer of cells. The collenchymatous cells occupy the region of the hypodermis; parenchymatous cells occupy the ground meristem. The primary growth phase reveals 3 vascular traces with both growth phases (Fig. 1C). On the other hand, the mid-rib of *S. melongena*. Fruit of *S. melongena* is made of a layer of cells in the epidermis the cell and tissue of a layer of cells in the epidermis the cell and tissue arrangements and a similar (Fig. 1D). Fruit anatomy has an epicycle of many layers of cells

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Table 1 : Number of flowers					
Plants	15 Days	25 Days	35 Days	45 Days	60 Days
Ut 1	0	0	2	4	10
Ut 2	0	0	3	2	11
Ut 3	0	0	1	5	10
Ut 4	0	0	0	1	8
Ut 5	0	0	1	3	9
T ₁	0	0	5	10	19
T ₂	0	0	5	10	20
T ₃	0	1	4	9	19
T ₄	0	0	5	10	20
T ₅	0	0	3	8	21

Table 2 : Number of fruits					
Ut 1	0	0	3	5	10
Ut 2	0	0	2	5	8
Ut 3	0	0	0	4	10
Ut 4	0	0	1	3	9
Ut 5	0	0	1	4	9
T ₁	0	0	5	10	20
T ₂	0	1	6	8	17
T ₃	0	0	4	9	12
T ₄	0	0	5	10	19
T ₅	0	0	4	9	18

Table 3 : Fruit size cm²					
Ut 1	0	0	2	4	6
Ut 2	0	0	1	3	7
Ut 3	0	0	0	4	5
Ut 4	0	0	2	2	7
Ut 5	0	0	2	4	6
T ₁	0	2	5	8	10
T ₂	0	2	4	7	8
T ₃	0	2	4	6	9
T ₄	0	2	3	8	10
T ₅	0	2	4	7	10

Table 4 : Width of plant (canopy) cm²					
Ut 1	2	5	7	8	9
Ut 2	3	5	5	7	9
Ut 3	2	3	4	7	8
Ut 4	3	4	2	8	7
Ut 5	3	5	4	8	8
1	4	6	10	14	16
2	5	7	8	14	17
3	4	6	11	13	16
4	4	7	9	10	16
5	5	5	9	12	15

Ut: Untreated; T:Treated

Leaf and Fruit Anatomy

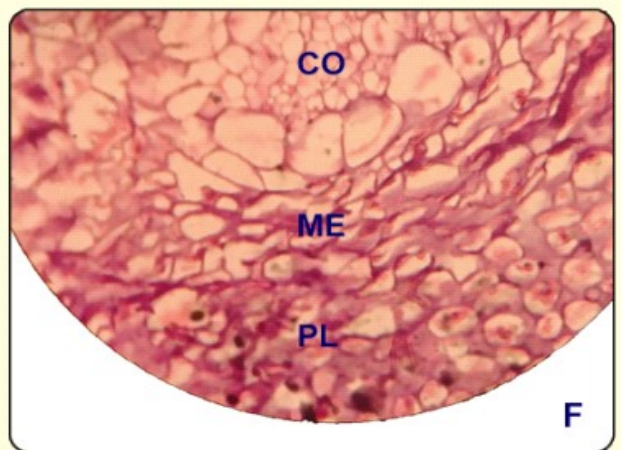
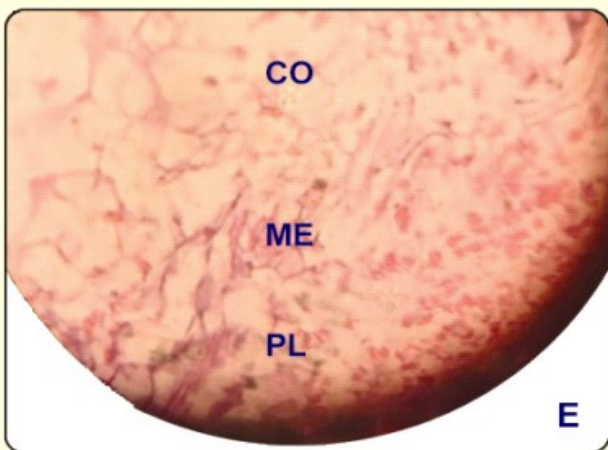
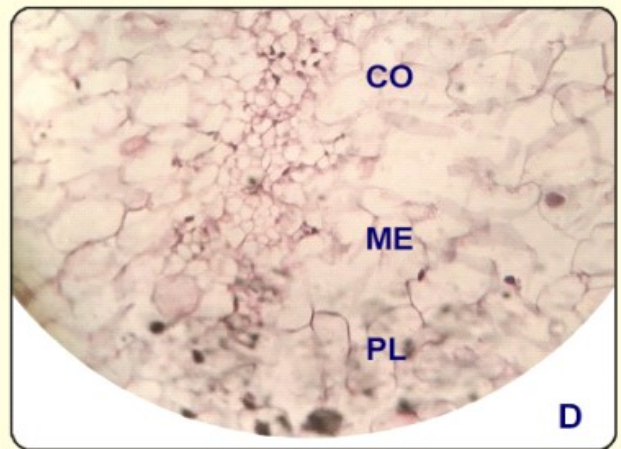
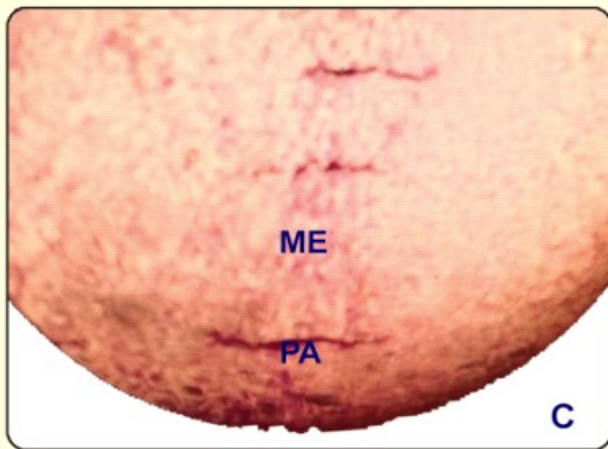
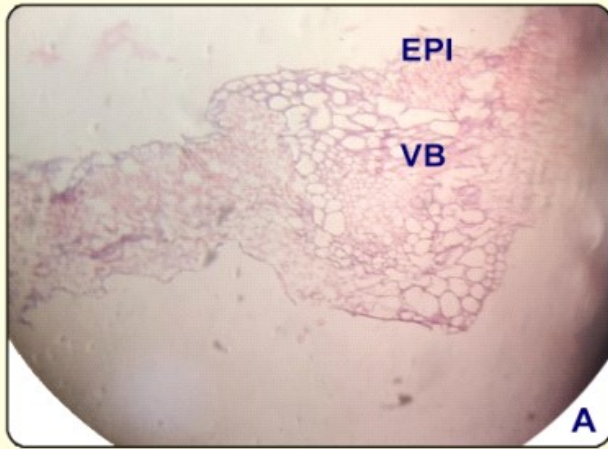


Fig. 1 : Epi-epidermis, vb- vascular bundle, mvb-mid rib vascular bundle, pa-partition me- mesophyll, pl- placenta, co-core

below the endodermis (inner-most part of the cortex) (Fig. 1E) and large pith occupied by collenchymatous cells. Also, the root anatomy of *S. melongena* revealed epiblema made of one layer. The vascular bundles have radical symmetry (Fig. 1F).

Lall and Ahmad (1965) observed compact vascular bundles in a thick layer with lignified cells and less area of pith in the leaf.

Effect of *panchagavya* on vegetative growth (plant height, number of leaves and branches per plant) and reproductive growth (fruits per plant, fruit length) which were considered as the important yield attributes having significant positive correlation with cortex and haulm yield. Effect of Jeevamrutha and *Panchagavya* after fermentation which favour the higher yield. These findings are in line with those reported by Kumar *et al.* (2011).

Thus, combined application of jeevamrutha and *panchagavya* results in better growth and yield attributes resulting into 59 per cent increased grain yield over without application of jeevamrutha and *panchagavya* *Solanum melongena*. Liquid organic formulations can effectively and efficiently be used to get higher grain yield in *S. melongena*.

Conclusion :

The results reveal that the egg plants show better response with bio-fertilisers. Combined application of jeevamrutha and *panchagavya* resulted in better growth attributes and contributed for improved fertility status of soil. It has resulted in 59 per cent increased grain yield (1478 kg ha' over control (601 kg ha'"). Hence, these liquid formulations are efficient organic substitutes and they can be applied along with organic manures in an integrated approach for obtaining higher crop yield besides improving the nutrient status of the soil. The anatomical characters assessed indicate that, very thick cuticle, more collenchymatous tissue, compact parenchymatous tissue,

cortical cells with less intercellular space, vascular tissue closely packed are recorded in the cells of the plants created untreated.

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