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EFFECT OF APPLICATION OF COMPOST AND PHOSPHOBACTERIA ON THE GROWTH AND DEVELOPMENT OF *LYCOPERSICON ESCULENTUM* MILL

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ABSTRACT

The tomato want to seeds were shown to the different pots containing different concentration of the compost and *Phosphobacteria* sterilized soil without application of compost or *Phosphobacteria* are maintained as control.When the sampling were 45 days old the morphometric parameters, above and below ground biomass, biomolecules were analyzed to find the effect of application of compost and *Phosphobacteria* on the growth of the plant. In this context the present study aims to increase the vegetable crops production with the application of Bio fertilizer and compost application to avoid chemical pollution. The next phase of the study the soil were sterilized completely with stream sterilization, compost and *Phosphobacteria* were mixed with different concentration to compare the effect of compost and *Phosphobacteria* on the growth and development of plants.

KEYWORDS: Lycopersiconesculentum Mill, *Phosphobacteria*, Biomolecules, Bio fertilizer, Sterilization.

INTRODUCTION

Tomato *Lycopersiconesculentum* Mill is one the most important vegetable worldwide. World tomato production in 2001 was about 105 million tons of fresh fruit from an estimated 3.9 million. As it is a relatively short duration crop and gives a high yield. Tomatoes contribute to a healthy, well-balanced diet. They are rich in minerals, vitamins, essential amino acids, sugars and dietary fibres. Tomato contains much vitamin B and C, iron and phosphorus.

Tomato requires a relatively cool, dry climate for high yield and premium quality. However, it is adapted to a wide range of climatic condition from temperate to hot humid tropical. The optimum temperature for most varieties lies between 21 and 24^{0}C. The plants can survive a wide range of temperatures, but the plant tissues are damaged below 10^{o}and above 38^{o}C.Tomato grows well on most mineral soils that have proper water holding capacity and aeration, and are free of salt. It prefers deep, well drained, sandy loam soils. The upper layer needs to be permeable. Soil depth of 15 to 20 cm is needed to grow a healthy crop. In heavy clay soils, deep ploughing allows better root penetration.In a low-cost recycling method for abattoir wastes, a blend of bovine blood and rumen digesta, bovineblood-rumen-digesta-mixture (BBRDM), has been utilized as a replacement to full-fat soybean meal in broiler chickens' starter and finisher diets (Odunsi et al. 2004). BBRDM was used as a replacement for groundnut cake and fishmeal in the diets of layer chickens (Odunsi 2003). In the present study, the application of BBRDM as a fertilizer and soil conditioner is being attempted for the first time. Generally, solanaceous vegetables require a large quantity of major nutrients like nitrogen (N), phosphorus (P), and potassium (K) for better growth and fruit yield. It is impractical to apply expensive fertilizer inputs for crops of marginal returns, and the rising cost of inorganic fertilizers have made them out of reach of small farmers in India. Organic agriculture is an alternative to conventional production system, and it can contribute to socio-economic and ecologically sustainable development, especially in poorer countries. The use of vermicompost in the organic production of tomato in the greenhouse might decrease costs, increase yields, improve the fruit composition and reduce negative effects on the environment (Atiyeh et al. 2000). For instance, improvement in phytonutrients in tomatoes can be achieved by cultivar selection, environmental factors and agronomic practices (Dorais et al. 2008).

MATERIALS AND METHODS

Collection of seeds and Fertilizer

Certified seeds of *Lycopersiconesculentum*Mill were procured form Agricultural Union Office, Karur-05. Compost and *Phosphobacteria* were also obtained in powder form the same office.

Compost and Phosphobacteria Preparation

Application of Fertilizers: Compost and *Phosphobacteria* with carrier material of 25g, 50g, 75g, and 100g of each was mixed with 500g of soil and transferred into different earthen pots

of equal size. Sterile control was maintained without the addition of compost or *Phosphobactria.*

Soil Analysis: Soil testing before and after plantation was carried out in the Agriculture Soil Testing Laboratory, Rayanoor, karur-05.

Biochemical Studies: Leaves were collected from 45 days old plant of *Lycopersiconesculentum* and the following biomolecules were estimated and the results are tabulated.

Estimation of chlorophyll: 1 g of fresh leaf material was ground using pestle and mortar in 10mlof 80% acetone. The homogenate was centrifuged at 3000 rpm for 15 minutes. The clear supernatant was collected in a 100 ml standard flask. The pellet was re-extracted with 5 ml of 80% acetone.The supernatant was collected and combined with the previous extract and made up the volume to 10 ml with 80% acetone. The absorbance of the solution is read at 645 nm, and 663 nm against 80% acetone as blank. Quantitative estimation of chlorophyll a, chlorophyll b and the total chlorophyll was calculated using the absorption coefficients.

Estimation of carotenoids: 1 g leaf material was ground using pestle and mortar in 10 ml of 80% acetone.The homogenate was centrifuged at 3000 rpm for 15 minutes.The clear supernatant was collected in a 100 ml standard flask.The pellet was re-extracted with 5 ml 80% acetone.The supernatant was collected and combined with the previous extract and made up the volume to 10 ml with acetone.The absorbance of the solution is read at 473 nm against 80% acetone as blank.Quantitative estimation of carotenoids was calculated using the absorption coefficient.

Estimation of starch

Extraction:1 g of plant material was homogenized in 10 ml of 80% ethanol to remove sugars.The homogenate was centrifuged at 3000 rpm for 15 minutes.The supernatant was discarded and the pellet was mixed thoroughly with 5 ml of 80% ethanol and centrifuged. This step is repeated to remove the traces of sugar.To the residue 5ml of distilled water and 6.5 ml of 52% perchloric acid are added and boiled for 20 minutes.After cooling, the solution was centrifuged and the clear supernatant is collected.The pellet was re-extracted and the supernatant is combined with the previous one and made up the volume to 10 ml.

Estimation: To 1 ml of the extract,4 ml of enthrone reagent is added. The mixture is heated in a boiling water bath for 10 minutes.After cooling the intensity of green color is read at 630 nm in spectrophotometer.

Estimation of total sugar

Extraction: 1 g of plant material was homogenized with 5 ml of 80% ethanol using pestle and mortar.The homogenate was centrifuged at 3000 rpm for 15 minutes.The clear supernatant is saved. The pellet is re-extracted with 80% alcohol. The supernatant was combined with the previous one and made to up 10 ml.

Estimation: To 1 ml of the extract, 1ml of 5% phenol and 5ml of conc. Sulphuric acid are added and shaked well. The intensity of the reddish brown color is measured at 490 nm in spectrophotometer.

Estimation of total protein

Extraction: 1 g of plant material is homogenized with 5 ml of distilled water using pestle and mortar.The homogenate was centrifuged at 3000 rpm for 15 minutes. The clear supernatant was saved. The pellet was re-extracted with 5 ml of distilled water. The supernatant is combined with the previous one and made up to 10 ml.From this 1 ml was taken in a test tube and 1.5 ml 5% TCA was added.This mixture was centrifuged at 3000 rpm for 15 minutes.The pellet was dissolved in 1 ml of 0.1 N NaOH and was used for protein estimation.

Estimation: To 0.1 ml of the extract 0.9 ml distilled water was added to make up 1 mlTo this 5 ml of reagent C is added and mixed well.This mixture is allowed to stand for 10 minutes. Then 0.5 ml folin phenol is added to the mixture. This mixture is shaked well and incubated at room temperature in the dark for 30 minutes.The intensity of the blue color is read at 660 nm by using spectrophotometer.

Estimation of phenol

Extraction:1 g of plant material was homogenized with 5 ml of 80% ethanol by using pestle and mortar.The homogenate was centrifuged at 3000 rpm for 15 minutes.The clear supernatant was saved. The pellet was re-extracted with 5 ml of 80% alcohol. The supernatant was combined with the previous one and made up to 10 ml.

Estimation: To 0.1 ml of the extract, 2.9 ml distilled water was added to make 3ml.To this 1ml folin phenol reagent, and 4 ml Na_2CO_3 was added.The intensity of the sample solution is measured 660nm using spectrophotometer.

RESULTS AND DISCUSSION

Application of organic manure or Bio fertilizers are the alternate fertilizers as the chemical fertilizer causes pollution. The present study deals with the application of biofertilizer, *Phosphobacteria* and compost to the important vegetable crop tomato. Before to study the growth of the plant, the soil parameters like chemical parameters and elemental analysis. The parameters such as pH, EC and N, P, K were analysed. The pH of the garden soil was around neutral and EC value also appreciable amount for the growth of the plant, soil elements like N, P, K also measured, among these elements potassium was little higher followed by Nitrogen and Phosphorous.

To summarize the present study the compost and *phosphobacteria* application to the tomato plant supported the growth of the plant by way of increased growth parameters, accumulation of biomolecules, and increased growth of microorganisms. Bio fertilizer has an extensive role in improving soil fertility and increasing crop yield (Kannaiyan*et al*., 2007). Green revolution of 1960's has tremendously enhanced the agriculture production mainly due to the abundant use of fertilizers; use of chemical fertilizers, devoid of organic source has made it soil sick and problematic. The adherence and survival of speculated phosphobacterial culture on the seeds of black gram, green gram, soybean, Maize and paddy showed maximum population in all seeds when inoculated with rice gruel (Sumathy, 2001).

As the next phase of the study the plants were grown in a pot experimental condition as described in material and methods the garden soil was sterilized and mixed with compost and phosphobacteria in various concentrations. Application of compost in 1:5 ratio showed a profused growth compared to the sterilized control and Unsterilized control (Plate -1). In Plate -2 the growth of plants with Phosphobacteria in given not showing much difference among the conleutration applied but slight in – trease in growth was observed when it in compared with sterilized control.The morphometric parameters of tomato in response to the application of compost are tabulated and presented(Table 1). In the parameters such as Plant length, Shoot length, Root length there was slight increase but the application of compost in 1:5 ratio showed two to three fold increase.In the same way the plant fresh weight, plant dry weight and number of leaves also showed increasing trend and higher concentration of

compost showed many fold increment of the weight of the plant (Table -2) data also presented in bar diagram for easy understanding.

The application of Phasphobacteria showed no difference in pH and EC values. But there was a drastic decrease of N, P, K with increasing concentration of Phosphobacteria application Table -3.As the phase of the study the microbial population of *Lycopersiconesculentum* grown rhizosphere soil were analyzed. The fungal population in non sterile soil showed professed growth as compared to sterile. The rhizosphere soil of *Lycopersiconesculentum*grown soil also showed little increased number of colonies compared to sterile control Plate – 2. The bacterial population also studied and presented in plate – 3. There was no much significant difference in the colonies of rhizosphere soil. But little less growth was observed in sterile soil.

Table 1: Effect of application of compost on morphometric parameters of 45 days old *Lycopersiconesculentum* Mill.

Compost	Morphometric parameters					
	PL	SL	RL	PFW	PDW	No. of Lvs
	(cm)			(g)		
C1	12	5	7	0.176	0.096	11
C2	27	14	13	1.107	1.064	23
25g	22.5	13	9.5	1.955	0.345	25
50g	26	17	9	3.296	2.600	27
75g	29	18	11	2.973	0.360	36
100g	35.2	24.9	10.3	8.630	1.165	57

PL: Plant Length **PFW**: Plant Fresh Weight **SL**: Shoot Length **PDW**: Plant Dry Weight **RL**: Root Length **No. of Lvs**: Number of leaves

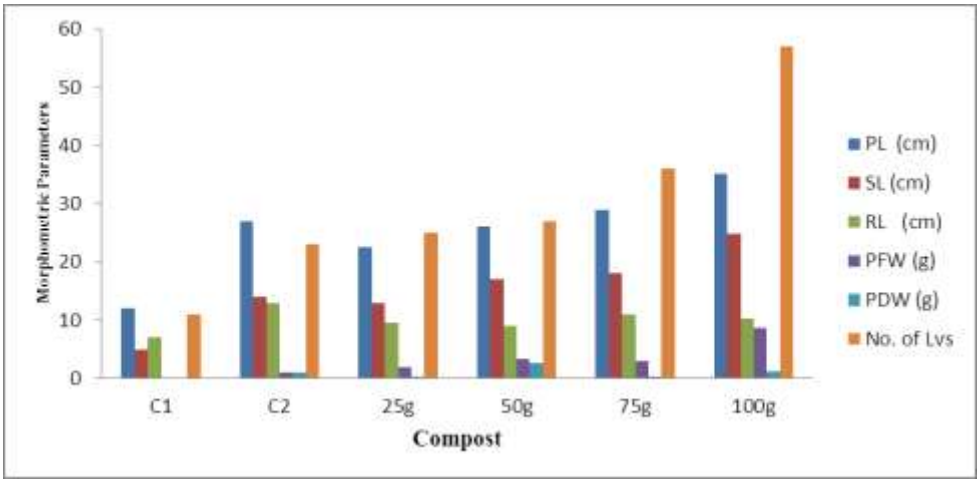

Fig.1 Effect of application of compost on morphometric parameters of 45 days old *Lycopersiconesculentum* Mill.

Table 2: Effect of application of Phosphobacteria on morphometric parameters of 45 days old *Lycopersiconesculentum* Mill.

Phosphobacteria	Morphometric parameters					
	PL	SL	RL	PFW	PDW	No. of Lvs
	(cm)			(g)		
C1	12	5	7	0.176	0.096	11
C2	27	14	13	1.107	1.064	23
25g	20.5	12.5	8	0.591	0.220	20
50g	26.5	8.5	18	1.139	0.198	21
75g	16.5	7.4	9.1	0.596	0.500	19
100g	9.5	6.3	3.2	0.175	0.024	12

PL: Plant Length **PFW**: Plant Fresh Weight **SL**: Shoot Length **PDW**: Plant Dry Weight **RL**: Root Length **No. of Lvs**: Number of leaves

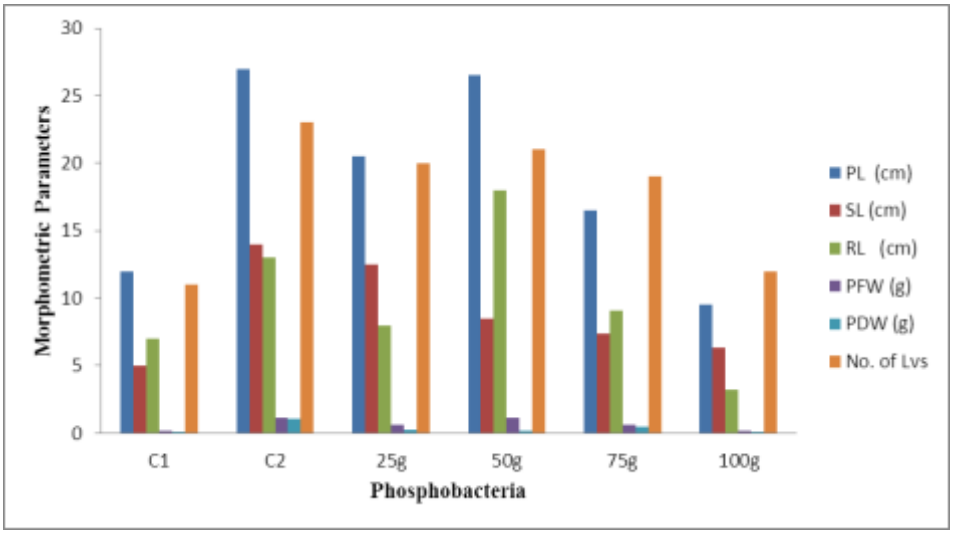

Fig.2: Effect of application of Phosphobacteria on morphometric parameters of 45 days old *Lycopersiconesculentum* Mill.

Table 3: Effect of application of compost on leaf biomolecules of 45 days old *Lycopersiconesculentum* Mill.

Compost	Biomolecules (mg/gfwt)							
	Chl a	Chl b	Total Chlorophyll	Carotenoids	Total soluble Starch	Total soluble Sugar	Total soluble Protein	Total Phenol
C1	0.069	0.127	0.197	0.0004	0.4	0.48	0.53	0.20
C2	0.063	0.158	0.221	0.004	0.2	0.20	0.24	0.13
25g	0.065	0.172	0.238	0.114	0.23	0.28	0.34	0.22
50g	0.067	0.174	0.241	0.150	0.28	0.39	0.50	0.20
75g	0.0691	0.177	0.246	0.049	0.55	0.58	0.72	0.28
100g	0.07	0.180	0.25	0.051	0.62	0.80	1.1	0.30

Chl a: Chlorophyll a **Chl b:** Chlorophyll b

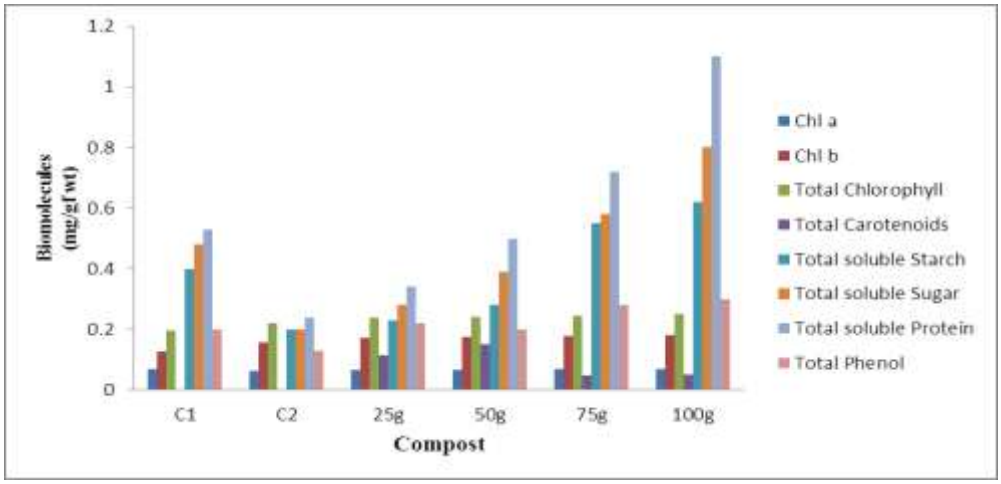

Fig.3: Showing the effect of application of compost on leaf biomolecules of 45 days old *Lycopersiconesculentum Mill*.

Table4: Effect of application of Phosphobacteria on leaf biomolecules of 45 days old *Lycopersiconesculentum* Mill.

Phosphobacteria	Biomolecules (mg/gfwt)							
	Chl a	Chl b	Total Chlorophyll	Carotenoids	Total soluble Starch	Total soluble Sugar	Total soluble Protein	Total Phenol
C1	0.069	0.127	0.197	0.0004	0.4	0.48	0.53	0.20
C2	0.063	0.158	0.221	0.004	0.2	0.20	0.24	0.13
25g	0.069	0.160	0.230	0.027	0.16	0.27	0.28	0.14
50g	0.071	0.165	0.236	0.074	0.38	0.43	0.32	0.17
75g	0.069	0.172	0.242	0.100	0.49	0.52	0.42	0.20
100g	0.070	0.177	0.248	0.166	0.5	0.62	0.58	0.23

Chl a: Chlorophyll a**Chl b:** Chlorophyll b

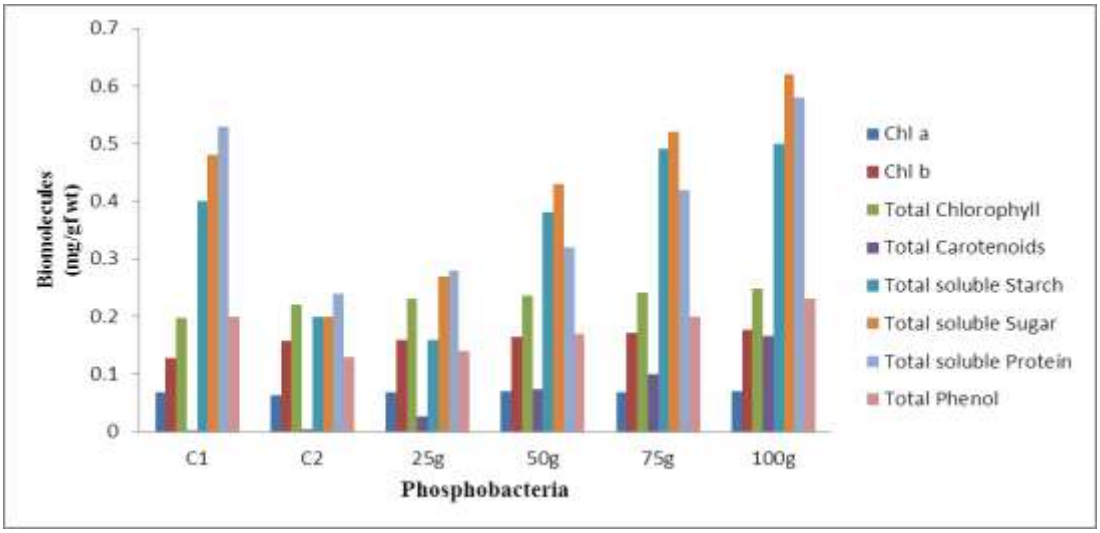

Fig.4: Showing the effect of application of compost on leaf biomolecules of 45 days old *Lycopersiconesculentum Mill*.

Table5: Effect of application of compost on the soil chemistry and soil elements of 45 days old *Lycopersiconesculentum* Mill grownrhizosphere soil.

Compost	EC ($mS\ cm^{-1}$)	pH	Elements (g)		
			N	p	k
C1	0.8	7.9	0.24	0.105	0.32
C2	0.9	8.3	0.19	0.1	0.26
25g	0.8	8.0	0.24	0.145	0.3
50g	0.9	8.0	0.24	0.1	0.37
75g	0.9	8.0	0.24	0.145	0.37
100g	0.9	8.0	0.24	0.058	0.44

Table 6: Effect of application of Phosphobacteria on the soil chemistry and soil elements of 45 days old *Lycopersiconesculentum* Mill.grownrhizosphere soil.

Compost	EC ($mS\ cm^{-1}$)	pH	Elements (g)		
			N	p	k
C1	0.8	7.9	0.24	0.105	0.32
C2	0.9	8.3	0.19	0.1	0.26
25g	0.8	8.1	0.09	0.074	0.24
50g	0.5	8.1	0.09	0.145	0.27
75g	0.4	8.0	0.19	0.045	0.24
100g	0.8	8.0	0.14	0.048	0.23

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