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RESEARCH ARTICLE

JUXTAPOSITION OF VEGETATIVE GROWTH AND REPRODUCTIVE PARAMETERS OF *LYCOPERSICON ESCULENTUM* LINN (SOLANACEAE) USING VERMICOMPOST AND CHEMICAL FERTILIZER

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ABSTRACT

The agriculture is the most important basic needs of the population. For better production and pest control farmers use different types of chemicals in agricultural fields which have hazardous effects on the population. To produce healthy crops and organic farmer needs to manage the soil well considering soil life, soil nutrients and soil structure. The organic farming specially vermicomposting is a modernization in agriculture to minimize the effects of hazardous effects of chemicals of population. Vermicompost is an odorless finely divided peat-like substance having good structure, moisture holding capacity, porosity, aeration, drainage, relatively large amount of available nutrients and microbial metabolites produced by interaction between *Eisenia foetida* and micro organization by the breakdown of organic wastes that may act as plant growth regulators. An experiment on influence of vermicompost and chemical fertilizer on variation in growth and reproductive parameter of *Lycopersicon esculentum L* (Tomato) revealed that plant supplied with vermicompost produced excellent vegetative growth with better yield and the vermicompost was superior over chemical fertilizer in all respect.

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INTRODUCTION

The important vegetable crop throughout the world is tomato which is native to south America but grows in temperate climate worldwide; and rank next to potato in term of the area but ranks first as a processing crop. During last 60 years in India population has increased in many folds. The use of chemical fertilizer in agriculture was a best practice since past. The fate of this best practice results today the great loss of water holding capacity and productivity of the soil and also increasing hazards and outbreak of pest, diseases and weeds. The chemical fertilizer not only hampering the soil health but also act as pollutants causing environmental pollution, dreaded disease of plants and animals including human beings. To overcome the dangerous effects the current global scenario firmly emphasizes the need to adopt ecofriendly agricultural practices (organic farming) for sustainable food production. Vermicompost contains significant quantities of nutrients large beneficial microbial population and biologically active metabolites particularly auxins, gibberellins, cytokinines and B vitamins which can be applied alone or in combination with inorganic fertilizers so as to get better vegetative growth and yield.

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We have a attempt to apply the vermicompost and chemical fertilizer on *Lycopersicon esculentum L* to observe comparative growth efficiency.

MATERIALS AND METHODS

The experiment was carried out in the geographical co-ordinate, latitude $21^0$54'0'' N and longitude $87^0$32'0" E. To study the comparative growth analysis of *Lycopersicon esculentum L* (Solanaceae), plants treated with vermicompost (T_2) and chemical fertilizer (T_1) three replicas of each set were taken at seedling stage i.e two leaved stage with 9 to 10 cm. plants height, and three sets for control (T_0) were also taken. The experiment was carried out in the period from January 2017 March 2017. Soil for experiment was clay loam. Size of the experimental pot was (30x24x30) cm. For the experimental study nutrient status of chemical fertilizer, vermicompost and soil were estimated. Soil in the polythene pots were prepared with 4 kg of soil without any fertilizer. After planting of three replica of each set fertilizer were applied in six phases. Vermicompost was procured from step –III, Kharagpur IIT and 45gm was given per pot and mixed fertilizer (DAP) 10-26-26 was applied at 5gm with 15 days interval starting from 15 days after planting. Irrigation and plant protection measures were taken as per need.

Hypocotyls length, plant height, length of internode, nos of nodes, nos of leaves, longevity and vitality of leaves, lamina size, branches from nodes, flowers from nodes (10^{th}) and nos of fruits observed and recorded at every 15 days intervals starting from 08.01.17 to 23.03.17.

RESULTS

Tomato is short lived perennial plant grown as an annual typically growing to 1 to 3 m tall with weakly woody stem. Vermicompost significantly stimulates the growth of tomato plant and shows a large variation in the every 15 days interval.

Parameters	Vermicompost	Soil
pH	7.2	6.5
Total Carbon (C%)	15.4	.068
Total Nitrogen (N%)	1.5	.047
Available Phosphorus (P%)	.92	.0014
Total Potassium (K%)	1.2	.053
Iron (Fe)	1160mg/kg	8.15ppm
Zinc (Zn)	13.8 mg/kg	1.17ppm
Manganese (Mn)	700mg/kg	18.14ppm

Table 1. Length of Hypocotyl

No. of bservation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0) (cm)	Chemical Fertilizer (T_1) (cm)	Vermicompost (T_2) (cm)	
1	Initial stage (1-14)	4.2	4.5	5	C>V
2	15	4.3	4.7	5.3	
3	30	4.5	5.2	5.9	
4	45	4.6	5.4	6	
5.	60	4.9	7	6.2	
6.	75	5.4	7.3	6.7	

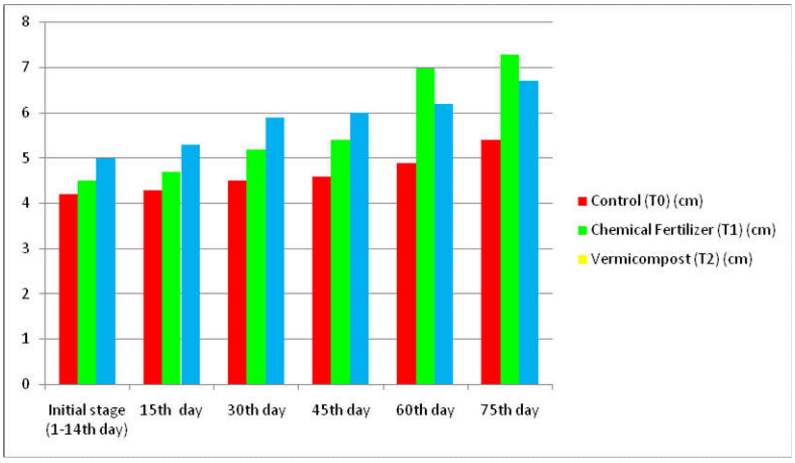


Table 2. Height of the plant

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0) (cm)	Chemical Fertilizer (T_1) (cm)	Vermicompost (T_2) (cm)	
1	Initial stage (1-14)	9	9	10	C>V
2	15	15	20	20	
3	30	30	53	47	
4	45	40	74	74	
5.	60	50	75	77	
6.	75	55	82	80	

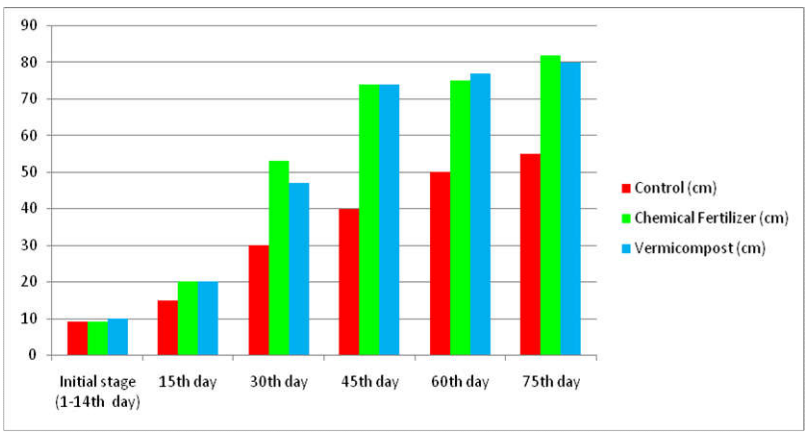


Table 3. Length of Internode

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0) (cm)	Chemical Fertilizer (T_1) (cm)	Vermicompost (T_2) (cm)	
1	Initial stage (1-14)	1.1	1.1	1.2	C>V
2	15	1.9	2.3	2.4	
3	30	2.2	3.1	3	
4	45	2.8	3.3	3.2	
5.	60	3.2	4	3.5	
6.	75	3.7	4.2	4	

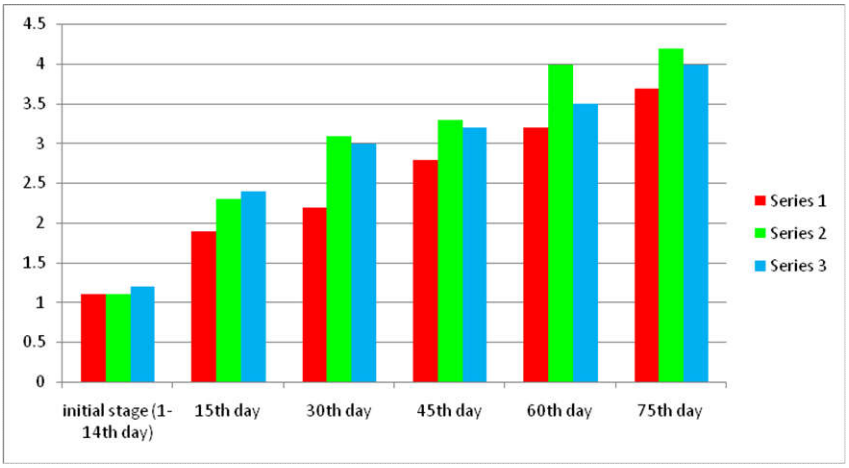


Table 4. Nos. of Node

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0) (cm)	Chemical Fertilizer (T_1) (cm)	Vermicompost (T_2) (cm)	
1	Initial stage (1-14)	4	4	4	C>V
2	15	6	9	9	
3	30	10	15	15	
4	45	15	20	19	
5.	60	15.2	20	20	
6.	75	15.5	20	21	

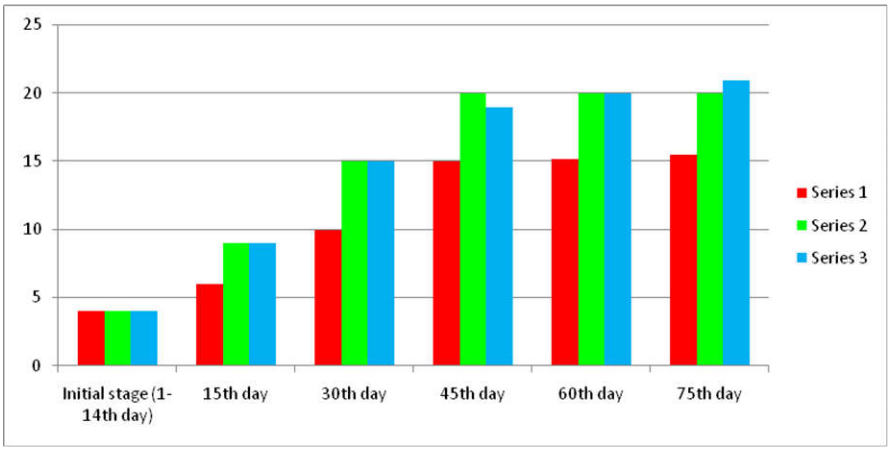


Table 5. Nos. of Leaves

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0) (cm)	Chemical Fertilizer (T_1) (cm)	Vermicompost (T_2) (cm)	
1	Initial stage (1-14)	2	2	2	C>V
2	15	6	8	9	
3	30	10	13	12	
4	45	12	15	15	
5.	60	14	17	17	
6.	75	15	17	17	

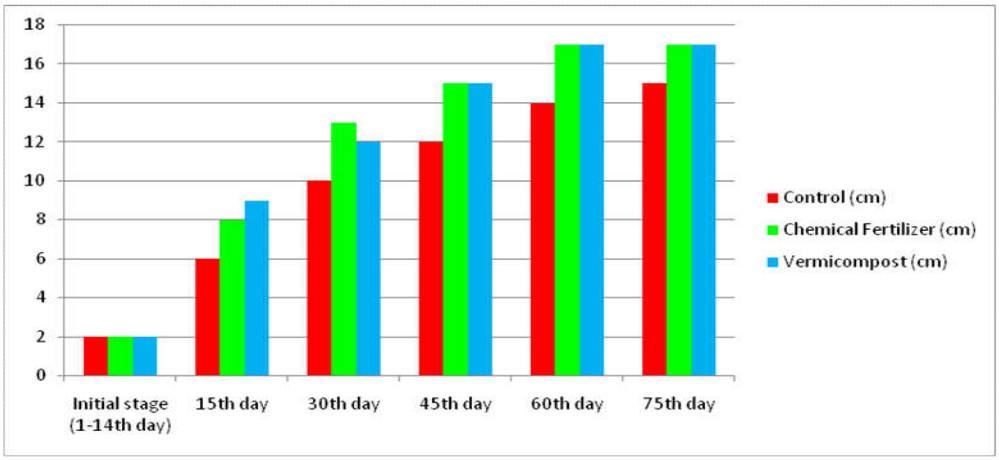


Table 6. Longivity and vitality of Leaves

No of observation	Plant Age (days)	Sets for experiments						
		Control (T_0)		Chemical Fertilizer (T_1)		Vermicompost (T_2)		Remarks
		Living	Dead	Living	Dead	Living	Dead	
1	Initial stage (1-14)	2	0	2	0	2	0	
2	15	6	0	8	0	9	0	
3	30	7	3	10	3	9	3	C<V
4	45	8	4	10	5	10	5	
5	60	4	10	7	10	9	8	
6	75	2	13	6	11	7	10	

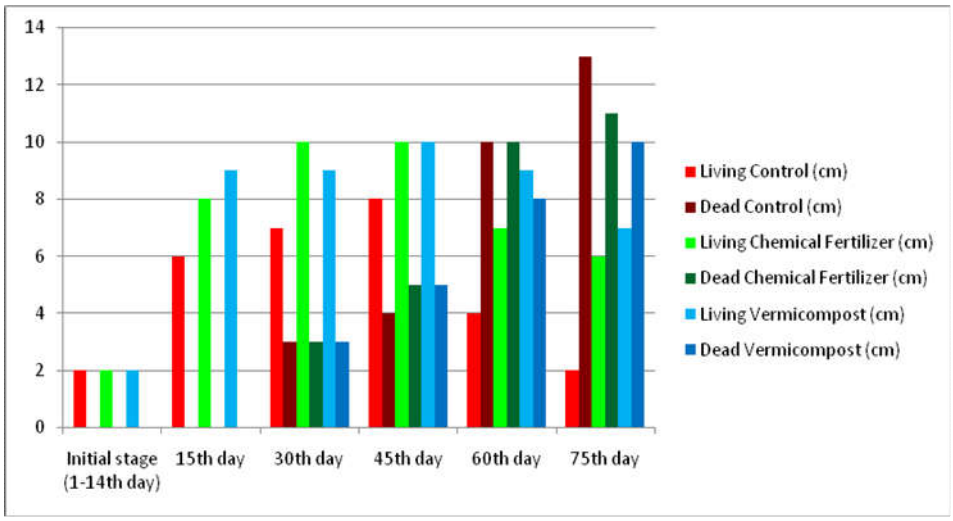


Table 7. Lamina size

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0) (cm)	Chemical Fertilizer (T_1) (cm)	Vermicompost (T_2) (cm)	
1	Initial stage (1-14)	3x1	3x1	3x1	C>V
2	15	4x2	5x2	5x2	
3	30	12x9	18x15	16x15	
4	45	15x11	26x28	20x22	
5.	60	Dried	Dried	20x22	
6.	75	All dried	All dried	All dried	

Table 8. Branches from nodes

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T0) (cm)	Chemical Fertilizer (T1) (cm)	Vermicompost (T2) (cm)	
1	Initial stage (1-14)	Nil	Nil	Nil	C=V
2	15	Nil	Nil	Nil	
3	30	2	3	3	
4	45	5	7	6	
5.	60	6	10	9	
6.	75	7	10	10	

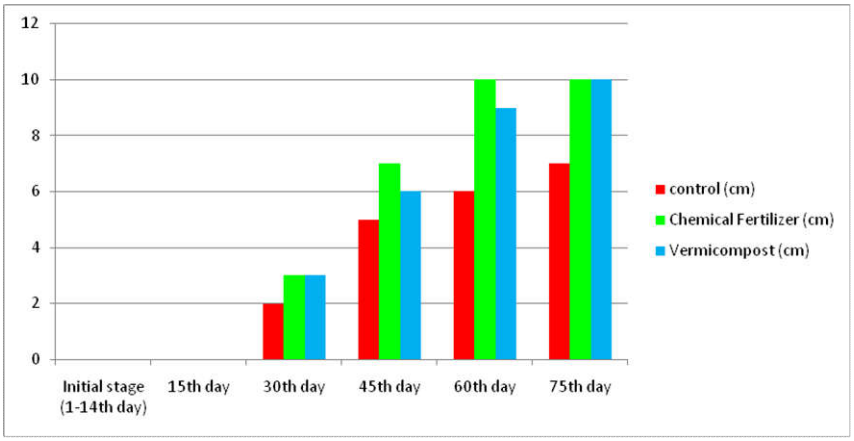


Table 9. Flowers from node (10th)

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0)	Chemical Fertilizer (T_1)	Vermicompost (T_2)	
		(cm)	(cm)	(cm)	
1	Initial stage(1-14)	Nil	Nil	Nil	C>V
2	15	Nil	Nil	Nil	
3	30	2	3	4	
4	45	4	7	6	
5.	60	4	7	6	
6.	75	5	7	6	

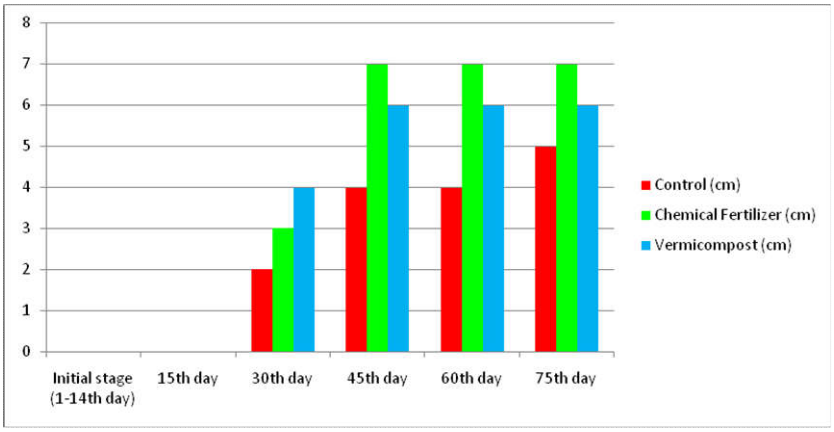
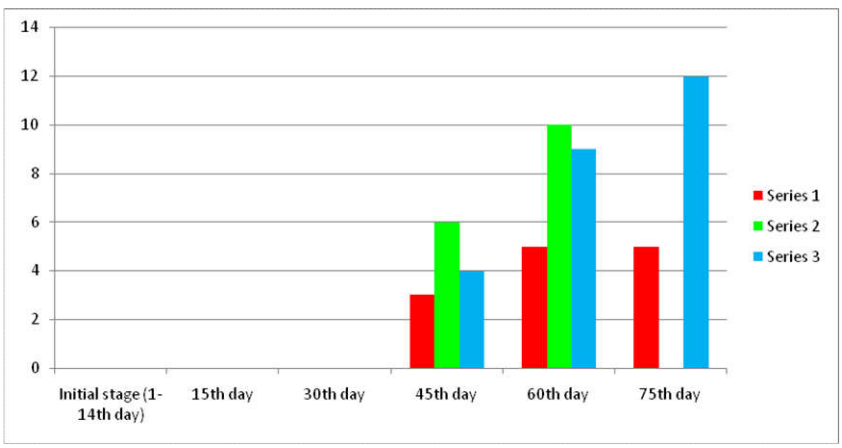


Table 10. Yield of plant (Nos. of Fruits)

No. of observation	Plant Age (days)	Sets for Experiments			Remarks
		Control (T_0)	Chemical Fertilizer (T_1)	Vermicompost (T_2)	
		(cm)	(cm)	(cm)	
1	Initial stage (1-14)	Nil	Nil	Nil	C<V
2	15	Nil	Nil	Nil	
3	30	Nil	Nil	Nil	
4	45	3	6	4	
5.	60	5	10 (ripen)	9	
6.	75	5 (ripen)	Nil	12	



DISCUSSIONS

Plants response to vermicompost showed much better results than control and chemical fertilizer. Vermicompost can also influence. a number of physical, biological and chemical processes of soil which have their bearings on plant's growth. Vermicompost treated plants showed maximum nos. of leaves, more no. of living leaves, more no. of nodes, more of less equal nos. of branching, late ripening of fruits, bigger size of fruits but overall stem height, hypocotyls length, internode length, show equal result with the vermicompost treated plants. Actually it has been noted that vermicompost initially form conductive environment with regard to physical parameters of soil which promote better root growth and other vegetative growth. The presence of beneficial microorganisms such as a fixer, phosphate solubilizers, cellulose decomposer or biologically active plant growth influencing factor such as phytohormones are released by beneficial micro organisms present in the vermicompost rich soil and continuously supplying the nutrient to the soil that improves the soil environment and also help to reduce heavy metal toxicity.

Conclusion

Considering the hypocotyls length, height of plant, nos. of nodes, nos. of leaves, size of lamina, nos. of living leaves, nos. of flowers, nos. of fruits, vermicompost shows better result shows better results than control and chemical fertilizer. But in respect of intermodal length, nos. of branches vermicomost and chemical fertilizer show more or less equal what is more less in control. Addition of vermicompost in tomato with NPK nutrients present in natural soil could be very effective responses on the growth. The mineralization of organic matter decrease the soil pH by organic acids produced in vermicompost and increases micronutrient complex formation (Gopal Reddy and Suryanarayan Reddy, 1998; Wong Average diameter of fruits in chemical 6 em. whereas in vermicom 9 em and fruits ripened so earlier in chemical fertilizer. In outward manifestation the get up the plants in chemical fertilizer is much more attractive and deep steadyness and stiffness of the plant body; taste, smell, colour of fruits are better in vermicompost. It has been found that the plants are too much susceptible under treatment of chemical fertilizer for pathogen in comparison to vermicompost.

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