Efficacy of Vermicompost on growth and yield parameters of *Lycopersicum esculentum*(Tomato)

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Abstract- The study was conducted to evaluate the effect of vermicompost and organic fertilizers on growth and yield of tomato plants. Various growth and yield parameters like mean Percentage of seed germination and seedling length plant height, yield/plant, marketable yield/plant, mean leaf number, total plant biomass were recorded for each treatment. Almost all the growth, yield and quality parameters increased significantly as compared to control, though the increase within the treatments was not found to be significant. Vermicompost is produced by vermicomposting of organic material through interactions between earthworm and microorganisms. The present study suggested that vermicompost is more favorable for vigorous production of tomatoes. The vermicompost can be economically and environmentally suitable and also maintenance of soil environment. The continued use of chemical fertilizers causes health and environmental hazards such as ground and surface water pollution by nitrate leaching. Compost refers to organic constituents, usually wastes, that have been mixed, piled, and moistened and undergo thermophilic decomposition that alters or decomposes the original organic materials.

Index Terms- Vermicompost, Growth, yield, Tomato, Cattle dung

I. INTRODUCTION

Increasing population in most of the Asian countries, the major challenge facing the mankind during the beginning of the new millennium is to provide food substance for all the people of this continent. With per capita land areas decreasing consistently, various measures are being adopted to increase the agricultural production from these shrinking resources to meet the emergent demand of escalating population. However, sustaining the food production from these decreasing land areas depends largely on one factor, maintenance of soil health at high levels for encouraging good growth of plants. The recent trend of consistently reducing the use of efficiency of mineral fertilizers under high productive systems associated with the problems of gradual deterioration of soil health and consequently, the productivity of the arable soils of this continent. It has been appreciated that mineral fertilizers can only supply plant nutrients to the soils but they cannot take care of other physical, chemical and biological attributes of soil health (Chattopadhyay, 2005).

In today's era, heavy doses of chemical fertilizers and pesticides are being used by the farmers to get a better yield of various field crops. These chemical fertilizers and pesticides decreased soil fertility and cause health problems to the consumers. Due to adverse effects of chemical fertilizers, interest has been stimulated for the use of organic manures (Follet *et al*.,1981). The green revolution in India promoted the indiscriminate use of chemical fertilizer and pesticides to obtain a better crop yield. In course of time, the tropicalsoil after receiving such chemicals turned unproductive due to lack of proper amendments of organic matters (Kale, 1995). The best alternative of the present day's environmental desperation is to make proper use of the available unutilized organic biodegradable wastes in order to convert them in to compost within a short period (Edwards, 1998).

The integration of vermicompost with inorganic fertilizers tended to increase the yield of crops viz- potato, rape seed, mulberry and marigold over other traditional composts. The application of vermicompost rendered better performance in respect of all round growth of mulberry plants in the lateritic soil of South West Bengal (Chakraborty *et al*., 2008). The nutrient level, especially the macro or micro-nutrients were found to be always higher than the compost derived from other methods (Kale, 1998). One of the unique features of vermicompost is that during the process of conversion of various organic wastes by earthworms, many of the nutrients are changed to their available forms in order to make them easily utilizable by plants.Therefore, vermicomposts have higher level ofavailable nutrients like nitrate or ammonium nitrogen, exchangeable phosphorous and soluble potassium, calciumand magnesium derived from the wastes (Buchanan *et al*., 1988).

The present work has been under take to evaluate comparative efficacies of vermicompost developed by indigenous method on tomato plants. The objective of this work is to evaluate the impact of vermicompost and organic manures on tomato plant height, number of leaves, length and breadth, weight of fruits, number of fruits.

II. MATERIALS AND METHODS

Preparation of vermicompost

Leaf litter was collected periodically from the Coimbatore and kept in large plastic container. The collected leaf litter was sun dried, cut into small pieces of 4 to 5 cm length and kept ready for composting. Compost mixture was prepared in the ratio of 1:1 (w/w) of lead and cow dung (13kg) in round plastic container, sprinkled with water to maintain moisture content and was allowed for pre-digestion. Pre-digestion of consort mixture was done for 21 days with regular mixing and turning of the mixture for pre-decomposition by the microbes. On 21 day of pre-digestion, the weight of the predigested compost mixture was noted.

After 21 days of pre-digestion, 10 kg of predigested mixture was transferred to the plastic container and 100 clitellate adult (45 days old).Sample of the epigenic earthworms, *Eudrilus eugeniae* (kinberg) were obtained from Tamil Nadu Agriculture University, Coimbatore, Tamil Nadu and maintained under laboratory conditions. The acclimatized earthworms were used for periodical vermicomposting of leaf litter collected from the college campus.

Eudrilus eugeniae (total biomass of 520 Gms) were introduced into each container containing the predigested mixture. Vermicomposting was allowed for 90 days with regular sprinkling of water to maintain the moisture content (65-70% RH) in the mixture. At the end of 90 days of vermicomposting, the vermicompost from the container were spread separately on a polythene sheet. From the vermicompost adult worms and young ones were handpicked and isolated. The vermicompost thus obtained by composting leaf litter was dried and for cultivation of plants.

Experimental set up

The polythene bag culture was conducted to analyze the effect of organic manure and vermicompost on the germination, growth parameters, chlorophyll content biochemical parameters, yield parameters. Two types of fertilizers vermicompost and organic manure were used for the study. The seeds of tomato were procured from the Department of Vegetable Crops, Horticultural College & Research institute, Tamil Nadu Agricultural University, Coimbatore. The dosage of manure used (5g/kg) was as per the recommendations of TNAU, Coimbatore.

Treatment set ups under polythene bag culture

Thick polythene bag of 4kg capacity (25cm X 22cm) were individually filled with growth medium containing soil along with supplemented substrate for different treatments.

The treatment details are as below

- T1-control soil
- T2-organic manure
- T3-vermicompost
- Control-4 kg of garden soil only (control). (Plat 1)

Organic manure

- 25% (3kg soil +1kg organic manure).
- 50 % (2 kg soil +2kg organic manure).
- 75 % (1 kg soil +3kg organic manure).
- 100%(4 kg organic manure). (Plat-2)

Vermicompost

- 25 % (3kg soil +1kg vermicompost)
- 50 % (2 kg soil +2kg vermicompost)
- 75 % (1 kg soil+3kg vermicompost)
- 100% (4kg vermicompost). (Plat-3)

Seed Sowing and Maintenance of Experimental set up

Under the polythene bag culture ten seeds of tomato (*Lycopersicum esculentum*) hybrid Var. (CoTH2) were sown with equal spacing between the seeds at uniform depth of 3cm in each treatment bags individually after moistening the soil and ten replications were maintained. The culture medium in bags were watered regularly twice (in the morning and evening) and kept in sunlight. Care was taken to avoid damage to the treatment set ups

Observation of Germination of Seed

The day sowing was taken as the first day and the treatment set up were observed for germination in the morning every day. The total number of seeds germinated on each day was counted and recorded. In addition the germination percentage and seedling length were observed for 30 days old seedlings.

Calculation of Germination Percentage

At the of 30 days after sowing the number of normal seedling germinated were counted and expressed in percentage. The germination percentage was calculated by using the formula outlined by IST (1995).

$$Germination\ percentage = \frac{\text{Number of seedlings}}{\text{Total no of seeds}} x100$$

Measurement of Length of the Seedling

At the end of the 30 days after sowing, the length of seedling was measured and the average length was calculated and represented in cm.

Measurement of Shoot Length

The length of the shoot from the base to the tip of the shoot was measured using the centimeter scale and the mean length was expressed in cm.

Measurement of Root Length

The root length of the root was measured from the root collar region to the tip of the root using the centimeter scale and mean length was expressed in cm.

Number of Leaves The total number of leaves in the plants were counted and recorded. **Measurement of Lead Area**

The leaf area yes carried out by following the method of Ambasht (1988). The lead was measured using the following formula

Actual area =L x B x K

- L- Length of the leaf
- B- Breadth of the leaf
- K- Constant factor (0.9 for narrow leaves and 0.6for broad leaves).
- Leaf area was expressed in cm.

Number of Fruits

The total number of fruits per plant from each treatment was counted and recorded.

Weighing of Fruits

The fruits obtained from each treatment per plant were weighed and recorded.

Statistical analysis

Data were subjected to one way analysis of variance (ANOVA) Duncan's multiple ranged test using sigmostat software to identify the homogeneous type of the data sets among different treatments for different plant parameters in different treatments.

III. RESULTS

A study have been carried out to analyse the effect of organic manure and vermicompost on vegetable crop Tomato (*Lycopersicum esculentum*). The percentage of seed germination, seedling length, growth parameters like shoot length, root length, number of leaves per plant, leaf area, yield parameter like number of fruits per plant and weight of fruits. The data are presented in Tables (1-11) and the same are shown in Figures (1-11).

Percentage of germination of seeds

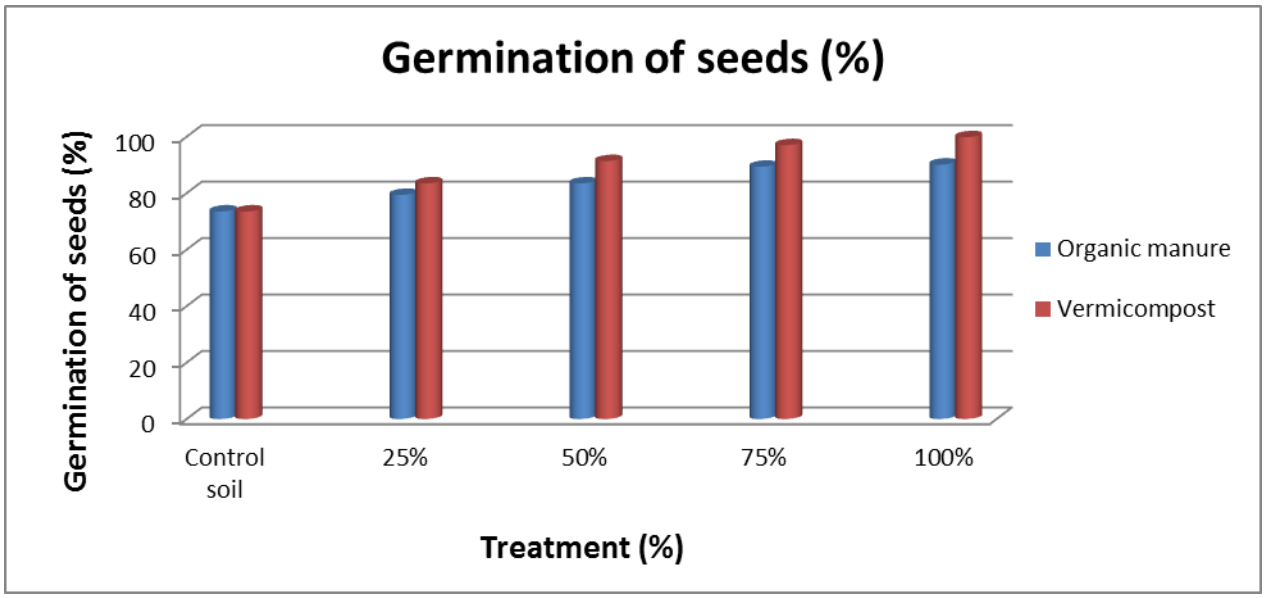
Tomato (*Lycopersicum esculentum*) seeds grown in control soil recorded the percentage of germination as 73.50. In soil amended with organic manure as 79.38 (25%), 83.45 (50%), 89.35 (75%) and 90.10 (100%). In soil amended with vermicompost the highest percentage of germination was observed as 83.45 (25%), 91.35 (50%), 97.00 (75%) and 99.80 (100%).The values are significant at 5% level.

Table 4. Influence of organic manure and vermicompost on the percentage of germination of tomato (Lycopersicum esculentum)

Treatment	Organic manure	Vermicompost
Control soil	73.50±1.91	73.50±1.67
25%	79.38±1.85	83.45±1.37
50%	83.45±1.34	91.35±1.23
75%	89.35±1.09	97.00±1.02
100%	90.10±0.86	99.80±0.58
LSD 5%	3.47	2.89

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 4. Influence of organic manure and vermicompost on the percentage of germination of tomato (Lycopersicum esculentum)



Seedling length

A perusal of table-5 and Figure-5 also revealed that the seedling length of tomato (*Lycopersicum esculentum*) was found to be 9.34 cm in control soil. Plants grown in organic manure amended soil recorded as 9.98cm (25%), 11.02 (50%), 13.12 (75%) and 15.67cm (100%).Where as that of plant grown in vermicompost amended soil was noted to be 13.17cm (25%),

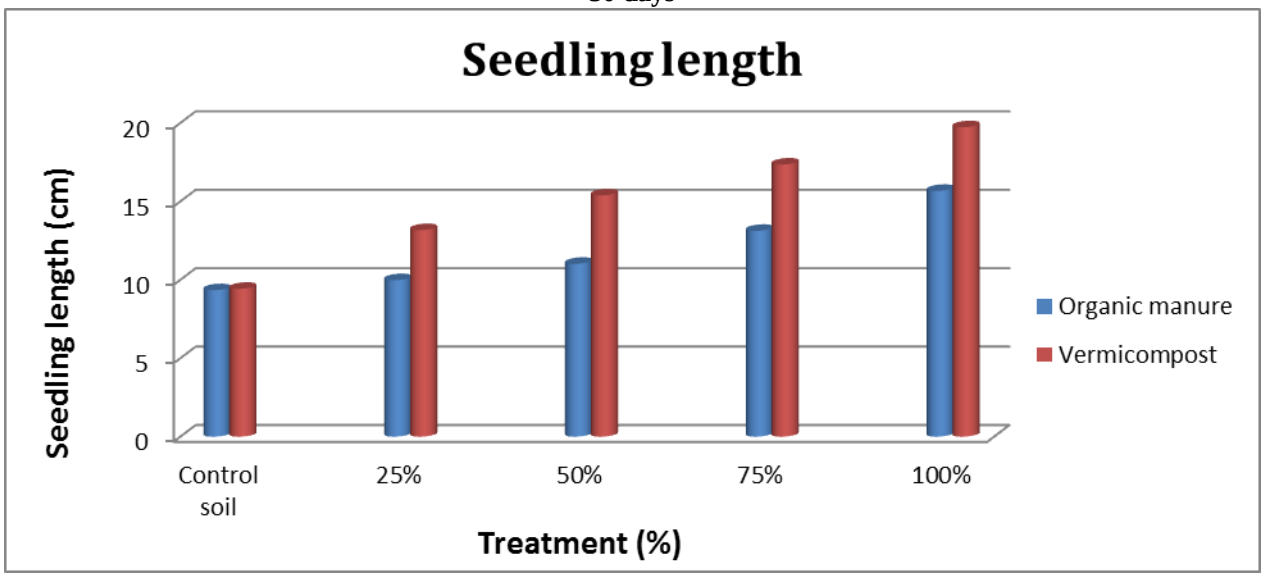
15.38cm (50%), 17.35cm (75%) and 19.73cm (100%). The values are significant at 5% level.

Table 5. Influence of organic manure and vermicompost on the Seedling length (cm) of tomato (Lycopersicum esculentum) in 30 days.

Treatment	Organic manure	Vermicompost
Control soil	9.34±0.025	9.34±0.025
25%	9.98±0.028	13.17±0.036
50%	11.02±0.034	15.38±0.056
75%	13.12±0.065	17.35±0.079
100%	15.67±0.074	19.73±0.098
LSD 5%	1.86	2.54

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 5. Influence of organic manure and vermicompost on the Seedling length (cm) of tomato (Lycopersicum esculentum) in 30 days



Growth parameters of tomato (*Lycopersicum esculentum*)

Growth parameters like the shoot length, root length, number of leaves leaf area and fresh biomass of tomato (*Lycopersicum esculentum*) plants grown in control soil and amended soils are given in Tables 6-11 and Figures 6-11.

Shoot length

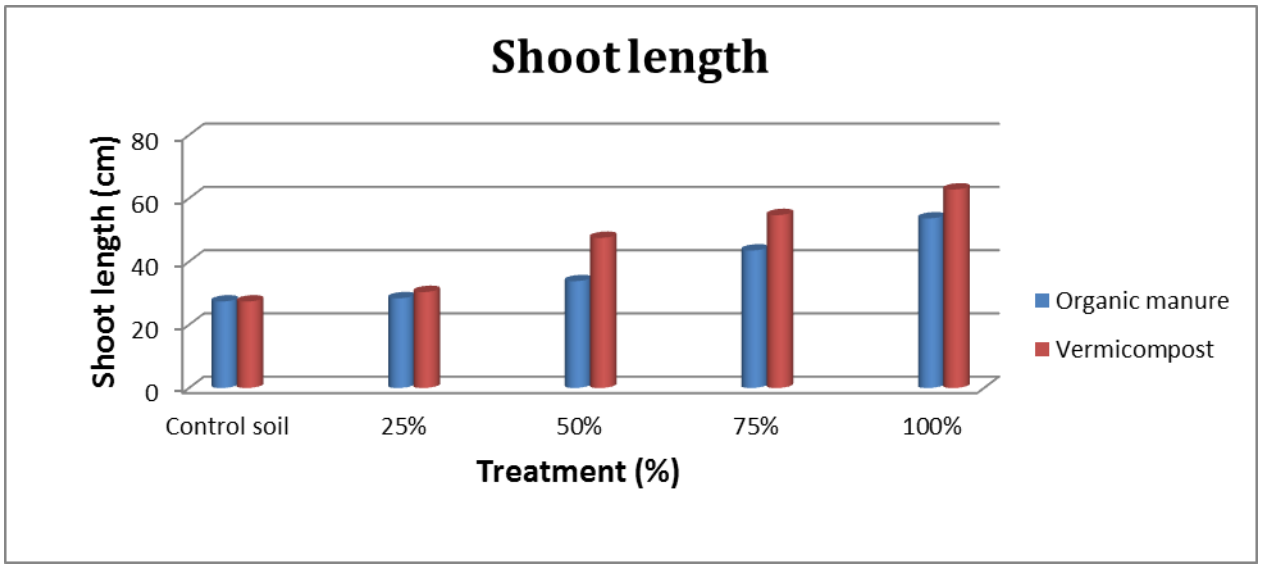
It could be observed that tomato *(Lycopersicum esculentum)* showed unequivocal differences in the shoot length of plants grown in garden soil (control soil) for 90 days in control and amended soils. In control soil, the shoot length of plants recorded was 27.35cm, where as that of plants grown in organic manure amended soil was only 28.38cm (25%), 33.78cm (50%), 43.48cm (75%) and 53.63cm (100%). On the other hand tomato plants grown in vermicompost amended soil recorded as 30.35cm (25%), 47.48cm (50%), 54.68cm (75%) and 62.78cm (100%). The highest shoot length was found to be recorded in plants grown in vermicompost. The values are significant at 5% level.

Table 6. Influence of organic manure and vermicompost on the Shoot length (cm) of tomato (Lycopersicum esculentum) in 90 days.

Treatment	Organic manure	Vermicompost
Control soil	27.35±0.85	27.35±0.85
25%	28.38±1.35	30.35±1.39
50%	33.78±1.47	47.48±1.48
75%	43.48±1.59	54.68±1.67
100%	53.63±1.82	62.78±1.98
LSD 5%	2.38	2.89

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 6. Influence of organic manure and vermicompost on the Shoot length (cm) of tomato (Lycopersicum esculentum) in 90 days.



Root length

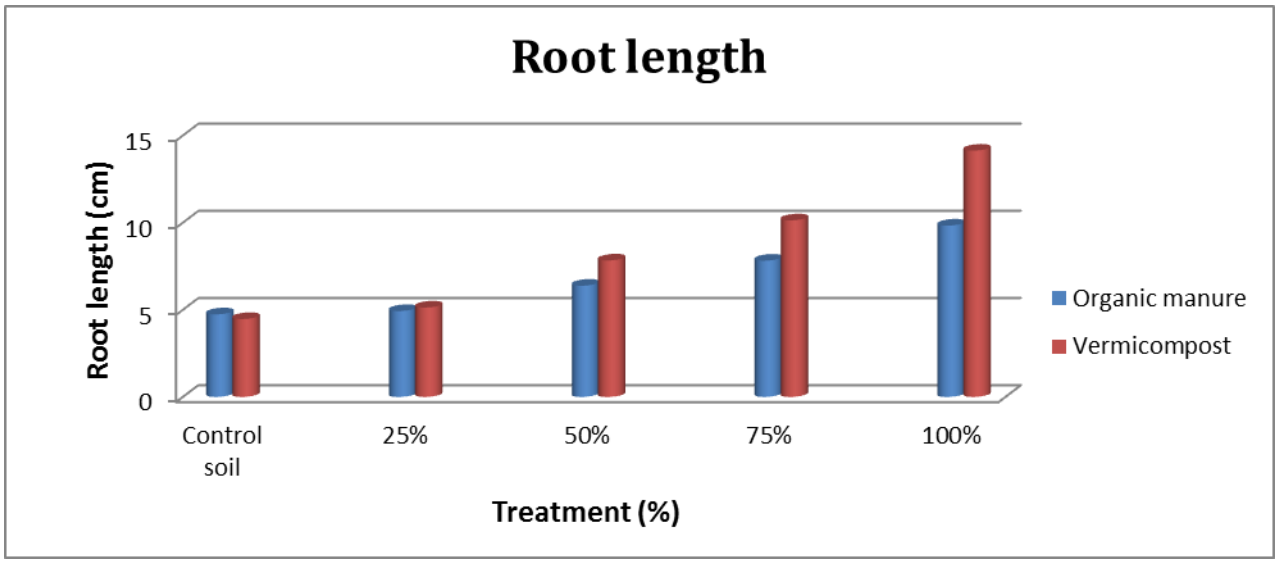
Tomato (*Lycopersicum esculentum*) plants grown in garden soil for 90 days the recorded root length in control soil was 4.74 cm. In amended soils (organic manure and vermicompost) the root length was 4.93cm (25%), 6.38cm (50%), 7.82cm (75%), 9.83cm (100%) and 5.13cm (25%), 7.83cm (50%), 10.13cm (75%), 14.13cm (100%) respectively. The values are significant at 5% level.

Table 7. Influence of organic manure and vermicompost on the Root length (cm) of tomato (Lycopersicum esculentum) in 90 days.

Treatment	Organic manure	Vermicompost
Control soil	4.74±0.23	4.47±0.23
25%	4.93±0.31	5.13±0.38
50%	6.38±0.39	7.83±0.48
75%	7.82±0.59	10.13±0.79
100%	9.83±0.78	14.13±1.03
LSD 5%	1.89	2.05

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 7. Influence of organic manure and vermicompost on the Root length (cm) of tomato (Lycopersicum esculentum) in 90 days.



Number of leaves per plant

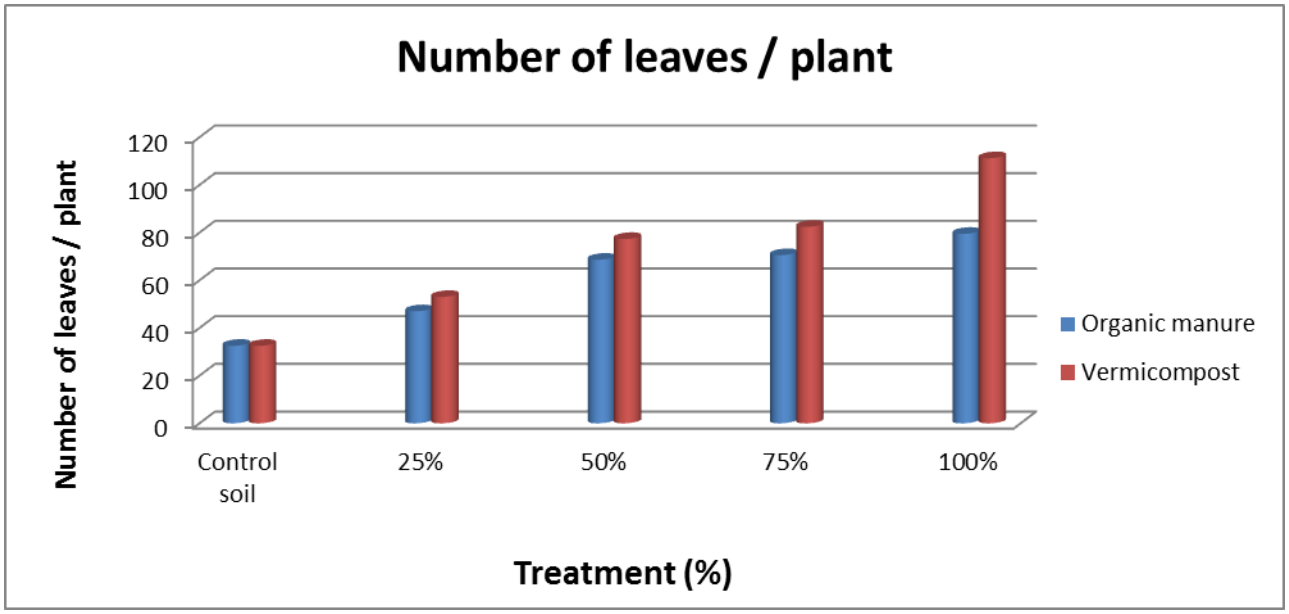
A perusal of Table - 8 and Figure - 8 revealed that the mean number of leaves per plant was found to be different in tomato (*Lycopersicum esculentum*) plants grown in control soil and amended soils. Plants grown in control soil recorded the mean number of leaves per plants as 32.50. Whereas of plants grown in organic manure amended soil was only 47.00 (25%), 68.62 (50%), 70.55 (75%) and 79.47 (100%). On the other hand tomato plants grown in vermicompost amended soil recorded as 53.00 (25%), 77.32 (50%), 82.41 (75%) and 111.2 (100%). The values are significant at 5% level.

Table 8. Influence of organic manure and vermicompost on the number of leaves per plant of tomato (Lycopersicum esculentum) in 90 days

Treatment	Organic manure	Vermicompost
Control soil	32.50±0.72	32.50±0.72
25%	47.00±0.56	53.00±0.86
50%	68.62±0.83	77.32±0.91
75%	70.55±0.89	82.41±0.98
100%	79.47±0.94	111.2±1.04
LSD 5%	1.98	2.02

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 8. Influence of organic manure and vermicompost on the number of leaves per plant of tomato (Lycopersicum esculentum) in 90 days



Average leaf area

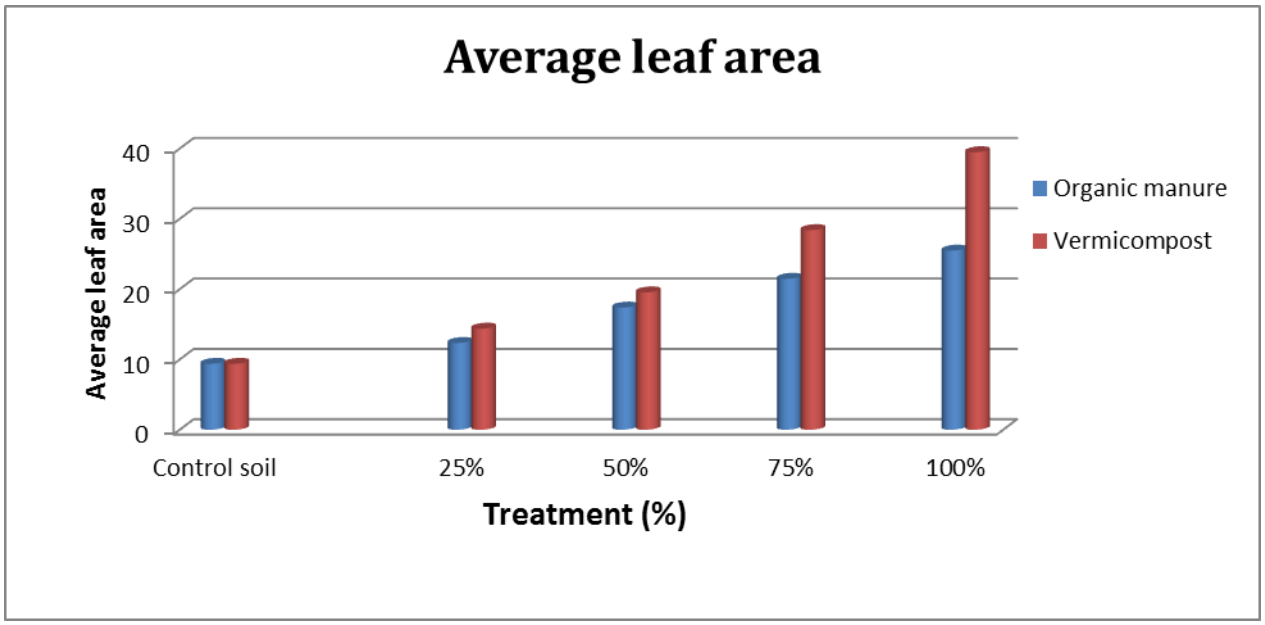
The average leaf area of tomato *(Lycopersicum esculentum)* plants was 9.38 cm in plants grown in control soil. The plants grown in soil amended with organic manure it was 12.34 cm (25%), 17.38 cm (50%), 21.47 cm (75%) and 25.48 cm (100%). In vermicompost treated plants the average leaf area was 14.38cm (25%), 19.54cm (50%), 28.39cm (75%) and 39.48cm (100%).The values are significant at 5% level.

Table 9. Influence of organic manure and vermicompost on average leaf area of tomato (Lycopersicum esculentum) in 90 days.

Treatment	Organic manure	Vermicompost
Control soil	9.38±0.38	9.38±0.38
25%	12.34±0.49	14.38±0.59
50%	17.38±0.68	19.54±0.96
75%	21.47±0.84	28.39±0.99
100%	25.48±0.93	39.48±1.05
LSD 5%	1.87	1.95

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 9. Influence of organic manure and vermicompost on average leaf area of tomato (Lycopersicum esculentum) in 90 days.



Number of fruits per plant

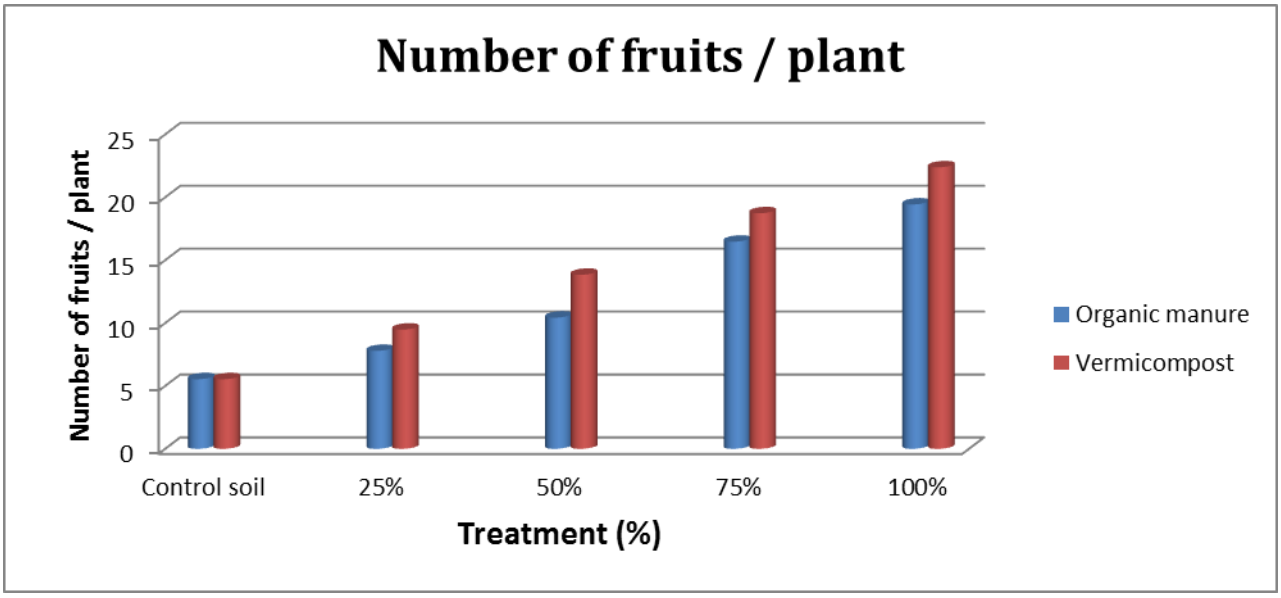
A perusal of Table -10 and figure -10 shows the mean number of fruits per plants recorded in tomato *(Lycopersicum esculentum)* plants grown in control and amended soil for 90 days. It could be observed that the tomato *(Lycopersicum esculentum)* plants showed unequivocal differences in the mean number of fruits per plants grown in control amended soils. In control soil, the mean number of fruits per plants was 5.54 gms where as the plants grown in organic manure amended soil was only 7.79 (25%), 10.43 (50%), 16.47 (75%) and 19.43 (100%). On the other hand plants grown in vermicompost amended soil it has recorded as 9.48 (25%), 13.84 (50%), 18.73 (75%) and 22.38 (100%). The maximum mean number of fruits per plants was recorded in plants grown in vermicompost. The values are significant at 5% level.

Table 10. Influence of organic manure and vermicompost on the number of fruits per plant of tomato (Lycopersicum esculentum) in 90 days

Treatment	Organic manure	Vermicompost
Control soil	5.54±0.79	5.54±0.79
25%	7.79±0.98	9.48±0.93
50%	10.43±0.98	13.84±0.94
75%	16.47±1.02	18.73±1.08
100%	19.43±1.04	22.38±1.13
LSD 5%	1.32	1.98

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 10. Influence of organic manure and vermicompost on the number of fruits per plant of tomato (Lycopersicum esculentum) in 90 days



Weight of the fruits

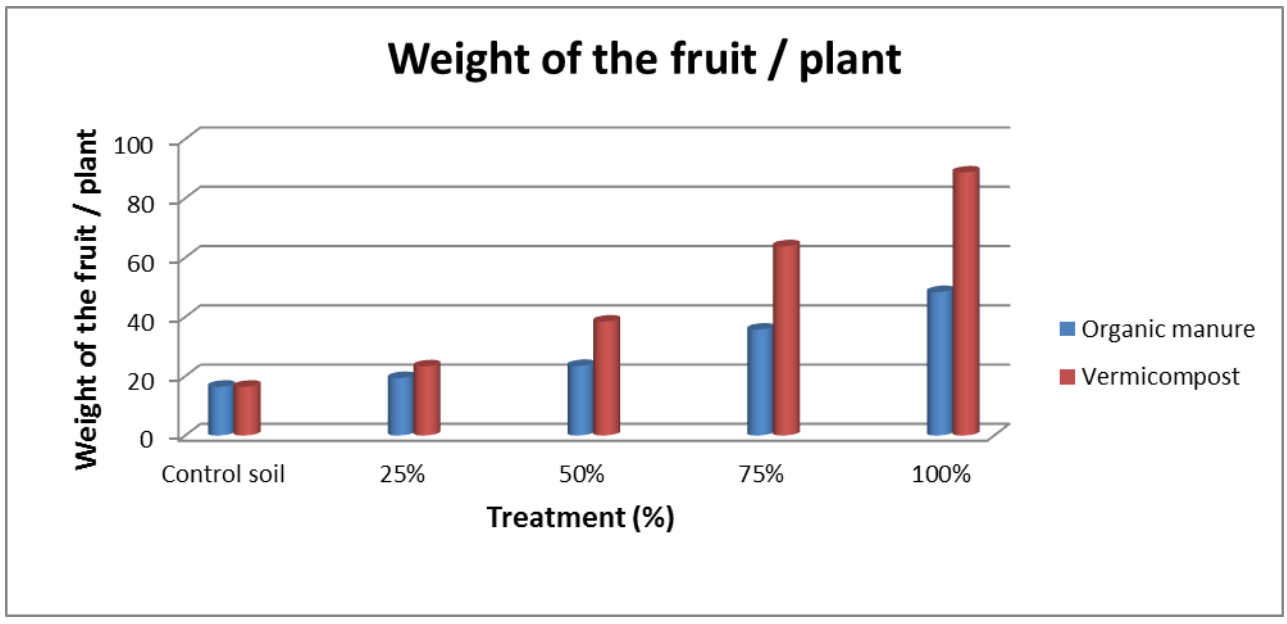
The mean weight of the fruits of tomato *(Lycopersicum esculentum)* plants grown in control and amended soil for 90 days are present in Table 11 and the same are shown inFigure11. Tomato *(Lycopersicum esculentum)* plants grown in control soil recorded the mean weight of the fruits as 16.45 gms. The plant grown in organic manure amended soil recorded the mean weight of the fruits19.38 gms (25%), 23.48 gms (50%), 35.73(75%), 48.38 gms (100%). The mean weight of the fruits in plants grown in vermicompost amended soil in 23.34 gms (25%), 38.44 gms (50%), 63.84 gms (75%), 88.73 gms (100%). The values are significant at 5% level.

Table 11. Influence of organic manure and vermicompost on the weight of fruits per plant of tomato (Lycopersicum esculentum) in 90 days

Treatment	Organic manure	Vermicompost
Control soil	16.45±0.74	16.45±0.74
25%	19.38±0.98	23.34±0.93
50%	23.48±0.98	38.44±0.94
75%	35.73±1.02	63.84±1.08
100%	48.38±1.04	88.73±1.13
LSD 5%	1.98	2.02

Values are mean ± SD of three replicates
Means followed by a common superscript are not significant at 5% level by using DMRT

Figure 11. Influence of organic manure and vermicompost on the weight of fruits per plant of tomato (Lycopersicum esculentum) in 90 days



IV. DISCUSSION

In the present study the effect of organic manure and vermicompost on the germination, growth and yield parameters on vegetable crops like tomato (*Lycopersicum esculentum*) grown in control soil and amended soil was studied. Ramaligam and Thilagar ,(2000) reported that the reduction in pH towards neutrality, reductions in organic matter, organic carbon, sulphur, calcium, manganese, zinc and significant elevations particularly in nitrogen, phosphorus and potassium levels in the vermicompost of sugarcane trash compared to control levels.

Suthar, (2009) demonstrated that during the vermicompost of some crop residue mixed with cattle dung resulted in an increase in total N (91-144%), available P (63-105%) and exchangeable K (45-90%) content of it. Therefore, ready vermicompost relatively contains mere exchangeable plant nutrients than those by other plant growth media. An important

feature of vermicompost is that, during the processing of the various organic wastes by earthworms, many of the nutrients that it contains age changed to forms that are more readily taken by plants such as nitrate or ammonium nitrate, exchangeable phosphorous and soluble potassium, calcium and magnesium (Suthar and Singh 2008).Increased levels of NPK were reported by Deepa kurian *et al.,* (2008) during prolonged period of 90 days of vermicomposting of leaf litter using *Eudrilus eugenia.*

The vermicompost contain humified organic matter characterised by high molecular weight and enzymatically active humic fraction which stimulate seed germination and plant growth (Dell Amico *et al*., 1994 and Garcia *et al*., 1992). Atiyeh *et al*., (2000) reported that the growth regulating material such as humic acid and hormones present in vermicompost could be the possible reason for the increased germination, growth and yield of plant.

Vermicompost of paddy straw appears to be favourable for seed germination whereas, the higher nitrogen content of vermicompost of lead litter night favour growth and yield of plants (Sathish kumar, 2004). Owa *et al*., (2008) reported that earthworm products are probably involved in nutrient utilization of the catabolic products of endosperm such that the bell proliferation and elongation in the embryo are facilitated. They also reported that the earthworm products must have therefore been introducing an additional factor, which way have part in causing breakdown of seed coat to facilitate germination.

The observed higher percentage of seed germination in tomato (*Lycopersicum esculentum*) seed grown in control soil and amended soil with vermicompost compared to the percentage of germination in control soil alone. This might probably indicates higher content of humic acids and growth promoting hormones in the vermicompost. Attainment of maximum percentage of germination in soils treated with vermicompost indicates that humic acids and growth promoting hormones are essential for seed germination. The observation is in the line with respect of the findings of Atiyeh *et al*., (2002 b); Sujatha *et al*., (2003); Satish kumar, (2004) and Owa *et al*., (2008).

Edwards and Burrows, (1998) concluded that seedling emergence of tomato, cabbage and radish was much better in vermicompost treated than in thermophilically composted animal waste. Vermicompost and goat manure significantly induced the growth of seedling at its early stages (2^{nd} and 3^{rd} week). This was because of both manures contain high amount of nitrogen which is important for plant growth (Pakeerathan *et al*., 2009).

Results showed that the length of seedlings of tomato (*Lycopersicum esculentum*) grown in vermicompost amended soil were highest compared to other treatments. This observation is in agreement with the findings of Edwards and Burrows, (1988) and Pakeerathan *et al*., (2009). It has also been revealed that the three tomato plant varieties sprayed with vermicompost extract increased total and marketable yield, fruit quality and fresh mass per plant (Siminus *et al*., 1998; Atiyeh *et al*., 2000a; Arancon *et al*., 2003; Zaller 2006). Azarmi *et al*., (2008) reported positive effects of growth, yield and elemental content of plant as compared to control in tomato (*Lycopersicum esculentum*).

Arancon *et al*., (2003) reported that the marketable yield of tomato (*Lycopersicum esculentum*) shoot weight, leaf areas and total and marketable fruit yields of pepper plant, leaf area, number of strawberry sucker, numbers of flowers, shoot weight, and total marketable strawberry yields increased significantly in plots treated with vermicompost compared to those from slots treated with inorganic fertilizer. The increased growth and yields were more probably due to the production of plant growth regulators by microorganisms or the effects of humates in the vermicompost (Cannellas *et al*., and Arancon *et al*., 2003).

A positive impact of vermicompost compared to control prepared by the bio-transformation of kitchen waste by earthworms and microbes on the germination, growth rate and yield to tomato and chilli was reported by Sujatha *et al*., (2003). Arun Kumar (2004) has reported that the significant increase in the growth parameters such as plant height, number of leaves and leaf in the growth parameters such as plant height, number of leaves and leaf length of *Amarathus dubius* grown in soil amended with vermicomposted sludge compared to those of the plants grown in sludge amended soil. Increased percentage of seed germination together with shoot and root length were reported in chilli and tomato grown in vermicompost amended soil compared to those grown in control red soil (Sajani Jose, 2005).

Tremendous increase in the leaf area of *Hibiscus esculentus* grown in leaf litter vermicompost amended soil reported by (Sivapandian *et al*., 2005).Together with early appearance of first flower and subsequent pearly fruiting could be attributed to this increased leaf chlorophyll contents of plants in vermicompost amended soils. Vermicompost release most of the nitrogen in nitrate form readily available for the plant uptake even for prolonged periods. This selective usage of minerals for stabilization of plants during early period of plant growth and establishment of higher leaf chlorophyll content following prolonged period of growth of plants. Vermicompost amended soils might favour an increased yield in plants (Edwards and Burrows, 1998).

The plant growth promoting substances present in vermicompost and vermiwash will have greater impact of growth parameters thus leading to improved fields as compared to the crop nourished with inorganically soured nutrients. Foliar application of vermiwash and any dung wash proved effective in increasing the leaf yield attributing parameters of mulberry. This superiority might be due to foliar feeding of major nutrient elements like nitrogen, phosphorus and potassium to plants and altered metabolic activities due to hormonal effect (Venkataramana *et al*., 2010).

The present investigation showed increase in shoot length in tomato (*Lycopersicum esculentum*) in vermicompost amended soil. The above findings are in collaboration with the findings of number of workers (Sujatha *et al*., (2003), Thangavel, (2003); Arun Kumar, (2004); Sivasubramanian and Ganesh Kumar, (2004); Sajani Jose, (2005).) A careful analysis of data on the maximum number of leaves per plant of 90 days of growth in control soil, organic manure and vermicompost amended soil indicated that the treatment of soil with nutrients enhanced the number of leaves per plant compared to control plant in tomato (*Lycopersicum esculentum)* plant. These observations are in line with the finding of Arun Kumar, (2004); Sivasubramanian and Ganesh Kumar, (2004); Venkataramana *et al*., (2010).

The leaf area of tomato (*Lycopersicum esculentum*) plants increased significantly in vermicompost treated control soil. In the serpent study the increase in the leaf area attest to the

stimulatory effect of the vermicompost towards increase in the biomass of the plant. This finding was also in uniformity with the findings of a number of workers (Canellas *et al*., (2000); Arancon *et al*., (2003); Sivasubramanian and Ganesh Kumar, (2004) and Sivapandian *et al*., (2005); Venkataramana *et al*., (2010).)

Results showed that an increase of fresh biomass was highest in tomato (*Lycopersicum esculentum*) grown in vermicompost amended soils. It could be taken to suggest, an increased chlorophyll synthesis and subsequent primary production in the plant. Similar findings are reported by Sivapandian *et al*., (2005); Nithya *et al*., (2006 a and b) and Pakeerathan *et al*., (2009).

In the present study it could be noted that the number and weight of fruits per plant increased in tomato (*Lycopersicum esculentum*) grown in vermicompost amended soil. These results were in agreement with the findings of Siminus *et al*., (1998); Atiyeh *et al*., (2000a); Arancon *et al*., (2003); Zaller (2006); Bucker field *et al*., (1999); Thangavel, (2003); Sivasubramanian and Ganesh Kumar, (2004); Saumya George *et al*., (2007); Azarmi *et al* .,(2008).

Tomato (*Lycopersicum esculentum*) plant grown in organic manure amended soil compared to vermicompost amended soil did not give better result compared to vermicompost treated plants, due to the slow release of the nutrients required by the tomato (*Lycopersicum esculentum*) plant; hence the better result from vermicompost contained media. This might be due to the fermentation process associated with organic manure which may generate heat and hinder growth. This result of the study implies that soil medium requires additional nutrient for fester seeding emergence, growth and yield.

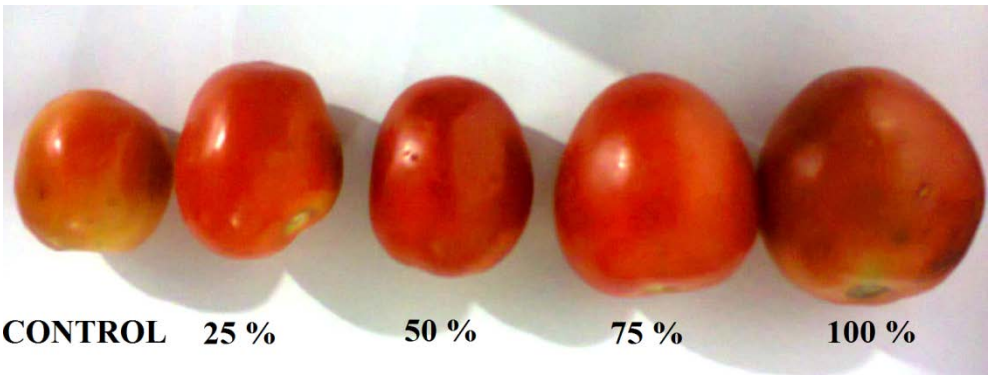
From the foregoing discussion, it could be concluded that vermicompost of leaf litter by the selected of earthworm would provide large quantities of highly nutrient rich vermicompost which could be used for application to ornamentals plants, trees and crops plants. It could also be concluded that vermicompost application in soil enhances the biological potential of soils and act as an efficient plant growth media for sustainable plant production. The improvement in all parameters could be attributed to be higher assimilatory surface which fairly indicates the photosynthetic capacity of the plant to respond to vermicompost to other treatment.

Vermitechnology in organic waste management would lead to zero waste technology farms without the organic waste being wasted and burned rather than would result in recycling and reutilization of precious organic waste brining about bio conservation and bio vitalization of natural resources.

Plat 8. Photograph showing the fruits of tomato (*Lycopersicum esculentum*) in control soil.

Plat 10. Photograph showing the fruits of tomato (*Lycopersicum esculentum*) in vermicompost amended soil.

Plat 9. Photograph showing the fruits of tomato (*Lycopersicum esculentum*) in organic manure amended soil.



V. SUMMARY

The effect of organic manure and vermicompost on growth parameters, yield parameters were comparatively studied in vegetable crops like tomato *(Lycopersicum esculentum*) grown in control and amended soil for 90 days. Vermicompost prepared from leaf letter and cow dung using *Eudrilus eugeniae* were used for the cultivation of vegetable crops. The seeds were sown separately in control soil and amended with organic manure and vermicompost in polythene bags.

- Percentage of seed germination and seedling length in tomato *(Lycopersicum esculentum*) seeds grown in vermicompost amended soil was maximum compared to other treatments.
- The growth parameters such as shoot length, root length, number of leaves per plant and leaf area of tomato *(Lycopersicum esculentum*) plants were studied.
- The shoot length of tomato *(Lycopersicum esculentum*) plants increased in treated with vermicompost and root length increased in vermicompost amended soil.
- The number of leaves preplant in tomato *(Lycopersicum esculentum*) increased in vermicompost amended soil. Compared to other treated soil
- The leaf area increased in tomato *(Lycopersicum esculentum*) plants treated with vermicompost amended soil.
- The number and weight of fruits per plant of tomato *(Lycopersicum esculentum*) plants grown in soil treated with vermicompost in increased compared to other treatments.

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