EFFECT OF VERMICOMPOST ON GROWTH YIELD OF SELECTED ORGANIC VEGETABLES

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***Abstract*: Vermicomposting appears to be the most promising as high value organic fertilizer which not only increases the plant growth and productivity by nutrient supply but is also cost effective and pollution free. Use of vermicompost promotes soil aggregation and stabilizes soil structure. Vermicompost produced from the organic wastes is not only having beneficial effects on soil health and growth, quality and yield of crop but also playing vital role in eradication of pollution hazards. Vermicompost can be used for all crops agricultural, horticultural, ornamental and vegetables at any stage of the crop. It helps to create better environments, thus reduce ecological risk. Thus, the present investigation was aimed at finding the response of vermicompost on the productivity of organic vegetables and the quality of product. The present study results clearly showed that the influence of vermicompost on the growth components of organic vegetables like plant height, number of leaves, leaf area index and shoot length. Moreover, the results significantly showed that treatment using vermicompost as good source compared to normal soil treatment.**

Keywords: **Vermicompost, earthworm, plant growth, organic farming, biodegradation**

1. INTRODUCTION

Agriculture is defined as an art, science and business of producing crops and livestock for economic purposes. Agriculture plays an essential role in the process of economic development of development of India. Agriculture production and distribution have not been able to catch up with the increasing population and this increased population will require about 260 million tonnes of grain per year (Aira M, Monroy F. & Domínguez J. 2006; Arancon *et al.*, 2004). In order to produce such an enormous amount of food grain, India would require extra land for cultivation which is beyond our scope as it would surely cause environmental pollution and deforestation. The only alternative at present is to improve the already existing crop varieties to yield more. Therefore there is a necessity to increase crop production is inevitable one (Parle J.N. 1963; Palleroni NJ. 1984; Bano K., Kale R.D. & Gajanan G.N. 1987; Atiyeh, R.M., *et al.,* 2000; Bashan Y. & Holguin G. 1997).

Chemical fertilizers are commercially produced synthetic chemical substances added to the soil to overcome the deficiency of mineral nutrients and to improve crop production. Chemical fertilizers enhance the vegetative growth plants (Bashan Y. & Levenony H. 1990; Burdman S., Kigel J. & Okony 1997; Edwards C.A., Arancon N.Q. & Greytak S. 2006). Chemical fertilizers enhance the crop yield on one hand whereas on the other hand act as environmental hazards. Therefore alternative methods of agricultural practice must be considered. Under present conditions, application of vermicompost is much promising. Thus present study aimed to test the effect of vermicompost to improve the soil quality as well as the plant growth (Park J., & Seaton R.A.F. 1996; Gandhi M., *et al.,* 1997; Humphries A.D., *et al.,* 2001).

2. MATERIALS AND METHODS

2.1 Preparation of vermicompost

Vermicompost was prepared by using earthworm with organic waste, cowdung etc.

2.1.1 Earthworm species: Eisenia fetida was used for this study. Earthworm was obtained from a commercial supplier in Chennai. Earthworms were cultivated in the laboratory using cow dung as breeding medium for three months before the start of experiments.

2.1.2 Preparation of vermibeds: The vermibeds were prepared in plastic troughs of 12’’x 17’’x 91” in triplicate with organic wastes with cow dung in ratio 5:1. Twenty numbers of the earthworm species *Eisenia fetidae*, were introduced manually in to set of troughs. After a month vermicompost was harvested for further study.

2.2 Physicochemical analysis of vermicompost

The harvested vermicompost was subjected to physicochemical analysis. The important parameters like pH, Electrical Conductivity, Total Nitrogen (Kjeldahl), Total Phosphate, Potassium, Sodium, Calcium, Magnesium, Sulphur, Zinc, Manganese, Iron and Copper were analyzed according to the procedure described by Tanden (1993) at National Agro Foundation Research & Development Centre, Anna University Taramani Campus, Chennai - 600 113.

2.3 Microbiological examination of vermicompost

Vermicompost was collected and stored at ambient temperature. The bacteriological characterizations such as number of colonies, grams test and biochemical analysis were performed as per the methods prescribed by Thendral Hepsibha & Geetha (2017).

2.4 Experimental Material - Organic vegetables

Vermicompost fertilizers are used for the production of organic vegetables. Experiment was conducted in a completely randomized block design. Seeds (Brinjal, Lady’s finger, Bitter guard and Chilly) were collected from Agricultural Research Station, Kovalam, Chennai. 39 days old seedlings were transplanted into pots (29 x 27 cm) containing sand, soil and vermicompost in the ratio of 1kg + 4kg + 3kg. All the plants were given water daily for two weeks and after that irrigated on alternate days. The initial pH of the soil was 6.65.

2.5 Growth characters analysis

Heights of the plant and number of leaves were examined at different intervals and the size of the leaves of different plants were examined at the time of harvesting.

3. RESULTS & DISCUSSION

Vermicompost produced by *E. fetida* was subjected to physicochemical analysis, the results showed that high amount of nutrients present in the vermicompost (Table 1). The present study focused to assess the effect of vermicompost on plant growth yield of organic vegetables like Lady's finger, brinjal, bitter guard and chilly. Microbial populations of the vermicompost soil was enumerated to identify the quality of the compost (Table 2) and these results correlated with the work of Kale R.D., *et al.*, (1992).

Table 1: Physico-chemical characterization of vermicompost

S. No	Parameters	Unit	Result
Physical parameters			
1.	pH		6.5 ± 0.01
2.	Electrical conductivity	µS/cm	12314 ± 1.45
Chemical parameters			
3.	Total Nitrogen (Kjeldahl)	%	0.26 ± 0.008
4.	Total Phosphate as P_2O_5 #	%	0.53 ± 0.01
5.	Potassium as K_2O #	%	0.29 ± 0.003
6.	Sodium as Na #	mg/kg	1200 ± 1.15
7.	Calcium as Ca #	mg/kg	3420 ± 0.57
8.	Magnesium as Mg #	mg/kg	1142 ± 0.57
9.	Sulphur as S #	mg/kg	143 ± 0.88
10.	Zinc as Zn #	mg/kg	9.52 ± 0.008
11.	Manganese as Mn #	mg/kg	15.33 ± 0.01
12.	Iron as Fe #	mg/kg	49.30 ± 0.34
13.	Copper as Cu	mg/kg	1.33 ± 0.01

Data are expressed as Mean ± SEM (Standard Error Mean)

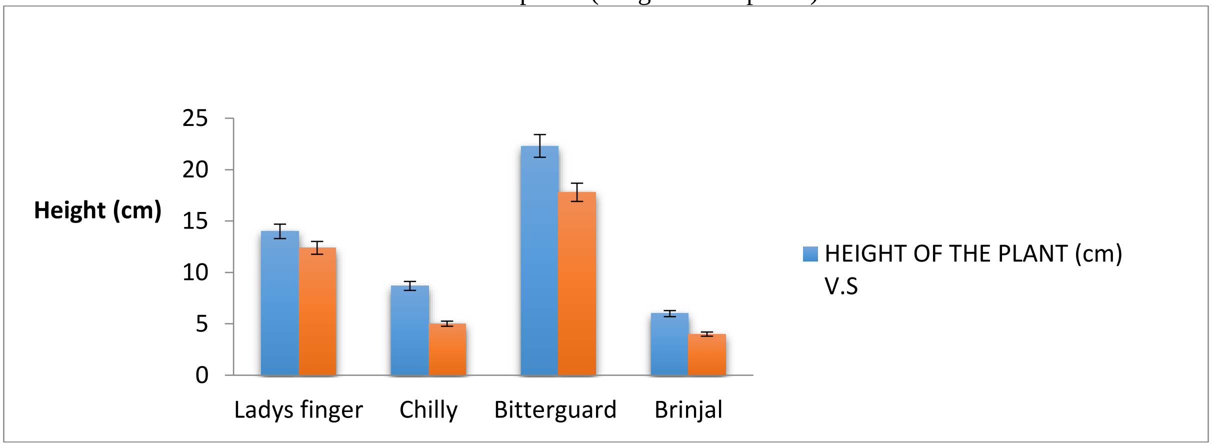
Table 2: Microbial population of vermicompost

S. No.	Test	Unit	Result
1.	Bacteria	Log (CFU / ml)	25 ± 0.01

Data are expressed as Mean ± SEM (Standard Error Mean)

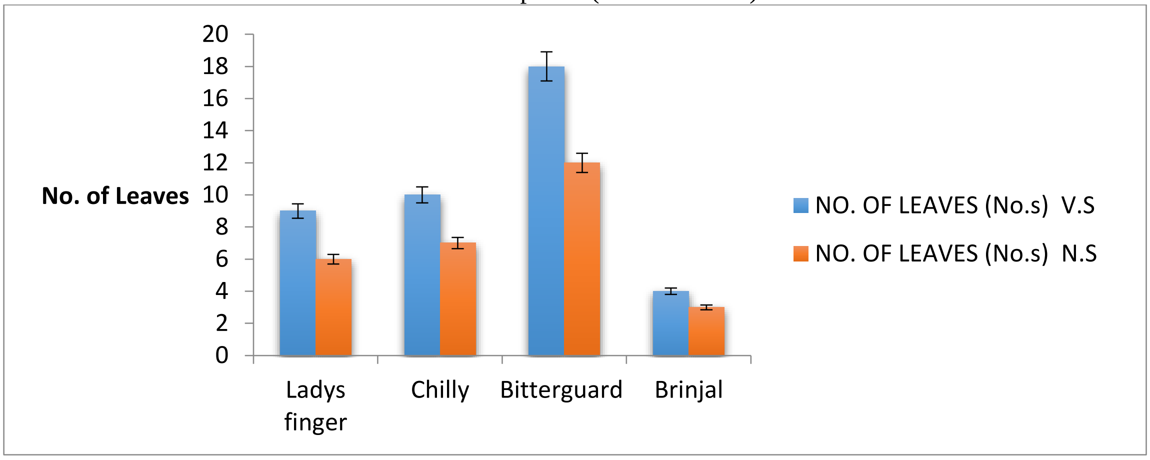
The plants which are treated with vermicompost soil are having more height when compared to normal soil plants. Among four plants bitter guard plant showed more height when compared to other plants (Figure 1). The plants which are treated with vermicompost soil are having more leaves when compared to normal soil plants. Among four plants bitter guard plant have more leaves when compared to other plants (Figure 2). These results were resembles with the work of Gupta A.K., Pankaj P.K & Upadhyava V (2008).

Figure 1: Comparison between vermicompost treated plants and normal soil plants (Height of the plants)



Earthworm actively increases the rate of turnover, mineralization, humification of soil organic matter. Improvement in the consistency of soil texture and increase in porosity, infiltration and soil water retention are other characteristics of vermicomposted soil. Vermicompost plays a major role in growth and yield of different plants when compared to normal plants the test plant showed more growth.

Figure 2: Comparison between vermicompost treated plants and normal soil plants (No. of Leaves)



These studies showed that increase in growth and yield at high amounts of vermicompost in the potting medium could probably be due to improvement in the physiochemical properties of the medium, increased in microbial diversity and activity and nutritional factors (Kale R.D., *et al.*, 1992; Subler S., Edwards C.A. & Metzger J. 1998; Sinha R.K., Heart S., Valani D & Chauhan K. 2009; Salma Mazid, Ratul Rajkhowa & Jogen Kalita 2011; Suman Gupta 2010). Result obtained from this experiment revealed that growth and yield parameters such as leaf area, height of the plants increased by applying vermicompost (Szczech M. 1999; Szczech M., & Smolinska U. 2001; Termorshuizen A.J., *et al.*, 2006; Vasanthraj David B. 2008; Wang D., *et al.*, 2010; Subbulakshmi G., & Thiruneelakandan R. 2011).

4. CONCLUSION

Agriculture being the backbone for Indian economy, accounts for about 30% of GDP and two third of the population is dependent on it. The present investigation was supporting the response of vermicompost on the productivity of organic vegetables. After taking various observations the results revealed that the application of vermicompost produced by the earthworm species *E. fetida* can support the growth of plants under controlled condition.

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