Research Journal of Agriculture and Forestry Sciences E-ISSN 2320-6063
Vol. **4(7),** 13-23, July **(2016)** *Res. J. Agriculture and Forestry Sci.*

Recycling of Vegetable Market Waste from Erode Town into Vermicompost and its Effect on Growth and yield of the plants

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Available online at: www.isca.in, www.isca.me
Received 30th April 2016, revised 22th June 2016, accepted 30th June 2016

Abstract

In the present study the fertility of soil and growth of plant has been standardized for the significance of compost as a source of humus and nutrients to increase the fertility of soil. Vermicompost obtain with help of earthworms has many benefits to soil, plant and environment. Different composts (vermicompost and pit compost) and garden soil (control) be taken first for chemical analysis and then to find the effect of these compost on growth of vegetative crop 'CoriandrumsativumL'. It was found that the vermicompost was rich in nutrient like Potassium, Nitrogen, Phosphorus and pH. It have the potential for improving plant growth than pit compost and garden soil (control). Maximum growth in this study conducted for a period of 30 days was found in pots containing vermicompost. In this study the assessment of nutrient and effect of plant growth was done. The result showed distinct differences between vermicompost, pit compost and garden soil (control).

Keywords: Humus, *Coriandrumsativum L,* pit compost, vermicompost.

Introduction

Hazardous waste causes adverse effects on human's health, soil, groundwater and the environment. Huge amount of this waste is dumped into the drainages, rivers or on the sea shore. This causes blockage of drainages, rivers and water logging during monsoon season in some part of India and in other suburban areas. Many types of waste is either burnt or filled in land[1]. Proper disposal of waste help in reducing environment problems. This study is done to reduce the pollution problems due to solid wastes and industrial sludge's by converting it into compost by using earthworms successfully, economically and usefully[2].

Earthworms are commonly known as "farmer's friend" or "nature's plowman". Earthworm aids the microbial community, physical and chemical properties of soil. Earthworm influences microbial community, physical and chemical properties of soil. They breakdown large soil particles into leaf litter and thereby enrich the availability of organic matter for microbial degradation and transforms organic waste into valuable vermicompost. Earthworms grinding and digesting the organic matter with the help of aerobic and anaerobic microorganisms[3]. Vermicompost is basically the equivalent of the good stuff in soil (humus) that sustains plant lifetime. It provides the soil moisture assist with the formation of good soil structure and nutrients.

These composts gives all nutrients in readily available forms and also enrich the uptake of nutrients by plants and plays a main role in improving growth and yield of various field crops[4].

Vermicomposting is an eco-friendly technique to degrade the organic waste. Earthworm convert this waste into better end product and offer solution to the difficulty of organic waste degradation[2]. Vermicompost is a non-thermophilic biological oxidation process in which organic matter are converted into vermicompost which exhibiting high porosity, aeration, drainage, water asset capacity and rich microbial activities[5,6]. The present study aims to evaluate the different chemical nutrients of composts (vermicompost and pit compost) and their effect on development of vegetative crop *Coriandrumsativum.*

Materials and Methods

The present study was carried out at "Bharathidasan College of Arts and Science", Erode. It is located at Ellispettai in Erode district about 14 km from Erode city. In the present investigation two types of composts and one garden soil (control) were taken and analyzed. These were garden soil, Vermicompost and Pit compost. The compost samples were collected in Ziploc polythene bags and were brought to the laboratory for investigation. The soil aggregates were broken up for grinding with pestle and mortar and the samples were spread for drying. After drying, the samples were passed through 2mm stainless steel or plastic sieve. Approximately 500g compost/soil samples were kept in clean polythene bags with proper labelling for analysis of different chemical parameters like pH, conductivity, potassium, phosphorus, humus content and organic matter. These experiments were held for two months (January to February). Each treatment was conducted in duplicate. First 8 pots were taken and 2 pots were filled with vermicompost (1 kgvermicompost + 1 kg soil in each), 2 pots were filled with pit compost (1 kg pitcompost + 1 kg soil in each) and further two pots were fed with garden soil (2 kg each as control) and 2 pots were filled with soil with chemical fertilizer. Twenty five coriander seed were sown in each pot at the depth of 5cm. After that seeds were allowed to germinate for 1 week. It was checked regularly and was watered regularly for 1 month and the unwanted weeds were taken out. Water was poured after 2 to 3 days, till the plants were grown fully. After that the coriander plants were measured every week along with the number of leaves.

In the analysis of vermicompost treated plants it showed maximum growth and number of leaves when compared to pit compost. Further result showed much better growth than the coriander plants grown in the pots fed with the garden soil (control).

Figure-1
Pots with soil + pit compost (1:1)

Figure-2
Pots with soil + vermicompost (1:1)

Figure-3
Garden soil 2kg each

Figure-4A
Pots showing plant growth in third week Garden soil (control)

Figure-4B
Vermicompost

Figure-4C
Collection of Market Waste

Figure-4D
Vermicompost Shed

Figure-4E
Vermicompost

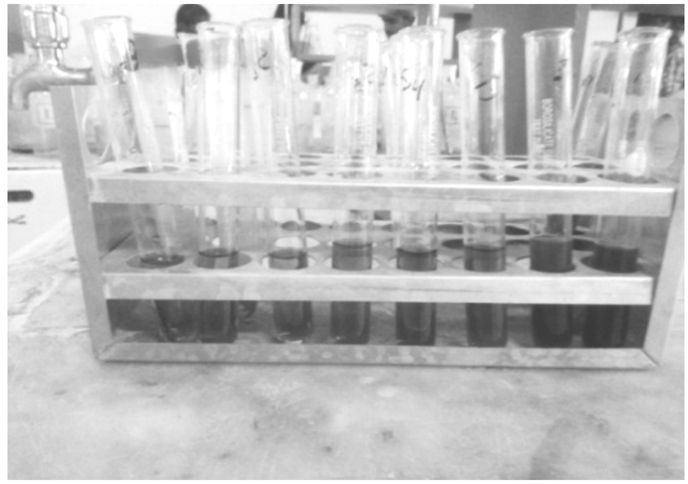

Figure-5
Plant extracts for starch estimation

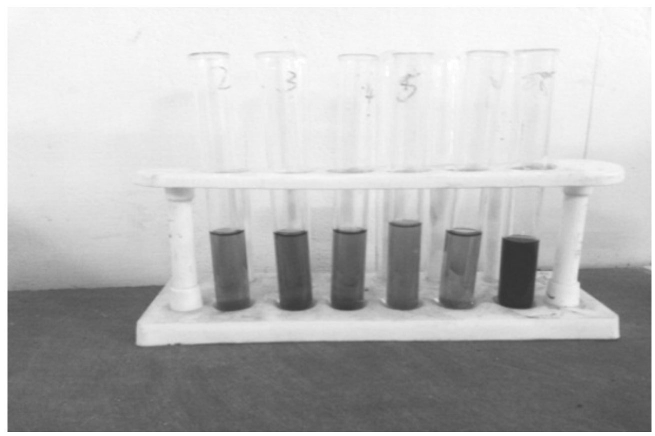

Figure-6
plant extracts for starch estimation

The carbohydrate and starch estimation in the plant samples was carried out by Anthrone method, chlorophyll estimation by Aminot and Rey method. The minerals such as phosphorus present in soil, vermicompost and pit compost were analysed by Bray method, Nitrogen and Potassium by Microkjeldhal method. The most promising and importance of Vermicomposting from vegetable market waste as a source of biofertilizer which increases the plant growth and productivity. The biofertilizer supply effective nutrient as well as cost effective and pollution free. Vermicompost usage promotes soil aggregation and stabilizes structure of soil. This leads to the improvement of air- water relationship of soil by increasing the water retention capacity and encourages extensive development of root system of plants. It was observed that the mineralization of enhanced nutrients results to boosting up of crop productivity. The vermicomposts have a increased capacity and more transferable calcium, magnesium, potassium than the soil in which worms live. Table-1 showed the nutrient content of different composts (vermicompost, pit compost) and Garden soil (control).

From the results (Figure-8 to 16) it was found that the pH of vermicompost, pit compost and garden soil (control) was 8.02, 7.69 and 7.61 respectively. The results demonstrate a significant increase in conductivity (0.07EC dsm), N (602Kg/ha), P (93.4Kg/ha), K + (137.9 Kg/ha), humus content (2.3%) and organic matter(3.96%) in pit compost, when compared to vermicompost, Conductivity was (0.07 EC dsm), P (29.8 Kg/ha), N(265.7), K+ (077.3 kg/ha), humus content (0.69%) and organic matter(1.18%) which further increases when compared to control (Garden soil) as conductivity was(0.05 EC dsm), N (262.8 Kg/ha), P (37.01), K + (132.3 Kg/ha), humus content (0.61%) and organic matter (1.05%) respectively. This indicates that vermicompost has higher nutrient content than pit compost which further shows more nutrient content than Garden soil (control). Due to high nutrient content in vermicompost the pea plants showed maximum growth in pit compost than Garden soil (control).

Table-1
Nutrient Content of Different Compost (Vermicompost, Pitcompost) and Garden Soil (Control)

Chemical parameter	Control	Pitcompost	Vermicompost
pH	8.02	7.61	7.69
Conductivity	0.07	0.05	0.07
N	265.7	262.8	602
P	29.8	37.01	93.34
K+	077.3	132.3	137.9
Humus content %	0.69	0.61	2.3
Organic matter %	1.18	1.05	3.96

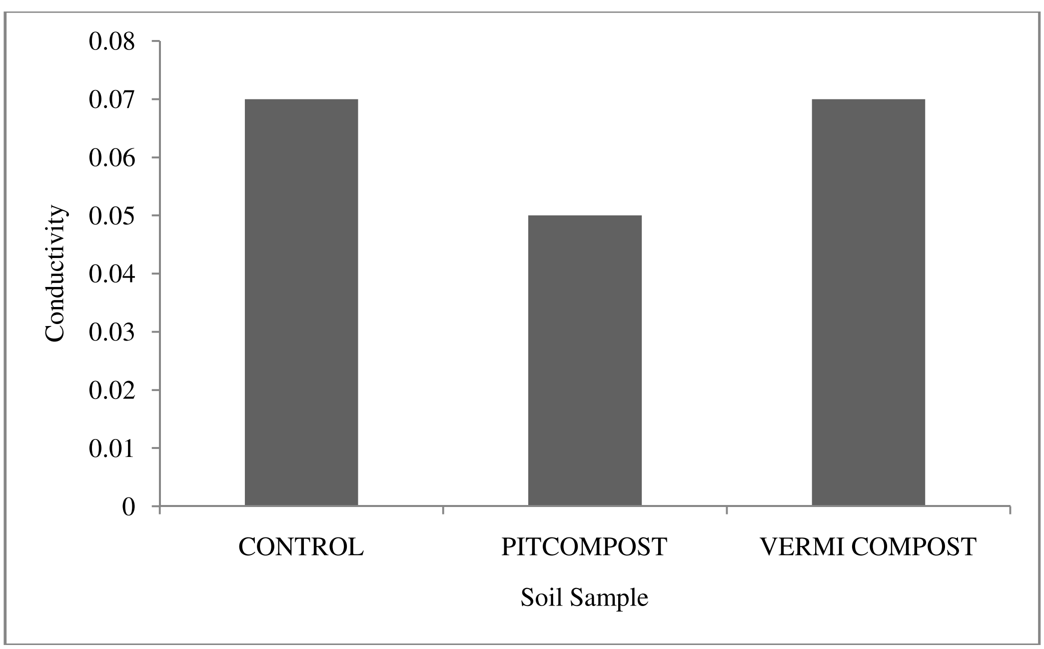

Figure-8
Conductivity level in the pit compost, vermicompost and control (garden soil)

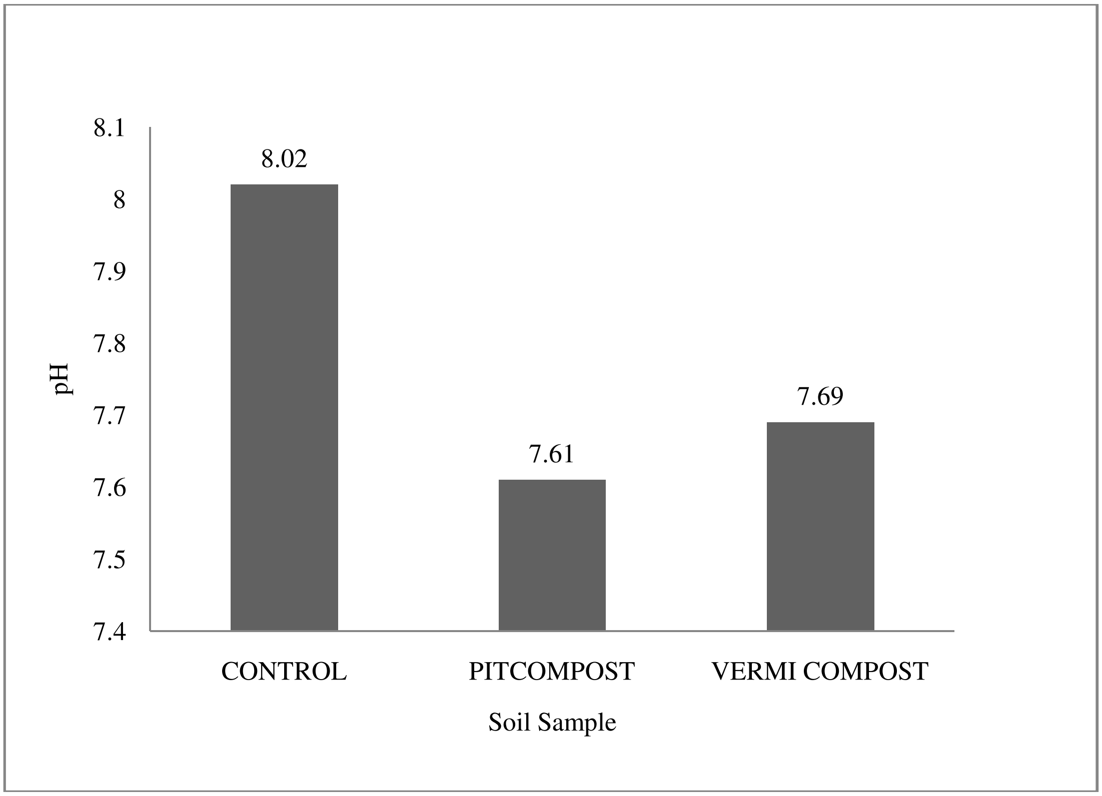

Figure-9
pH level in the pit compost, vermicompost and control (garden soil)

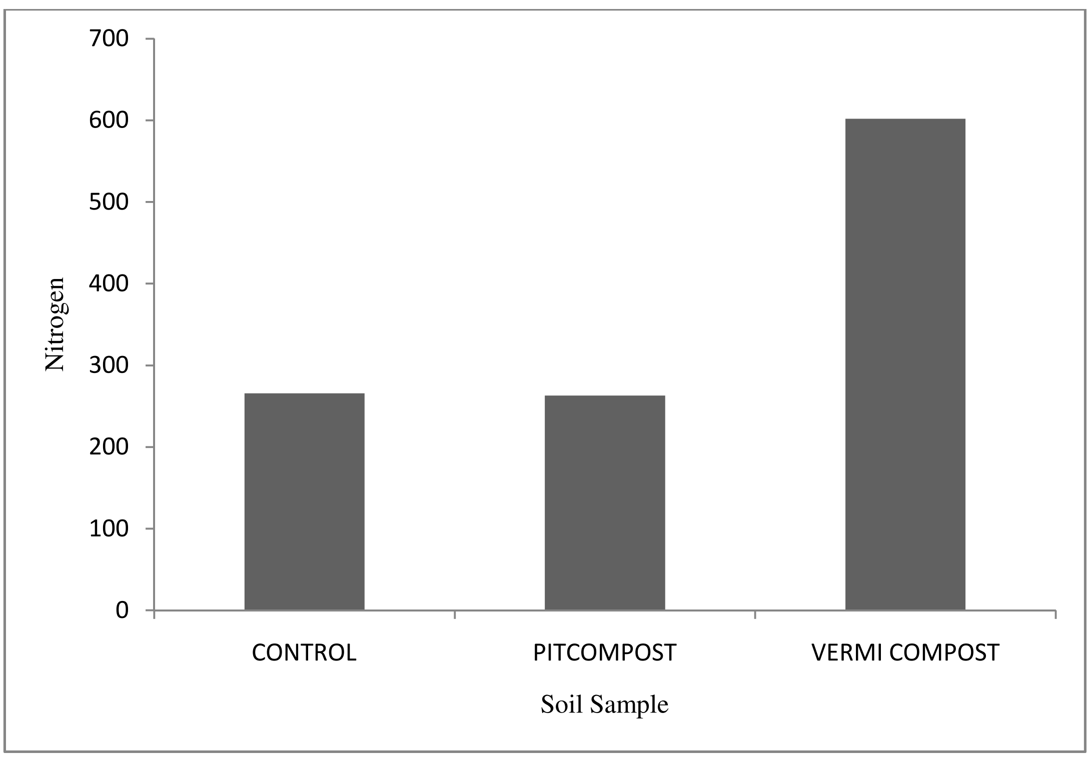

Figure-10
Nitrogen level in the pit compost, vermicompost and control (garden soil)

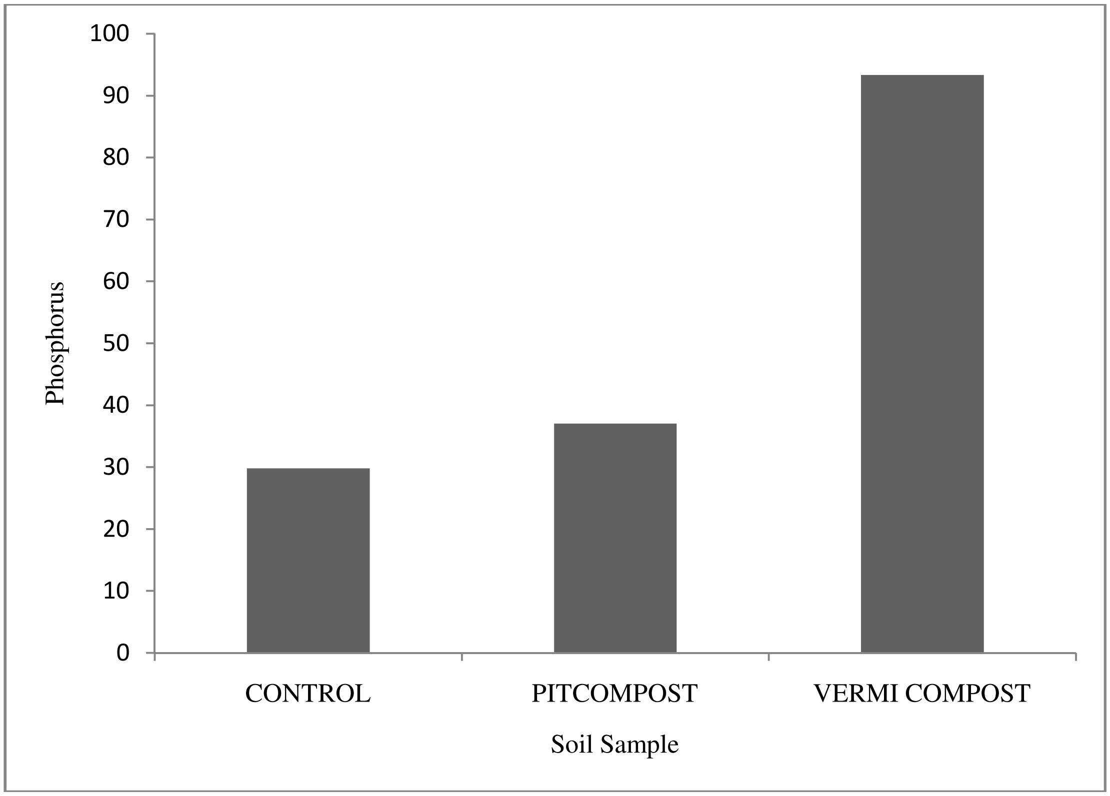

Figure-11
Phosphorus level in the pit compost, vermicompost and control (garden soil)

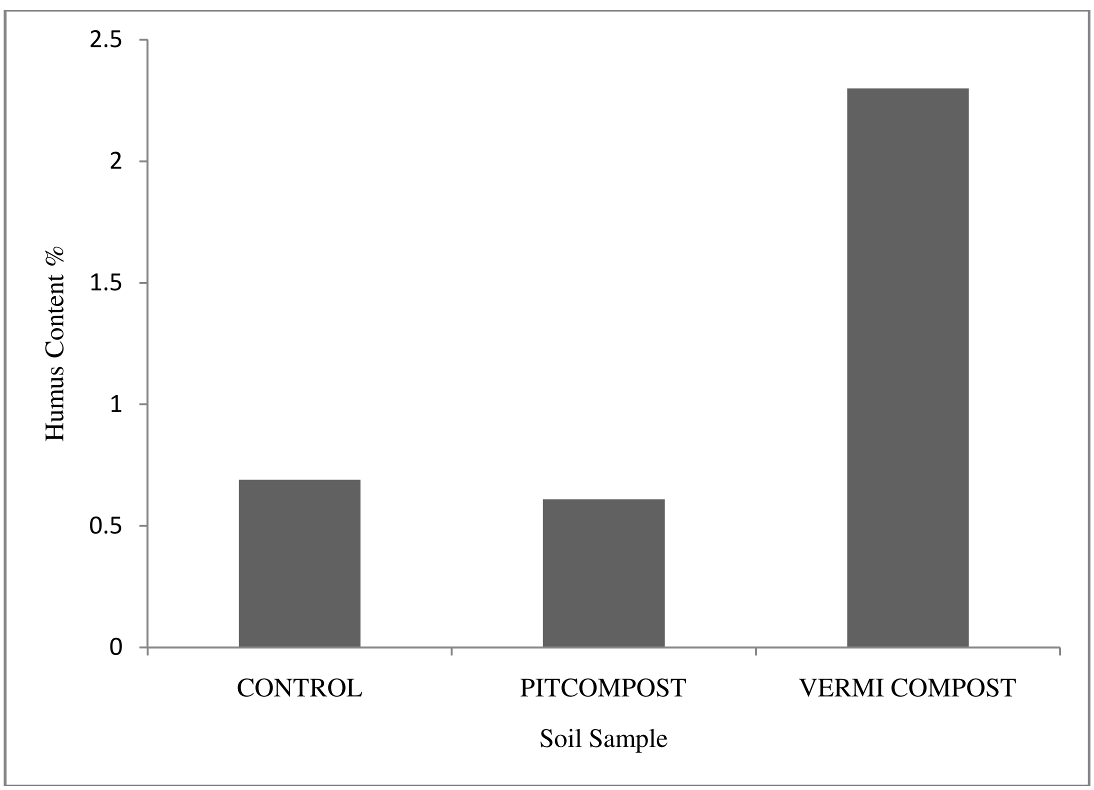

Figure-12
Humus content level in the pit compost, vermicompost and control (garden soil)

Table-2
Phytochemical Analysis in Plants Grown Using Different Compost (Vermicompost, Pitcompost) and Garden Soil (Control)

Parameters	Control (Garden soil)	Pitcompost	Vermicompost
Chlorophyll	0.5622g	0.7259g	1.5874g
Starch	10.44 mg	12.66mg	14.6 mg
Carbohydrate	5.2 mg	5.8mg	7.2 mg

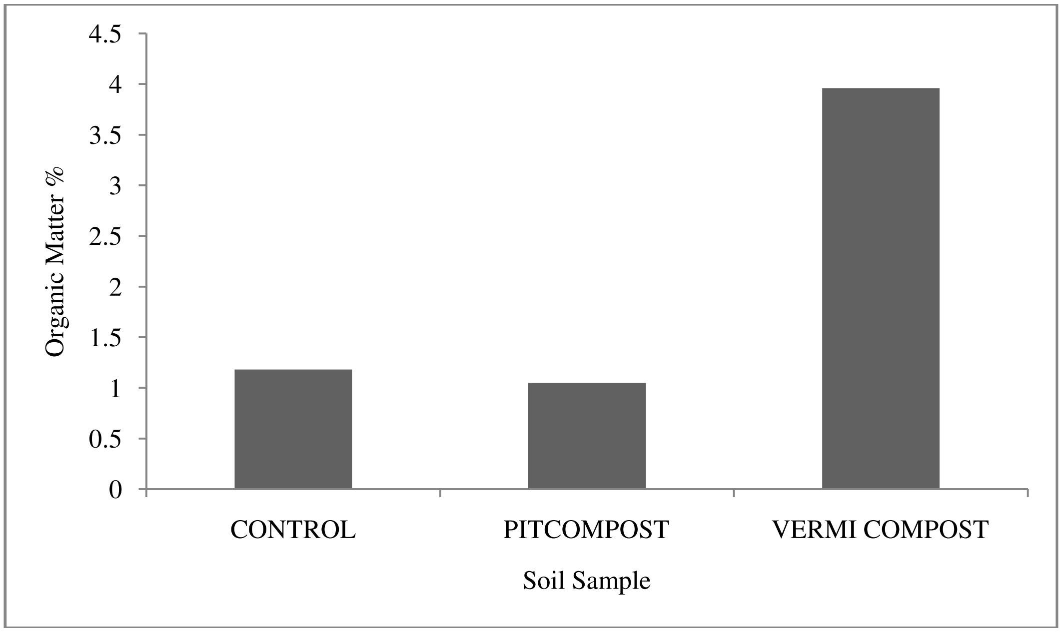

Figure-13
Organic matter level in the pit compost, vermicompost and control (garden soil)

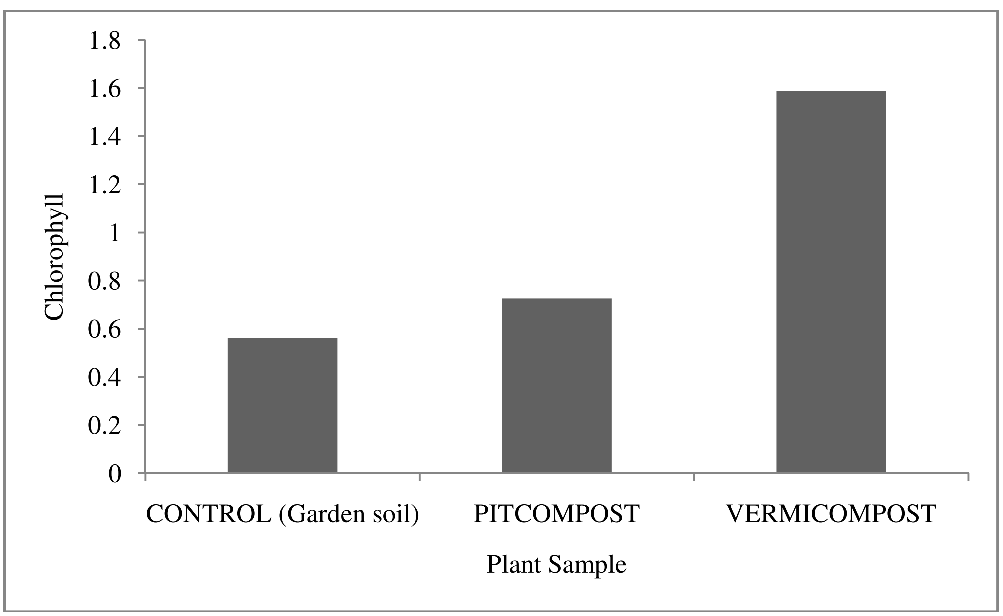

Figure-14
Chlorophyll level in pit compost, vermicompost and control (garden soil)

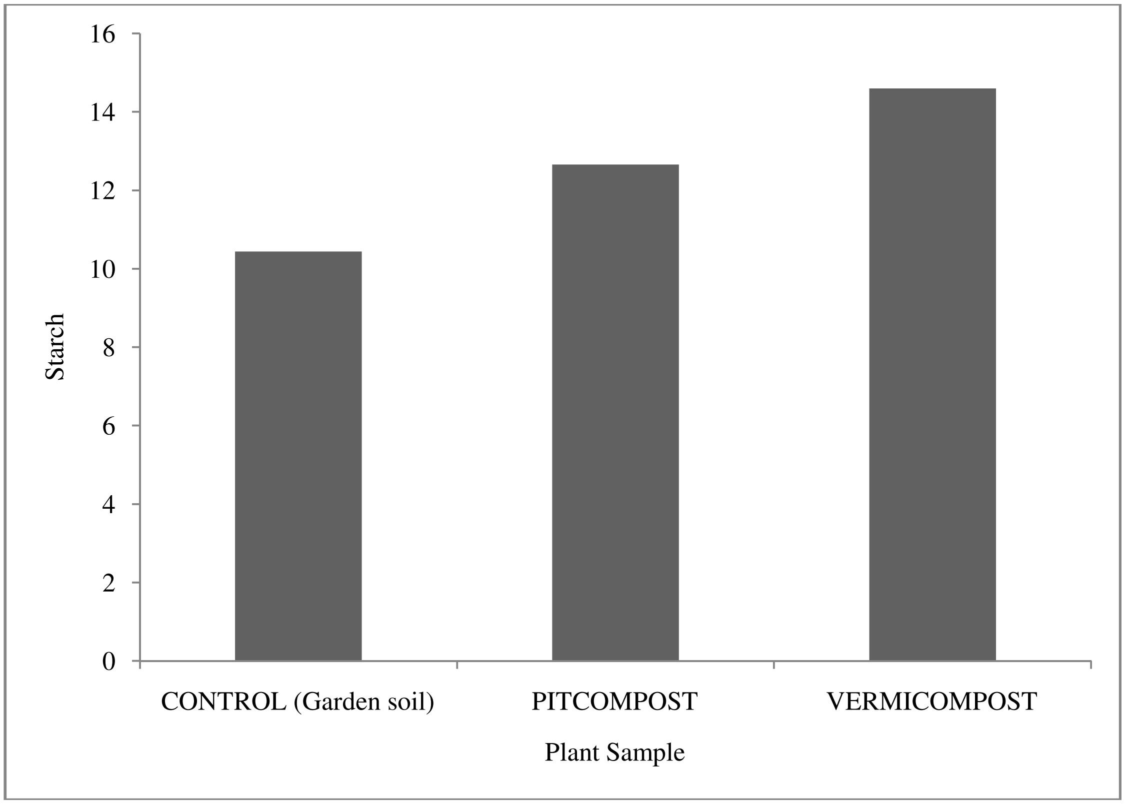

Figure-15
Starch level in the pit compost, vermicompost and control (garden soil)

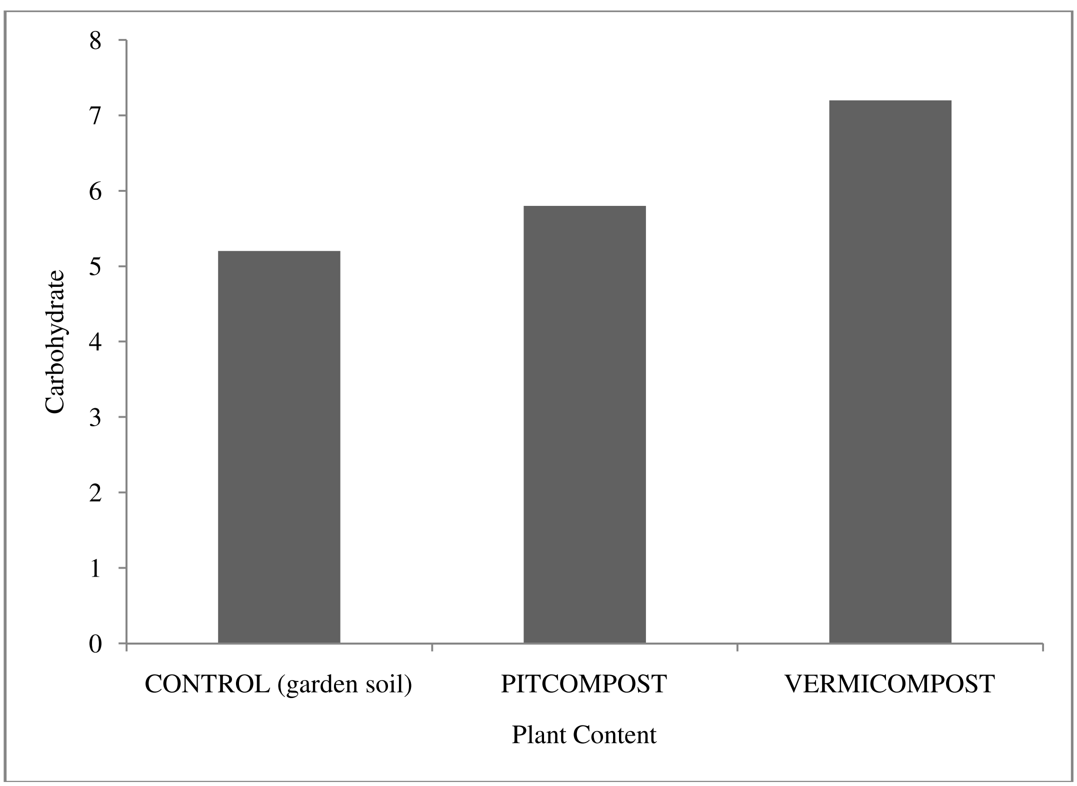

Figure-16
Carbohydrate level in the pit compost, vermicompost and control (garden soil)

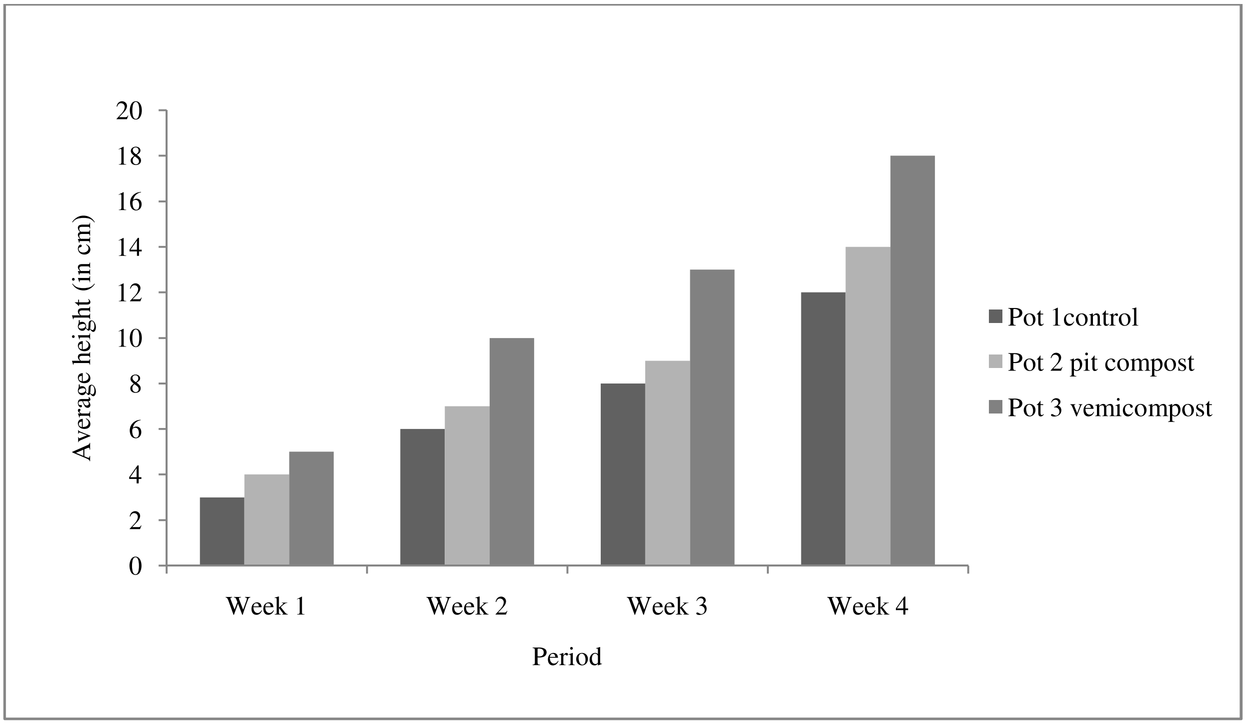

Figure-17
Comparative impact level of pit compost, vermicompost and control (garden soil) on height of coriander plants

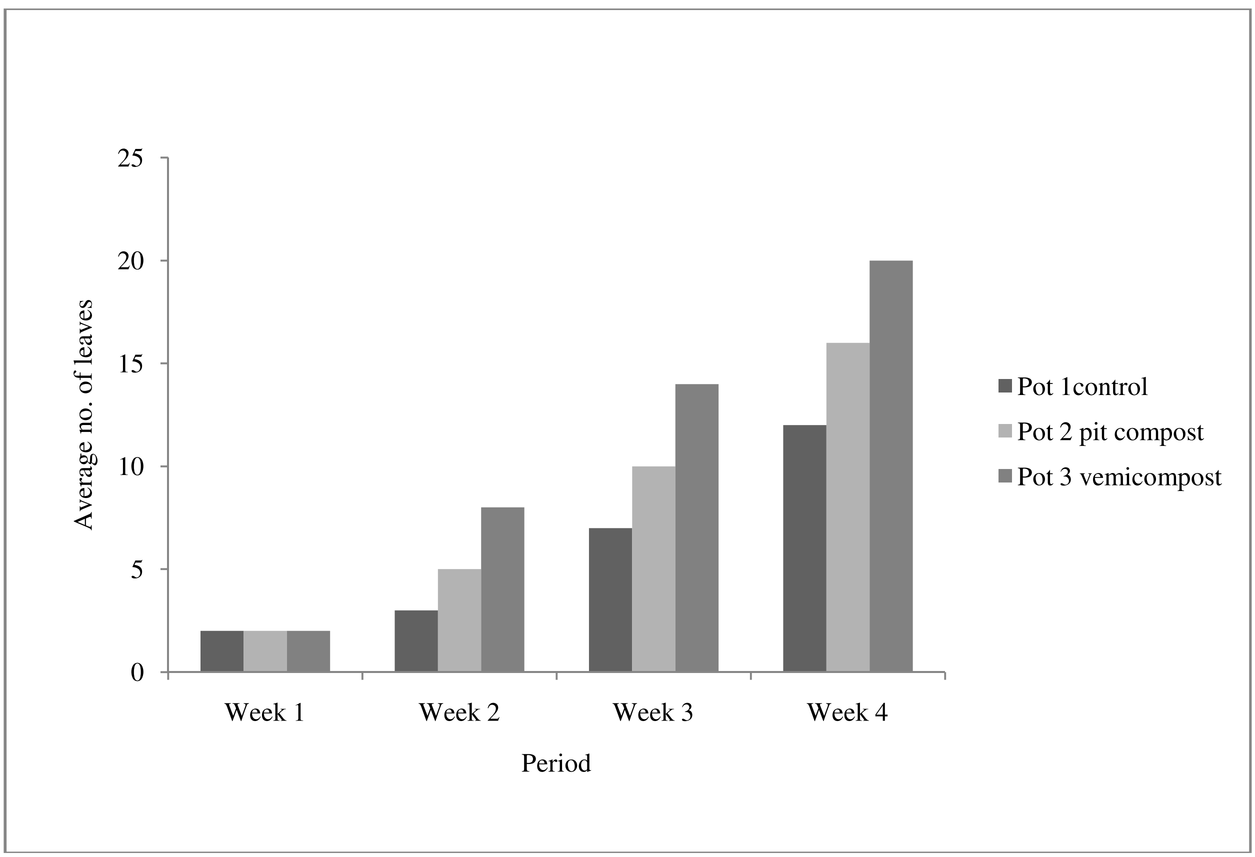

Figure-18
Comparative impact level of pit compost, vermicompost and control (garden soil) number of leaves of coriander plants

Table 3
(a) The Average Height of *Coriandrumsativum*L Plantin Different Pots. (b)The average number of leaves of *Coriandrumsativum* Lplant in different pots.

Period	Measurement	Pot 1control	Pot 2 pit compost	Pot 3 vemicompost
Week 1	Average height (in cm)	3cm	4cm	5cm
	Average no. of leaves	2	2	2
Week 2	Average height (in cm)	6cm	7cm	10cm
	Average no. of leaves	3	5	8
Week 3	Average height (in cm)	8cm	9cm	13cm
	Average no. of leaves	7	10	14
Week 4	Average height (in cm)	12 cm	14cm	18cm
	Average no. of leaves	12	16	20

The result in the two tables demonstrate that the growth of coriander plant grown in vermicompost soil was maximum (18 cm) along with number of leaves (20), as compared to growth of coriander plants grown in pit compost (14cm), number of leaves (16), which was further. Maximum than the coriander plants grown in garden soil (control) (12cm), number of leaves (12), respectively. Vermicompost soil increased the amount of Chlorophyll present (0.7874g), total starch content (12.6mg) and carbohydrate 6.3 mg compared to pit compost chlorophyll (0.6259g), starch (11.88 mg) and carbohydrate (5.4mg) level while in garden soil was chlorophyll (0.5622g), starch (10.44 mg) and carbohydrate (5.2mg) were precise respectively. Thus it was observed that the vermicompost contains nutrient content to such an extent that enhance the growth of coriander plant at a faster rate in comparison to pit compost and garden soil.

Summary: The present work summarizes that for obtaining maximum crop yield as well as profit from Vermicompost, soil should be inoculated with Vermicompost and Pit compost. In addition Pit compost enhances the rate of organic matter mineralization which results in increase in plant nutrients. Composting is an alternative technology for a sustainable solid waste management. Vermicompost can be used to promote soil fertility and soil quality, enhances crops yield and quality accelerates the production of quality fertilizer by promoting decomposition of waste and inorganic matter used in agriculture and lowers the hazards of continued cropping in open and green house environment. Vermicompost is rich source of natural organic fertilizer. The physical and biological property of soil was improved. It showed more beneficial impact on plants than soil. Pit compost produces a natural fertilizer and improves the physical, chemical as well as biological properties of the soil. These composts provide variety of nutrients in readily existing forms and also enhance the uptake of nutrients by plants. It plays a major role in improving growth of plant and yield of various field crops.

Conclusion

Nowadays environmental pollution is affected from extensive application of chemical fertilizer. So to overcome this difficulty Verrmicompost based biocompost could be used as sustainable agriculture. It can be recommended to farmers and cultivators for the necessitate of public health. This process will reduce the environmental damage. Composting is an effective way to manage organic waste.

Acknowledgement

The authors greatly acknowledge the encouragement and support of the Principal and Management of Bharathidasan College of Arts and Science, Erode. The financial assistance provided by UGC, New Delhi is also duly acknowledged.

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