

Effect of vermicompost produced from industrial wood waste on vegetables under field conditions

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ABSTRACT

To promote the organic cultivation of vegetable crops the Department of Agriculture, Government of Kerala has been supporting several large and small scale schemes in various localities in the state. In 2014 the department financially supported The Western India Plywoods Ltd under this scheme for an organic vegetable cultivation programme. As part of this scheme studies were undertaken to assess the impact of vermicompost produced from wood waste on growth enhancement and productivity of vegetable crops like tomato, chilli and brinjal grown under field conditions. The growth performance of the crops raised in the soil mixed with appropriate quantity of vermicompost was compared with that in the normal soil. Observations recorded at 5 weeks' interval up to 15 weeks showed growth enhancement in the crop plants with vermicompost-added soil. Although the significant effect of vermicompost on growth of tomato and chilli was not profound as that of brinjal its impact on overall plant productivity was quite evident. However remarkable differences could be observed in brinjal plants grown in both the normal soil as well as vermicompost-treated soil. Enhancement in growth parameters such as leaf number, plant height and fruit yield was observed.

Keywords: Vermicompost; industrial wood waste; vegetables; plant growth

INTRODUCTION

Vegetables are the critically important food components of our dietary system as they provide vital nutrients for health and maintenance of our body. However the cultivation and development of vegetables are the processes which require high amounts of nutrient input (Sahoo et al 2015). The vegetables according to their temperature requirement are classified as tropical, subtropical and temperate. The tropical vegetables require optimum temperature range of 18-30°C for their proper growth and development. Among the tropical vegetables the Solanaceae members such as tomato, chilli and brinjal are widely cultivated and therefore considered as the popular vegetable crops in the world. Tomato (*Lycopersicon esculentum*) is the world's most widely grown vegetable after potato and sweet potato. Brinjal (*Solanum melongena* L) is one of the major commercial crops grown all over the country due to its high nutritive value (Rehman 2008) and Chilli

(*Capsicum annum* L) is also an important crop with high consumption rate (Datta et al 2011). The responsible factor behind the higher demand of chilli is its unique economic, nutritious and pharmacological significance.

According to Zhu and Chen (2002) there exists strong positive correlation between annual food production and consumption of fertilizers. However unscrupulous over-usage of fertilizers will definitely have a negative repercussion on to the society. Scientific investigations have shown that on many high-yielding farmlands the fertilizer application rate has been too high resulting not only in decreased efficiency and large costs but also negative impacts on air and water quality. This is where the farming practices using organic manure take up the position. Organic farming refers to the limited use of a majority of synthetic chemicals in both crop and livestock production (Lampkin 2002). However it incorporates a range of other management practices many of which are utilized

in conventional systems on a significant scale (Gardner and Brown 1998). Vermicomposting better known as vermiculture biotechnology is one of the economically viable options for propagation of cost-effective and eco-friendly organic manure (Perera and Nanthakumaran 2015, Sahoo et al 2015). Large amounts of lignocellulosic wastes generated through forestry and agricultural practices, paper-pulp industries, timber industries and many agro-industries which generally impose a threat to the environment can be effectively converted to organic manures using this technology (Sreenivasan 2013).

Vermicomposting is an efficient as well as easily adoptable technique of compost preparation. This composting system not only decomposes a huge amount of organic wastes but also helps to maintain higher nutrient status in composted materials (Ceccanti and Masciandaro 1999, Lazcano and Domínguez 2011, Hema and Rajkumar 2012). Appropriate mixing of the vermicompost with soil can be assumed to have a major role in improving growth and yield of different field crops, vegetables, flowers and fruit crops. The present investigations were carried out to observe the effect of vermicompost on vegetative growth and fruiting of tomato, chilli and brinjal under field conditions.

MATERIAL and METHODS

The present field experiment was done in a land suitable for farming inside the plywood factory complex located at 11°55'N latitude and 75°20'E longitude at an altitude of 12.0 m amsl during November-December 2014.

In order to find out the impact of vermicompost on growth and development of vegetable crops, multiple plots of equal size were demarcated. The area was manually planted with the pot-raised seedlings of equal size by digging planting holes of appropriate dimension. Vermicompost (200 g) prepared out of the wood waste was supplemented to the base of each planting stock whereas the seedlings for control treatments were planted at an adequate distance without adding any amount of manure. The periodical recording of data pertaining to the growth parameters like number of leaves, plant height and fruit harvest (yield) were collected along with the general growth conditions in the field. Thus the mean values of observed data for a period of nearly four months (15 weeks) were worked out for the purpose of comparison.

RESULTS and DISCUSSION

The observations on the growth and development of the three crops under this work on field cultivation of vegetables using vermicompost produced from wood waste (Plate 1) are summarised below:

Leaf number and plant height

The changes in leaf number and plant height are presented in Fig 1 and Fig 2. Observations recorded at 5 weeks interval up to 15 weeks exhibited an increasing order of growth enhancement. Vermicompost-treated plants showed better growth than control. Enhancement in shoot height was maximum at 15 weeks of growth in vermicompost-added plants of brinjal as compared to other 2 crops.

Similar results were reported for brinjal by Dhanalakshmi et al (2014) where they also found enhanced leaf yield after the application of varying concentrations of vermicompost in the crops such as tomato, okra, chilli etc. The investigations also showed the results in accordance with the observations of Murarkar et al (1998) that vermicompost application enhances the leaf yield. The positive impact on the morphological development of different crops using different vermicompost treatments was illustrated by earlier studies of Garg and Bhardwaj (2000) and Rampal and Sharma (2006). Sahoo et al (2015) evaluated the effect of vermicompost on growth and development of chilli and brinjal grown under polypot conditions and noted the superiority in growth of plants grown in vermicompost-treated soil.

Fruit harvest

The details on fruit harvest of tomato, chilli and brinjal are depicted in Fig 3 (Plate 2). The vermicompost-treated plants showed an increased fruit yield which was quantitatively double the number of fruits recorded from the control (untreated) soil. Thus the effect of vermicompost on plant productivity was quite evident. Similarly Sahoo et al (2015) reported four times more number of fruits in the vermicompost-treated plants as compared to the untreated plants. The same study also noted an enhancement in length and weight of the fruits in chilli. Dhanalakshmi et al (2014) in their study also pointed out the significant vigour in fruit yield of okra plant grown in the vermicompost-treated soil.



(a)



(b)



(c)

Plate 1. Field cultivation of vegetables using vermicompost (a) Tomato (b) Chilli (c) Brinjal



Plate 2. Harvested vegetables of chilli, brinjal and tomato

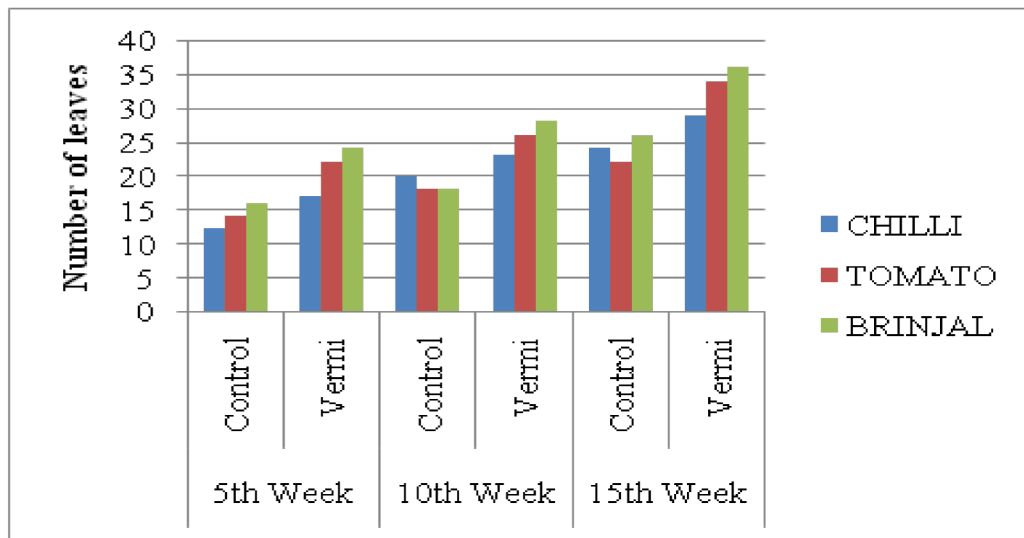


Fig 1. Comparison of changes in leaf number

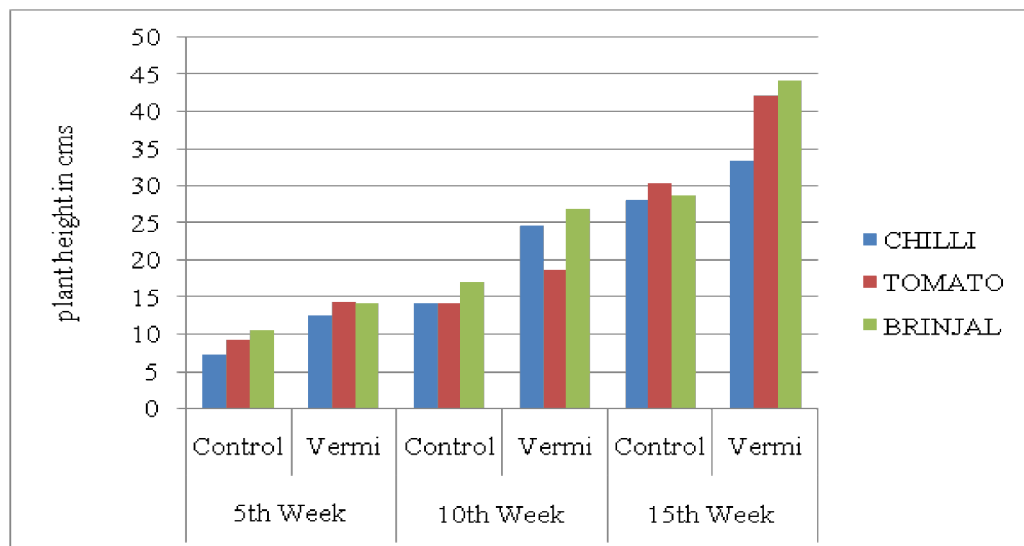


Fig 2. Comparison of changes in plant height

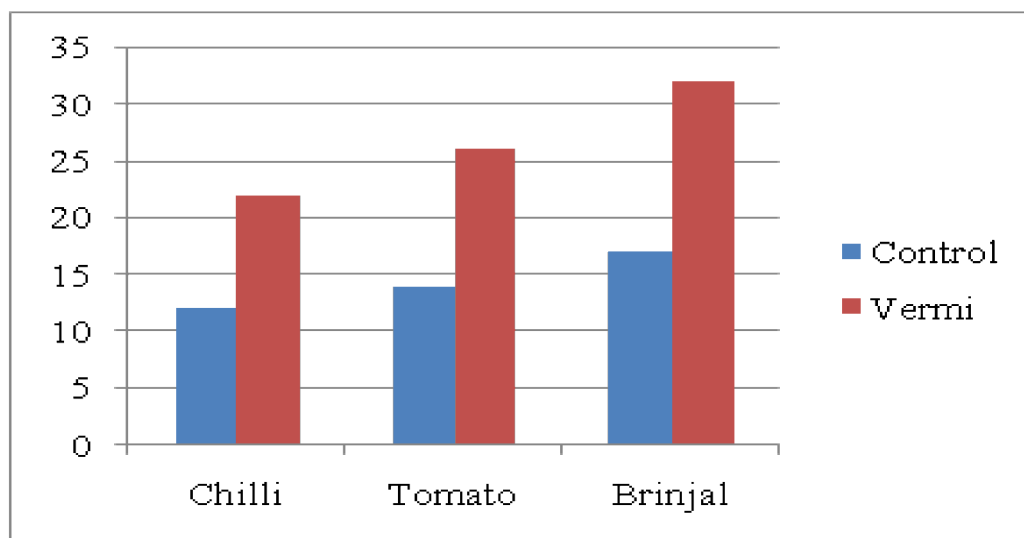


Fig 3. Yield of chilli, tomato and brinjal

Very significant differences could be observed in plants of both the normal soil and vermicompost-treated soil. Thus the present investigations revealed that the growth performance of chilli, tomato and brinjal under field conditions could be largely influenced by the vermicompost treatment. The laboratory evaluations done so far under fairly controlled conditions also put forward the same kind of results.

CONCLUSION

In addition to the results furnished above there were some other important revelations that the present investigations could offer. The area where the vermicompost treatment was applied was observed with reduced instances of pest attack, reduced weed growth, rapid growth and development of seedlings, production of better quality vegetables etc. Therefore the present study on preliminary basis has clearly demonstrated the field level impact of vermicompost on plant growth. To formularize the general usage pattern of this organic manure and to identify its multiple significance in the field level applications more in-depth studies need to be conducted by giving consideration to the aspects concerning crop productivity and improvement such as agro-climatic zones and its micro-habitat.

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