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Research Article

EFFECT OF VERMICOMPOST ON THE GROWTH AND YIELD OF CHILLI

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ABSTRACT

Vermicompost is a by-product of earthworm mediated organic waste that contains nutrients like nitrogen, phosphorus, potassium, calcium, magnesium, Sulphur, iron, manganese, zinc, copper and boron, the uptake of which has a positive effect on plant nutrition. The study was carried out to evaluate the growth and yield pattern of chilli by the application of different concentrations of vermicompost. Significant results were observed in growth parameters on 30th day, 45th day and 60th day. The yield was significantly higher in chilli plant treated with optimum concentration of vermicompost.

INTRODUCTION

Vermicomposting is the process by which worms are used to convert organic materials (usually wastes) into a humus-like material known as vermicompost. The goal is to process the material as quickly and efficiently as possible. Compost contains variable amounts of N, P and K, and is a valuable source of plant nutrients. Among various sources of organic matter, vermicompost have been recognized to possess potential as soil amendments (Arancon *et al*., 2005). There is much evidence that the activity of earthworms accelerates organic matter mineralization, decomposition of polysaccharides, increase humus in the soil, and reduce the availability of toxic heavy elements to plants (Dominguez *et al*., 1997). The biological activity of earthworms provides nutrient rich vermicompost for plant growth thus facilitating the transfer of nutrients to plants (Ismail, 2000). The benefits of vermicomposting in recycling of organic wastes, viz., animal wastes (Aira *et al*., 2002), crop residues (Bansal and Kapoor, 2000), industrial wastes (Yadav and Garg, 2010; Garg *et al*., 2012) have been carried out. Application of vermicompost produced by biodegradable waste could be one of the most economical and attractive methods of solving the problems like waste disposal and the requirement to increase the organic matter content of soil.

The main aim of the present investigation is to study the effect of vermicompost on the growth and yield of chilli plant.

MATERIALS AND METHODS

The experiment was carried out with vegetable crops in pot culture in Avinashilingam Institute for Home Science and Higher Education for Women. For preparing vermicompost, the ingredients required are vegetable wastes, fruit wastes, leaf wastes, banana stem wastes, earthworm and cattle dung.

Collection of materials for compost preparation

- Collection of vegetable, fruit, leaf and banana wastes from pazhamudhir nilayam situated in and around Coimbatore
- Collection of cowdung from farm

Growth Parameters

Plant samples were uprooted carefully on 30th, 45th day and 60th day and the following growth parameters were measured and recorded for all the treatments.

1. Root Length (cm)
2. Shoot Length (cm)
3. Number of leaves
4. Fresh Weight (gm)
5. Dry Weight (gm)

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Root Length

The plants were taken from control and treatment pots and washed to get rid off adhering soil particles. The length of the root was measured with the help of a scale from root collar point to root tip and expressed in centimeter. Ten seedlings were randomly selected from each treatment and their root length was measured.

Shoot Length

The shoot length of the plants was measured with the help of scale from the root collar point to shoot apex and expressed in centimeter. Ten seedlings were randomly selected from each treatment and their shoot length was measured. The observations were statistically analysed.

Number of leaves

The number of leaves present in the uprooted plants was calculated.

Fresh Weight

Fresh weight of the plants was measured with the help of an electronic digital balance and expressed in grams.

Dry weight

The collected plant materials were kept in hot air oven at 55°C for 24 hours. Then, the dry weight of the plants was measured using an electronic digital balance and expressed in grams.

Pot Culture Experiment

Pot culture experiments were conducted with chilli seeds to study the response of different doses of vermicompost on the growth of the plants. The pot culture experiment was conducted in the green house of Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu.

The experiment was carried out in the period from December 2016 to March 2017. The size of the experimental pot was 30cm x 24cm x 30cm. Experimental pots were filled with different doses of vermicompost. Triplicates were maintained for each treatment.

Yield Parameters

The number of fruits harvested per plant in each treatment were counted and expressed as number of fruits per plant.

RESULTS AND DISCUSSION

Description of the plant

Chilli is an annual herb growing up to 1m height and is native to tropical America. They are widely cultivated throughout the tropics (Plate 1). *Capsicum annum* L. aptly described as the plant that bites back, is a common condiment in certain diets. The leaves are simple and alternate, elliptical to lanceolate, with smooth margins. The small flowers are borne singly or rarely in pairs in the axils, they are white or occasionally purple, campanulate (bell-shaped), often with 5 lobes, and contain 5 bluish stamens. The fruits are many-seeded berries, pod-like, but with no sutures, that vary considerably in size and shape, ripening to green, yellow, orange, red, or purple.

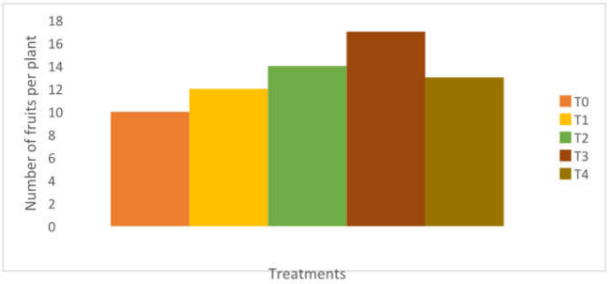

Fig 1 Yield Parameter of Chilli in different treatments

Plate 1

The result of the experiment conducted by the application of the prepared vermicompost in chilli plant is given below:

Growth parameters

The growth parameters namely shoot length, root length, number of leaves, fresh weight and dry weight were measured on 30th day, 45th day and 60th day and tabulated.

Table 1 Growth Parameters of Chilli on 30th Day

S. No.	Treatment	Shoot length	Root length	No. of leaves	Fresh weight	Dry weight
1	T_0	3.00 ± 0.50	1.23 ± 0.25	3.33 ± 0.58	1.07 ± 0.05	0.04 ± 0.00
2	T_1	3.50 ± 0.50	1.80 ± 0.10	4.00 ± 0.00	1.26 ± 0.02	0.04 ± 0.01
3	T_2	3.17 ± 0.58	1.80 ± 0.00	4.00 ± 0.00	1.21 ± 0.01	0.04 ± 0.01
4	T_3	4.20 ± 0.53	2.03 ± 0.12	4.67 ± 0.58	1.57 ± 0.02	0.08 ± 0.01
5	T_4	3.33 ± 0.29	1.60 ± 0.17	3.67 ± 0.58	1.18 ± 0.06	0.04 ± 0.00
SEd		0.3994	0.1247	0.3651	0.0289	0.0072
CD (p<0.05)		0.8900	0.2779	0.8136	0.0645	0.0161
Cd (p<0.01)		1.2660	0.3953	1.1573	0.0917	0.0230

Values are mean ± SD of three samples in each group

Table 2 Growth Parameters of Chilli on 45th Day

S. No.	Treatment	Shoot length	Root length	No. of leaves	Fresh weight	Dry weight
1	T_0	6.27 ± 1.62	5.00 ± 1.00	7.33 ± 0.58	1.13 ± 0.06	0.34 ± 0.03
2	T_1	6.83 ± 1.61	4.63 ± 1.10	5.33 ± 0.58	1.50 ± 0.26	0.48 ± 0.10
3	T_2	6.00 ± 1.00	4.00 ± 1.00	5.67 ± 0.58	1.33 ± 0.12	0.43 ± 0.06
4	T_3	8.33 ± 0.58	7.17 ± 1.04	7.67 ± 1.53	1.97 ± 0.15	0.70 ± 0.09
5	T_4	5.33 ± 0.58	3.67 ± 0.58	5.33 ± 0.58	1.33 ± 0.12	0.42 ± 0.05
SEd		0.9566	0.7849	0.6992	0.1282	0.0592
CD (p<0.05)		2.1315	1.7488	1.5579	0.2857	0.1319
Cd (p<0.01)		3.0319	2.4876	2.2161	0.4064	0.1877

Values are mean ± SD of three samples in each group

Table 3 Growth Parameters of Chilli on 60th Day

Treatment	Shoot length	Root length	No of leaves	Fresh weight	Dry weight
T0	9.33 ± 0.58	7.23 ± 0.25	8.33 ± 0.58	1.22 ± 0.03	0.43 ± 0.02
T1	10.00 ± 0.00	5.27 ± 0.31	8.67 ± 0.58	1.65 ± 0.04	0.54 ± 0.03
T2	10.00 ± 1.00	5.13 ± 0.15	8.33 ± 1.53	1.82 ± 0.03	0.64 ± 0.03
T3	12.67 ± 1.15	7.73 ± 0.50	10.00 ± 0.00	2.04 ± 0.04	0.78 ± 0.03
T4	9.67 ± 0.58	5.50 ± 0.10	6.67 ± 0.58	1.81 ± 0.01	0.63 ± 0.03
SEd	1.5466	0.6849	1.8991	1.4371	0.1591
CD(P<0.05)	3.2115	0.6488	1.6579	1.8957	0.2309
CD(P<0.01)	3.0319	1.1876	2.2161	1.1068	0.2127

Values are mean ± SD of three samples in each group

The growth was found to be higher in the pots treated with 19g vermicompost (T_3) on all the days tested (Table 1, 2 & 3) plants. Plant growth parameters such as shoot length, root length, number of leaves, fresh weight and dry weights were better in vermicompost treated plants rather than the control plant. These results are in accordance with the earlier findings (Narkhede *et al*., 2011). Application of vermicompost produced by biodegradable waste could be one of the most economical and attractive method of solving the problems like waste disposal and the requirement to increase the organic matter content of soil.

Vermicompost has the potential to improve the growth of plant when added to soil and also very essential and beneficial for soil fertility. The greatest plant growth responses and yields have occurred usually when vermicompost constituted a relatively small proportion (10-40%) of the total volume of the plant growth medium in which they are incorporated (Atiyeh *et al*., 2002).

Chilli is a rich source of vitamins A, C and E. Hundred gram of edible portion of chilli provides 24k cal of energy, 1.3 g of protein, 4.3 g of carbohydrate and 0.3 g of fat. The chemical fertilizers like N, P and K have played significant role on increasing the yield and quality of plants during early seventies. But in recent years, the use of chemical fertilizers has been shown to result in several problems like loss of fertility, soil health and multiple nutrient deficiencies and loss of microbial activities which ultimately result in reduced crop productivity and quality (Singh *et al*., 2014). Excessive use of agro-chemicals like pesticides and fertilizers over years has affected the soil health and lead to declining of crop yields and quality of products. Hence a natural balance needs to be maintained for existence of life and property.

Yield Parameters

The yield was significantly higher in T_3 in chilli plant. The application of optimum dosage of vermicompost significantly increased the yield of chilli. Microorganism help in faster decomposition of organic manures there by increasing the availability of nutrients to the plants. Increase in fruit weight have been observed by Sivakumar *et al*. (1999) in *Capsicum.* Growth and yield pattern of chilli was significantly observed in 50:50 ratio when different concentrations of vermiwash was used (Sundararasu, 2016).

CONCLUSION

Organic vegetable production is controlled by essential macro and micronutrients and other growth promoting compounds present in the media that is supplied through inorganic and organic sources. With the current awareness on organic food production, the organic waste material that is processed by naturally occurring earthworm species may be used to improve the soil quality, thereby increasing the plant growth.

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