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STUDIES ON THE INFLUENCE OF ORGANIC FERTILIZERS ON THE GROWTH AND SOME BIOCHEMICAL PARAMETERS OF CHILLI (*CAPSICUM ANNUM* L. VAR)

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ABSTRACT
A pot culture experiment was conducted in botanical garden of Aska Science College campus to study the influence of different organic fertilizers on the growth parameters and bimolecular contents of Chilli plant. The results revealed that the vegetative growth viz: shoot length, root length, shoot weight and root weight of plants were increased 37.05%,49.69%,35.75% and 51.21% respectively in vermicompost treatment compared with control. Degree of influence was more in vermicompost treatment followed by cow dung compost and leaf compost. The similar trend of results were also noticed in chlorophyll, carbohydrate and protein content of 45 day's old chilli plants. Vermicompost treatment plants were showed 43.58%, 41.26%, 42.46% increase of chlorophyll, carbohydrate and protein contents respectively over control. Among organic fertilizers, vermicompost showed significantly higher vegetative growth and bimolecular content. The pot experimental studies suggest the possibility of using vermicompost as source for crop improvement.

INTRODUCTION

Chilli (*Capsicum* sp.) is one of most important crop cultivated in most parts of the world. It provides capsicin a pungent substance is a substituted benzylamine derivative. Organic fertilizer is the key to improve the sustainability of agricultural farming system and soil productivity. Application of fertilizers enhances crop growth and yield, but exclusive use of chemical fertilizer may lead to stagnation or declined in productivity due to emerging deficiency of other nutrients degradation of chemical, biological and biophysical condition of soil. The increasing costs of fertilizers also prevent their use by resource poor farmers. Vermicompost being rich NPK and other nutrients can be used as a substitute for chemical fertilizer (Jeyabal and Kuppuswamy, 2001). Utilisation of earthworms to breakdown organic waste is gaining popularity in different part of the world (Edward, 1998). Earthworm convert organic waste to vermicomposts, are finally divided peat like materials with high porosity, aeration, drainage, water holding capacity and microbial activity which make them excellent soil amendment or conditioners (Atiyeh *et al.,* 1999).

In view of this an attempt was made to study the influence of leaf compost, cow dung compost and vermicompost produced from cow dung on the vegetative growth and biochemical parameters of chilli plant.

MATERIALS AND METHODS

Leaf litter was collected periodically from the campus of Aska Science College, Aska and kept in a trench (3 feet long, two feet breadth and 1.5 feet height). The collected leaf litter was sun dried, cut into small pieces of 3 to 4cm length and kept ready for composting. Composting mixture was prepared in the ratio 1:1 (w/w) of leaf litter and cow dung in trench, sprinkled with water to maintain moisture content of this organic mixture was allowed for decomposition. After 90 days leaf compost were collected for experiment.

Fresh cow dung was collected form the dairy farm present near college campus and kept in a trench (3 x 2 x 1.5 feet) for decomposition. After 90 days compost were collected for experiment.

Sugarcane bagasse was collected from Aska Cooperative Sugar mill 3k away from college campus and kept in a cement tank. Compost mixture was prepared in the ratio 25:50 (w/w)kg of Sugarcane bagasse and cow dung in cement tank, sprinkled water to maintain moisture content of organic mixture was allowed for pre-digestion for 20 days. Sample of epigeic earth worms *Eisenia foetida* were obtained from OUAT, Bhubaneswar and maintained under laboratory conditions. The acclimatized earth worms (total biomass 250g) were introduced into cement tank containing the pre-digested mixture. Vermicomposting was allowed for 90 days with regular sprinkling of water to maintain the moisture content in the mixture. At the end of 90 days compost material of cement tank were heaped and collected. Collected compost air dried under shade and sieved through 2 mm wire mess. Prepared vermicompost were used for experiment.

Experimental set up

Leaf compost, cow dung compost and vermicompost 2kg each were mixed with 8kg of garden soil and kept in separate cement pots. 10kg of garden soil was also kept similarly in cement pot as control treatment for comparing the results with other treatments. All treatments were replicated thrice and arranged in randomized block design in botanical garden of the college. After 10 days soils were sowed with 5 seeds of chilli in each cement pot. After 45 days the plants collected and measured shoot length and weight, root length and weight and some biochemical parameters like chlorophyll content (Arnon, 1949), carbohydrate (Herbert *et al.,* 1971) and protein (Lowry *et al.,* 1951) were estimated.

RESULTS AND DISCUSSION

The observations on the plant growth parameters like shoot length and weight; root length and weight were recorded after 45 days. Shoot length of chilli plant was highest in vermicompost treated plants over control *i.e.* 37.05% followed by cow dung compost (26.9%) and leaf compost (21.67%). Similar trend was observed in shoot weight *i.e.* 35.75%, 26.42% and 19.68% in vermicompost, cow dung compost and leaf compost treatment respectively. Percentage of increase over control was more or less similar to shoot length.

Root length was increased 49.69% over control in vermicompost treatment plant. Cow dung compost and leaf compost observed increase of 41.38% and 33.89% over control. The trends of increased percentage of root weight over control were 51.21, 41.46 and 31.70 in vermicompost, cow dung compost and leaf compost receptively. In all treatments the percentage of increase over control in root length and weight is more than shoot length and weight (Table 1).

The result were in conformity with the finding of other workers Arancon *et al*. (2002), Kavita and Nagendra (2002) and Shanthi and Dhanalakshmi (2008), but the results of Shanthi and Deepthi (2010) showed decease in shoot length over control in ground nut. The root length and weight were increased over control in all treatments studied. The results corroborate with the reports of Kavitha and Nagendra (2002); Brar *et al.* (2006), but decease of root length in ground nut (Santhi and Deepthi, 2010).

Chlorophyll content in the leaves of chilli was found to be maximum in vermicompost treatment. The increased percentage over control was 43.58. In cow dung compost and leaf compost percentage of increase over control was found 23.80 and 20.14 respectively. Carbohydrate content in the leaves of all treatments was increased over control. The increased percentages were 41.26, 26.21 and 19.41 in vermicompost, cow dung compost and leaf compost respectively.

The result noticed that protein content of leave was highest in vermicompost treatment followed by cow dung compost and leaf compost. The percentage of increase over control was 42.46, 30.36 and 25.11 in vermicompost, cow dung compost and leaf compost respectively (Table 2).

The data of experiment revealed that three organic fertilizers viz. vermicompost, cow dung compost and leaf compost enhanced significantly all the parameters (chlorophyll content, carbohydrate and protein content of leave) over control in the chilli plant. Similar results were also observed by other worker such as Sharma and Agrawal (2009) on chlorophyll content of wheat plant, Nithya (2005) on chlorophyll content of ladies finger, Arancon *et al*. (2002) on carbohydrate content, Hirumani and Kumari (2004) on protein content of leave in chilli and Shanti and Deepthi (2010) on carbohydrate and protein content of groundnut. The result of chlorophyll content was not corroborate with the findings of Shanti and Deepthi (2010) in ground nut.

The present investigation has clearly proved that vermicompost treatment exhibited better influence on shoot length and weight, root length and weight, chlorophyll content, carbohydrate and protein content of leave over control in chilli plant. It could be suggested that vermicompost may be due to the influence of combined effect of various ingredients of vermicompost such as macro (N. P. K.) and micro (Ca, Mg, Mn, Fe, S, Zn and Cu), plant growth hormones (IAA, IBA and GA), vitamins, enzymes and many beneficial microbes. It may be also suggested that vermicompost release nutrient slowly

Table 1: Effect of leaf compost, cow dung compost and vermicompst on 45 days old plants shoot and root length and shoot and root weight of chilli (*Capsicum annum*.)

	Control (Garden soil)	Leaf compost	Cow dung compost	Vermi-compost	% of Increase or decrease over control			
					Control (Garden soil)	Leaf compost	Cow dung compost	Vermi-compost
Shoot Length (cm)	38.2 ± 0.48	46.26 ± 0.29	48.25 ± 0.16	52.11 ± 0.81	—	21.67	26.90	37.05
Root Length (cm)	16.14 ± 0.16	21.61 ± 0.42	22.82 ± 0.26	24.16 ± 0.36	—	33.89	41.38	49.69
Shoot Weight (mg)	3.86 ± 0.11	4.62 ± 0.28	4.88 ± 0.26	5.24 ± 0.18	—	19.68	26.42	35.75
Root Weight (mg)	0.82 ± 0.02	1.08 ± 0.05	1.16 ± 0.19	1.24 ± 0.26	—	31.70	41.46	51.21

(Each value is mean of 5 replicate ± SD)

Table 2: Effect of leaf compost, cowdung compost and vermicompost on 45 days old plant's chlorophyll content, leaf carbohydrate and protein content of chilli (*Capsicum annum*)

Types of Treatment	Bimolecular contents (mg/g.fr.wt.)			% of increase or decrease over control		
	Chlorophyll	Carbohydrate	Protein	Chlorophyll	Carbohydrate	Protein
Control (Garden Soil)	2.73 ± 0.16	2.06 ± 0.15	4.38 ± 028	—	—	—
Leaf compost	3.28 ± 0.26	2.46 ± 0.31	5.48 ± 0.42	20.14	19.41	25.11
Cow Dung Compost	3.38 ± 0.21	2.60 ± 0.19	5.71 ± 0.46	23.80	26.21	30.36
Vermicompost	3.92 ± 0.25	2.91 ± 0.13	6.24 ± 0.25	43.58	41.26	42.46

(Each Value is mean of 5 replicates ± S.D.)

for absorption with additional nutrients. Brattsten (1979) also suggested that the vermicompost consists of beneficial microbes, vesicular Arbascular myocorrhizae and important enzymes like amylase, protease, cellulose, kinitase and invertase which might have promoted better synthesis of secondary metabolites. Hendrix *et al*. (1994) revealed that the higher yields in the plants may due to the fact that vermicompost supplies direct available nutrients such as nitrogen to the plants and these organic fertilizers improves the proportion of water stability of the soil. Prabha *et al*. (2007) suggested that vermicompost contains many enzymes and beneficial microbes such as nitrogen fixation bacteria and hormones synthesizing microbes.

It is concluded that among the organic fertilizers, vermicompost influenced better vegetative growths and increased the level of macromolecular content in 45 day's old chilli plant which are utilised for the different anabolic reaction.

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