

GROWTH AND YIELD PERFORMANCE OF GREEN CAPSICUM (*Capsicum annuum* L.) AS INFLUENCED BY VERMICOMPOST APPLICATION GROWN AT ROOFTOP OF CHANDPUR AREA

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Abstract

A pot experiment was conducted during rabi season during 2020-21 at a rooftop of Chandpur 150 MW Combined Cycle Power Plant (CCPP) Area in Chandpur Sadar upazila under Chandpur district to study the impact of different dosages of vermicompost (VC) on the growth and yield parameters of green capsicum plants (*Capsicum annuum* L.). It was laid out in a randomized complete block design (RCBD) with three replications each of six treatments viz. T1: 0 ton VC ha⁻¹ (control), T2: 2.5 ton VC ha⁻¹, T3: 5 ton VC ha⁻¹, T4: 7.5 ton VC ha⁻¹, T5: 10 ton VC ha⁻¹, and T6: 15 ton VC ha⁻¹. Results revealed that maximum plant height (38.53 cm), number of leaf plant⁻¹ (80), and highest number of branches plant⁻¹ (6) were recorded in T5 followed by T3. The highest values for rest of the growth and yield parameters were found from the plant receiving VC at the rate of 5 ton ha⁻¹ (T3), such as, longest leaf per plant (12.84 cm), highest number of branches plant⁻¹ (6), maximum girth (3.53 cm), maximum number of fruits plant⁻¹ (7), average fruit weight (44.75 g fruit⁻¹), maximum weight of fresh (320.28 g fruits plant⁻¹) and dry (4.43 g fruits plant⁻¹); and maximum total fresh (109.40 g) and dry weight (21.03 g) of plants. Highest fruit length (18.97 cm) and diameter of fruit (7.30 cm) were recorded in T5 and T4, respectively. Almost all of the growth and yield parameters were observed lowest in control (T1). Study indicates that supreme dose of VC 15 ton ha⁻¹ in T6 yielded lower performance compare to 10 and 5 ton VC ha⁻¹. Considering the overall performance, it may be concluded that vegetative growth and yielding capacity of green capsicum plants can be boosted up by applying vermicompost at the rate of 10 ton ha⁻¹ and 5 ton ha⁻¹, respectively. This new information will be beneficial for growers, researcher and relevant workers.

Key words: Capsicum; Vermicompost; Growth; Yield.

INTRODUCTION

Sweet pepper (*Capsicum annuum* L.) which belongs to the Solanaceae family is a dicotyledonous flowering plant (Knapp *et al.* 2004). It is popularly known as ‘king of all spices’. There are many different varieties of peppers ranging from 30 to 90 cm tall. The five domesticated species of chili peppers are *Capsicum annuum*, *Capsicum frutescens*, *Capsicum chinense*, *Capsicum pubescens* and *Capsicum baccatum*. Capsicum offers a number of nutritional values. Green capsicums are rich in vitamin C which has strong antioxidant that strengthens natural immunity to diseases and vitamin A which is a fat soluble vitamin and an important antioxidant help to decrease the health hazards caused by free radicals (Diaz-Laviada 2010). They are also a source of vitamin B6, folic acid, beta-carotene and fiber. Capsicum has been known as a part of human diet as spice, condiments and vegetables since the commencing of civilization. Although capsicum is the most important summer crop of temperate regions, now a days efforts are being made to grow sweet pepper in Bangladesh (Paul 2009). According to BBS (Bangladesh Bureau of Statistics) report of 2019, annual production of capsicum in Bangladesh was 11 M ton covering an area of 8 acres of land during the years 2018-2019 (BBS 2020).

The “Green Revolution” of 1960s has promoted the increased use of chemical fertilizers tremendously which has undoubtedly boosted up the crop productivity many folds, but the continuous and imbalanced application of these fertilizers has also produced detrimental effects on soil health and the

environment. Besides, the use of industrial fertilizers in agricultural production is expensive for majority of the farmers who are mostly marginal and small, and they do not apply the recommended dose of fertilizers (van Diepeningen 2006). In the above scenario, one of the possible options of reducing the use of chemical fertilizer could be recycling of organic wastes. Composting has been used as a means of recycling organic matter back into the soil to improve soil structure and fertility which is an environmental friendly method. Traditional composting of organic wastes has been known for years, but new methods of thermophilic composting have become much more common in organic waste treatment. One such composting technique is vermicomposting.

Vermicomposting is a decomposition process that involves the joint action of earthworms and microorganisms to transform organic residues into a secondary product named vermicompost, which can be used as manure for crop production. Vermicompost is a slow release fertilizer and is rich with essential plant nutrients produced by the earthworms' digestion of organic wastages (e.g. food waste, horticultural waste, poultry droppings and food industry sludge) which contains higher nutritional value than traditional composts (Huang *et al.* 2014, Lalander *et al.* 2015). It is finely divided peat-like materials with low C: N ratio which has been shown to have high levels of total and available nitrogen, phosphorous, potassium (NPK) and micro nutrients, such as Zinc (Zn) and Manganese (Mn), microbial and enzyme activities and growth (Chaoui *et al.* 2003, Pariari and Khan 2013). It improves the physical, chemical and biological characteristics of soil that favour better plant growth. Vermicompost reduces the irrigation requirement of soil as it has high water holding capacity and high soil porosity compared to conventional compost due to its humus content (Chaudhuri *et al.* 2016).

It has also been reported that the application of vermicompost significantly suppresses root pests via the modulation of soil properties and plant defenses, particularly for susceptible plant (Xiao *et al.* 2016) and helps in the production of healthier plants with better resistance towards pests and diseases (Liu *et al.* 2019). Releasing of nutritional elements according to plants requirement stimulates plant growth even with small amount of humic acid in the vermicompost (Adhikary 2012).

Vermicompost has been scientifically proved as miracle plant growth enhancer (Chaoui *et al.* 2003). A number of experiments are available in the literature on organic farming of vegetable crops, viz. tomato (Arancon *et al.* 2002), cucumber (Sallaku *et al.* 2009), okra (Ansari and Sukhrai 2010), chinese cabbage (Wang *et al.* 2010), coriander (Ravimycin 2016), spinach (Islam *et al.* 2020), strawberry (Rahman *et al.* 2021), lettuce (Chowdhury and Rahman 2021) and so on. But, scanty information is available on the cultivation of green capsicum using vermicompost under Bangladesh edaphic conditions. Farmers' interest also increasing day by day to cultivate capsicum in the field condition. Yet, this rooftop gardening of capsicum in the country has been popularizing in the recent years. Keeping the above facts in mind, a rooftop pot experiment was carried out with green capsicum using vermicompost in Chandpur area.

The objectives of this experiment were:

(i) to evaluate the effects of different doses of vermicompost on the growth and yield of green capsicum plants grown at rooftop and to generate information for the capsicum growers and relevant personnel and

(ii) to minimize the production cost of capsicum to encourage the small scale farmers and also to make beneficial to the producer of vermicompost.

METERIAL AND METHODS

Collection of soil sample, vermicompost and seedlings

Samples (0 to 15 cm depth) were collected from selected garden land of Chandpur 150 MW Combined Cycle Power Plant (CCPP) area in Chandpur Sadar Upazila under Chandpur district of Bangladesh. The area is situated at 23° 22' 23" N latitude and 90° 66' 92" E longitude. The samples were air-dried, grounded by using a wooden hammer and sieved through a 3 mm sieve. The soil is slightly acidic, pH 6.5 (1:2.5 w/v H₂O), organic matter (1.71-3.40%) with silty loamy texture (BARC 2018). Vermicompost and three types of inorganic fertilizers, viz. urea, TSP and MoP for basal application (20-15-30 kg ha⁻¹) were collected from local market. Seedlings (21-day old) were collected from the Chandpur Police Line nursery. This study was conducted from mid-November 2020 to March 2021 on a rooftop of Chandpur 150 MW Combined Cycle Power Plant area, Balirmath in Chandpur Sadar Upazila under Chandpur district of Bangladesh.

Pot experiment

The experiment was laid out in a randomized completely block design (RCBD) having three replications. There were used six treatments in the experiment, viz. T₁: Control (VC 0-ton ha⁻¹), T₂ (VC 2.5-ton ha⁻¹), T₃ (VC 5-ton ha⁻¹), T₄ (VC 7.5-ton ha⁻¹), T₅ (VC 10-ton ha⁻¹) and T₆ (VC 15-ton ha⁻¹).



Fig. 1. A pictorial view of the experiment. First pot at right side is a control treatment (T₁) compared with T₃ (5-ton ha⁻¹) and T₅ (10-ton ha⁻¹) treatment plants shown in the upper part of the photographs.

Before transplanting the seedlings into the pot, these were kept in sunlight for 5 days in the research area. Ten kg capacity plastic pot was filled with 8 kg of air-dried soil keeping a drainage hole at the bottom. Urea, TSP and MoP fertilizers were applied at the ratio of 20:15:25 kg ha⁻¹ as basal dose. One bell pepper plant was transplanted in each pot. At the beginning stage, the plants were irrigated daily and few days later it maintained twice or according to the moisture requirement of the soil. The neem (*Azadirachta indica*) extract was applied to the plants at an interval of 10 days after transplanting through foliar application for pest control. A wooden stick was tied with the main stem of each capsicum plant to support the plant for straight standing. After 30 days of transplanting, the terminal buds were removed from all the plants to get sprouting of branches as per the traditional agricultural practices. The

growth and yield parameters, such as (a) height, (b) number of leaf, (c) longest leaf, (d) leaf area, (e) number of branches, (f) girth, (g) number of fruits, (h) fresh and dry weight of a fruit, (i) length and diameter of fruit (j) fresh and dry weight of root, shoot and leaf etc. were evaluated.

Harvesting

The plants (105 - day old) were harvested as root, shoot, leaf and fruit. Mature fruits were harvested at 80-105 days after transplanting or three to six weeks after flowering. The roots were washed with tap water and finally with distilled water to remove any adhering particles on the root surface. Then the roots were wrapped with soft tissue paper. After cleaning, fresh weight of root, shoot leaf and fruits were recorded. Then, the samples were air-dried at room temperature and finally oven-dried at 65°C for 48 hours. The dry weight of the samples was recorded and then grounded with a mechanical grinder and stored in plastic containers. Statistical analyses of the data were carried out following One-Way ANOVA using the Tukey test to estimate the significant difference among the treatments using Minitab 19.

RESULTS AND DISCUSSION

Plant height

Before application of vermicompost in pots, the average plant height was 2.5 cm initially. After incorporation of VC in different rates of the treatments, the significant increase ($p < 0.05$) in the plant height was observed in compare to control. Analysis of the results demonstrated that the tallest plant (38.53 cm) was recorded at maturity stage of capsicum in T₅ where 10-ton ha⁻¹ vermicompost was applied followed by T₃, T₂, T₄, T₆ and T₁, respectively (Table 1). This enhanced growth parameter of plant height obtained due to vermicompost acted as a good source of organic fertilizer which supplied favourable nutrients to the capsicum plant and would have improved the soil properties. This is in agreement with Pariari and Khan (2013) who found better plant height of capsicum with the integrated nutrient management of chilli (*Capsicum annum* L.) in Gangetic alluvial plains.

Most similar result was achieved in a study by Arancon *et al.* (2002) who observed that the growth of field peppers increased significantly when vermicompost was applied to field plots at the rates of 10-ton ha⁻¹ compared with those receiving equivalent amounts of inorganic fertilizer.

Table 1. Effects of different doses of vermicompost on the height (cm) of green capsicum plants.

Treatments	Days after transplanting						
	15d	30d	45d	60d	75d	90d	105d
T ₁ :Control(VC0)	7.63 ^a	14.40 ^a	21.50 ^a	24.33 ^d	24.73 ^e	25.16 ^f	25.23 ^f
T ₂ :VC _{2.5} .ton ha ⁻¹	6.50 ^c	10.40 ^c	15.03 ^c	24.33 ^d	27.86 ^d	28.60 ^d	28.76 ^d
T ₃ :VC ₅ . ton ha ⁻¹	6.96 ^{bc}	12.16 ^b	19.00 ^b	30.96 ^b	33.83 ^b	35.10 ^b	35.13 ^b
T ₄ :VC _{7.5} .ton ha ⁻¹	7.10 ^b	10.90 ^c	14.33 ^c	25.30 ^c	29.23 ^c	29.86 ^c	29.93 ^c
T ₅ :VC ₁₀ .ton ha ⁻¹	7.03 ^b	12.66 ^b	19.50 ^b	33.03 ^a	37.40 ^a	38.36 ^a	38.53 ^a
T ₆ :VC ₁₅ .ton ha ⁻¹	7.90 ^a	12.40 ^b	15.26 ^c	23.06 ^e	24.76 ^e	26.30 ^e	26.33 ^e

Values followed by different letters are significantly different at $P \leq 0.05$ according to Tukey's multiple range test (Tukey's test).

Number of leaf

The results of the number of leaves produced per plant at 15 days interval are presented in Table 2. It was observed that in the initial stage the variation in the number of leaves between the treated pots and control were not great, rather the control group showed much more leaves than the treated groups up to

30 days. After 30 days, the leaves showed pronounced growth. It was found during the study that the T₂ (VC 2.5 ton ha⁻¹) and T₅ (VC 10 ton ha⁻¹) treatments contributed maximum number of leaves (80 leaves plant⁻¹) during 75-90 days of growth. After 90 days, leaf number slightly decreased due to defoliation. At harvesting, T₂ (79 leaves plant⁻¹) produced the highest number of leaves followed by T₅ (VC 10 ton ha⁻¹) and lowest with control (13 leaves plant⁻¹). Similar observation was reported by Adiloglu *et al.* (2018) who reported that significant rise in the plant width, the number of leaves, leaf size, leaf width, and the plant fresh weight was observed upon the increasing doses of vermicompost application in lettuce cultivation.

Table 2. Effects of different doses of vermicompost on the number of leaf of green capsicum plants.

Treatments	Days after transplanting						
	15d	30d	45d	60d	75d	90d	105d
T ₁ :Control(VC ₀)	14 ^a	24 ^a	31 ^{ab}	30 ^d	15 ^d	14 ^d	13 ^c
T ₂ :VC _{2.5} .ton ha ⁻¹	12 ^a	16 ^b	36 ^a	70 ^a	80 ^a	80 ^a	79 ^a
T ₃ :VC ₅ .ton ha ⁻¹	13 ^a	17 ^b	27 ^b	49 ^c	56 ^c	60 ^c	57 ^c
T ₄ :VC _{7.5} .ton ha ⁻¹	13 ^a	13 ^b	26 ^b	46 ^c	62 ^c	71 ^b	69 ^b
T ₅ :VC ₁₀ .ton ha ⁻¹	13 ^a	15 ^b	29 ^{ab}	62 ^{ab}	71 ^b	80 ^a	77 ^a
T ₆ :VC ₁₅ .ton ha ⁻¹	12 ^a	16 ^b	26 ^b	52 ^{bc}	61 ^c	56 ^c	49 ^d

Values followed by different letters are significantly different at P≤0.05 according to Tukey's multiple range test (Tukey's test).

Leaf area

The highest leaf area, 87.68 cm² was recorded at maturity stage of capsicum plants in the T₃ followed by T₅ (Table 3). Based on superiority, in case of leaf area, the treatments could be arranged in the following sequence of T₃>T₅>T₁>T₄>T₂>T₆. However, maximum leaf area was observed in 5-ton ha⁻¹ (T₃). The influence of vermicompost is clear on the leaf area increment of plant and this finding are in agreement to the study of rice–legume of Jeyabal and Kuppuswarmy (2001). Vermicompost is a good source of organic matter and improves the physico-chemical properties of soil and thereby results in the highest leaf area of capsicum which showed similarity with the present study. Another study conducted by Rahman *et al.* (2021) who demonstrated that application of vermicompost at the rate of 25-ton ha⁻¹ gave higher leaf area in strawberry plants.

Table 3. Effects of different doses of vermicompost on the leaf area (cm² plant⁻¹) of green capsicum plants.

Treatments	Days after transplanting						
	15d	30d	45d	60d	75d	90d	105d
T ₁ :Control(VC ₀)	20.47 ^a	33.91 ^a	41.17 ^c	61.65 ^c	64.81 ^c	65.20 ^c	65.71 ^c
T ₂ :VC _{2.5} .ton ha ⁻¹	15.78 ^d	24.09 ^f	30.78 ^f	39.20 ^e	48.81 ^e	54.21 ^f	55.07 ^e
T ₃ :VC ₅ .ton ha ⁻¹	17.93 ^b	30.87 ^d	51.02 ^a	65.08 ^b	83.48 ^a	87.12 ^a	87.68 ^a
T ₄ :VC _{7.5} .ton ha ⁻¹	16.73 ^c	25.22 ^e	35.67 ^d	48.19 ^d	54.93 ^d	57.71 ^d	57.97 ^d
T ₅ :VC ₁₀ .ton ha ⁻¹	17.08 ^c	32.71 ^b	47.76 ^b	67.70 ^b	69.69 ^b	69.84 ^b	70.20 ^b
T ₆ :VC ₁₅ .ton ha ⁻¹	17.27 ^c	31.57 ^c	32.12 ^e	47.66 ^e	55.08 ^d	52.22 ^e	52.64 ^f

Values followed by different letters are significantly different at P≤0.05 according to Tukey's multiple range test (Tukey's test).

Number of branches and girth

The effects of vermicompost on the number of branches emerged from main stem and the girth of green capsicum plants were investigated on the day of 60 (Table 4). During this experimental period, the

number of branches was increased significantly ($p < 0.05$) in all the treated plants when compared to the control at the end of the investigation. The results showed that it produced the highest number of branches (6) in T₃ (VC 5-ton ha⁻¹), but no significant difference with T₅ (VC 0-ton ha⁻¹) was observed. The lowest number of branches (2) was recorded in control (T₁) treatment. Results are in agreement with Baloch *et al.* (2008). In their study they reported that organic fertilizer contains macro and micro nutrients along with NPK which provide nutrients and significantly affected the number of branches per plant.

Table 4. Effects of different doses of vermicompost on the number of branches and girth of green capsicum plants.

Treatments	Number of branches plant ⁻¹				Girth (cm plant ⁻¹)			
	60d	75d	90d	120d	60d	75d	90d	120d
T ₁ :Control(VC ₀)	1 ^b	1 ^b	2 ^c	2 ^c	2.03 ^d	2.33 ^d	2.37 ^d	2.37 ^e
T ₂ :VC _{2.5} .ton ha ⁻¹	2 ^{ab}	3 ^{ab}	3 ^{bc}	5 ^{ab}	2.07 ^{cd}	2.36 ^d	2.86 ^c	2.90 ^c
T ₃ :VC ₅ .ton ha ⁻¹	3 ^{ab}	4 ^a	5 ^{ab}	6 ^a	3.17 ^a	3.20 ^a	3.50 ^a	3.53 ^a
T ₄ :VC _{7.5} .ton ha ⁻¹	2 ^{ab}	3 ^{ab}	3 ^{bc}	4 ^{abc}	2.25 ^c	2.56 ^c	2.86 ^c	2.94 ^c
T ₅ :VC ₁₀ .ton ha ⁻¹	4 ^a	5 ^a	6 ^a	6 ^a	2.65 ^b	2.86 ^b	3.13 ^b	3.27 ^b
T ₆ :VC ₁₅ .ton ha ⁻¹	2 ^{ab}	3 ^{ab}	3 ^{bc}	3 ^{bc}	2.20 ^{cd}	2.66 ^c	2.76 ^c	2.76 ^d

Values followed by different letters are significantly different at $P \leq 0.05$ according to Tukey's multiple range test (Tukey's test).

Fruits

The results displayed in Table 5 showed the maximum number of fruits (7 fruits plant⁻¹) was harvested at maturity stage from T₃ followed by T₅ (4 fruits plant⁻¹), while the lowest number of fruits (2 fruits plant⁻¹) was recorded in control and T₄. The results point out that the yield of T₄ was lower than the T₃ and T₅. Yet this yield of T₄ and T₁ carried the same value. The yields of T₄ might have closer with T₃ and T₅. It can be explained from the facts of the study that the plants in T₄ were injured by insects and causes the yield reduction. Similar observation was found in a study of Arancon *et al.* (2002). They reported that growth and yields of field tomatoes and peppers increased significantly when the vermicompost applied to field plots at the rates of 20 ton ha⁻¹ and 10 ton ha⁻¹ for tomato and at rates of 10 ton ha⁻¹ and 5 ton ha⁻¹ for pepper compared with those receiving equivalent amounts of inorganic fertilizer.

Table 5. Effects of different doses of vermicompost on the fruits of green capsicum plants.

Treatments	No. of fruits per plant	Largest fruit length (cm)	Largest fruit diameter (cm)	Fresh weight of total fruits (g/plant)	Dry weight of total fruits (g/plant)	Fresh weight of a fruit (g/plant)	Dry weight of a fruit (g/plant)
T ₁ :Control(VC ₀)	2 ^b	15.40 ^d	5.83 ^d	61.00 ^f	5.125 ^f	30.10 ^d	2.56 ^e
T ₂ :VC _{2.5} .ton ha ⁻¹	3 ^b	16.00 ^c	5.37 ^e	88.00 ^c	10.70 ^c	44.00 ^a	3.57 ^c
T ₃ :VC ₅ .ton ha ⁻¹	7 ^a	16.53 ^b	6.17 ^c	320.25 ^a	31.02 ^a	44.75 ^a	4.43 ^a
T ₄ :VC _{7.5} .ton ha ⁻¹	2 ^b	13.90 ^e	7.30 ^a	73.33 ^e	6.55 ^e	38.66 ^c	3.28 ^d
T ₅ :VC ₁₀ .ton ha ⁻¹	4 ^{ab}	18.97 ^a	6.57 ^b	167.33 ^b	15.96 ^b	41.83 ^b	3.99 ^b
T ₆ :VC ₁₅ .ton ha ⁻¹	3 ^b	14.06 ^e	4.23 ^f	85.50 ^d	7.15 ^d	28.25 ^e	2.38 ^f

Values followed by different letters are significantly different at $P \leq 0.05$ according to Tukey's multiple range test (Tukey's test).

Further observation showed in Table 6 that it was yielded the same number of fruits (3 fruits plant⁻¹) in the T₆ (where highest 15 ton ha⁻¹ dose of VC was applied) and T₂ (where lowest dose of VC 2.5 ton ha⁻¹)

was applied). It's an evidence that there is no need of highest dose VC at the rate of 15 kg ha⁻¹ application to produce maximum yield. Similar findings were observed in a study conducted by Jashi and Vig (2010).

The maximum length of fruit (18.97 cm) was recorded in T₅ followed by T₃ where the largest diameter (7.30 cm) was observed in T₄. The maximum fresh weight of total fruits (320.25 g) was recorded in T₃ followed by T₅, T₂, T₆, T₄ and T₁. In case of the dry weight of total fruits per plant, similar finding was observed. The average weight of individual capsicum fruit was recorded for each treatment and demonstrated in the Table 5. The results show that there was a significant treatment difference for weight of fruit measured under the application of graded dosages of vermicompost. The average fresh and dry weight of individual fruit per treatment was significantly higher in T₃ followed by T₂, T₅, T₄, T₁ and T₆. Almost similar observation was found from another study on the effect of vermicompost and other fertilizers on the cultivation of tomato plants using different fertilizers having equal concentration of nutrients to determine their impact on different growth parameters of tomato plants (Chanda *et al.* 2011). They found that the application of vermicompost supplemented with NPK treated plots displayed better results with regard to the fresh and dry weights of leaves, dry weight of fruits, number of branches and fruits per plant from other fertilizers treated plants.

Fresh and dry weight of plants

The fresh and dry weights of root, shoot and leaf varied significantly ($p < 0.05$). The highest shoot weight (42.67 g) and leaf weight (56.0 g) were recorded in T₃ which varied significantly from other treatments except T₅. The maximum weight of root (11.20 g) was recorded in T₅ followed by T₃. The lowest root, shoot, and leaf weights were recorded in control (T₁). However, the maximum fresh weight and dry weight of plants were measured in T₃ (VC 5-ton ha⁻¹) which varied significantly from other treatments except T₅ (VC 10-ton ha⁻¹). This behavior is consistent with the findings of research workers Karmegam and Daniel (2000) who found that the fresh and dry matter yields of green gram were higher in vermicompost amended soils than soils with bio-digested slurry.

Table 6. Effects of different doses of vermicompost on the fresh and dry weights of green capsicum plants.

Treatments	After harvesting of plants				After harvesting of plants			
	Fresh weight (g/plant)				Dry weight (g/plant)			
	Root	Shoot	Leaf	Total	Root	Shoot	Leaf	Total
T ₁ (Control(VC ₀))	4.42 ^e	14.67 ^d	18.67 ^f	37.76 ^f	0.67 ^f	2.18 ^e	4.02 ^f	6.87 ^f
T ₂ (VC _{2.5} .ton ha ⁻¹)	7.50 ^c	11.33 ^e	36.67 ^d	55.50 ^d	1.42 ^d	4.30 ^c	6.78 ^c	12.50 ^d
T ₃ (VC ₅ .ton ha ⁻¹)	10.73 ^b	42.67 ^a	56.00 ^a	109.4 ^a	1.86 ^b	7.72 ^a	11.45 ^a	21.03 ^a
T ₄ (VC _{7.5} .ton ha ⁻¹)	7.83 ^c	33.77 ^c	42.00 ^c	83.60 ^c	1.61 ^c	6.42 ^b	5.75 ^d	13.78 ^c
T ₅ (VC ₁₀ .ton ha ⁻¹)	11.20 ^a	42.00 ^b	53.33 ^b	106.53 ^b	1.97 ^a	7.87 ^a	10.83 ^b	20.67 ^b
T ₆ (VC ₁₅ .ton ha ⁻¹)	5.38 ^d	14.67 ^d	28.67 ^e	48.72 ^e	0.93 ^e	3.80 ^d	4.60 ^e	9.33 ^e

Values followed by different letters are significantly different at $P \leq 0.05$ according to Tukey's multiple range test (Tukey's test).

All vermicompost treatments had significant positive influence over control on the growth and yield parameters. Highest fruit yield was found in T₅ (VC 10-ton ha⁻¹) and lowest in control. The performance of T₃ also found better in enhancing the growth and yield. An evaluation from the study revealed that highest dose containing T₆ (VC 15-ton ha⁻¹) reduced the growth and yield. It created an evidence that

utilization of cheap price vermicompost on green capsicum chili or vegetable crops will minimize the cost of production. Small scale farmers and producer of vermicompost will also be benefited.

REFERENCES

- Adhikary, S. 2012. Vermicompost, the story of white gold: A review. *J. Agric. Sci.* **3**(7): 905-917.
- Adiloğlu, S., F. E. Açıkgöz, Y. Solmaz, E. Çaktü and A. Adiloğlu. 2018. The effects of vermicompost on the growth and yield of lettuce plant (*Lactuca sativa* L. var. Crispa). *Int. J. Plant Soil Sci.* **21**(1): 1-5.
- Ansari, A. A. and K. Sukhraj. 2010. Effect of vermiwash and vermicompost on soil parameters and productivity of okra (*Abelmoschus esculentus*) in Guyana. *Afr. J. Agric. Res.* **5**(14): 1794-1798.
- Arancon, N. Q., C. A. Edwards, P. Bierman, J. Metzger, S. Lee and C. Welch. 2002. Applications of vermicomposts to tomatoes and peppers grown in the field and strawberries grown under high plastic tunnels. *Proceedings of the International Earthworm Symposium. September 2002.* Cardiff Wales, UK.
- Baloch, Q. B., Q. I. Chachar and M. N. Tareen. 2008. Effect of foliar application of macro and micro nutrients on production of green chilies (*Capsicum annuum* L.). *J. Agric. Technol.* **4**(2): 177-184.
- B. A. R. C (Bangladesh Agricultural Research Council). 2018. *Fertilizer Recommendation Guide-2018.* Priyanka Printing and Publications, Naya Palton, Dhaka 1000. 223 pp.
- B. B. S (Bangladesh Bureau of Statistics). 2020. *Yearbook of Agricultural Statistics-2019.* Planning Division, Ministry of planning, Government of the People's Republic of Bangladesh, Dhaka.
- Chanda, G. K., G. Bhunia and S. K. Chakraborty. 2011. The effect of vermicompost and other fertilizers on cultivation of tomato plants. *J. Hortic. Forestry* **3**(2): 42-45.
- Chaoui, H. I., L. M. Zibilske and T. Ohnot. 2003. Effects of earthworms cast and compost on soil microbial activity and plant nutrient availability. *Soil Biol. Biochem.* **35**: 295-302.
- Chaudhuri, P. S., T. K. Paul, A. Dey, M. Datta and S.K. Dey. 2016. Effects of rubber leaf litter vermicompost on earthworm population and yield of pineapple (*Ananas comosus*) in West Tripura, India. *Int. J. Recycl. Org. Waste Agric.* **5**: 93-103.
- Chowdhury, S. and M. K. Rahman. 2021. Influence of different organic manures on growth, yield, and mineral accumulation in lettuce (*Lactuca sativa* L.). *Dhaka Univ. J. Biol. Sci.* **30**(2): 159-168.
- Díaz-Laviada, I. 2010. Effect of capsaicin on prostate cancer cells. *Future Oncol.* **6**(10): 1545-1550.
- Huang, K., F. Li, Y. Wei, X. Fu and X. Chen. 2014. Effects of earthworms on physicochemical properties and microbial profiles during vermicomposting of fresh fruit and vegetable wastes. *Bioresour. Technol.* **170**: 45-52.
- Islam, M. M., S. M. Akther, S. A. Sujon, M. A. Karim and M. K. Rahman. 2020. Effects of vermicompost on the growth and protein content of spinach (*Spinacia oleracea* L.). *Bangladesh J. Bot.* **49**(1): 141-146.

- Jashi, R. and A. P. Vig. 2010. Effect of vermicompost on the growth, yield and quality of tomato (*Lycopersicon esculentum* L.). *Afric. J. Basic Appl. Sci.* **2**: 117-123.
- Jeyabal, A. and G. Kuppaswamy. 2001. Recycling of organic wastes for the production of vermicompost and its response in rice-legume cropping system and soil fertility. *Eu. J. Agron.* **15**(13): 153-170.
- Karmegam, N. and T. Daniel. 2000. Effect of vermicompost on the growth and yield of green gram (*Phaseolus aureus* Rob.). *Tropical Agric.* **76**(2): 143-146.
- Knapp, S., L. Bohs, M. Nee and D. M. Spooner. 2004. Solanaceae a model for linking genomics with biodiversity. *Com. Func. Genom.* **5**(3): 285-291.
- Lalander, C. H, A. J. Komakech and B. Vinnerås. 2015. Vermicomposting as manure management strategy for urban small-holder animal farms--Kampala case study. *Waste Manag.* **39**: 96-103.
- Liu, D., W. Han, Y. Zhang and Y. Jiang. 2019. Evaluation of vermicompost and extracts on tomato root-knot nematode. *Bangladesh J. Bot.* **48**: 845-851.
- Pariari, A. and S. Khan. 2013. Integrated nutrient management of chilli (*Capsicum annum* L.) in Gangetic alluvial plains. *J. Crop Weed* **9**(2): 128-130.
- Paul, T. K. 2009. *Technology of Sweet Pepper Production in Bangladesh*. PhD Thesis. Department of Horticulture, BSMRAU, Salna, Gazipur, pp. 225.
- Rahman, M., M. Alauddin and A. H. M. Z. Ali 2021. Growth and yield performance of strawberry (*Fragria ananassa*) under various doses of vermicompost and NPK fertilizers grown at rooftop of Charfassion area in the Southern parts of Bangladesh. *Dhaka Univ. J. Biol. Sci.* **30**(2): 283-292.
- Ravimycin, T. 2016. Effects of vermicompost (VC) and farmyard manure (FYM) on the germination percentage, growth, biochemical and nutrient content of coriander (*Coriandrum sativum* L.). *Int. J. Adv. Res. Biol. Sci.* **3**(6): 91-98.
- Sallaku, G., I. Babaj., S. Kaciu and A. Balliu. 2009. The influence of vermicompost on plant growth characteristics of cucumber (*Cucumis sativus* L.) seedlings under saline conditions. *J. Food Agric. Environ.* **7**: 869-872.
- Van Diepeningen, A. D., O. J. deVos, G. W. Korthals and A. H. C. van Bruggen. 2006. Effects of organic versus conventional management on chemical and biological parameters in agricultural soils. *Appl. Soil Ecol.* **31**: 120-135.
- Wang, D., Q. Shi, X. Wang, M. Wei, M. J. Hu, J. Liu and F. Yang. 2010. Influence of cow manure vermicompost on the growth, metabolite contents and antioxidant activities of Chinese cabbage (*Brassica campestris* ssp. *Chinensis*). *Biol. Fertil. Soils* **46**: 689-696.
- Xiao, Z. G., M. Q. Liu, L. H. Jiang, X. Y. Chen, B. S. Griffiths, H. X. Li and F. Hu. 2016. Vermicompost increases defense against root-knot nematode (*Meloidogyne incognita*) in tomato plants. *Appl. Soil Ecol.* **105**:177-186

