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Growth and yield response of Broccoli to vermicompost and farmyard manure

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ABSTRACT

The present experiment was carried out at Agricultural Research field, Noakahali Science and Technology University, Noakhali, Bangladesh during the period from September 2018 to February 2019 to find out the effects of Vermicompost and Farmyard manure growth and yield of Broccoli. The single factor experiment was carried out by Randomized Complete Block Design (RCBD) with three replications. Three treatments viz., T_0= Control, T_1= Vermicompost and T_2= Farm Yard Manure as well as Centeuro variety were used. Data were recorded from different stages of plant growth on plant height at different days after transplanting, number of leaves/plant, leaf length, leaf diameter, plant spread, 50% curd initiation days, 50% curd maturation days, curd diameter, Marketable curd weight, Net curd weight and Yield/plot. All the recorded parameters were statistically significant among the treatments. The tallest plant (43.67cm) can be recorded from T_1 (vermicompost) whereas lower plant height (38.10cm) was notified from control (T_0). The maximum number of leaves (16.03) recorded from vermicompost treated plant where minimum from control (T_0; 13.28). Highest leaf length (40.67cm), leaf diameter (16.22cm), plant spread (47.91cm✓), early curd initiation (73.22 days), early curd maturation (89.72 days), curd diameter (16.16cm), marketable curd weight (452.67g), net curd weight (361.43g) and yield/plot (3.94kg) was found from vermicompost treated plant is compared with Farmyard manure whereas lowest data recorded from control. Observing the results it can be stated that using of vermicompost treated plants gave better growth and yield contributing characters of Broccoli in contemporary with other treatments.

***Key Words**: Curd, Treatments, Vermicompost, Farmyard manure and Characters.*

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I. Introduction

Broccoli (*Brassica oleraces* L Var. *Italica* Planck) belongs to the family Brassicaceae or Cruciferae (mustard family) is an important cole crop vegetable and becoming popular day by day in Bangladesh. It is either consumed raw as salad or cooked to prepare curries, soup and pickles. It contains more nutrients among cole crops and rich in vitamins, minerals, antioxidants also fat and cholesterol free (Zhang, 2004). It holds Vitamin A higher than cauliflower in 130 times as well as cabbage in 22 times (Thamburaj and Singh, 2014). Use of chemical fertilizers alone increases the crop yields in the initial years but adversely affects sustainability at later stage (Gupta et al., 2019). Use of chemical fertilizers continuously into soil has negative impacts on soil texture, structure, organic matter as well as soil microbial activities (Alam et al., 2007). On the other hand, application of organic matters has significant role in terms of maintaining soil fertility and crop productivity (Karmegam and Daniel, 2000).

Organic matter plays a direct effect on plant growth by increasing available form of macro and micro nutrients during mineralization. It also improves soil physical and chemical properties as well as leading to sustainable agriculture (Chaterjee et al., 2005). Bulk density, water holding capacity, humic substances, microbial activities and hormone concentration in optimum range also obtained by application of farm fard manure and vermicompost (Sharma and Garg, 2017; Swami and Bazaya, 2010). Therefore, growth and yield of broccoli can be enhanced to a great extent by application of farm-yard manure and vermicompost. Considering these points in view the present experiment was conducted to find out the effects of farmyard manure and vermicompost on the growth and yield contributing characters of Broccoli in Noakhali.

II. Materials and Methods

The experiment was conducted to study the response of growth and yield of broccoli cv. Centauro to vermicompost and farmyard manure on Agricultural Research Field, Noakali Science and Technology University, Sonapur, Noakhali during the period of September 2018 to February 2019. The experiment was conducted under the AEZ 18 i.e. Young Meghna Estuarine Floodplain. This region occupies young alluvial land adjoining the Meghna estuary. The soil of the experimental site was sandy loam and pH was 7.3. The single factor experiment is carried out Randomized Complete Block Design with three replications. Three treatments viz., T_0= Control, T_1= Farm-yard manure and T_2= Vermicompost were selected.

Seedbed was prepared for rising broccoli seedling. The soil properly loosened with spade and big clods were broken and properly prepared for seed sowing. Then seed was sown in the seed bed. Seed was sowed in the seed bed on 25th September 2018. Before seed sowing, seed treatment with Carbandazim 50 WP solution in 20 minutes then sun dried for three hours. Main Plots were prepared by spade and weed and unwanted materials are removed.

Vermicompost and FYM manure both applied separately in separate plots in 15 days before transplanting at 3 kg/plot. 300 gram TSP and 150 gram MOP were applied during land preparation and 500 gram urea was applied in 25, 40 and 55 days after transplanting of plants per plot. Total number of plot 9. The unit plot size was 2.43 meter square. The distance between the blocks was 1 m and between plots was 50 cm. 28 days old healthy seedlings are transplanted (Hossain et al., 2020) on 30 October maintaining spacing 45 cm × 60 cm (plant to plant and row to row) at the rate of one seedling per hill. 9 plants are planting in each plot. Immediately after transplanting, light watering to the individual seedlings was provided to overcome water deficit. After the establishment of the seedlings, watering was done as and when necessary.

Weeding and mulching were done to keep the plots free from weeds, easy aeration of soil and to conserve soil moisture, which ultimately ensured better growth and development. Earthing up was done after the plant establishment. The continuous observation was done to ensure better growth of plants for good yield. The data were collected from the 6 plants except for yield/plot from each plot in different stages of crop growth for obtaining plant height at different days after transplanting, number of leaves/plant, leaf length, leaf diameter, plant spread, 50% curd formation days, curd diameter, Marketable curd weight, Net curd weight and Yield/plot parameters were discussed. The observed

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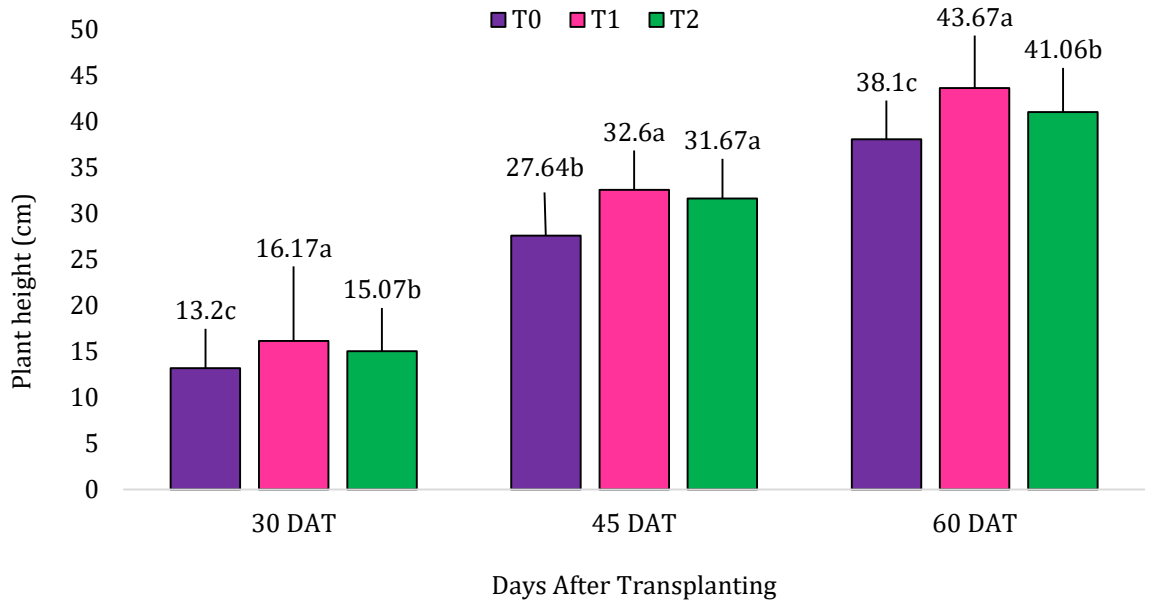
data of different parameters in this experiment were analyzed web-based agricultural statistics software package (WASP) and Microsoft Office Excel 2013 to find out the significant or non-significant within treatments and means were compared at 5% probability level (Gomez and Gomez, 1984)

III. Results and Discussion

Plant height (cm)

Plant height of different stages of crop growth was varied significantly (Figure 01). The highest plant height (16.17cm) at 30 days after transplanting were recorded from plants treated with vermicompost (T_1) in comparison with farmyard manure (T_2;15.07cm) and the lowest data (13.20cm) were noted from control (T_0). In case of 45 and 60 days after transplanting superior data (32.60 cm; 43.67cm) were recorded from vermicompost used plants in comparison with farmyard manure (31.67cm; 41.06 cm) treated plants whereas the lowest (27.64cm; 38.10cm) data were notified from control. Similar results were recorded by Kumar et al. (2013). Successive increase in vermicompost levels significantly increased the plant height (Mal et al., 2015).



T_0= Control, T_1= Vermicompost, T_2= Farmyard manure, Similar letters are not differed at 5% probability and dissimilar letters are differed at 5% probability level.

Figure 01. Effects of vermicompost and farmyard manure on plant height of Broccoli

Number of leaves/plant

A good number of leaves indicate better growth and development of a crop. It is also positively related to the yield of crops. The greater number of leaves, the greater the photosynthetic area which may result in higher fruit yield. Statistically significant data recorded among the treatments in terms of number of leaves/plant at 30, 45 and 60 days after transplanting (Figure 02). Superior data was found from vermicompost treated plants compared with other treatments. The highest number of leaves (7.07) at 30 DAT recorded from vermicompost in comparison with Farmyard manure (6.40) and the lowest data (6.0) were notified from control. In case of 45 DAT maximum leaves (13.23) obtained from vermicompost treated plant whereas the lowest data (9.79) were recorded from control meanwhile vermicompost also gives the superior results (16.03) at 60 DAT in comparison with T_2 (15.21) farmyard manure) and lowest data notified from control (T_0;13.28). This result could be found due to more nitrogen, phosphorus and potassium content in vermicompost in comparison with farmyard manure (Panta et al., 2018). Mal et al. (2015) reported that maximum number of leaves/plants can be obtained from application of 10 tons of vermicompost per hectare of land.

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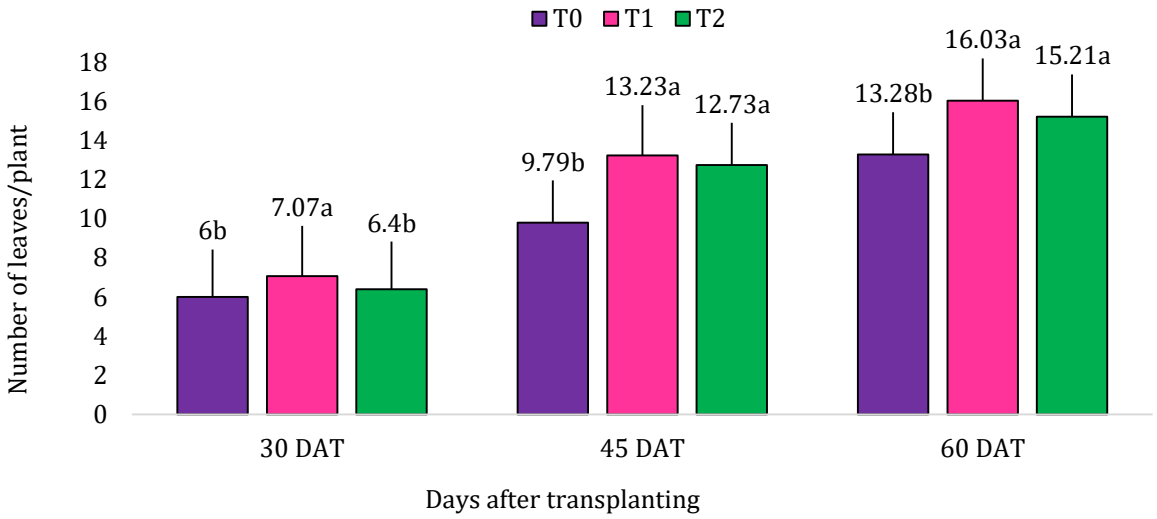
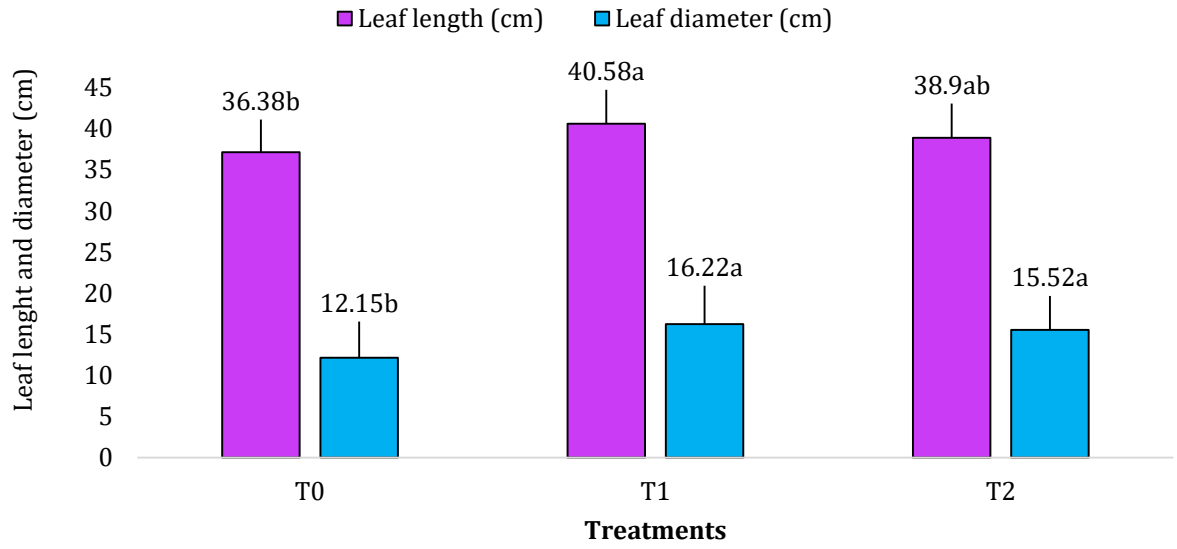


T_0= Control, T_1= Vermicompost, T_2= Farmyard manure, Similar letters are not differed at 5% probability and dissimilar letters are differed at 5% probability level.

Figure 02. Effects of vermicompost and farmyard manure on number of leaves/plant of Broccoli

Leaf length and diameter

Leaf length and diameter were affected by the application of vermicompost and farmyard manure. The highest leaf length and diameter (40.58cm; 16.22cm) were recorded from vermicompost treated plants (T_1) in compared with farmyard manure (38.9cm; 15.5cm) whereas lowest data (36.38cm; 12.15cm) were notified from control (Figure 03). Similar findings have also been reported by Kumar et al. (2013).



T_0= Control, T_1= Vermicompost, T_2= Farmyard manure, Similar letters are not differed at 5% probability and dissimilar letters are differed at 5% probability level.

Figure 03. Effects of vermicompost and farmyard manure on leaf length and diameter of Broccoli

Plant spread (cm✓)

The maximum plant spread (47.91 cm✓) was recorded from application of vermicompost (T_1) whereas minimum plant spread (38.02 cm✓) was found from Control (T_0). Farmyard manure treated plants gave 38.02 cm✓ (Figure 04). The results can be happened due to might be increase in leaf number, leaf length and diameter under different treatments can be attributed to the increase in plant spread.

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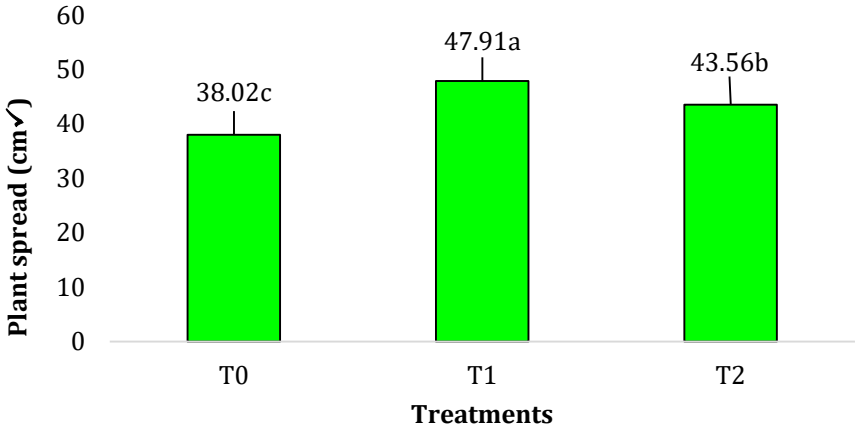

T_0= Control, T_1= Vermicompost, T_2= Farmyard manure, Similar letters are not differed at 5% probability and dissimilar letters are differed at 5% probability level.

Figure 04. Effects of vermicompost and farmyard manure on plant spread of Broccoli

50% curd initiation and maturation days

Days to curd initiation and maturation of 50% plants represented in Table 01. Early curd initiation and maturation (73.22 days; 89.72 days) data recorded from vermicompost treated plants (T_1) followed by farmyard manure (75.8 days; 94.07 days). Meanwhile higher days required to 50% curd initiation and maturation (80.8 days; 102.84 days) from control (T_0). Similar results were noted by Meena et al. (2017). It might be concluded that vermicompost enhances the early curd initiation, maturation as well as development in comparison to farmyard manure and control. Chaterjee et al. (2005) reported that curd initiation becomes more earlier for application of recommended doses of fertilizers over the organic manure application.

Curd Diameter (cm)

Among the treatments, curd diameter was significantly varied (Table 01). Superior curd diameter (16.16cm) was found from vermicompost treated plants (T_1) followed by farmyard manure (T_2; 13.82cm) whereas lowest data (11.39 cm) obtained from control. Lodhi et al. (2017) noted that organic manures increase the curd diameter over control. Vermicompost enhances the curd diameter also reported Singh et al. (2018).

Marketable and net curd weight (g)

Marketable curd weight (g) and Net curd weight (g) in this study are presented in (Table 01). Significantly varied among the treatments in terms of marketable and net curd weight. Regarding marketable curd weight, superior curd weight (452.67g) was found from vermicompost (T_1) whereas inferior data (332.33g) collected from control (T_0). Meanwhile, farmyard manure treated plants gave 409.34g marketable curd. In terms of net curd weight maximum curd weight (361.43g) also recorded from vermicompost treated plants followed by farmyard manure (298.87g) and minimum data obtained from control (230.67g). The lowest yield was found from control due to lack of available nutrients whereas vermicompost release more nutrients than farmyard manure (Panta et al. 2018). Organic manures in combination with inorganic fertilizers has a significant role in enhancing yield parameters in sprouting broccoli reported by Dash et al. (2019).

Yield/plot (kg)

Yield/plot varied significantly among the treatments (Table 01). The highest yield/plot (3.94kg) was found from Vermicompost in comparison with Farmyard manure (3.55kg) whereas lowest data (2.02kg) was recorded from control. The beneficial role of farmyard manure and vermicompost in improving physical, chemical and biological properties of soil, which in turn, help in better nutrient absorption by plants, also resulted in higher values for yield contributing parameters reported by Bahadur et al. (2003). Higher yield and head diameter can be obtained through availability of soil nutrients and favourable soil conditions resulting in healthy plant and high vegetative growth. The minimum yield was noted from control because of lacking plant nutrients into soil resulting in lower plant growth and yield contributing characters (Shangguan et al. 2000; Lawlor, 2002).

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Table 01. Effects of Vermicompost and Farm yard manure on Yield contributing characters of Broccoli

Treatments	Days to 50% curd initiation	Days to 50% curd maturation	Curd Diameter (cm)	Marketable curd weight (g)	Net curd weight (g)	Yield/ plot (kg)
T_0	80.8a	102.84a	11.39c	332.33b	230.67c	2.02b
T_1	73.22b	89.72b	16.16a	452.67a	361.43a	3.94a
T_2	75.8ab	94.07b	13.82b	409.34a	298.87b	3.55a
CV (%)	3.16	3.46	5.54	8.34	7.37	9.48
Significance	*	*	**	*	**	**
CD (5%)	5.49	7.49	1.73	75.29	49.62	0.68
CD (1%)			2.87		82.30	1.131

T_0= Control, T_1= Vermicompost, T_2= Farmyard manure, CV= coefficient of variation, *= significant at 5% level of probability, **= significant at 1% level of probability, CD= critical difference, Similar letters are not differed at 5% probability and dissimilar letters are differed at 5% probability level

IV. Conclusion

From the study, it could be revealed that significant effect on growth and yield contributing characters of Broccoli to vermicompost application. Recorded data regarding on plant height, number of leaves/plant, leaf length, leaf diameter, plant spread, 50% curd initiation, 50% curd maturation, curd diameter, marketable curd weight, net curd weight and yield/plot were superior to vermicompost compared to farmyard manure than control. Finally, it could be finished that application of vermicompost of Broccoli production is more beneficial than farmyard manure.

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