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GROWTH AND YIELD OF BROCCOLI (*Brassica oleracea* var. *italica*) TO DIFFERENT ORGANIC MANURES

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ABSTRACT

Shapla SA, Hussain MA, Mandal MSH, Mehraj H, Jamal Uddin AFM (2014) Growth and yield of broccoli (*Brassica oleracea* var. *italica*) to different organic manures. *Int. J. Sustain. Crop Prod.* 9(2), 29-32.

The experiment was conducted at Horticulture Farm of Sher-e-Bangla Agricultural University, Bangladesh during the period from October 2011 to March 2012 to find out the response of broccoli to different organic manures. The experiment consisted four different organic manures *viz.* M_0: Control i.e. no manure application; M_1: Cowdung @ 15 t/ha; M_2: Poultry Manure @ 12 t/ha and M_3: Vermicompost @ 13 t/ha following Randomized Complete Block Design with three replications. Maximum weight of primary curd (484.7 g), diameter of primary curd (10.0 cm), number of secondary curd (3.0), weight of secondary curd (76.7 g), dry matter content of leaves (13.9 g), dry matter content of curds (13.1 g), yield/plot (11.2 kg) and yield/hectare (12.0 ton) were found from M_2 while minimum from M_0.

Key words: *Brassica oleracea var. italica, organic manures, growth and yield*

INTRODUCTION

Broccoli (*Brassica oleracea* var. italica L.) belongs to Brassicaceae family is a biennial and herbaceous cole crops. Maintenance of soil fertility through the use of nutrients is important and about 50% of the world's crop production being attributed to organic fertilizer use (Pradhan 1992). Use of organic manures improve soil texture, structure, humus, aeration, water holding capacity and microbial activity (Pare *et al*. 2000). Good soil has more than 3% organic matter content but soil of Bangladesh have less than 1.5% organic matter even less than 1% organic matter (BARC 1997). Productivity of soils is declining due to depletion of organic matter caused by high cropping intensity. On an average well rotted cowdung contains 0.5% N, 0.2% P_2O_5 and 0.5% K_2O (Yawalkar *et al*. 1984). Application of vermicompost and poultry manure subsequently increase yield attributing characters and yield of broccoli (Sameera *et al*. 2005). Therefore, present investigation was carried out to find out the effect of organic manures on growth and yield of broccoli.

MATERIALS AND METHODS

The experiment was conducted at Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during the period from October 2011 to March 2012 to study the effect of organic manures on growth and yield of broccoli. Experiment consisted of four treatments *viz.* M_0: Control i.e. no manure application; M_1: Cowdung @ 15 t/ha; M_2: Poultry Manure @ 12 t/ha and M_3: Vermicompost @ 13 t/ha using Randomized Complete Block Design with three replications. Premium cultivar was used in the experiment. Each block was divided into 4 plots where 4 treatments were allotted at random. There were 12 unit plots altogether in the experiment. The size of the each plot was 2.25 m × 2.4 m. The distance maintained between two blocks and two plots were 1.0 m and 0.5 m, respectively. Cowdung, poultry manure and vermicompost were applied as per treatment as a basal dose. 23 days old healthy and uniform seedlings were transplanted in experimental plots on 18th November, 2011. Seedlings were planted in the plot with maintaining distance between row to row and plant to plant was 60 cm and 45 cm, respectively. For the data collection, five plants were randomly selected from each unit plot except yields of curds, which was recorded plot wise. Data were collected on plant height, number of leaves/plant, days to first visible curd, length of stem, diameter of stem, fresh weight of leaves/plant, length of root, fresh weight of roots/plant, weight of primary curd, diameter of primary curd, number of secondary curd, weight of secondary curds, dry matter content of leaves, dry matter content of curd, yield/plot and yield/hectare. Only the compact mature curds were harvested with 15 cm long fleshy stalk by using as sharp knife. The curds were harvested in compact condition before the flower buds opened (Thomson and Kelly, 1985). Before harvesting of the broccoli head, compactness of the head was tested by pressing with thumbs. After harvesting the main curd, secondly the shoots were developed from the leaf axils, which also developed into small secondary curds and were harvested over a period of time. For the dry weight, at first 100 gm samples of selected plant was collected, cut into pieces and was dried under sunshine for a few days and then dried in an oven at 70^{0}C for 72 hours before taking dry weight till it was constant then dry weight was recorded with a beam balance. Collected data were statistically analyzed by using MSTAT-C computer package program. The mean values were evaluated and analysis of variance was performed by the 'F' (variance ratio) test. The significance difference among the treatments was estimated by Duncan's Multiple Range Test (DMRT) at 1% level of probability (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Significant variation was found in number of leaves/plant and plant height of broccoli to different organic manure at different DAT (days after transplanting) and at harvest. Maximum number of leaves/plant was found from M_2 (17.1) which was statistically identical with M_3 (16.8) while minimum from M_0 (11.6) (Fig. 1). Rate of

release of nitrogen from the manure is higher in poultry litter than other sources of manures which ultimately were reflected in maximum number of leaves/plant (Thompson and Kelly, 1988). Tallest plant was found from M_2 (54.4 cm) which was statistically identical with M_3 (52.8 cm) while shortest was found from M_0 (41.3 cm) (Fig. 2). Organic fertilizer released all type of micro and macro nutrients that improved soil physical properties for higher growth of broccoli plants and plant height might be increased due to greater availability of nutrients (Sivakumar *et al.* 2007 and Nguyen *et al.* 2004; Ajari *et al.* 2003).

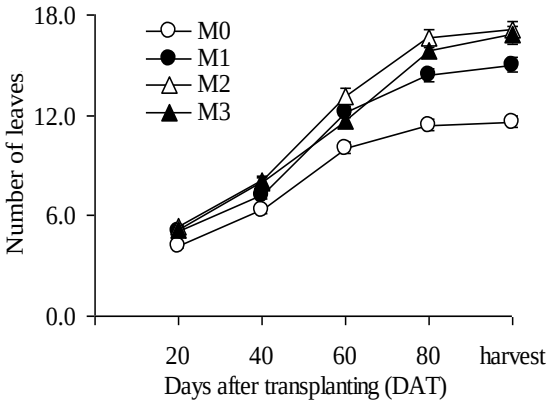

Fig. 1. Effect of organic manures on number of leaves/ plant

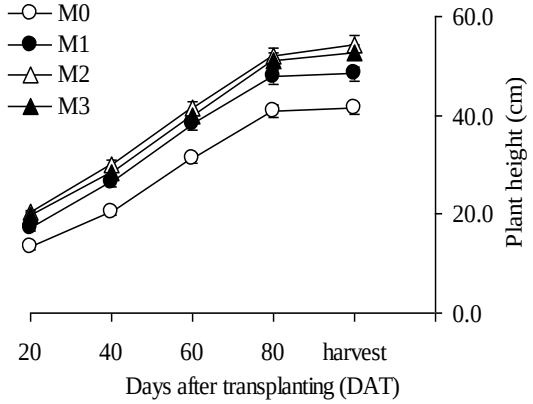

Fig. 2. Effect of organic manures on plant height

Days to first visible curd, length of stem, diameter of stem, fresh weight of leaves/plant, length of root, fresh weight of roots/plant showed significant variation to the organic manures. Minimum 50.6 days from transplanting to first visible curd was found from M_2 which was statistically similar with M_3 (53.0) wand M_1 (52.4) whereas maximum from M_0 (58.9) (Table 1). Longest stem was found from M_2 (26.2 cm) which was statistically identical with M_3 (25.7 cm) while shortest from M_0 (16.4 cm) (Table 1). Maximum stem diameter was found from M_2 (4.1 cm) which was statistically identical with M_3 (3.9 cm) while minimum from M_0 (3.1 cm) (Table 1). Maximum fresh weight of leaves/plant was found from M_2 (246.2 g) which was statistically identical with M_3 (234.8 g) while minimum M_0 (178.0 g) (Table 1). Increased leaf production in okra attributed to beneficial effect of poultry manure (Umoetok *et al.* 2007). Longest root was found from M_2 (25.3 cm) which was statistically identical with M_3 (24.7 cm) while minimum from M_0 (20.5 cm) (Table 1). Maximum fresh weight of roots/plant was found from M_2 (23.0 g) which was statistically similar with M_3 (22.8 g) and M_1 (21.4 g) while minimum from M_0 (19.4 g) (Table 1).

Table 1. Influence of broccoli to different organic manures on days to first visible curd, stem length, stem diameter, fresh weight of leaves, root length and fresh weight of roots[X]

Organic manures[Y]	Days to first visible curd	Length of stem (cm)	Diameter of stem (cm)	Fresh weight of leaves/plant (g)	Length of root (cm)	Fresh weight of roots/plant (g)
M_0	58.9 a	16.4 c	3.1 c	178.0 c	20.5 c	19.4 b
M_1	52.4 b	23.8 b	3.4 b	214.0 b	23.6 b	21.4 a
M_2	50.6 b	26.2 a	4.1 a	246.2 a	25.3 a	23.0 a
M_3	53.0 b	25.7 a	3.9 a	234.8 a	24.7 ab	22.8 a
LSD(0.01)	2.5	1.9	0.3	16.3	1.6	1.7
CV (%)	4.8	8.2	7.9	7.6	6.9	8.1

[X]In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.01 level of probability

[Y]M_0: Control i.e. no manure application; M_1: Cowdung @ 15 t/ha; M_2: Poultry manure @ 12 t/ha and M_3: Vermicompost @ 13 t/ha

Weight of primary curd, diameter of primary curd, number of secondary curd and weight of secondary curd broccoli varied significantly to different organic manures. Maximum weight of primary curd was found from M_2 (484.7 g) which was statistically identical with M_3 (466.5 g) whereas minimum from M_0 (253.9 g) (Table 2). Organic fertilizer released all type of micro and macro nutrients that improved soil physical properties for higher weight of primary curd. From the experiment it was found that poultry manures increased the weight of the primary curds and it might be caused that poultry manure contents high amount of nitrogen and nitrogen enhanced the photosynthesis, cell division, cell enlargement (Balyan *et al.* 1988; Sharma *et al.* 2002 and Singh 2004) Maximum diameter of primary curd was found from M_2 (10.0 cm) which was statistically identical with M_3 (9.9 cm) while minimum from M_0 (8.6 cm) (Table 2). Maximum number of secondary curd/plant was found from M_2 (3.5) which was statistically identical with M_3 (3.4) whereas minimum from M_0 (2.2) (Table 2). Application of different organic manures showed significant variation on weight of secondary curd/plant of

broccoli. Maximum weight of secondary curd/plant was found from M_2 (76.7 g) which was closely followed by M_3 (68.4 g) whereas minimum from M_0 (47.8 g) (Table 2).

Table 2. Response of broccoli to different organic manures on weight of primary curd, diameter of primary curd, number of secondary curd and weight of secondary curd[X]

Organic manures[Y]	Weight of primary curd (g)	Diameter of primary curd (cm)	Number of secondary curd	Weight of secondary curd/plant (g)
M_0	253.9 c	8.6 c	2.2 c	47.8 d
M_1	453.5 b	9.4 b	3.0 b	58.8 c
M_2	484.7 a	10.0 a	3.5 a	76.7 a
M_3	466.5 ab	9.8 ab	3.4 a	68.4 b
LSD(0.01)	19.0	0.5	0.3	5.8
CV (%)	4.7	4.9	1.7	9.4

[X]In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.01 level of probability

[Y]M_0: Control i.e. no manure application; M_1: Cowdung @ 15 t/ha; M_2: Poultry manure @ 12 t/ha and M_3: Vermicompost @ 13 t/ha

Different organic manure showed significant variation on dry matter content of leaves, dry matter content of curd, yield/plot and yield/hectare of broccoli. Maximum dry matter content of leaves was found from M_2 (13.9 g) which was statistically identical with M_3 (13.8 g) while minimum from M_0 (11.8 g) (Table 3). Maximum dry matter content of curd was found from M_2 (13.1 g) which was statistically identical with M_3 (12.3 g) while minimum from M_0 (11.6 g) which was statistically similar with M_1 (12.2 g) (Table 3). Maximum yield/plot was found from M_2 (11.2 kg) while minimum from M_0 (6.0 kg) (Table 3). Addition of poultry manure brought about improvement in soil chemical properties; soil pH, total N, available P, organic matter, exchangeable cations and cation exchange capacity were improved. Poultry manure could be used for soil management as it improves soil nutrient status and could be used for sustainable production of crops. Animal manure increased soil pH and macronutrient of soil (Ano and Agwu, 2006). The reduction in exchange acidity in plots that received organic manure suggests the ability of poultry manure to supply calcium to the soil (Cooper and Warman, 1999). Application of organic materials could ameliorate slightly acidic tropical soil to improve crop production (Akande *et al*. 2003). Poultry manure also increased soil organic matter, nitrogen, pH, phosphorus and cation exchange capacity (Adeniyan and Ojeniyi, 2003; Ayeni *et al.* 2008). Maximum yield/hectare was found from M_2 (12.0 ton) which was closely followed by M_3 (11.4 ton) whereas minimum from M_0 (6.5 ton) (Table 3). Manuring efficiency was initially higher with commercial fertilizer than the poultry manure alone, since lower amounts of total nutrients were applied using commercial fertilizer (Hochmuth *et al.* 1993). Highest curd yield of 20.70 and 16.75 tons/hectare were obtained with poultry manure and cowdung against 9.0 tons/hectare in the control treatment (Akter *et al*. 1996). Highest total yield and quality of broccoli were recorded by adding poultry manure in the two seasons (Abou *et al*. 2006).

Table 3. Response of broccoli to different organic manures on dry matter content of leaves, dry matter content of curds, yield/plot and yield per hectare[X]

Organic manures[Y]	Dry matter content of leaves (g)	Dry matter content of curds (g)	Yield/plot (kg)	Yield (ton/ha)
M_0	11.8 c	11.6 b	6.03 d	6.5 d
M_1	13.4 b	12.2 b	10.3 c	11.0 c
M_2	13.9 a	13.1 a	11.2 a	12.0 a
M_3	13.8 ab	12.3 ab	10.7 b	11.4 b
LSD(0.01)	0.4	0.8	0.4	0.3
CV (%)	4.4	6.8	4.6	2.8

[X]In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.01 level of probability

[Y]M_0: Control i.e. no manure application; M_1: Cowdung @ 15 t/ha; M_2: Poultry Manure @ 12 t/ha and M_3: Vermicompost @ 13 t/ha

CONCLUSION

From the above result and discussion it can be concluded that poultry manure (12 ton/ha) was the best for the broccoli production. As vermicompost (13 ton/ha) had statistically similar response to the broccoli production so farmers can use vermicompost also concerning the availability and economic concern of the vermicompost and poultry manures.

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