



Original Research Article

## Effect Of Organic Manures On Yield And Economic Analysis Of Tomato Varieties

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Received: 02/05/2015

Revised: 20/05/2015

Accepted: 24/05/2015

### ABSTRACT

The field experiment was conducted in the Horticultural farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during the period from October 2013 to March 2014. Two factors were used in the experiment, viz. factor A: four types of organic manure such as  $M_0$  = Control,  $M_1$  = Cow dung (20 t/ha),  $M_2$  = Poultry manure (16 t/ha) and  $M_3$  = Vermi compost (14 t/ha) and factor B: three varieties such as  $V_1$  = BARI tomato 15,  $V_2$  = BARI tomato 14 and  $V_3$  = BARI tomato 2. The experiment was laid out in Randomized complete Block Design with three replications. The maximum yield (86.25 t/ha) was recorded from treatment combination of  $M_2V_1$ , while  $M_0V_3$  gave the minimum (31.25 t/ha). The highest benefit cost ratio (2.98) was obtained from  $M_2V_1$  and the lowest (1.41) from  $M_0V_3$ .

**Key Words:** Tomato, organic manures, variety, yield and economic analysis.

### INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) belongs to the family Solanaceae. It was originated in tropical America, [1] particularly in Peru, Ecuador and Bolivia of the Andes. [2] It is one of the important, popular and nutritious vegetables grown in Bangladesh in both winter and summer season around all parts of the country. [3] Bangladesh produces 103 thousand tones of tomato from 18.16 thousand hectares of land, the average yield being 8.72 t/ha. [4] This yield is very low compared to other tomato growing countries. This low yield may be due to use of low yielding varieties and poor crop management.

Organic matter is a source of food for the innumerable number of microorganisms and creatures like earthworm who breaks down these to micronutrients, which are easily absorbed by the plants. Organic manure plays a direct role in plant growth as a source of all necessary macro and micronutrients in available forms during mineralization, improving the physical and physiological properties of soils. Organic manures such as cow dung, poultry manure and vermin compost improves the soil structure, aeration, slow release nutrient which support root development leading to higher growth and yield of tomato plants. The

macronutrients calcium and micronutrients boron, manganese, molybdenum and iron are important for tomato cultivation. Biologically active soils with adequate organic matter usually supply enough of these nutrients. [5]

Tomato can be grown on a wide range of soil types, ranging from light sand to heavy loam or, even clay that are well supplied with organic matter. Fertilizer management is one of the most important factors, which assured crop production. Use of chemical fertilizers in crop production is one of the important causes of environmental pollution. Use of organic matter in crop production has many advantages over chemical fertilizers. Organic manure saves the crop plants from adverse environment.

Increasing the production and improving the keeping quality of tomato are of paramount importance, now-a-days, for meeting the internal demand the consumers. Hence efforts should be given to identify varieties with high yield potential. Adequate information's on field performance of tomato cultivars are lacking in the country. The present study was undertaken in view of the following objective to determine the best organic manure on growth and yield of tomato.

## **MATERIALS AND METHODS**

The field experiment was conducted in the Horticultural farm at Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka-1207, Bangladesh during the period from October 2013 to March 2014. The location of the experimental site was at in 23.75<sup>0</sup> N latitude and 90.34<sup>0</sup> E longitudes with an elevation of 8.45 meter from the sea level. The climate of the experimental area was subtropical in nature. It is characterized by heavy rainfall, high temperature, high humidity and relatively long day during kharif season (April to

September) and a scanty rainfall associated with moderately low temperature, low humidity and short day period during rabi season (October to March). Soil of the study site was silty clay loam in texture. The area represents the Agro-Ecological Zone of Madhupur tract (AEZ-28) with p<sup>H</sup> 5.8-6.5, ECE 25-28. Three varieties of tomato were used in this experiment. Tomato seeds were collected from Vegetable division, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur. Seedbed was prepared on 8 October' 2013 for raising seedlings of tomato and the size of the seedbed was 3 m × 1 m. Seeds were sown on 12 October 2013 in the seedbed. Healthy and 30 days old seedlings were transplanted into the experimental field on 12 November 2013. The field experiment was conducted by Randomized Complete Block Design (RCBD) with three replications. Two factors were used in the experiment, viz. four types of organic manure and three types of variety. Two factors were used in the experiment, viz. factor A. four types of organic manure such as M<sub>0</sub>= Control, M<sub>1</sub> = Cow dung (20 t/ha), M<sub>2</sub> = Poultry manure (16 t/ha) and M<sub>3</sub> = Vermi compost (14 t/ha) and factor B. three varieties such as V<sub>1</sub> = BARI tomato 15, V<sub>2</sub> = BARI tomato 14 and V<sub>3</sub> = BARI tomato 2. The total numbers of plot were 36. The size of a unit plot was 2.4 m × 2.4 m. The experimental area was first opened on 15 October 2013 by a disc plough to open direct sunshine to kill soil borne pathogens and soil inhabitant insects. It was prepared by several ploughing and cross ploughing with a power tiller followed by laddering to bring about a good tilth. Thirty days-old healthy seedlings were transplanted at the spacing of 60 cm × 40 cm in the experimental plots on 12 November 2013. Fruits were harvested at 3-day intervals during early ripe stage when they attained slightly red color. Harvesting was started

from 15 February, 2014 and was continued up to 15 March, 2014. The data in respect of yield components were statistically analyzed to find out the significance of the experimental results. The means of all the treatments were calculated and the analysis of variance for each of the characters under study was performed by F test. The difference among the treatment means were evaluated by Duncan's Multiple Range Test (DMRT). [6]

The cost of production was analyzed in order to find out the most economic treatment of organic manures and varieties of tomato. All the non-material and material input costs and interests on running capital were considered for computing the cost of production. The interests were calculated for six months @ 13% per year. The price of one kg tomato at harvest was considered to be Tk. 5.00. Analyses were done according to the procedure determining by Alam *et al.* [7]

## RESULTS AND DISCUSSION

### Yield per plant

Yield per plant varied significantly due to application of different organic manures (Table 1). The maximum (2.06 kg/plant) yield was recorded from M<sub>2</sub> (Poultry manure), while the minimum (0.99kg/plant) was found from M<sub>0</sub> (Control treatment). The results also agreed to the findings of Kushwah *et al.* [8]

Different varieties showed significant variation on yield per plant under the present investigation (Table 1). The maximum (1.75 kg/plant) yield was recorded from V<sub>1</sub> (BARI Tomato 15) and the minimum (1.37kg/plant) yield was obtained from V<sub>3</sub> (BARI Tomato2). Similar trend of results were found by scientists like Thompson *et al.*, [9] Hossain and Ahmed [10] and Berry *et al.* [11]

**Table 1: Effect of organic manures and varieties on yield/plant and yield/plot of tomato**

Treatment	Yield/Plant (Kg)	Yield/Plot (Kg)
Organic manures		
M <sub>0</sub>	0.99 c	23.68c
M <sub>1</sub>	1.53 bc	32.64 b
M <sub>2</sub>	2.06 a	44.08a
M <sub>3</sub>	1.65 b	40.96 ab
Variety		
V <sub>1</sub>	1.75 a	36.9 a
V <sub>2</sub>	1.54 ab	34.86 a
V <sub>3</sub>	1.37 b	34.26 a
LSD (0.05)	0.32	9.01
CV (%)	8.21	7.54

A significant variation was found due to combined effect of organic manures and varieties for yield per plant (Table 2). The maximum (2.07 kg/plant) yield was recorded from treatment combination of M<sub>2</sub>V<sub>1</sub> (Poultry manure + BARI Tomato 15), and M<sub>0</sub>V<sub>3</sub> (Control treatment + BARI Tomato 2) gave the minimum yield (0.75 kg/plant).

**Table 2: Combined effect of organic manures and varieties on yield/plant, yield/plot and yield of tomato**

Treatment	Yield / Plant (Kg)	Yield /Plot (kg)	Yield (t/ha)
M <sub>0</sub> V <sub>1</sub>	1.18 cd	28.32 cd	49.17 cd
M <sub>0</sub> V <sub>2</sub>	1.03 de	24.72 de	42.92 de
M <sub>0</sub> V <sub>3</sub>	0.75 e	18.0 e	31.25 e
M <sub>1</sub> V <sub>1</sub>	1.19 d	28.56 d	49.58 d
M <sub>1</sub> V <sub>2</sub>	1.39 c	33.36 c	57.92 c
M <sub>1</sub> V <sub>3</sub>	1.50 bc	36.0 bc	62.50 bc
M <sub>2</sub> V <sub>1</sub>	2.07 a	49.68 a	86.25 a
M <sub>2</sub> V <sub>2</sub>	1.69 bc	40.56 b	70.42 b
M <sub>2</sub> V <sub>3</sub>	1.75 b	42.0 ab	72.92 ab
M <sub>3</sub> V <sub>1</sub>	1.71 bc	41.04 ab	71.25 ab
M <sub>3</sub> V <sub>2</sub>	1.70 bc	40.8 ab	70.83 b
M <sub>3</sub> V <sub>3</sub>	1.71 bc	41.04 ab	71.25 ab
LSD (0.05)	0.32	9.01	15.65
CV (%)	8.21	7.54	9.21

### Yield per plot

Yield per plot varied significantly due to application of different organic manures (Table 1). The maximum (44.08 kg/plot) yield was recorded from M<sub>2</sub> (Poultry manure) and the minimum (23.68 kg/plot) was recorded from M<sub>0</sub> (Control treatment). Different varieties showed significant variation on yield per plot under the present trial (Table 1). The maximum (36.9 kg/plot) yield was recorded from V<sub>1</sub> (BARI Tomato

15) and the minimum yield (34.26 kg/plot) was recorded from V<sub>3</sub> (BARI Tomato 2). The variation was found due to combined effect of organic manures and varieties for yield per plot (Table 2). The maximum (49.68kg/plot) yield was recorded from treatment combination of M<sub>2</sub>V<sub>1</sub> (Poultry manure + BARI Tomato 15) and M<sub>0</sub>V<sub>3</sub> (Control treatment + BARI Tomato 2) gave the minimum yield (18.00 kg/plot).

### Yield per hectare

Yield per hectare varied significantly due to different organic fertilizer (Figure 1). The maximum (67.36 t/ha) yield was obtained from M<sub>2</sub> (Poultry manure) and the minimum (50.56 t/ha) was recorded from M<sub>0</sub> (Control treatment).

Different varieties showed significant variation on yield per hectare under the present investigation (Figure 2). The maximum yield (63.85 t/ha) was recorded from V<sub>1</sub> (BARI Tomato 15) and the minimum yield (59.48 t/ha) was recorded from V<sub>3</sub> (BARI Tomato 2). The present investigation also agreed to the findings of Ajlouni *et.al.* [12]

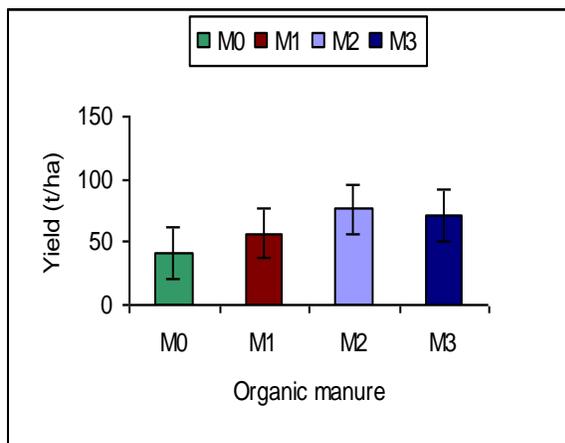


Figure 1. Effect of organic manures on yield of tomato

A significant variation was found due to combined effect of organic manures and varieties for yield per hectare (Table 2). The maximum yield (86.25 t/ha) was recorded from treatment combination of

M<sub>2</sub>V<sub>1</sub> (Poultry manure + BARI Tomato 15) and the treatment combination of M<sub>0</sub>V<sub>3</sub> (Control treatment + BARI Tomato 2) gave the minimum yield (31.25 t/ha).

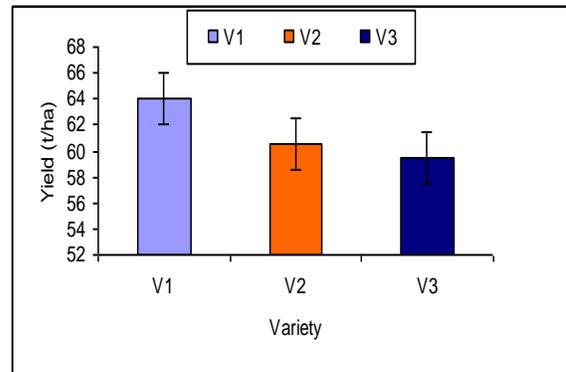


Figure 2. Effect of organic manures on yield of tomato

### Economic analysis

Input costs for land preparation, seed cost, fertilizer, irrigation and man power required for all the operations from sowing to harvesting of tomato were recorded for unit plot and converted into cost per hectare (Table 3). Price of tomato was considered in market of Gorgon, Dhaka rate basis. The economic analysis was done to find out the gross and net return and the benefit cost ratio in the present experiment and presented under the following headings:

**Gross return:** In the combination of organic manures and variety showed different gross return under the trial (Table 3). The highest gross return (USD 5,390.63) per hectare was recorded from M<sub>2</sub>V<sub>1</sub> (Poultry manure and BARI tomato 15) and the lowest gross return (USD 1,953.13) was recorded from M<sub>0</sub>V<sub>1</sub> (no fertilizer and BARI tomato 15).

**Net return:** In case of net return different treatment combination showed different amount of net return (Table 3). The highest net return (USD 3,583.81) was recorded from M<sub>2</sub>V<sub>1</sub> (Poultry manure and BARI tomato 15) and the lowest net return (USD 564.44) was recorded from M<sub>0</sub>V<sub>1</sub> (no fertilizer and BARI tomato 15).

**Benefit cost ratio:** The combination of organic manures and variety for benefit cost ratio was different for treatment combination (Table 3). The highest (2.98) benefit cost ratio was recorded from M<sub>2</sub>V<sub>1</sub>

and the lowest benefit cost ratio (1.41) was recorded from M<sub>3</sub>V<sub>3</sub>. From economic point of view, it was apparent from the above results treatment combination of M<sub>2</sub>V<sub>1</sub> was more profitable compare to others.

**Table 3. Cost and return in tomato production as influenced by organic manures and variety**

Treatment	Total cost of production (USD/ha)	Yield (t/ha)	Gross income (USD)	Net Return (USD)	Benefit cost Ratio (BCR)
M <sub>0</sub> V	1,388.69	49.17	1953.13	564.44	2.21
M <sub>0</sub> V <sub>2</sub>	1,388.69	42.92	2,682.5	1,293.81	1.93
M <sub>0</sub> V <sub>3</sub>	1,388.69	31.25	3,073.13	1,684.44	1.47
M <sub>1</sub> V <sub>1</sub>	1,667.44	49.58	3,098.75	1,431.31	1.86
M <sub>1</sub> V <sub>2</sub>	1,667.44	57.92	3,620.00	1,952.56	2.17
M <sub>1</sub> V <sub>3</sub>	1,667.44	62.5	3,906.25	2,238.81	2.34
M <sub>2</sub> V <sub>1</sub>	1,806.81	86.25	5,390.25	3,583.81	2.98
M <sub>2</sub> V <sub>2</sub>	1,806.81	70.42	4,401.25	2,594.44	2.44
M <sub>2</sub> V <sub>3</sub>	1,806.81	72.92	4,557.5	2,750.69	2.52
M <sub>3</sub> V <sub>1</sub>	3,019.38	71.25	4,453.13	1,391.94	1.45
M <sub>3</sub> V <sub>2</sub>	3,019.38	70.83	4,426.88	1,365.69	1.45
M <sub>3</sub> V <sub>3</sub>	3,019.38	71.25	4,453.13	1,433.75	1.41

Price of tomato@ USD 62.5 per ton

## CONCLUSION

The maximum (2.07 kg/plant) yield was recorded from treatment combination of M<sub>2</sub>V<sub>1</sub> while the treatment combination M<sub>0</sub>V<sub>3</sub> gave the minimum yield (0.75 kg/plant). The maximum (49.64kg/plot) yield was recorded from treatment combination of M<sub>2</sub>V<sub>1</sub> while the treatment combination of M<sub>0</sub>V<sub>3</sub> gave the minimum yield (18.00 kg/plot). The maximum yield (86.25 t/ha) was recorded from treatment combination of M<sub>2</sub>V<sub>1</sub> while the treatment combination of M<sub>0</sub>V<sub>3</sub> gave the minimum yield (31.25 t/ha). The highest benefit cost ratio (2.98) was obtained from the treatment combination of poultry manure and BARI Tomato 15 and the lowest benefit cost ratio (1.41) was found from the treatment combination of vermicompost with BARI Tomato 2.

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How to cite this article: Chowdhury Md. SN, Khairul Mazed HEM, Pulok Md. AI et. al. Effect of organic manures on yield and economic analysis of tomato varieties. *Int J Res Rev.* 2015; 2(5):211-216.

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