



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 3.4
IJAR 2015; 1(5): 94-97
www.allresearchjournal.com
Received: 08-02-2015
Accepted: 20-02-2015

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Effect of organic manures on assessment of shelf life of tomato varieties (*Lycopersicon esculentum* Mill.)

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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 M₀= Control, M₁ = Cow dung (20 t/ha), M₂ = Poultry manure (16 t/ha) and M₃ = Vermi compost (14 t/ha) and factor B: three varieties such as V₁ = BARI tomato 15, V₂ = BARI tomato 14 and V₃ = BARI tomato 2. The experiment was laid out in Randomized complete Block Design with three replications. In case of shelf life three storage conditions were used, such as open at room temperature 24 °C, perforated polythene bag in room temperature 24 °C and refrigerator in 10 °C with both in half ripe and full ripe conditions. The height shelf life was found when tomato was kept in refrigerator in 10 °C in half ripe (23.80 days) and lowest (1.00 days) from open room temperature 24 °C in full ripe condition.

Keywords: Tomato, varieties, organic manures and shelf life.

1. Introduction

Tomato (*Lycopersicon esculentum* Mill.) belongs to the family Solanaceae. It was originated in tropical America [7], particularly in Peru, Ecuador and Bolivia of the Andes [6]. 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 [5]. Bangladesh produces 103 thousand tones of tomato from 18.16 thousand hectares of land, the average yield being 8.72 t/ha (BBS, 2010). 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 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. 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 [8].

In Bangladesh, a large number of tomato varieties are grown which are of exotic origin and were developed long before. Most of them lost their potentiality due to genetic deterioration and disease contamination. Hence, in order to improve the present situation of tomato production in Bangladesh, it is essential to better varieties to the growers of Bangladesh. Recently the Bangladesh Agricultural Research Institute (BARI) developed some varieties with good contributing characters.

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.

Stage of maturity at harvest is another important factor regulating different physiological changes during storage and ripening of tomato. Storage quality of tomato is highly dependant

upon the stage of harvesting. Tomatoes when harvested at later stages had reduced shelf life, while early harvesting caused more loss in weight but showed better storability^[9]. Shelf life depends to a great extent on the variety and to some extent on the storing condition. Research in many countries of the world contributed to the development of variety with good shelf life of tomato. 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 long shelf life. Adequate information's on field and storage performance of tomato cultivars are lacking in the country. The present study was undertaken in view of the following objective to investigate the suitable storage condition for higher shelf life of tomato.

2. 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° N latitude and 90.34° 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^H 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_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 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.

Laboratory experiment was carried out after harvesting the fruit to find out the shelf life of tomato at different storage condition. The experiment was laid out in two factors Completely Randomized Design (CRD) with four organic manures and 3 varieties combinations under three storage conditions. The storage conditions were as follows:

- i) Stored in open condition at room temperature (24 °C) both in half ripe and full ripe stage
- ii) Stored in perforated polythene bags at room temperature (24 °C) both in half ripe and full ripe stage
- iii) Stored in perforated polythene bags at 10 °C in refrigerator both in half ripe and full ripe stage.

The three mature tomatoes were selected for each treatment. The selected tomato was kept in a perforated polythene bag. The changes of physiological structure of tomato fruit were recorded by eye estimation. Laboratory trail comprised of four organic manure and three varieties combinations with three storage conditions. Data on post harvest duration (days) was estimated until the changes of physiological structure of tomato fruit under different storage condition. The data in respect of yield, quality and 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) (Gomez and Gomez, 1984).

3. Results and Discussion

Organic manures exhibited a significant influence on shelf life of tomato at different storage conditions viz., open at room temperature, polyethylene bag at room temperature and polyethylene bag at refrigerator (Table 1).

Shelf life of tomato in open at room temperature in half ripen condition ranged from 4.00 to 12.00 days and in open at room temperature in full ripen condition ranged from 2.00 to 8.80 days. In half ripen condition the maximum shelf life (12.00 days) of tomato was found in M_2 (Poultry manure) and minimum (4.00 days) was found in M_0 (control). In full ripen condition the maximum shelf life (8.80 days) of tomato was found in M_2 (Poultry manure) and minimum (2.00 days) was found in M_0 (control).

Shelf life of tomato in polyethylene bag at room temperature in half ripens condition ranged from 7.00 to 15.47 days. And in full ripen condition ranged from 5.00 to 11.80 days. In half ripen condition the maximum shelf life (15.47 days) of tomato was found in M_2 (Poultry manure) and minimum (7.00 days) was found in M_0 (control). In full ripen condition the maximum shelf life (11.80 days) of tomato was found in M_2 (Poultry manure) and minimum (5.00 days) was found in M_0 (control).

Shelf life of tomato in polyethylene bag at refrigerator in half ripens condition ranged from 12.00 to 20.47 days and in full ripen condition ranged from 10.00 to 16.00 days. In half ripen condition the maximum shelf life (20.47 days) of tomato was found in M_2 (Poultry manure) and minimum (12.00 days) was found in M_0 (control). In full ripe condition the maximum shelf life (16.00 days) of tomato was found in M_2 (Poultry manure) and minimum (10.00 days) was found in M_0 (control).

Table 1: Effect of different levels of organic manure and storage condition on shelf life (days) of tomato

Treatments	Storage condition on shelf life (days) of tomato					
	Open at room temperature (24 °C)		Polyethylene bag at room temperature (24 °C)		Polyethylene bag at refrigerator (10 °C)	
	Period (days)		Period (days)		Period (days)	
	Half ripe	Full ripe	Half ripe	Full ripe	Half ripe	Full ripe
M ₀	4.00 d	2.00 c	7.00 d	5.00 c	12.00 d	10.00 c
M ₁	7.30 c	5.30 b	10.20 c	8.30 b	15.20 c	13.30 b
M ₂	12.13 a	8.80 a	15.47 a	11.80 a	20.47 a	16.80 a
M ₃	9.00 b	6.44 b	12.00 b	9.33 b	17.00 b	14.33 b
LSD (0.05)	1.69	1.69	1.69	1.69	1.69	1.693
CV (%)	5.54	6.21	7.21	6.32	6.54	6.24

Means in the column followed by different letter(s) differed significantly by DMRT at 5% level of significance

Different varieties exhibited a significant influence on shelf life of tomato at different storage conditions, viz. open at room temperature, polyethylene bag at room temperature and polyethylene bag at refrigerator (Table 2).

Shelf life of tomato in open room temperature in half ripen condition ranged from 5.15 to 11.40 days and in open room temperature in full ripen condition ranged from 2.48 to 8.90 days. In half ripen condition the maximum shelf life (11.40 days) of tomato was found in V₁ (BARI tomato 15) and minimum (5.15 days) was found in V₃ (BARI tomato 2). In full ripen condition the maximum shelf life (8.90 days) of tomato was found in V₁ (BARI tomato 15) and minimum (2.48 days) was found in V₃ (BARI tomato 2).

Shelf life of tomato in polyethylene bag at room temperature in half ripen condition ranged from 8.40 to 14.32 days and in full ripen condition ranged from 5.40 to 11.90 days. In half ripen condition the maximum shelf life (14.32 days) of tomato was found in V₁ (BARI tomato 15) and minimum (8.40 days) was found in V₃ (BARI tomato 2). In full ripen condition the maximum shelf life (11.90 days) of tomato was found in M₂ (Poultry manure) and minimum (5.40 days) was found in V₃ (BARI tomato 2).

Shelf life of tomato in polyethylene bag at refrigerator in half ripen condition ranged from 13.40 to 19.33 days and in full ripen condition ranged from 10.40 to 16.90 days. In half ripen condition the maximum shelf life (19.33 days) of tomato was found in V₁ (BARI tomato 15) and minimum (13.40 days) was found in V₃ (BARI tomato 2). In full ripen condition the maximum shelf life (16.90 days) of tomato was found in M₂ (Poultry manure) and minimum (10.40 days) was found in V₃ (BARI tomato 2).

Among the three storage condition it was found that the shelf life of tomato increased in the polyethylene bag at refrigerator condition. This could be due the effect of low temperature in refrigerator. Low temperature minimizes the respiration of tomato as well as polyethylene bag also minimize the respiration process. The positive effect of polymeric film was also reported by Dennis, *et al.* (1979) [3].



Open at room temperature



Polyethylene bag at room temperature (24 °C)



Polyethylene bag at refrigerator (10 °C)

Plate 1: Post harvest analysis

Table 2: Effect of different levels of variety and storage condition on shelf life (days) of Tomato

Treatments	Storage condition on shelf life (days) of tomato.					
	Open at room temperature (24 °C)		Polyethylene bag at room temperature (24 °C)		Polyethylene bag at refrigerator (10 °C)	
	Period (days)		Period (days)		Period (days)	
	Half ripe	Full ripe	Half ripe	Full ripe	Half ripe	Full ripe
V ₁	11.40 a	8.90 a	14.32 a	11.90 a	19.33 a	16.90 a
v ₂	7.77 b	5.52 b	10.77 b	8.52 b	15.77 b	13.52 b
V ₃	5.15 c	2.48 c	8.40 c	5.40 c	13.40 c	10.40 c
LSD (0.05)	1.69	1.69	1.69	1.69	1.69	1.69
CV (%)	5.54	6.21	7.21	6.32	6.54	6.24

Means in the column followed by different letter(s) differed significantly by DMRT at 5% level of significance

Combined application of variety and organic manure exhibited a significant influence on shelf life of tomato at different storage conditions, viz. open at room temperature, perforated polyethylene bag at room temperature and polyethylene bag at refrigerator (Table 3). Shelf life of tomato in open at room temperature in half ripen condition ranged from 3.00 to 15.80 days and in full ripen condition ranged from 1.00 to 12.80 days. The maximum shelf life in half ripen (15.80 days) of tomato was found in M₂V₁ which was statistically similar to that of M₃V₁ and the minimum (3.00 days) was found in M₀V₃.

Shelf life of tomato in polyethylene bag at room temperature in half ripens condition ranged from 6.00 to 18.80 days. The maximum shelf life (18.80 days) of tomato was found in M₂V₁ which was statistically similar to that of M₃V₁ and the minimum (6.00 days) was found in M₀V₃. Shelf life of

tomato in polyethylene bag at room temperature full ripens condition ranged from 4.00 to 15.80 days. The maximum shelf life (15.80 days) of tomato was found in M₂V₁ which was statistically similar to that of M₃V₁ and the minimum (4.00 days) was found in M₀V₃.

Shelf life of tomato in polyethylene bag at refrigerator in half ripens condition ranged from 11.00 to 23.80 days. The maximum shelf life (23.80 days) of tomato was found in M₂V₁ which was statistically similar to that of M₃V₁ and the minimum (11.00 days) was found in M₀V₃. Shelf life of tomato in polyethylene bag at refrigerator in full ripens condition ranged from 9.00 to 20.80 days. The maximum shelf life (20.80 days) of tomato was found in M₂V₁ which was statistically similar to that of M₃V₁ and the minimum (9.00 days) was found in M₀V₃.

Table 3: Combined effect of variety, organic manure, stage of maturity and Storage condition on shelf life (days) of tomato

Treatment	Storage condition on shelf life (days) of tomato					
	Open at room temperature (24 °C)		Polyethylene bag at room temperature (24 °C)		At refrigerator (10 °C)	
	Period (days)		Period (days)		Period (days)	
	Half ripe	Full ripe	Half ripe	Full ripe	Half ripe	Full ripe
M ₀ V ₁	5.00 e	3.00 d	8.00 e	6.00 d	13.00 e	11.00 d
M ₀ V ₂	4.00 ef	2.00 de	7.00 ef	5.00 de	12.00 ef	10.00 de
M ₀ V ₃	3.00 f	1.00 e	6.00 f	4.00 e	11.00 f	9.00 e
M ₁ V ₁	10.30 bc	8.30 b	13.00 c	11.30 b	18.00 c	16.30 b
M ₁ V ₂	7.30 d	5.30 c	10.30 d	8.30 c	15.30 d	13.30 c
M ₁ V ₃	4.30 ef	2.30 de	7.30 ef	5.30 de	12.30 ef	10.30 de
M ₂ V ₁	15.80 a	12.80 a	18.80 a	15.80 a	23.80 a	20.80 a
M ₂ V ₂	11.80 b	8.80 b	14.80 b	11.80 b	19.80 b	16.80 b
M ₂ V ₃	8.80 cd	4.80 c	12.80 c	7.80 c	17.80 c	12.80 c
M ₃ V ₁	14.50 a	11.50 a	17.50 a	14.50 a	22.50 a	19.50 a
M ₃ V ₂	8.00 d	6.00 c	11.00 d	9.00 c	16.00 d	14.00 c
M ₃ V ₃	4.50 ef	1.83 de	7.50 ef	4.50 de	12.50 ef	9.50 de
LSD _(0.05)	1.69	1.69	1.693	1.693	1.69	1.693
CV (%)	5.54	6.21	7.21	6.32	6.54	6.24

Means in the column followed by different letter(s) differed significantly by DMRT at 5% levels of significance

It was revealed that the shelf life of tomato increased dependent with different organic manures (M) and varieties (V) application in all the three storage condition. Among the three storage condition it was found that the shelf life of tomato increased in the polyethylene bag at refrigerator condition. This could be due the effect of low temperature in refrigerator. Low temperature minimizes the respiration of tomato as well as polyethylene bag also minimize the respiration process. Similar results reported by Beard (1990)^[2] and suggested that application of organic manures in excess of 180 kg/ha must be avoided for better storage in cabbage.

4. Conclusion

In case of storage conditions Tomato kept in polyethylene bag in refrigerator in half ripe at 10 °C showed highest shelf life (23.80 days) while the lowest shelf life (1.00 days) was observed when the tomato were open at room temperature without polyethylene bag in full ripe condition.

5. References

1. BBS. Monthly Statistical Bulletin. Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Govt. of the People's Republic of Bangladesh, Dhaka, 2010, 55.
2. Berad LS. Effect of nitrogen fertilization on stored cabbage, I. Development of physiological disorders on

tolerant and susceptible cultivars, J Hort Sci 1990; 65(3):289- 296.

3. Dennis C, Browne KH, Adamic F. Controlled atmosphere storage of tomato. Proc. Symp. On quality of vegetables. Hort 1979; 93:75.
4. Gomez K A and Gomez A A. Statistical Procedure for Agricultural Research (Edn. 2), John Willey and Sons, New York, 1984, 28-92.
5. Haque MS, Islam MT, Rahman M. Studies on the presentation of semi-concentrated tomato juice. Bangladesh J Agril Sci 1999; 26(1):37-43.
6. Kalloo. Tomato (*Lycopersicon esculentum* Mill). Indian Hort 1989; 33(1):12-15.
7. Salunkhe DK, Desai BB, Bhat NR. Vegetables and Flower Seed Production. Edn. 1, Agricola Publishing Academy., New Delhi, India, 1987, 118-119.
8. Singh SP, Kushwah VS. Effect of integrated use of organic and-inorganic sources of nutrients on potato (*Solanum tuberosum*) production. Indian J Agrono 2006; 51(3):236-238.
9. Subburamu K, Singaravelu M, Nazar A, Irulappan I. Effect of stage of harvest in tomato cultivars in improving the shelf life and fruit quality. South Indian Hort 1990; 938(4):199-203.