

EFFECTS OF PLANTING TIME ON THE GROWTH AND YIELD OF TOMATO VARIETIES IN LATE SEASON

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ABSTRACT

An experiment was conducted at Jessore to observe the effect of planting date and variety on the yield of late planting tomato. The potentiality of fruiting in the late season were evaluated for BARI tomato 4, 5, 6 and 12 by planting December 01, December 16, January 01, January 16 and February 01. A combination of December 01 planting with BARI Tomato 5 variety performed better in respect of yield (57.07 t/ha). The variety BARI Tomato 5 also showed potential fruiting capability during late winter season and February 01 planting produced 11 ton/ha of potential yield. All the four varieties showed potential fruiting capability during late winter season and February 01 planting produced 4-6 tons of potential yield during late season.

Key words : Planting time, Growth, Yield, Tomato, Varieties

INTRODUCTION

Tomato (*Lycopersicon esculentum*) is one of the most important winter vegetables of Bangladesh. It is a popular and nutritious vegetable rich in vitamin A and C. Tomato has a great demand throughout the year, but its production is concentrated during the month from January to March in our country. Although production of summer tomatoes just started in this country, there is still a long way to go for successful commercial production of the crop during the summer season in this country due to a number of limitations. Successful production of tomato in summer season requires heat tolerant varieties together with some special techniques of using growth regulators and poly tunnels.

In Bangladesh, production of tomato in the late and early growing season is difficult due to the prevailing high temperature. High temperature before and after the short winter

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season inhibits fruit setting and subsequent development. The non-availability of tomato during summer and rainy seasons is mainly because of prevailing high summer temperature (Abdalla and Verkerk, 1968). The ideal blossom setting temperature for tomatoes is around 30°C. They can still hold their blossoms up to 35°C, but it will decline in that range. After 30°C for any length of time and the blossoms fall off before they can produce a tomato, and your fruit production goes downhill rapidly (www.early-tomato.com.2009). There are great variations among the cultivars in flowering and fruiting under high temperature conditions (above 30°C). High temperature coupled with ultra high rainfall is the major bottleneck for tomato cultivation during off season in Bangladesh. Bangladesh Agricultural Research Institute has developed (BARI) some heat tolerant varieties, which can grow both in winter and summer seasons. So, there prevails a scope of extending the picking of tomato in late season by selecting proper variety and proper date of planting. Among them BARI Tomato 4, 5, 6 and 12 are reported to be heat tolerant and recommended for cultivation during summer season with growth regulators. During the pick season, the price of tomato remains very low. But after that, price of the tomato increased gradually. The availability of tomato can be extended by cultivating heat tolerant varieties in late season. Information regarding the potentiality of the BARI released heat tolerant tomato varieties are yet to be assessed in the agro-ecology of Jessore. Therefore, the present experiment was undertaken to study response of different genotypes of tomato during off season under the agro-climatic conditions of this region.

MATERIALS AND METHODS

The experiment was carried out at the Regional Agricultural Research Station, Jessore during 2003-04. Five planting dates (December 01 and 16, January 01 and 16 and 01 February) were used as main factor and four tomato varieties viz. BARI Tomato-4, BARI Tomato-5, BARI Tomato-6 and BARI Tomato-12 were used as sub-factor. The experiment was laid out in a split plot design with 3 replications. Planting dates were assigned in the main plot and varieties in the sub-plot. The unit plot size was 3 m x 4 m. Thirty days old seedlings were transplanted maintaining 60 x 50cm spacing between and within rows. The crop was fertilized with 10 tons of cowdung and 100, 34, 104, 27, and 1.3 kg N, P, K, S and B/ha, respectively. Half of cowdung, P, K and full dose of S and B were applied during final land preparation. The remaining 50% cowdung, P and 50% N were used during pit preparation prior to planting. The rest N and K were applied in two equal installments at 21 and 35 DAT. Thirty days old seedling were planted as per treatment. Irrigation, weeding, plant protection and other intercultural operation were done as and when necessary. Harvesting continued from 11 March to 22 April depending on the planting date and maturity of different varieties. Data on plant height, number per plant, Weight of fruit per plants and yield per plot were taken and analyzed as per standard statistical rule.

RESULTS AND DISCUSSION

The planting time in the late season had remarkable influence on the growth as well as yield and yield components of tomato. Delayed planting gradually decreased the plant height, fruit set, fruit number, fruit weight and yield of tomato. Sharma and Tiwari (1996) reported that transplanting on 13 February resulted in greater fruit set (82.23%) and number of fruit/plant (48.70) than transplanting on 5 or 25 March. Yield and yield contributing characters were influenced significantly due to difference sowing planting dates (Table 1). The highest yield (48.70 t/ha) was obtained from 01 December planting, being 23, 97, 325 and 573% higher than that planted in 16 December, 01 January, 16 January and 01 February, respectively. The yield/plant was significantly different under all 5 dates of planting. The highest fruit setting (43.52%) was obtained in 01 December planting, followed by 16 December, 01 February, 01 January and 16 January planting. The higher yield in 01 December planting was owing to higher fruit setting and number of fruit production. At the time of flowering and fruit setting higher flower and fruit production as well as higher yield. Levy *et al.* (1978) reported that high temperature between 15°C and 20°C is optimum for fruit setting of tomato. The average day temperature of 23.30°C - 27.5°C during January-February reduced the flower and fruit production. Abdul and Harris (1978) reported that temperature affected the level of endogenous hormones. They found that low temperature reduced the level of different gibberellins in young leaves and this was associated with an increase in the number of flowers. This may be possible cause of higher flower production as well as fruit production is 01 December planting. Saito and ITO (1971) also agree to this finding.

Table 1. Effect of date of planting on the yield and yield components of late planting tomato at RARS, Jessore during 2003-04

Planting date	Plant height (cm)	Fruits settings (%)	Fruits/plant (no.)	Yield/plant (kg)	Yield (t/ha)
Dec. 01	99.52 ^a	43.52 ^a	46.47 ^a	1.91 ^a	48.70 ^a
Dec. 16	93.85 ^b	29.46 ^a	33.80 ^b	1.62 ^b	39.60 ^b
Jan. 01	87.38 ^c	22.70 ^c	25.34 ^c	1.23 ^c	24.63 ^c
Jan. 16	68.21 ^d	13.44 ^d	15.58 ^d	0.54 ^d	11.46 ^d
Feb. 01	69.48 ^d	22.72 ^c	9.50 ^e	0.32 ^e	7.23 ^e
F Test	**	**	*	*	*
CV (%)	9.77	12.80	11.23	12.63	10.56

Yield and yield components of tomato were significantly influenced by the varieties planted during late season (Table 2). BARI Tomato 4 and 5 were observed statistically identical in all the studied parameters except fruit setting and those varieties produced significantly shorter plant height than BARI Tomato 12 and BARI Tomato 6. On the other hand both BARI tomato 4 and 5 produced significantly higher number and weight of fruit per plant and the corresponding yield were also recorded higher than BARI Tomato 6

and BARI Tomato 12. Among the different varieties the highest yield was recorded in BARI Tomato 5 followed by BARI Tomato 4. The fruit setting was found the highest in BARI Tomato 5 followed by BARI Tomato 4. High fruit setting (29.84%) resulted in highest yield in BARI Tomato 5.

Table 2. Effect of variety on the yield and yield components of late planting tomato at RARS, Jessore during 2003-04

Variety	Plant height (cm)	Fruits settings (%)	Fruits/plant (no.)	Yield/plant (kg)	Yield (t/ha)
BARI Tomato 4	63.34 ^c	34.51 ^b	35.62 ^a	1.23 ^a	29.47 ^a
BARI Tomato 5	63.43 ^c	37.49 ^a	37.68 ^a	1.33 ^a	30.82 ^a
BARI Tomato 6	100.72 ^b	23.38 ^c	18.20 ^b	1.02 ^b	24.21 ^b
BARI Tomato 12	107.25 ^a	12.62 ^d	13.05 ^c	0.91 ^c	20.79 ^c
F Test	**	*	**	**	**
CV (%)	9.77	12.80	11.23	12.63	10.56

The combined effect of time and variety also had significant influence on all the parameters. The highest yield (57.07 t/ha) was obtained from 01 December planting with the variety BARI Tomato 5 which was statistically identical to 01 December planting with variety BARI Tomato 4. The yield of different varieties decreased gradually up to final planting date in all the varieties. Hossain (2001) reported that tomato picking period could be extended from 21 January to 25 May with use of the variety BARI Tomato 5 and BARI Tomato 4 planted at different dates under Jessore condition. BARI Tomato 5 picking period was the longest (35.83 days) in October 25 planting and shortest (15.83 days) in February 14 planting. December 01 and December 16 planting produced considerably reasonable yield of tomato. But January 01 planting produced almost 50 percent less of the yield than earlier plantings and January 16 and February 01 planting produced almost 1/3 and 1/6 of the yield than earlier December 01 and December 16 plantings irrespective of the varieties. The yield of tomato was remarkably reduced in February planting. The lower yield in this planting was due to the lower number of fruit setting and also the low survivability of the plants. In the late season planting, it was observed that BARI Tomato 6 produced the lower number of fruit per plant but bigger in size. The least number of fruit (4.10) and the lowest yield (4.5 t/ha) were from the BARI Tomato 12 at February planting. Tomato planted on 15 August gave maximum yield than those of 15 May, 15 June and 15 July and TM0832 was the highest yielding hybrid than TM0836, TM0831 and TM0832 (BARI, 1998).

From the overall results a combination of December 01 planting with BARI Tomato 5 variety performed better in respect of yield. The variety BARI Tomato 5 also showed potential fruiting capability during late winter season and February 01 planting produced 11 t/ha of potential yield. However, the availability of tomato can be extended by cultivating heat tolerant variety BARI Tomato 5 in late season to solve the non-availability of tomato during summer and rainy season's at Jessore region.

Table 3. Interaction effect of planting date and variety on the yield and yield components of late planting tomato at RARS, Jessore during 2003-2004

Planting time	Variety	Plant height (cm)	Fruits settings (%)	Fruits/Plant (no.)	Yield/Plant (g)	Average fruit wt (g)	Yield (t/ha)
Dec. 01	BARI Tomato 4	74.93 ^{fg}	62.69 ^a	64.73 ^a	2.17 ^b	33.50	55.91 ^a
	BARI Tomato 5	76.73 ^{fg}	70.38 ^a	71.57 ^a	2.41 ^a	33.70	57.07 ^a
	BARI Tomato 6	118.20 ^b	30.06 ^{cd}	29.03 ^{def}	1.68 ^c	57.90	43.02 ^{cd}
	BARI Tomato 12	128.20 ^a	21.47 ^{fgh}	20.53 ^{efg}	1.41 ^d	68.80	38.79 ^d
Dec. 16	BARI Tomato 4	69.32 ^{gh}	43.26 ^{bc}	44.40 ^{bc}	1.69 ^c	37.95	44.60 ^{bc}
	BARI Tomato 5	69.07 ^{bc}	46.41 ^b	47.13 ^b	1.97 ^b	41.86	48.69 ^b
	BARI Tomato 6	111.07 ^{bc}	26.21 ^e	24.57 ^{dg}	1.37 ^d	55.70	32.42 ^e
	BARI Tomato 12	125.97 ^a	23.42 ^{efg}	19.10 ^{fgh}	1.42 ^d	74.37	32.69 ^e
Jan. 01	BARI Tomato 4	65.30 ^h	31.38 ^{cd}	34.33 ^{ed}	1.42 ^d	41.20	26.57 ^f
	BARI Tomato 5	64.10 ^h	31.42 ^{cd}	32.83 ^{de}	1.21 ^{de}	36.70	24.39 ^f
	BARI Tomato 6	105.43 ^c	21.39 ^{fgh}	19.47 ^{fg}	1.22 ^{de}	62.69	25.43 ^f
	BARI Tomato 12	113.70 ^b	19.62 ^{gh}	14.72 ^{ghi}	1.08 ^e	73.31	22.14 ^f
Jan. 16	BARI Tomato 4	54.33 ⁱ	24.27 ^{ef}	22.13 ^{efg}	0.58 ^f	26.11	13.47 ^g
	BARI Tomato 5	52.10 ⁱ	22.13 ^{efg}	21.00 ^{efg}	0.60 ^d	28.47	12.71 ^g
	BARI Tomato 6	87.13 ^{de}	18.81 ^{ghe}	12.40 ^{ghi}	0.57 ^{fg}	40.04	13.82 ^g
	BARI Tomato 12	79.27 ^{ef}	17.25 ^{he}	6.80 ^{hi}	0.40 ^{fgh}	59.26	5.82 ⁱ
Feb. 01	BARI Tomato 4	52.83 ⁱ	15.78 ^{hef}	12.50 ^{ghi}	0.32 ^{gh}	25.20	6.80 ^{hi}
	BARI Tomato 5	54.20 ⁱ	19.83 ^{gh}	15.87 ^{ghi}	0.43 ^{fgh}	27.11	11.25 ^{gh}
	BARI Tomato 6	81.77 ^{def}	11.16 ⁱ	5.53 ⁱ	0.26 ^h	47.19	6.37 ⁱ
	BARI Tomato 12	89.13 ^d	19.34 ^{gh}	4.10 ⁱ	0.25 ^h	58.78	4.51 ⁱ
F-test		**	**	**	**	**	**
CV (%)		9.77	12.80	11.23	12.63	10.56	11.76

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