J. Sylhet Agril. Univ. 6(1&2): 41-45, 2019 **ISSN: 2308-1597**

ASSESSMENT OF HYBRID SUMMER TOMATO PRODUCTION AT LATE WINTER SOWINGS

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(Available online at www.jsau.com.bd)

Abstract

An experiment was carried out to assess the influence of two sowing dates on growth and yield of hybrids tomato during summer season at the experimental field of Horticulture department, Sylhet Agricultural University, Sylhet using RCBD with three replications during January to June, 2018. In this study, four tomato hybrids viz., BARI Hybrid Tomato-3, BARI Hybrid Tomato-4, BARI Hybrid Tomato-8 and BARI Hybrid Tomato-10 were grown at two different sowing dates i.e. 2 January and 1 February. Tomato hybrids had showed significant variations on inflorescence characteristics, fruit qualities and yield attributes of tomato during late winter. Almost similar fruit yields were recorded from January and February sowing (43.86 t ha^{-1} and 43.52 t ha^{-1}, respectively) indicating bright scope of growing tomato in late winter. The highest fruit weight $plant^{-1}$ as well as fruit yield per hectare and number of fruit $plant^{-1}$ were obtained from BARI Hybrid Tomato-4 (1.59 kg $plant^{-1}$, 54.06 t ha^{-1} and 31.83, respectively) while the lowest yield was found in BARI Hybrid Tomato-3 (1.08 kg $plant^{-1}$, 36.72 t ha^{-1} and 19.83, respectively). The heaviest individual fruit was found in BARI Hybrid Tomato-10. The interaction effect had significant influence on growth and yield of tomato production. The highest fruit weight $plant^{-1}$ and fruit yield per hectare (1.66 kg $plant^{-1}$ and 56.44 t ha^{-1} , respectively) was found from BARI Hybrid Tomato-4 on January sowing whereas the lowest was found in BARI Hybrid Tomato-3 on February sowing (1.05 kg $plant^{-1}$ and 35.70 t ha^{-1}).

Keywords: Tomato hybrids, Sowing dates and Late winter.

Introduction

Tomato (*Solanum lycopersicum* L) is one of the most popular and nutritious garden vegetable all over the universe. It belongs to Solanaceae family. Tomato is grown in almost all areas of Bangladesh during winter season due to the presence of congenial atmosphere (Rashid, 1999; Haque *et al.*, 1999; Patwary *et al.*, 2013). Tomato requires day temperature of 21-28ºC and moderately cool night temperature of 15-20ºC for proper fruit setting (Grubben, 1977). High temperature (both day and night), humidity, rainfall and light intensity are the basic limiting factors of tomato production (Abdullah and Verkerk, 1968, Shalaby, 2012). High temperature at day and night above 32ºC and 21ºC respectively was recorded as limiting factor to fruit set unimpaired complex of physiological process in the pistil leading to floral or fruit abscission (Picken, 1984). For the fulfillment of increasing demand of tomato in summer season, the Horticultural Research Center (HRC) of Bangladesh Agricultural Research Institute (BARI) has been developed some heat tolerant varieties. As a high demand vegetable, we need to increase the availability of tomato all around the year. During lean period especially during late winter to early summer there is a scanty of vegetable supply in Bangladesh. For that reason, newly developed tomato hybrids can be evaluated during late winter to extend availability of tomato during lean period. Keeping these aspects in the present study, different tomato varieties viz. BARI Hybrid Tomato–3, BARI Hybrid Tomato–4, BARI Hybrid Tomato–8 and BARI Hybrid Tomato–10 are aimed to grow at two sowing dates (January and February).

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Materials and Methods

The experiment was conducted at the experimental field of Horticulture Department, Sylhet Agricultural University, Sylhet from January to June, 2018. The experiment was factorial RCBD where, factor A: four tomato hybrids (BARI Hybrid Tomato-3, BARI Hybrid Tomato-4, BARI Hybrid Tomato-8, BARI Hybrid Tomato-10) and factor B: Sowing dates (2 January and 1 February). The unit plot size was 2.3 m × 2.4 m having 4 rows per bed and 6 plants row^{-1} and 24 plants bed^{-1} for transplantation. Plants were spaced at 60 cm × 40 cm between row to row and plant to plant, respectively. Seeds of four hybrid tomato varieties were sown in raised seedbed on 2 January 2018 and 1 February 2018 respectively and seedlings were transplanted to the main field when the seedlings were 28 days old. The given doses of fertilizers were Cowdung @15 t ha^{-1}, urea @ 300 kg ha^{-1}, TSP @ 200 kg ha^{-1} and MoP @ 140 kg ha^{-1} respectively (Rashid and Singh, 2000). Making poly tunnel, gap filling, weeding, mulching, staking and other important intercultural operations were done throughout the whole cropping period. Collected data on yield and yield attributes were analyzed using MSTAT software for analysis of variance and means were separated under Duncun Multiple Range Test (DMRT).

Results and Discussion

Effect of sowing dates

Influence of sowing dates on tomato production during late winter season is presented in Table 1. Yield and yield attributes due to sowing dates were not significantly affected except fruit breadth and TSS (%). The crops grown from late winter season required around 52-53 days to first flower and harvested at around 87 day after sowing. Similar results in relation to days to first flower and first harvest were also reported by other researchers (Ahmad *et al*., 2011; Islam *et al*., 2017). Fruits harvested from the plants grown from 1 February sowing had higher fruit breadth and TSS (%) than that of crop grown from 2 January sowing. The most important yield contributing characters like number of fruits per plant, individual fruit weight, fruit weight plant^{-1} were not significantly affected due to sowing dates. However, crops grown from both of the sowing dates produced around 24.0 number of fruits plant^{-1}. Plants of January and February sowing produced fruit had statistically similar individual fruit weight (53.33 g and 54.54 g, respectively). The fruits weight plant^{-1} was 1.29 kg in 2 January sowing which was at par with that of 1 February sowing (1.28 kg). Ahammad *et al.* (2009) found that the fruits weight was ranged from 0.32 to 1.91 kg plant^{-1} when evaluated in late season. The corresponding fruit yield t ha^{-1} from 2 January sowing was 43.86 t ha^{-1} identical to that of 1 February sowing (43.52 t ha^{-1}). Hossain *et al*. (2014) observed that the yield was ranged from 24.60 to 74.75 t ha^{-1} among three sowing dates (Oct 1, Oct 15 and Oct 30). However, present findings indicated that to improve tomato availability in the market in late winter to summer, tomato can be grown in both January and February sowing in Sylhet region.

Table 1. Effect of sowing dates yield and yield attributes of hybrids tomato

Sowing dates	Days to first flower	Days to first harvest	Fruit length (cm)	Fruit Breadth (cm)	TSS (%)	Number of fruits plant^{-1}	Individual fruit wt. (g)	Fruit yield plant^{-1} (kg)	Fruit yield (t ha^{-1})
January	53.08	87.25	4.64	3.85	4.59	24.75	53.33	1.29	43.86
February	52.58	86.08	4.70	4.47	4.80	23.83	54.50	1.28	43.52
F-test	NS	NS	NS	**	*	NS	NS	NS	NS
CV (%)	2.26	1.28	7.18	9.49	5.14	11.09	5.86	10.51	10.51

* indicates significant at 5%, ** indicate significant at 1% level of probability and NS: Not-significant

Effect of hybrids

Significant variations for yield and yield attributes were observed among the tomato hybrids grown in late winter (Table 2). For first flowering, BARI Hybrid Tomato-10 (50.16 days) required minimum days, whereas the maximum was in BARI Hybrid Tomato-4 (56.33 days). The minimum days required for harvesting was found in BARI Hybrid Tomato-10 (85.16 days) while BARI Hybrid Tomato-4 required maximum days (90.50 days). Islam *et al.* (2017) observed similar variation in days to flower and days to harvest among tomato hybrid when grown in summer season.

The maximum fruit length was found in BARI Hybrid Tomato-3 (5.76 cm) while minimum was in BARI Hybrid Tomato-4 (4.11 cm). The highest fruit breadth was produced by BARI Hybrid Tomato-3 (6.18 cm) whereas the lowest was in BARI Hybrid Tomato-8 (3.16 cm). The highest TSS% was recorded from BARI Hybrid Tomato-4 (4.95%) while the lowest TSS% was found in BARI Hybrid Tomato-10 (4.30%). Similar variation in fruit length, fruit breadth, locule, TSS, pericarp thickness was also reported by several researchers when worked with several tomato hybrids grown in summer season (Ahmad *et al.*, 2011, Yesmin *et al.*, 2014). The highest number of fruit plant^{-1} was found from BARI Hybrid Tomato-4 (31.83) while the lowest was found in BARI Hybrid Tomato-10 (19.33). Yesmin *et al.* (2014) also recorded 26.0-51.0 fruits plant^{-1} among eight tomato hybrid grown during summer season. The heaviest individual fruit weight was recorded from BARI Hybrid Tomato-10 (60.00 g) indicating this hybrid suitable for bigger sized fruit. The highest yield plant^{-1} was produced by BARI Hybrid Tomato-4 (1.59 kg plant^{-1}) which was very much appreciable since this hybrid produced similar amount of fruits plant^{-1} at several parts of the country (Anonymous, 2011). The lowest yield was found in BARI Hybrid Tomato-3 (1.08 kg plant^{-1}). Islam *et al.* (2017) was also found yield variation of tomato hybrids during summer season in Sylhet. The highest yield was produced by BARI Hybrid Tomato-4 (54.06 t ha^{-1}) followed by BARI Hybrid Tomato-8 (54.44 t ha^{-1}) and BARI Hybrid tomato-10 (39.10 t ha^{-1}) whereas the lowest yield was recorded from BARI Hybrid Tomato-3 (36.72 t ha^{-1}).

Table 2. Influence of hybrids on yield and yield attributes of tomato

Hybrids	Days to first flower	Days to first harvest	Length of fruit (cm)	Breadth of fruit (cm)	TSS%	Number of fruits plant^{-1}	Individual fruit wt. (g)	Fruit yield kg plant^{-1}	Fruit yield (t ha^{-1})
BHT-3	56.33a	90.50a	5.76a	6.18a	4.88a	19.83c	55.00ab	1.08	36.72
BHT-4	50.83c	85.83b	4.11b	3.48c	4.95a	31.83a	50.16b	1.59	54.06
BHT-8	54.00b	85.16b	4.43b	3.16c	4.66ab	26.16b	50.50b	1.31	44.54
BHT-10	50.16c	85.16b	4.36b	3.83b	4.30b	19.33c	60.00a	1.15	39.10
F-test	**	**	**	**	**	**	**	**	**
CV (%)	2.26	1.28	7.18	9.49	5.14	11.09	5.86	10.51	10.51

** indicates significant at 1% level of probability and NS: Not-significant. Means followed by same letter(s) in a column do not differ significantly.
BHT: BARI Hybrid Tomato

Combined effect of sowing dates and hybrids

Most of the parameters were not largely affected due to interaction between sowing dates and hybrids except days to flower, fruit breadth and fruit yield (Table 3). The minimum days required to first flower by the plants of BARI Hybrid Tomato-10 (49.00 days) was found from February sowing while the maximum days (56.33 days) required for the BARI Hybrid Tomato-3 was found in case of both 2 January and 1 February sowing. Malviya (2015) found that the minimum days (60.96 days) required for flower initiation were found in when tomato hybrid grown from last week of September. Days to first harvest of the hybrid from different sowing dates varied 84 to 91 days which was supported by other researchers (Ahmad *et al*. 2011; Malviya, 2015). The highest number of fruits plant^{-1} (33.66) was recorded from BARI Hybrid Tomato-4 from 2 January sowing while the lowest number of fruit plant^{-1} (18.66) was found from BARI Hybrid Tomato-10 on 2 January sowing. Combination of BARI Hybrid Tomato-10 and 1 February sowing exhibited the highest (61.66 g) individual fruit weight while BARI Hybrid Tomato-4 at 2 January sowing showed the lowest (49.33 g) individual fruit weight. The highest weight (1.66 kg plant^{-1}) was found from BARI Hybrid Tomato-4 on 2 January sowing whereas the lowest weight (1.05 kg plant^{-1}) was obtained from BARI Hybrid Tomato-3 on 1 February sowing (1.05 kg plant^{-1}). Ahammad *et al.* (2009) found that the highest yield plant^{-1} (2.41 kg plant^{-1}) was obtained from 01 December planting of the variety BARI Tomato 5 while the lowest yield (0.25 kg plant^{-1}) was produced from the BARI Tomato 12 on February 01 planting. BARI Hybrid Tomato-4 produced the highest yield (56.44 t ha^{-1}) on 2 January sowing while the lowest yield was obtained from BARI Hybrid Tomato-3 when grown on 1 February sowing (35.70 t ha^{-1}). Hossain *et al.* (2014) found the highest marketable fruit yield (97.21 t ha^{-1}) from BARI Tomato-2 on October 1 sowing against the lowest yield (19.86 t ha^{-1}) from BARI Tomato-9 in October 30.

Table 3. Combined effect of sowing dates and hybrids on yield and yield attributes of tomato

Treatment combinations	Days to first flower	Days to first harvest	Fruit length (cm)	Fruit breadth (cm)	TSS (%)	Number of fruits plant^{-1}	Individual fruit wt. (g)	Fruit yield kg plant^{-1}	Fruit yield (t ha^{-1})
S_1H_1	56.33a	91.00	5.76	5.96a	4.90	20.33	55.00	1.11bc	37.74bc
S_1H_2	52.00cd	86.33	4.06	2.80d	4.83	33.66	49.33	1.66a	56.44a
S_1H_3	52.66bc	85.66	4.50	3.16cd	4.56	26.33	50.66	1.32b	44.88b
S_1H_4	51.33ce	86.00	4.23	3.50bc	4.06	18.66	58.33	1.08c	36.72c
S_2H_1	56.33a	90.00	4.76	6.40a	4.86	19.33	55.00	1.05c	35.70c
S_2H_2	49.66de	85.33	4.16	4.16b	5.06	30.00	51.00	1.52a	51.68a
S_2H_3	55.33ab	84.66	4.36	3.16cd	4.76	26.00	50.33	1.30b	44.20b
S_2H_4	49.00e	84.33	4.50	4.16b	4.53	20.00	61.66	1.23b	41.82b
F-test	**	NS	NS	*	NS	NS	NS	**	**
CV (%)	2.26	1.28	7.18	9.49	5.14	11.09	5.86	10.51	10.51

* indicates significant at 5%, ** indicates significant at 1% level of probability and NS: Not-significant. Means followed by same letter(s) in a column do not differ significantly.

S_1: January sowing H_1: BARI Hybrid Tomato-3 H_3: BARI Hybrid Tomato-8

S_2: February sowing H_2: BARI Hybrid Tomato-4 H_4: BARI Hybrid Tomato-10

From the above results and discussion, it may be concluded that to extend availability of tomato in late winter in the market BARI Hybrid Toamto-4, BARI hybrid to-8 and BARI hybrid Tomato-10 can be considered for cultivation since these hybrids produced appreciable amount of tomato during date winter.

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