



Performance of local and exotic hybrid tomato varieties in Bangladesh

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ABSTRACT

Thirteen local and exotic hybrid tomato varieties viz. BARI F₁ Tomato-4, BARI F₁ Tomato-5, BARI F₁ Tomato-6, BARI F₁ Tomato-7, BARI F₁ Tomato-8, Lali, Abhilash, Nayak, Moon, Delta, Mintoo super, Mintoo, and Success were evaluated to see their performances during the winter season of 2012-2013. The design used was RCBD (Randomized Complete Block Design) having three replications. Unit plot size was 4.0m x 1.0m maintaining the spacing 60cm x 50cm. The seeds were sown on 23 October 2012 and the seedlings were transplanted in the main field on 28 November 2012. Different parameters were studied in this study. All the characters showed significant differences among the varieties. The variety Nayak required maximum days for 50% flowering (77.00) while BARI F₁ tomato-4 and 8 required minimum days for 50% flowering (60.00). The highest plant height was found in Success variety (134.3cm) and the lowest was found in BARI F₁ Tomato-7 (103.3). The maximum number of fruits/cluster (5.83) was recorded from BARI F₁ tomato-8 while minimum were recorded from Mintoo Super (4.40). BARI F₁ tomato-4 variety produced the maximum number and weight of fruits/plant (87.6 and 2.30 kg) whereas BARI F₁ tomato-6 and Delta produced minimum number and weight of fruits per plant (49.33 and 1.62 kg). The average fruit weight was maximum in BARI F₁ tomato-5 (52.73 g) and minimum in Abhilash (41.97 g). The maximum fruit length and diameter (5.14 cm and 5.41 cm) were obtained from BARI tomato-7 and 5 whereas minimum fruit length and diameter (3.77 cm and 4.22 cm) were obtained from BARI F₁ tomato-4 and Mintoo. The number of locule/fruit was found maximum in BARI F₁ tomato-5 (4.33) while minimum no. of locule/fruit was found in Delta (2.13). The variety Nayak showed maximum thickness of pericarp (0.52cm) and BARI F₁ tomato-8 showed minimum thickness of pericarp (0.34cm). The TSS percentage was found maximum (5.00) in BARI F₁ tomato-8 and Mintoo while minimum TSS percentage (4.00) was found in BARI F₁ tomato-8 and Mintoo Super. The shelf life of the fruits were maximum in Delta (18.00 days) and minimum in Abhilash (5.00 days). The variety Nayak required maximum days to 1st harvest (154.0) and BARI F₁ tomato-4 and 8 required minimum days to 1st harvest (138.0). Yellow leaf curl virus was found maximum in the variety Lali (10.41%) and minimum (2.08%) in BARI F₁ tomato-5 and Mintoo. No virus infected plants were found in the rest varieties. The yield ranged from 64.92 to 93.21 t/ha. The maximum yield (93.21t/ha) was obtained from BARI F₁ tomato-4 while minimum yield was obtained from Delta (64.92 t/ha). Considering the results it can be concluded that most of the local varieties showed better performance compared to the exotic varieties.

Key words: Tomato, local, exotic variety, performance, Bangladesh

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INTRODUCTION

Tomato (*Lycopersicon esculentum*) is a vegetable crop of considerable economic importance in

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Bangladesh. The fruit is relatively nutritious and contains moderate quantities of vitamin C (Vallareal, 1980). Tomato is widely grown in Bangladesh usually in winter season as normally prevailing temperature is congenial for its optimum growth and yield. With the increase of population the demand of tomato is increasing day by day. It is also possible to earn large amount of foreign currency by producing quality tomatoes and exporting them. The increasing demand can be met only with increase in production per unit area. The lower yield in tomato could be due to the fact that the traditional grown cultivars used by our farmers are much sensitive to hot climate, which limits the production of the crop to early summer. Some cultivars have wider adoption while others provide a valuable source of variability in breeding material. The yielding ability of a genotype is the result of its interaction with the environment. The diverse variation of agro climatic condition in different regions of Bangladesh and the effect of global climate change can affect the growing conditions, thus the performance of different tomato varieties also varies greatly.

The advantages of hybrid tomato cultivars are uniformity in shape and size, increased vigor, early maturity, high yield and resistance to specific pests and pathogens (Allard, 1960; Hageman et al., 1967). Sudha- kar and Purushotham (2009) evaluated different F₁ hybrids of tomato for higher yield. Under current scenario all hybrid seeds for vegetables including tomato for open field and off-season cultivation are being imported from different countries like Holland, Japan, USA and China etc. at a very high price. Recently farmers are cultivating hybrid tomato varieties which are mostly developed locally by different seed companies and some varieties are imported from abroad. BARI (Bangladesh Agricultural Research Institute) has also developed some hybrid tomato varieties and released for commercial cultivation. However, the growth characters and nutritional quality of tomatoes varied significantly among different hybrids. Selection of high yield and nutritious hybrid tomatoes is important under existing agro climatic condition of Bangladesh for commercial purpose. It was therefore considered appropriate to make a comparative study of local as well as exotic cultivars of tomatoes for screening high yielding varieties suitable to our agro-climatic conditions.

MATERIALS AND METHOD

Study area

The experiment was carried out at Agricultural Research Station, Burirhat, Rangpur during winter season of 2012-2013.

Varieties and experimental design

Thirteen hybrid tomato varieties namely BARI F₁ Tomato-4, BARI F₁ Tomato-5, BARI F₁ Tomato-6, BARI F₁ Tomato-7, BARI F₁ Tomato-8, Lali, Abhilash, Nayak, Moon, Delta, Mintoo super, Mintoo and Success were included in the experiment. The experiment was laid out in randomized complete block design (RCBD) with three replications.

Spacing, plot size and others

Unit plot size was 4.0m x 1.0m maintaining the spacing 60cm x 50cm. The seeds were sown on 23 October 2012 and the seedlings were transplanted in the main field on 28 November 2012.

Fertilization

Manures and fertilizers were applied at the rate of 5t cowdung, 550kg Urea, 450kg TSP, 250kg MP and 120kg Gypsum per hectare. Half of the cowdung was applied during final land preparation. The remaining half of the cowdung, the entire quantity of TSP, Gypsum and one third each of Urea and MP were applied during pit preparation. The rest of Urea and MP were applied in two equal installments as top dressing at 21 and 35 days of transplanting. Intercultural operations were done as and when necessary.

Data collection

Data were recorded on different parameters. The parameters included in the study were days to flowering (days from the date of sowing to first flowering were recorded), plant height in cm (when the plants attained the maximum height after which the plant ceased to grow for measurement the plant were selected randomly. number of fruits/plant (fruits harvested from ten plants of each treatment were counted and converted number of fruits per plant), number of fruits/cluster (total fruits number along with clusters were collected from a plant then converted number of fruits per cluster), Fruit length in cm (when the fruit attained certain maturity then the

length was measured with the help of measuring tape), fruit diameter in centimeter (fruit diameter was measured with the help of vernier caliper, when the fruit reached up to certain maturity), average fruit weight in gm (measured with the help of balance and their average was taken), no of locule/fruit (matured fruits were cut by a sharp knife and locules number were counted), Thickness of pericarp in centimeter (Thickness of pericarp was measured with the help of vernier caliper, when the fruit reached up to certain maturity), Total Soluble Solids in % (It was measured with the help of refractometer), Shelf life in days (marketable shape, size and colour containing fruits were collected from each treatment then they are kept in a room with room temperature and days were counted just before rotten), days to 1st harvest(days from the date of sowing to first harvesting were recorded), virus infection in percentage ((it was calculated by the following formula:

Virus Infection (%) =

$$\frac{\text{Number of virus infected plants}}{\text{Number of total plants}} \times 100$$

and yield per plant in kg (It was taken in kg, when all the hybrids of tomato got maturity and at harvest stage per picking) and yield per hectare in kg (it was calculated by the following formula:

$$\text{Yield (kg per ha)} = \frac{\text{Yield (kg per ha)} \times 100}{\text{Plot size (m}^2\text{)}}$$

Statistical Analysis

The data collected was subjected to analysis of variance, and subsequently the significant means were separated by the least significant difference test by using the MSTATC software at 5% probability level.

RESULTS AND DISCUSSION

The characters studied have been presented in table 1. All the characters showed significant differences among the varieties.

Days to 50% flowering

Data were collected for days to 50% flowering against each variety. The variety Nayak required maximum days (77.00) for 50% flowering

followed by Minto Super (76.00) Abhilash and Delta (75.00) and Moon (74.00). Among the exotic tomatoes only Lali (68.00), Minto (67.00) and Success (68.00) showed lower required days to 50% flowering. Among the all varieties used in this study BARI F₁ tomato-4 and BARI F₁ Tomato-8 required minimum days (60.00) for 50% flowering. Other local varieties showed required days that do not differ significantly ($p \leq 0.5$) (table 1).

Plant height (cm)

The highest plant height was found in exotic Success variety (134.3) followed by moon (121.0), BARI F₁ Tomato-6 (120.9), BARI F₁ Tomato-4 and Minto (119), whereas lowest height was found in BARI F₁ Tomato-7 (103.3). Among the local varieties highest plant height was found in BARI F₁ Tomato-6 (120.9) and lowest was found in BARI F₁ Tomato-7 (103.3). On the other hand, among the exotic varieties the highest plant height was found in Success (134.3) and lowest was found in Delta (103.6). This study is in dissimilarity with the study of Hossain et al. (2004) where BARI F₁ Tomato-7 showed highest height (113.4 cm) and lowest height showed by BARI F₁ Tomato-8 (91.37cm). This variation might be due to variation in weather of the study region or variation in the planting time. The BARI Tomato 7 produced the tallest plant (109.4 cm) observed in a study by Ashrafuzzaman et al. (2010). BARI F₁ Tomato-4 BARI F₁ Tomato-6 showed and 92.13 and 125.43 cm average height in a study by Hassan et al. (2005).

Number of fruits per cluster and per plant

The maximum number of fruits/cluster (5.83) was recorded from BARI F₁ tomato-8 which was statistically similar to two exotic varieties Lali and Moon, while minimum was recorded from Minto Super (4.40) which was statistically similar to most of the varieties studied here. The number of fruits per cluster was found 4.67 in this study whereas 5.66 in BARI tomato-4 in a study by Hasan et al. (2005).

BARI F₁ tomato-4 variety showed significant variations among the varieties with a highest number of fruits per plant (87.6) whereas BARI F₁ tomato-6 minimum number of fruits per plant (49.33). Among the exotic varieties only Minto showed higher number of 74.13 fruits per plant

which is next to the number showed by local variety BARI F₁ tomato-4. The number of fruits per plant was observed far higher than the study of Hasan et al. (2005) who found only 29.37 fruits per plant in BARI tomato-4 variety. The number of fruits per plant in BARI tomato-7 was 30.6 in a study by Ashrafuzzaman et al. (2010). The variation in number of fruits per plant was genotype dependent.

Weight of fruits/plant (kg) and. fruit weight (g)

The weight of BARI F₁ Tomato-4 per plant was highest (2.30kg) among both local and exotic varieties which was statistically similar to Mintoo and Success whereas the lowest weight of total fruits per plant (1.62) was observed in Delta which

was statistically similar to BARI F₁ Tomato-7. The heaviest fruit (52.73 g) was found in BARI F₁ tomato-5 (52.73 g). In contrast, the lightest fruit (41.97 g) was found in Abhilash, which was statistically similar to Lali and Nayak. The higher fruit weight was observed for same varieties by Hossain et al. (2004). The variation in individual fruit weight of different genotypes might be due to their different genotypic characters.

Fruit length and diameter

The maximum fruit length and diameter (5.14 cm and 5.41 cm) were obtained from BARI tomato-7 and 5 whereas minimum fruit length and diameter (3.77 cm and 4.22 cm) were obtained from BARI F₁ tomato-4 and Mintoo.

Table 1

Performance of 13 local and exotic hybrid tomato varieties during 2012-13.

Name of varieties	Days to 50% flowering	Plant height at last harvest (cm)	No. of fruits/ cluster	No. of fruit/plant	Wt. of fruits/plant (kg)	Av. fruit wt. (g)	Fruit length (cm)
Local varieties							
BARI F ₁ Tomato-4	60.00c	119.5b	4.67cd	87.6a	2.30a	46.13a-d	3.77g
BARI F ₁ Tomato-5	67.00b	117.1b	4.73cd	52.4cd	2.19ab	52.73a	4.76a-e
BARI F ₁ Tomato-6	64.00bc	120.9b	4.77cd	49.33d	1.86de	50.03a-c	4.54c-f
BARI F ₁ Tomato-7	68.00b	103.3d	4.50cd	50.57cd	1.76ef	44.9b-d	5.14a
BARI F ₁ Tomato-8	60.00c	117.7b	5.83a	54.67cd	2.09a-c	45.30b-d	4.63b-e
Exotic varieties							
Lali	68.00b	111.0c	5.20a-c	57.33cd	2.09a-c	47.9a-d	4.29ef
Abhilash	75.00a	110.9c	5.00b-d	59.93c	2.19a-c	41.97d	4.38d-f
Nayak	77.00a	109.1c	5.03b-d	60.47c	1.99b-d	42.60d	4.81a-d
Moon	74.00a	121.0b	5.10a-d	60.40c	1.94c-e	51.47ab	5.10ab
Delta	75.00a	103.6d	4.73cd	54.7cd	1.62f	44.97b-d	4.39c-f
Mintoo Super	76.00a	117.3b	4.40d	54.77cd	1.91c-e	46.23a-d	4.43c-f
Mintoo	67.00b	119.0b	5.57ab	74.13b	2.26a	43.7c-d	4.10fg
Success	68.00b	134.3a	5.03b-d	55.47cd	2.25a	45.10b-d	4.85a-c

Means followed by same letter(s) do not differ significantly at 5% level.

Other characteristics

The number of locule/fruit was found maximum in BARI F₁ tomato-5 (4.33) while minimum no. of locule/fruit was found in Delta (2.13). The variety Nayak showed maximum thickness of pericarp (0.52cm) and BARI F₁ tomato-8 showed minimum thickness of pericarp (0.34cm) (Table 2).

The TSS percentage was found maximum (5.00) in BARI F₁ tomato-8 and Mintoo while minimum TSS percentage (4.00) was found in BARI F₁ tomato-8 and Mintoo Super. The shelf life of the fruits was maximum in Delta (18.00 days) and minimum in Abhilash (5.00 days).

The variety Nayak required maximum days to 1st harvest (154.0) and BARI F₁ tomato-4 and 8 required minimum days to 1st harvest (138.0).

Yellow leaf curl virus was found maximum in the variety Lali (10.41%) and minimum (2.08%) in BARI F₁ tomato-5 and Mintoo. No virus infected plants were found in the rest varieties.

The yield ranged from 64.92 to 93.21 t/ha. The maximum yield (93.21t/ha) was obtained from BARI F₁ tomato-4 which is closely followed by Mintoo (91.35t/ha), Success (89.88 t/ha), Abhilash (89.68 t/ha) and BARI F₁ tomato-5 (86.84 t/ha) while minimum yield was obtained from Delta (64.92 t/ha). In a study by Hasan et al. (2005) BARI tomato-6 produced higher yield (55.16 t ha⁻¹) than BARI tomato-4 (51.8 t ha⁻¹). BARI tomato-7 provides 84.9 t/ha yields (Ashrafuzzaman et al., 2010). It is observed that different yield potentialities were observed in different studies. This might be due to variation in genotype, seasons and experimental setup.

Table 2

Performance of 13 local and exotic hybrid tomato varieties during 2012-2013.

Name of varieties	Fruit diameter (cm)	No. of locule/ fruit	Thickness of pericarp (cm)	TSS (%)	Shelf life (Days)	Days to 1 st harvest	Virus infection (%)	Yield (t/ha)
Local varieties								
BARI F ₁ Tomato-4	4.36ef	3.07bcd	0.40b-d	4.90a	16.00ab	138.0e	0	93.21a
BARI F ₁ Tomato-5	5.41a	4.33a	0.39b-d	4.60a-c	7.00fg	145.0c	2.08	86.84a-c
BARI F ₁ Tomato-6	4.99a-c	4.00a	0.47ab	4.70ab	9.00ef	142.0d	0	74.39ef
BARI F ₁ Tomato-7	4.42d-f	3.13bc	0.47ab	4.00d	14.00bc	146.0c	4.16	70.53fg
BARI F ₁ Tomato-8	5.28a	4.20a	0.34d	5.00a	10.00e	138.0e	0	83.77b-d
Exotic varieties								
Lali	4.88a-e	2.67c-e	0.40b-d	4.30b-d	11.00de	146.0c	10.41	83.78b-d
Abhilash	5.31a	3.20bc	0.37cd	4.20cd	5.00h	152.0ab	0	89.68ab
Nayak	4.67b-f	2.47e	0.52a	4.60a-c	7.00g	154.0a	0	79.62c-e
Moon	4.32f	2.27e	0.47ab	4.20cd	9.00ef	151.0b	4.16	78.36d-f
Delta	4.46c-f	2.13e	0.42b-d	4.43bc	18.00a	152.0ab	6.25	64.92g
Mintoo Super	5.06ab	3.20bc	0.45a-c	4.00d	13.00cd	153.0ab	0	73.88ef
Mintoo	4.22f	3.13bc	0.40b-d	5.00a	10.00e	145.0c	2.08	91.35ab
Success	4.92a-d	3.30b	0.46ab	4.70ab	9.00ef	146.0c	0	89.88ab

Means followed by same letter(s) do not differ significantly at 5% level.

Comparison of performance between local and exotic varieties

It is observed that flowering comes earlier in local varieties compared to exotic varieties. The growths of most of plants of both exotic and local varieties are similar. Earlier harvest is possible for most of the local varieties compared to exotic varieties. The average yields of local and exotic varieties were almost same in this experiment. Virus infection to local varieties is less than the exotic varieties. Considering the above facts of earlier flowering, better growth performance, less virus infection less harvest time which can save the production cost and management, the local varieties can be used for substantial production of tomatoes in Bangladesh. However, this experiment deserves further study to evaluate the better performance of local varieties in Bangladesh.

REFERENCES

- Steel RGD, Torrie JH and Dickie DA (1997). Principles and procedures of statistics - A biometric approach. 3rd ed. McGraw-Hill Publish. Co. Toronto, Canada.
- Ashrafuzzaman M, Haque MA, Ismail MR, Islam MT and Shahidullah SM (2010). Genotypic and seasonal variation in plant development and yield attributes in tomato (*Lycopersicon esculentum* Mill.) Cultivars. International Journal of Botany, 6: 41-46.
- Hasan MF, Ahmed B, Rahman MA, Alam MM and Khan MMH (2005). Environmental effect on growth and yield of tomato. Journal of Biological Sciences, 5 (6): 759-767.
- Hossain MM, Khalequzzaman KM, Hossain MA, Mollah MRA and Siddique MA (2004). Influence of planting time on the extension of picking period of four tomato varieties. Journal of Biological Sciences, 4 (5): 616-619.