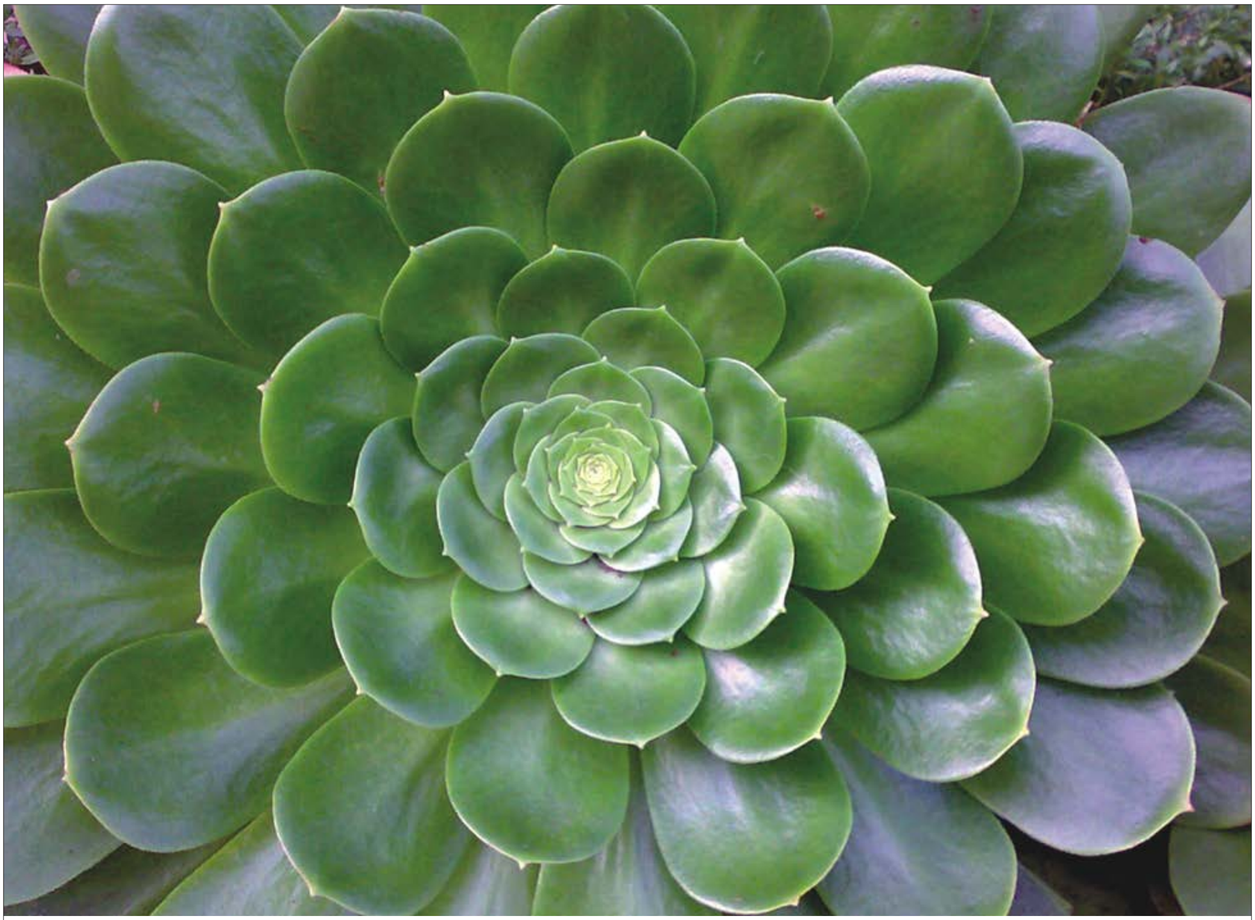

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Research Article
Assessment of Some Exotic Inbred and Hybrid Genotypes of Tomato for Yield and its Component Traits

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Abstract
Nine inbreed and 8 hybrid genotypes of tomato were collected from AVRDC to evaluate the growth and yield attributing traits comparing with two local varieties viz., Raton and Binatomato-5 at Bangladesh condition. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and found significant variation in all the characters. Among all, inbreed genotype CLN-2777A produced the highest yield (75.24 t ha^{-1}), which was closely followed by hybrid genotype WVCT-8 (70.21 t ha^{-1}), inbreed genotype CLN-2413 (68.63 t ha^{-1}) and two local varieties Raton (67.92 t ha^{-1}) and Binatomato-5 (66.87 t ha^{-1}). The inbreed genotype CLN-2777B and CLN-2777F produced the lowest yield 17.90-24.08 t ha^{-1}, respectively. Besides the yield, inbreed genotype CLN-2777A also produced the highest number of leaves per plant (78.20), number of primary branches per plant (9.10), harvesting duration (48.10 days), fruit weight per plant (2.25 kg) with 53.90% reproductive efficiency and the 2nd highest yield producing genotype WVCT-8 also produced the highest number of flowers per cluster (10.40), number of flowers per plant (146.60), number of fruits per cluster (3.70) and days to first harvest (95.90). Comparing yield and yield contributing characteristics, exotic hybrid genotypes performed better than exotic inbreed but the local varieties performed constantly better. The present results indicated that the exotic inbreed genotype CLN-2777A and hybrid genotype WVCT-8 may be selected as high yielding tomato variety in Bangladesh.

Key words: Exotic, hybrid, inbreed, tomato genotypes, yield traits

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important warm-season fruit vegetable grown throughout the world which belongs to the family Solanaceae. It is an excellent source of many nutrients and secondary metabolites that are important for human health: Foliate, potassium, vitamins C and E, flavonoids, chlorophyll, beta-carotene and lycopene (Willcox *et al*., 2003; Lumpkin, 2005). It is also a delicious vegetable used in salads, soups and processed into stable products like ketchup, sauce, puree, marmalade, chutney and juice. Several studies reported the beneficial effects of anti-oxidant compounds in tomato preventing cancer (Sesso *et al*., 2005; Fanasca *et al*., 2007). Among the vegetables, maximum attempts have been made to improve this crop. Short duration of the crop, easiness in cultivation and a large number seeds per fruit has made it an ideal crop for research works (Singh, 2005). In Bangladesh, tomato has a great demand round the year, but its production is mainly concentrated during the winter season. Perhaps, the low yield of tomato in Bangladesh is associated with unavailability of quality seeds, improved genotypes, proper management etc. Out of these, improved genotypes may overcome this situation greatly.

Tomato is one of the most consumed vegetable in the world and an excellent plant genetic analysis system. There is demand for development of high yielding open pollinated and or hybrid cultivars of tomato. Hybrids are usually known to be characterized by good quality characters and high yield. Therefore, tomato hybrid cultivars were extensively, used in commercial production (Solieman *et al*., 2013). Study of genetic diversity is the process, by which variation among individuals or groups of individuals or populations is analyzed. Knowledge about levels and patterns of genetic diversity can be an invaluable aid in crop breeding for diverse applications including analysis of genetic variability in cultivars, identifying diverse parental combinations to create segregating progenies with maximum genetic variability for further selection (Biswas *et al*., 2000; Hussain *et al*., 2001; Islam, 2006; Wagh *et al*., 2007; Dagade *et al*., 2015).

A number of genotypes are grown in this country. Most of them are exotic origin and were developed long before. Recently, some high yielding genotypes are developed in Bangladesh by research organizations, but these are not beneficial to increase the yield. So, by increasing tomato producing area we can fulfill our demand, but due to limitations of lands it is not possible. The most logical way to increase the total production at the national level from our limited land resources is to increase the yield per unit area. Hence, in order to improve the present situation of tomato production in Bangladesh, it is essential to release better genotypes, suitable for Bangladesh and can be developed either by selection or by hybridization. Now-a-days the farmers are eager for cultivating hybrid genotypes, benefited by high yield with low seed rate (Singh, 2005). The present investigation was undertaken to compare the growth and morphological characteristics of some exotic hybrid genotypes along with inbred genotypes of tomato and also select their suitability in Bangladesh conditions.

MATERIALS AND METHODS

Soil and climate: The field experiment was carried out at the experimental field of Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, Bangladesh during 20 October, 2012-31 March, 2013. The soil of the experiment area was silty loam and belongs to the old Brahmaputra flood plain (AEZ-9) Alluvial Tract. The selected site was a medium high land and the pH of the soil was 6.67 with organic matter content of 1.05%. The experiment area was situated in the subtropical climatic zone, characterized by heavy rainfall, high humidity, high temperature and relatively long day during kharif season (April-September) and low rainfall, low humidity, low temperature and short day period during rabi season (October-March). Rabi season is favorable for tomato cultivation in Bangladesh. The soil pH, nutrient status of the soil, monthly recorded temperature, relative humidity, rainfall and sunshine hours are presented in the Table 1 and 2.

Experimental materials and design: Nineteen genotypes of tomato were used as experimental materials. Among these, CLN-2413, CLN-2418, CLN-2460E, CLN-2777A, CLN-2777B, CLN-2777C, CLN-2777D, CLN-2777E and CLN-2777F as exotic

Table 1: Physical and chemical characteristics of soil (0-15 cm) of the experimental site

Soil characteristics	Analytical data
%Sand (0.2-0.02 mm)	25.18
%Silt (0.02-0.002 mm)	70.90
%Clay (<0.002 mm)	2.7
Textural class	Silty loam
Organic matter (%)	1.05
Total nitrogen (%)	0.07
Available phosphorus (ppm)	14.30
Exchangeable potassium (meq/100 g soil)	0.25
Available sulphur	13.2
Soil pH (in H_2O solution)	6.67

Source: Experimental soil samples were analyzed in the Department of Soil Science, Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, Bangladesh

Table 2: Monthly record of temperature, Relative Humidity (RH), rainfall and sunshine of the experimental site during the period from October, 2012 and March, 2013

	**Average air temperature (°C)			*Total rainfall	**Ave RH	*Ave sunshine	Soil temperature (°C) depth at (cm)		
Month	Max	Min	Ave	(mm)	(%)	(h)	5	10	20
October, 12	31.54	23.16	27.35	218.3	85.10	189.68	29.3	29.7	29.6
November, 12	29.71	18.49	24.10	67.0	85.07	226.30	26.0	26.5	26.7
December, 12	26.04	13.22	19.63	00.0	83.55	202.32	22.1	22.4	21.5
January, 13	23.47	13.09	18.26	30.6	84.32	127.6	19.8	20.4	20.7
February, 13	24.94	13.81	19.37	5.4	74.03	189.4	20.4	20.9	20.8
March, 13	29.42	20.46	24.94	95.3	80.87	164.4	26.0	26.1	25.3

*Monthly total, **Monthly average Source: Weather Yard, Department of Irrigation and Water Management, Bangladesh Agricultural University, Mymensingh, Bangladesh, Max: Maximum, Min: Minimum, Ave: Average, RH: Relative humidity

inbred genotypes and WVCT-1, WVCT-2, WVCT-3, WVCT-4, WVCT-5, WVCT-6, WVCT-7 and WVCT-8 as exotic hybrid genotypes with two local varieties Binatomato-5 and Raton used as control. The seeds of exotic inbreed and hybrid genotypes were collected from AVRDC. The experiment was laid out in a Randomized Complete Bock Design (RCBD) with three replications. The size of unit plot was 2×2 m^2. The distance between the blocks was 50 cm and between plots was 30 cm. The plot were fertilized with a general dose of urea, Triple Super Phosphate (TSP), Muriate Of Potash (MOP) and cowdung as sources of nitrogen, phosphorus and potassium were applied at 500, 440, 225 and 12,000 kg ha^{-1}, respectively.

Seedling raising and transplanting: The seedlings were raised in iron trays as seed bed (91.44×60.96 cm^2) prepared by mixing equal amount of sand soil and oil cake. The seeds were sown at 25 October, 2012. Complete emergence of seedling took place within 8 days after sowing. Healthy and uniform sized 34 days old seedlings were taken separately from the seed bed and were transplanted in the experimental field on 29 November, 2012 maintaining a spacing of 50 and 50 cm between the rows and plants respectively. The seedlings were watered after transplanting. Shading was provided by pieces of banana leaf sheath for three days to protect the seedlings from the direct sunshine. During foggy weather sprayed dithane M-45 fortnightly @ 2 g L^{-1} against disease infestation especially late blight of tomato and applied Dimecron 50 EC @ 2 ml L^{-1} against the insects like cut worm, leaf hopper and others.

Data collection and analysis: Fruits were harvested at 5 days intervals during maturity and ripening stage. The maturity of the crop was determined on the basis of red color of fruits. At harvest, yield and plant characters like plant height (cm), number of leaves per plant, number of primary branches per plant, number of flower clusters per plant, number of flowers per cluster, number of flowers per plant, number of fruits per cluster, number of fruits per plant and fruit yield (t ha^{-1}) were measured from 10 randomly selected plants. Besides, days to first flowering and days to first harvest and its duration were recorded and few parameters were calculated by the following equations:

$$\text{Reproductive efficiency (\%)} = \frac{\text{Total No. of flowers in sample plants}}{\text{Total No. fruits in sample plants}} \times 100$$

$$\text{Reproductive efficiency (\%)} = \frac{\text{Total No. of flowers in sample plants}}{\text{Total No. fruits in sample plants}} \times 100$$

$$\text{Individual fruit weight (g)} = \frac{\text{Total fruit weight in sample plants}}{\text{Total No. of fruit in sample plants}}$$

$$\text{Fruit yield (t ha}^{-1}\text{)} = \frac{\text{Fruit weight per plot}}{\text{Area of unit plot} \times 1,000} \times 10,000$$

The data in respect of growth, yield and yield contributing characters were statistically analyzed to find out the statistical significance to the experimental results. Data were analyzed using analyses of variance (ANOVA) technique with the help of computer package MSTAT and difference among treatment means were adjusted with Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

RESULTS AND DISCUSION

Plant height (cm): Plant height is one of the most important growth components and differed significantly among the studied genotypes (Table 3). The highest plant height was obtained in exotic inbreed genotype CLN-2413 (99.30 cm) at final harvest, which was statistically similar to WVCT-8 (97.40 cm). Similarly, the inbreed CLN-2777C (56.70 cm) obtained the shortest height closely followed by CLN-2460E (58.50 cm) and CLN-2418 (59.20 cm). Inbreed lines comparatively shorter than the studied hybrid lines. Hossain (2007) recorded highly significant in the plant height, where, the tallest plant height (102 cm) was observed under poultry manure in Raton. Karim (2005) also found significant variation for the plant height among the cultivars.

Table 3: Variation in the growth and yield contributing characters of tomato genotypes

Genotypes	Plant height (cm)	No. of leaves per per plant	No. of primary branches per plant	Days to first flowering	No. of flowering clusters per plant
CLN-2777A	72.90^{ghi}	78.20^{a}	9.10^{a}	46.10^{bcde}	21.90^{b}
CLN-2777B	76.20^{fgh}	56.60^{d}	5.90^{ef}	43.00^{efgh}	12.00^{fgh}
CLN-2777C	56.70^{j}	47.20^{f}	5.80^{ef}	47.50^{abc}	10.00^{ijk}
CLN-2777D	86.10^{de}	50.90^{ef}	5.20^{ghi}	44.90^{cdef}	12.45^{efg}
CLN-2777E	73.10^{ghi}	58.10^{cd}	7.00^{bc}	46.20^{bcde}	14.00^{de}
CLN-2777F	70.10^{i}	69.60^{b}	7.30^{b}	47.10^{abcd}	16.50^{c}
CLN-2413	99.30^{a}	68.10^{b}	6.50^{cd}	45.00^{cdef}	9.30^{k}
CLN-2418	59.20^{j}	33.20^{i}	5.10^{hijk}	35.00^{i}	9.80^{jk}
CLN-2460E	58.50^{j}	42.30^{gh}	4.95^{hijk}	45.00^{cdef}	10.30^{hijk}
WVCT-1	85.50^{de}	46.60^{fg}	5.09^{hij}	41.30^{gh}	13.80^{def}
WVCT-2	84.30^{de}	40.20^{h}	4.70^{ijk}	42.00^{fgh}	11.30^{ghij}
WVCT-3	74.90^{fghi}	40.90^{h}	4.60^{jk}	42.30^{fgh}	12.60^{efg}
WVCT-4	79.90^{ef}	41.20^{gh}	4.50^{ijk}	41.30^{gh}	11.80^{ghi}
WVCT-5	93.40^{bc}	49.80^{ef}	5.10^{ghi}	41.70^{gh}	14.40^{de}
WVCT-6	83.70^{e}	50.20^{ef}	4.20^{k}	41.00^{h}	15.10^{cd}
WVCT-7	90.20^{cd}	53.30^{de}	5.60^{fgh}	44.30^{defg}	12.80^{efg}
WVCT-8	97.40^{ab}	62.10^{c}	6.20^{de}	43.00^{efgh}	14.30^{de}
Binatomato-5	71.30^{hi}	51.30^{ef}	5.85^{efg}	49.50^{ab}	16.80^{c}
Raton	78.00^{fg}	70.00^{b}	7.30^{b}	51.00^{a}	24.70^{a}
$LSD_{(0.05)}$	5.543	4.745	0.542	2.801	1.675

In a column, figure bearing same letters do not differ significantly at 5% level by DMRT, LSD: Least significant difference

Number of leaves per plant: Leaves are very important vegetative organs, as they are chiefly concerned with the physiological processes, photosynthesis and transpiration. Among the studied genotypes CLN-2777A gave the highest (78.20) number of leaves per plant which was statistically different from the others and the lowest number of leaves (33.20) was found in CLN-2418 and other genotypes were ranged from 40-70 leaves per plant. Exotic inbreed genotypes performed comparatively better than exotic hybrid in respect of leaf number per plant. Hossain (2007) observed highly significant variation in respect of number of leaves per plant in Raton.

Number of primary branches per plant: Number of primary branches per plant varied significantly among the genotypes (Table 3). The highest number of primary branches per plant was observed in CLN-2777A (9.10), while the lowest was in WVCT-6 (4.20), which was statistically similar to WVCT-3, WVCT-4, WVCT-2, CLN-2460E and CLN-2418. Islam (2006) stated that, the number of primary branches per plant varied significantly from 9.67-5.00 during the studying with 4 tomato genotypes. Sengupta *et al.* (2002) also stated that branches number was significant influenced by the genotypes.

Days to first flowering: Days to first flowering were significantly different among the studied genotypes (Table 3). The mean values indicated that the genotype Raton took maximum days (51) to flowering, which was statistically similar to Binatomato-5, CNL-2777C and CLN-2777F. On the other hand CLN-2418 required the minimum number of days to first flowering (35). Hybrid genotypes required more or less same days to first flowering which was ranged from 41-43 days. Wagh *et al.* (2007) observed that days to first flowering were significantly varied among the genotypes. Kumar *et al.* (2004) also found highly significant on days to first flowering.

Number of flower clusters per plant: The genotypes had significance influences on flower clusters per plant. The genotype Raton gave the highest (24.70) number flower clusters per plant, which was closely followed by CLN-2777A (21.90) whereas, the lowest (9.30) was found in CLN-2413, which was statistically similar to CLN-2418, CLN-2777C and CLN-2460E. Hossain (2003) found that the highest number flower clusters per plant (24) was in M-20. Kabir (2004) observed highly significance variation from the number of flower clusters per plant, where recorded that, at maturity maximum number of flower clusters per plant (24.77) was in poultry manure. Karim (2005) also observed significant variation among the studied genotypes.

Number of flowers per cluster: A marked variation in the number of flowers per cluster was obtained in different genotypes (Table 4). The highest number of flowers per cluster (10.40) was produced in the genotype WVCT-8, while the lowest (5.10) was found in WVCT-3, which was statistically similar to WVCT-4. Total number of flowers in a cluster significantly varied due to the genotypic effects of the tomato plant. Hossain (2003) found that the highest

Table 4: Performance evaluation of the reproductive characters of the tomato genotypes

Genotypes	No. of flowers per cluster	No. of flowers per plant	No. of fruits per cluster	No. of fruits per plant	Reproductive efficiency (%)
CLN-2777A	8.60^{bc}	140.70^{a}	1.82^{fg}	38.30^{def}	53.90^{a}
CLN-2777B	6.75^{ef}	102.30^{b}	1.71^{fgh}	16.40^{j}	16.10^{i}
CLN-2777C	7.30^{d}	73.00^{cd}	1.59^{gh}	24.50^{i}	33.50^{efg}
CLN-2777D	6.60^{f}	73.81^{cd}	3.12^{bcd}	36.65^{efg}	43.20^{bc}
CLN-2777E	7.60^{d}	107.30^{b}	1.42^{hi}	28.00^{hi}	26.12^{h}
CLN-2777F	6.70^{ef}	111.00^{b}	1.08^{i}	18.30^{j}	16.40^{i}
CLN-2413	7.20^{de}	66.20^{d}	2.41^{e}	30.23^{h}	35.90^{def}
CLN-2418	6.50^{f}	60.90^{d}	2.40^{e}	29.50^{hi}	46.63^{b}
CLN-2460E	5.90^{gh}	63.30^{d}	1.99^{f}	18.00^{j}	25.42^{h}
WVCT-1	6.30^{fg}	86.40^{c}	2.89^{bcd}	32.80^{gh}	38.01^{de}
WVCT-2	6.50^{f}	73.90^{cd}	3.35^{ab}	33.00^{fgh}	44.85^{bc}
WVCT-3	5.10^{i}	65.20^{d}	3.30^{ab}	36.90^{efg}	29.40^{gh}
WVCT-4	5.60^{hi}	66.50^{d}	3.10^{bcd}	36.40^{efg}	31.76^{fg}
WVCT-5	7.40^{d}	106.20^{b}	3.11^{bcd}	41.10^{de}	38.77^{d}
WVCT-6	7.30^{d}	110.00^{b}	2.90^{bcd}	42.60^{cd}	38.73^{d}
WVCT-7	9.10^{b}	113.80^{b}	2.92^{bcd}	46.30^{bc}	40.61^{cd}
WVCT-8	10.40^{a}	146.60^{a}	3.70^{a}	53.10^{a}	52.50^{a}
Binatomato-5	8.20^{c}	139.20^{a}	2.70^{de}	36.80^{efg}	32.80^{fg}
Raton	6.30^{fg}	144.30^{a}	2.81^{cd}	49.40^{ab}	24.85^{h}
LSD $_{(0.05)}$	0.505	13.08	0.358	4.808	4.535

In a column, figure bearing same letters do not differ significantly at 5% level by DMRT, LSD: Least significant difference

number of flowers per cluster in the line M-20, which supported the present findings.

Number of flowers per plant: The number of flowers per plant in the genotypes of tomato varied significantly. The genotype Raton produced the maximum (146.60) number of flowers per plant, which was statistically similar to WVCT-8, CLN-2777A and Binatomato-5 (Table 4). The minimum (60.90) number of flowers per plant was found in CLN-2418, which was statistically similar to the genotypes CLN-2460E, WVCT-3, CLN-2413, WVCT-4, CLN-2777C and WVCT-2. Number of flowers per plant depends on the number of flower clusters and number of flowers per plant. Mao *et al*. (2007) stated that flower number in tomato plants varies due to the genotypic variations.

Number of fruits per cluster: Number of fruits per cluster among the genotypes also varied significantly. The genotype WVCT-8 gave the maximum number of fruits (3.70) per cluster, which was statistically similar to WVCT-2 and WVCT-3. The minimum number of fruits (1.08) per cluster was recorded in the genotype CLN-2777F, which was statistically similar to CLN-2777E (Table 4). Both check variety and exotic hybrid genotypes produced more fruits per cluster compared to inbreed genotypes of tomato. Wang *et al*. (2006) observed that under direct sowing vaishali produced the highest number of fruits per cluster (3.60) that supports this research results.

Number of fruits per plant: Number of fruits per plant among the genotypes varied significantly. The highest number of fruits per plant (53.10) was obtained from WVCT-8, which was statistically similar to Raton (49.40), whereas, the lowest (16.40) was found in CLN-2777B, which was statistically similar to CLN-24160E and CLN-2777F (Table 4). Exotic hybrid genotypes as well as check variety produced more fruits per plant than inbreed genotypes due to the flower clusters per plant, number of flowers per cluster and number of flowers per plant. Islam (2006) reported significant variation among the studied tomato genotypes, where the highest number of fruits per plant (53.67) was obtained in Binatomato-5. Kabir (2004) also found significant genotypic variation for the number of fruits per plant in tomato.

Reproductive efficiency (%): A significant variation was observed in reproductive efficiency of different tomato genotypes. Among the studied genotypes the highest (53.90%) reproductive efficiency was observed in CLN-2777A, which was statistically similar to WVCT- 8 (52.50%), while the lowest was found in CLN-2777B (16.10%) which was closely followed by CLN-2777F (16.40%) (Table 4). Reproductive efficiency depends on the quality of the seeds as well as the varietal performance. Wagh *et al*. (2007) observed that the reproductive efficiency was significantly varied among the genotypes.

Days to first harvest: Analysis of variance (ANOVA) revealed a significant variation in respect of days to first harvest in

Table 5: Effects of genotypes on the yield and yield contributing characters of tomato

Genotypes	Days to first harvest	Harvesting duration (days)	Fruit weight per plant (kg)	Individual fruit weight (g)	Yield (t ha^{-1})
CLN-2777A	88.69^{c}	48.10^{a}	2.250^{a}	50.33^{bc}	75.24^{a}
CLN-2777B	77.41^{def}	36.30^{bcd}	0.500^{g}	31.40^{fg}	17.90^{j}
CLN-2777C	80.55^{d}	33.50^{bcde}	1.060^{de}	43.36^{cde}	37.17^{g}
CLN-2777D	78.15^{def}	31.72^{cdef}	0.908^{ef}	42.09^{cde}	41.20^{ef}
CLN-2777E	80.06^{d}	30.00^{def}	1.090^{cde}	38.85^{def}	38.01^{fg}
CLN-2777F	78.35^{def}	30.00^{def}	0.690^{fg}	37.65^{def}	24.08^{i}
CLN-2413	74.35^{f}	42.53^{ab}	1.960^{b}	63.10^{a}	68.63^{b}
CLN-2418	67.60^{g}	31.70^{cdef}	1.837^{b}	36.50^{ef}	40.66^{ef}
CLN-2460E	75.10^{ef}	41.00^{abc}	0.905^{ef}	42.04^{cde}	31.67^{h}
WVCT-1	88.34^{c}	19.80^{g}	1.391^{c}	42.40^{cde}	48.68^{d}
WVCT-2	81.10^{d}	23.00^{fg}	1.140^{cde}	47.50^{bcd}	39.86^{efg}
WVCT-3	88.30^{c}	25.30^{efg}	1.248^{cd}	36.70^{ef}	43.57^{e}
WVCT-4	89.00^{c}	23.02^{fg}	1.179^{cde}	35.36^{ef}	41.19^{ef}
WVCT-5	88.00^{c}	26.71^{efg}	1.150^{cde}	30.80^{fg}	40.32^{ef}
WVCT-6	91.00^{bc}	23.08^{fg}	1.020^{de}	22.40^{g}	35.77^{g}
WVCT-7	92.90^{b}	24.00^{efg}	1.710^{b}	36.98^{ef}	59.78^{c}
WVCT-8	95.90^{a}	38.50^{bcd}	1.990^{ab}	53.35^{b}	70.21^{b}
Binatomato-5	81.10^{d}	38.60^{bcd}	1.930^{b}	38.60^{def}	66.87^{b}
Raton	78.72^{de}	40.80^{bc}	1.970^{ab}	51.81^{bc}	67.92^{b}
LSD (0.05)	3.691	7.805	0.289	8.698	3.774

In a column, figure bearing same letter s do not differ significantly at 5% level by DMRT, LSD: Least significant difference

different genotypes. The genotype WVCT-8 required the longest time (95.90 days) to first harvest, while the genotype CLN-2418 required the shortest time (67.60 days) to first harvest (Table 5). Few genotypes of the tomato have the capacity to ripen early due to the presence of certain genes. Islam (2006) observed that significant variation among the studied tomato genotypes enhanced the early maturity time to harvest.

Harvesting duration (days): The harvesting duration in the studied genotypes significantly varied. The longest (48.10 days) duration was found in CLN-2777A, which was statistically similar to CLN-2413 and CLN-2460E. On the other hand, the genotype WVCT-1 required the shortest (19.80 days) duration, which was closely followed by WVCT-6, WVCT-4 WVCT-2, WVCT-7 and WVCT-3 (Table 5). These results corroborated by the statement of Kabir (2004) that long durated plant raised the maturity time.

Fruit weight per plant (kg): Fruit weight per plant was significantly influenced by different genotypes tested in the study. The highest fruit yield per plant (2.25 kg) was observed in CLN-2777A, which was statistically similar to WVCT-8 and Raton (Table 5). Similarly, the lowest fruit weight per plant (0.50 kg) was observed in CLN-2777B which was statistically similar to CLN-2777F. Hossain (2007) found a highly significant difference in respect of fruit weight per plant. Karim (2005) also observed the highest variation for fruit weight per plant of tomato, which supported the present findings.

Individual fruit weight (g): The weight of individual fruit showed significant variation among the genotypes. The highest individual fruit weight (63.10 g) was observed in CLN-2413 which was statistically different with others, whereas, the lowest individual fruit weight (22.40 g) was observed in WVCT-6 which was statistically similar to WVCT-5 and CLN-2777B (Table 5). Islam (2006) found highly significant differences in respect of individual fruit weight. Das *et al*. (1998) observed a considerable range of variation among 23 diverse genotypes of tomato with respect to individual fruit weight.

Fruit yield (t ha^{-1}): The fruit yield of studied tomato genotypes was converted to per plot and then to per hectare and expressed in metric ton, i.e., t ha^{-1}. The genotypes had the significant variation in respect of yield (t ha^{-1}) (Table 5). Inbreed genotype CLN-2777A produced the highest yield (75.24 t ha^{-1}), which was closely followed by hybrid genotype WVCT-8 (70.21 t ha^{-1}), inbreed genotype CLN-2413 (68.63 t ha^{-1}) and two local varieties Raton 67.92 t ha^{-1}) and Binatomato-5 (66.87 t ha^{-1}). However, the inbreed genotype CLN-2777B and CLN-2777F produced the lowest yield 17.90 and 24.08 t ha^{-1}, respectively. Comparing all, hybrid genotypes produced more yield than inbreed but the local varieties performed constantly better. These results indicated that the highest yield producing genotype had better yield attributing characters like number of flowers per cluster, number of fruits per cluster individual fruit weight and fruit weight per plant. Hossain (2003) observed significant variation in yield of different genotypes where the genotype M-58 gave the highest yield (65.53 t ha^{-1}) and M-83 gave the lowest yield (33.40 t ha^{-1}). Karim (2005) and Mao *et al.* (2007) also observed the significant variation among the genotypes tested in respect of fruit yield.

CONCLUSION

It could be concluded in the study that among the genotypes, with the best performance was in the exotic hybrid genotype WVCT-8 and the inbred genotype CLN-2777A respect of some morphological attributes and yield under Bangladesh conditions. By cultivating these two genotypes, farmers would be able to earn profit. But for wider acceptability of the results, the experiment needs to be repeated. Further experimentation is needed to confirm the results under field conditions at different Agro-Ecological Zones of Bangladesh and also in summer season.

REFERENCES

Biswas, V.R., N.C. Tiwari and N. Kumar, 2000. Growth and yield potential study on tomato (*Lycopersicon esculentum* L.) hybrids at Pithoragarh conditions. Agric. Sci. Digest, 20: 124-125.

Dagade, S.B., A.V. Barad and L.K. Dhaduk, 2015. Studies on hybrid vigour in F_1 and its retention in F_2 for fruit firmness and related traits in tomato. Intern. J. Applied Biol. Pharmaceut. Technol., 6: 193-198.

Das, B., M.H. Hazarika and P.K. Das, 1998. Genetic variability and correlation in fruit characters of tomato (*Lycopersicon esculentum* Mill.). Ann. Agric. Res., 19: 77-80.

Fanasca, S., A. Martino, E. Heuvelink and C. Stanghelli, 2007. Effect of electrical conductivity, fruit pruning and truss position on quality in greenhouse tomato fruit. J. Horticult. Sci. Biotechnol., 82: 488-494.

Gomez, K.A. and A.A. Gomez, 1984. Statistical Procedures for Agricultural Research. 2nd Edn., John Willy and Sons, New York, USA., ISBN-13: 9780471870920, pp: 97-411.

Hossain, M.M., 2003. Comparative morpho-physiological studies of some exotic and local genotypes of tomato. M.S. Thesis, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Hossain, M.M., 2007. Evaluation of tomato genotypes in respect of some morphological attributes and yield. M.S. Thesis, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Hussain, S.I., K.M. Khokhar, T. Mahmood, M.H. Laghari and M.M. Mahmud, 2001. Yield potential of some exotic and local tomato cultivars grown for summer production. Pak. J. Biol. Sci., 4: 1215-1216.

Islam, M.K., 2006. Yield performance of some tomato genotypes in early winter. M.S. Thesis, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Kabir, M.S.A., 2004. Morpho-physiological evaluation of elite genotypes of tomato in early summer season. M.S. Thesis, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Karim, M.R., 2005. Study of growth and yield performance of late transplanted summer tomato genotypes. M.S. Thesis, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Kumar, S., T. Singh, B. Singh and J.P. Singh, 2004. Studies on heritability and genetic advance in tomato (*Lycopersicon esculentum* Mill). Prog. Agric., 4: 76-77.

Lumpkin, H.M., 2005. A comparison of lycopene and other phytochemicals in tomtoes grown under conventional and organic management systems. Technical Bulletin No. 34, AVRDC, The World Vegetable Center, Taiwan, pp: 1-19.

Mao, X.J., J.X. Wang, J.Y. Wang, X. Cao and Y.T. Wei, 2007. A new fresh-eating small tomato variety Jidong 216. Acta Hortic. Sinica, 34: 265-265.

Sengupta, S.K., J.C. Dwivedi and S.S. Kushwah, 2002. Response of tomato (*Lycopersicon esculentum* Mill.) to bioinoculants at different levels of nitrogen. Veg. Sci., 29: 186-188.

Sesso, H.D., J.E. Buring, S.M. Zhang, E.P. Norkus and J.M. Gaziano, 2005. Dietary and plasma lycopene and the risk of breast cancer. Cancer Epidemiol. Biomarkers Prev., 14: 1074-1081.

Singh, N.P., 2005. Basic Concepts of Vegetable Science. International Book Distributing Co., Lucknow, India, pp: 336-434.

Solieman, T.H.I., M.A.H. El-Gabry and A.I. Abido, 2013. Heterosis, potence ratio and correlation of some important characters in tomato (*Solanum lycopersicum* L.). Sci. Horticult., 150: 25-30.

Wagh, R.S., R.W. Bharud, R.S. Patil and M.N. Bhaleker, 2007. Correlation analysis of growth, yield and fruit quality components in tomato. J. Maharashta Agric. Univ., 32: 29-31.

Wang, W., F. Yao and G. Su, 2006. A new cherry tomato hybrid Jinong Jinyu. Acta Horticulturae Sinica, 6: 1410-1410.

Willcox, J.K., G.L. Catignani and C. Lazarus, 2003. Tomatoes and cardiovascular health. Crit. Rev. Food Sci. Nutr., 43: 1-18.