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EVALUATION OF SUMMER TOMATO MUTANTS FOR HIGHER YIELD AND GOOD KEEPING QUALITY

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ABSTRACT

A pot experiment was carried out at the pot yard of Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh during *kharif-1* season to evaluate the performance of five summer tomato genotypes (CLN 2418, CLN 2443, CLN 2366, CLN 2413 and J-5) on the basis of some important morphological and yield components. The experiment was conducted in Completely Randomized Design with three replications. The collected data were analyzed statistically and means were adjudged by DMRT at 5% level of probability. Results revealed that there were significant genotypic differences in respect of all parameters studied. It was further revealed that in general, high yielding genotypes showed superior performance in respect of yield contributing characters compared to low yielding ones. The genotypes, CLN 2418 and CLN 2443 produced higher fruit yield (1.49-1.54 kg plant^{-1}) with the highest being in CLN 2418 (1.54 kg plant^{-1}) due to its superiority in respect of all yield contributing characters. In contrast, CLN 2366 produced the lowest fruit yield (1.25 kg plant^{-1}) due to poor performance in yield contributing characters. Further, harvesting duration was the highest in CLN 2418 (36 days) and the lowest was in CLN 2443 (30 days). But the keeping duration was the highest in CLN 2443 (9 days). CLN 2418 also showed 7 days shelf life when stored in room temperatures without deteriorating the quality in summer season.

Key words: Tomato, mutant, yield, keeping quality.

Introduction

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important popular and nutritious vegetable crops in Bangladesh. It belongs to the family *Solanaceae*. It is cultivated in almost all home gardens and also in the field for its adaptability to wide range of soil and climate in Bangladesh. The crop performs better under an average monthly temperature of 20-23^{0}C. But commercially, it may grow at temperature ranging from 15-27^{0}C (Haque *et al.*, 2009). However, tomato is widely grown in Bangladesh usually in winter season. With the increase of population, the demand of tomato in our country is increasing day by day. The availability of quality summer vegetable in Bangladesh is very limited in number. Now-a-days, tomato is grown both in the winter and summer seasons in Bangladesh. But the production in the summer season is much less than that of winter. There is a great demand for tomato in summer. The present summer cultivated varieties are having low yield potentiality. So it is necessary to develop high yield variety for summer cultivation. In this regard, some research institutes (BARI, BINA and BAU) are trying to develop high yielding genotypes suitable for summer cultivation which need to be assessed morpho-physiologically for getting stable high yielding genotypes. Keeping the above views in mind, the present experiment was designed to achieve the objectives to evaluate the morpho-physiological characters of some genotypes of summer tomato; to select morpho-physiologically better genotypes with higher yield; and to select good keeping quality genotype.

Materials and Methods

A pot experiment was carried out at the pot yard of Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh during *kharif-1* season. Geographically the experimental area is located at 24^{0}75 N latitude

and $90^0$50 E longitudes at the elevation of 18 m above the sea level. The soil of the experiment was collected from farm. \

Treatment of the experiment: The experiment consisted of five summer tomato genotypes. They were CLN 2418, CLN 2443, CLN 2366, CLN 2413 and J-5 (check).

Preparation of pots and fertilizer applications: Silty loam soils were collected from BINA farm, Mymensingh. The collected soil was well pulverized and dried in the sun. Plant propagules, inert materials, visible insects and pests were removed from this soil. The dry soil was thoroughly mixed with well rotten cowdung. This prepared medium was used in filling the pots after well mixing with the given amounts of urea, triple superphosphate, muriate of potash, gypsum and cowdung at the rate of 3.70, 2.15, 1.30, 0.80 and 150 g pot^{-1} corresponding to 300, 160, 140, 40 and 10000 kg ha^{-1}, respctive1y. Earthen pots of 30 cm diameter and 35 cm height were used for the experiment. The pots of the experiment were filled with 12 kg of soils.

Experimental design and transplanting of seedlings: The experiment was laid out in a Completely Randomized Design (CRD) with 3 replications. Two seedlings were sown in each pot. Finally, they were thinned to one seedling after 20 days of transplanting.

Collection of data: The following parameters were collected. Morpho-physiological parameters: Plant height, Number of branches $plant^{-1}$, Total dry matter $plant^{-1}$, Days to first fruiting, Days to first and last harvest**,** Fruit picking period**.** Yield and yield contributing characters: Number of flowers cluster $plant^{-1}$, Number of flowers $cluster^{-1}$, Number of fruits $plant^{-1}$**,** Single fruit weight, Fruit yield $plant^{-1}$.

Statistical analysis: The collected data were analyzed statistically following the analysis of variance (ANOVA) technique and the mean differences were adjudged by Duncan's Multiple Range Test (DMRT) using the statistical computer package program, MSTAT-C (Russel, 1986).

Results and Discussion

Some morpho-physiological and agronomic parameters

Plant height: Plant height differed significantly among the studied genotypes (Table 1). The tallest plant was recorded in J-5 (117.4 cm) which was significantly different from others. In contrast, the shortest plant was recorded in CLN 2413 (70.0 cm). These results were in agreement the result of Kabir (2004) who stated that plant height differed significantly among the studied genotypes in tomato.

Number of branches $plant^{-1}$: Number of branches $plant^{-1}$ had shown high variability amongst the studied genotypes (Table 1). The highest number of branches $plant^{-1}$ was recorded in J-5 (7.25). In contrast, the lowest number of branches $plant^{-1}$ was recorded in CLN 2418 (3.15). Other genotypes had branches $plant^{-1}$ in between 3.17 to 3.33. The differential response of branching in the genotypes could be attributed to its genetic potentiality. Further, most of the researchers reported that tomato fruit yield was significantly and positively correlated with branch number. In the present experiment, 3-5 produced the highest number of branches but performed lower yield because of most of the branches were inactive (profuse branching).

Total dry matter production $plant^{-1}$: CLN 2418, the high yielding genotype showed the highest TDM (364 g $plant^{-1}$). On the other hand, J-5 showed the lowest TDM (320.8 g $plant^{-1}$). Increased TDM in CLN 2418 was possibly might be due to greater leaf area. The result was supported by the result of Kabir (2004) who reported that increased TDM was observed in high yielding genotypes compared to low yielding ones. In the present experiment, similar result was also observed. Further, Hossain (2003) reported that high yielding genotypes had greater TDM than in low yielding ones in tomato. Increased TDM in CLN 2418 was possibly might be due to greater leaf area. The result was supported by the result of Kabir (2004) who reported that increased TDM was observed in high yielding genotypes compared to low yielding ones. Similar result was also observed by Hossain (2003).

Days to first fruiting: Days required to first fruiting ranged from 42.0 to 45.7 days among the genotypes (Table 1). Of the genotypes, CLN 2413 had shown the earliest fruiting (42.0 days) and it was significantly different from the remainder. In contrast, the maximum days of fruiting occurred in CLN 2418 (45.7 days). This result was in agreement with Karim (2005) and Kabir (2004) who reported flower opening between 35 and 45 days after transplanting in tomato.

Days to first ripening: Days required to first ripening had significant variability amongst the studied genotypes (Table 1). J-5 required the highest days to ripening (96 days). On the other hand, CLN 2418 required the lowest days to ripening (78.0 days).

Picking duration: Picking duration had significant variability amongst the studied genotypes (Table 1). The highest harvesting duration was recorded in CLN 2418 (36 days). In contrast, the lowest harvesting duration was recorded in CLN 2443 (30 days).

Table 1. Effect genotypes on morpho-physiological and phonological characters in five summer tomato

Genotype	Plant height (cm)	Number of branches plant^{-1}	Total dry matter production plant^{-1} (g)	Days to first fruiting	Days to first ripening	Picking duration (days)
CLN -2418	71.0 b	3.15 b	364.0 a	45.7 a	78.0 d	36.0 a
CLN- 2443	71.0 b	3.17 b	347.8 ab	44.7 ab	84.6 bc	30.0 c
CLN -2366	75.4 b	3.33 b	335.4 bc	44.7 ab	86.2 b	32.0 bc
CLN -2413	70.0 b	3.25 b	355.0 ab	42.0 b	89.2 b	32.0 bc
J-5 (Check)	117.4 a	7.25 a	320.8 c	44.5 ab	96 a	33.0 b
F-(test)	**	**	**	**	**	**
CV (%)	10.84	11.37	5.50	4.22	2.30	6.75

In a column same figure (s) do not differ significantly at $p \leq 0.05$ as per DMRT
** indicate significant at 1% level of probability.

Yield contributing characters

Number of flower cluster plant^{-1}: The number of flower cluster plant^{-1} was significantly different among the genotypes. CLN 2413 produced the highest number of flower cluster plant^{-1} (12.8) followed by CLN 2418 (12.5), CLN 2443 (11.8) and CLN 2366 (12.3). J-5 produced the lowest number of flower cluster plant^{-1} (10.7). Result further revealed that high yielding genotypes also bad higher number of flower cluster plant^{-1} (Table 2).

Number of fruit cluster^{-1}: The number of fruit production cluster^{-1} was also significantly different amongst the genotypes. The genotypes CLN 2418 and CLN 2443 had high yield and also possessed greater number of fruit cluster^{-1} with being the highest in CLN 2418 (3.01).

Single fruit weight: The genotype CLN 2418 produced the highest single fruit weight (72.41 g). The lowest single fruit weight was found in CLN 2366 (43.37 g).

Fruit diameter: CLN 2418 produced the heavier fruit (4.10 cm). The minimum fruit diameter was found in CLN 2366 (3.68 cm). Other three genotypes, CLN 2443, CLN 2413 and J-5 produced medium sized fruits (range 3.80 -3.91 cm).

Fruit yield: There was a remarkable difference in respect of fruit yield plant^{-1}. The genotype CLN 2418 produced the highest fruit yield plant^{-1}. (1.54 kg) and it was similar to CLN 2443 (1.49 kg). The fruit yield was higher in CLN 2418 and CLN 2443 because of producing higher number of fruits plant^{-1} and larger fruit size. In contrast, CLN 2366 produced the lowest fruit yield (1.25 kg) due to the production of lower number of fruits plant^{-1}. Most of the researchers reported that fruit yield in tomato mostly depend on fruit number and fruit size (Dutta *et al*,1995; Karim, 2005) that supported the present experimental results.

Keeping duration: The effect of genotypes on fruit keeping duration under room temperature during summer season was significant. Result revealed that the highest fruit keeping duration under natural room condition was observed in CLN 2443 (9 days) and the lowest keeping duration was observed in CLN 2413 and CLN 2366 (5 days). The fruits of CLN 2418 and CLN2028 were good till 7 days.

Table 2. Effect of genotypes on yield attributes in five summer tomato

Genotype	Number of flower cluster plant^{-1}	Number of fruit cluster^{-1}	Single fruit weight (g)	Fruit diameter (cm)	Fruit yield (kg)	Keeping duration
CLN -2418	12.5a	3.01 a	72.41 a	4.10 a	1.54 a	7 days b
CLN- 2443	11.8b	2.67 b	57.60 ab	3.80 ab	1.49 a	9 days a
CLN -2366	12.3 b	2.58 b	43.37 bc	3.68 ab	1.25 b	5 days d
CLN -2413	12.8 a	2.45 b	52.82 ab	3.80 ab	1.28 b	5 days d
J-5 (Check)	10.7 c	1.90 c	61.43a	3.91 ab	1.31 b	6 days c
F-(test)	**	**	**	**	**	**
CV (%)	10.81	10.17	7.90	5.74	3.32	1.01

Conclusion

The study concluded that genotypes CLN 2418 and CLN 2443 performed best regarding yield contributing characters and yield and these two genotypes could be stored in room temperature for 7-9 days without hampering the quality during summer season. However, more studies are needed to confirm their performance in field conditions.

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