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PERFORMANCE OF VARIOUS GENOTYPES OF TOMATO UNDER FOOTHILL CONDITION OF NAGALAND

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ABSTRACT

A field experiment was conducted during rabi season of 2013-2014 at the School of Agricultural Sciences and Rural Development, Medziphema (Nagaland) to evaluate the performance of various genotypes of tomato under foothill condition of Nagaland. Thirteen genotypes of tomato (Lycopericon esculentum Mill.) were evaluated for their growth, yield and quality characters in randomized block design with three replications. Plot size measured 1.8 m x 1.8 m with a spacing of 60 x 45cm. Results revealed that all the genotypes exhibited significant variation in their performance in term of growth, yield and quality characters. Among the genotypes, 2013/TODVAR-1 recorded maximum fruit yield (32.59 t ha^{-1}) and vitamins C content (74.58 mg 100^{-1}g of fruit). The maximum TSS content (6.45 ^{0}Brix) was recorded in genotype 2012/TODVAR-3 which was at par with genotype 2013/TODVAR-1. The genotype 2013/TODVAR-1 was found promising genotype under existing agro-climatic condition of Nagaland.

Key words: Tomato, genotypes, growth, quality, yield

INTRODUCTION

Tomato (*Lycopericon esculentum* Mill.), belonging to the family Solanaceae, is one of the important vegetable crop, grown throughout the world. Tomato is rich source of minerals and vitamins and treated as protective food. Lycopene, that impart red colour of tomato, s one of the most powerful natural antioxidant. In India, tomato occupies an area of 1.20 million hectares and annual production of 19.40 million tonnes with productivity of 16.1 tonnes ha^{-1} (IHD, 2014). Tomato is warm season crop and can be grown successfully in the plains as well as in the hills. Ripe fruits of tomato are used as salad and cooked also. Tomato is utilized in the preparation of different processed items such as puree, paste, powder, ketchup, sauce, soup and canned whole fruit (Thamburaj and Singh, 2005). Nagaland has a potentiality for the cultivation of tomato. Nagaland is bestowed with the agro-climatic condition, which is very suitable for tomato cultivation. The potential of tomato is not fully exploited, this may be due to the lack of proper knowledge about the genotypes best suited under the prevailing agro climatic condition of Nagaland Bhati and Kanaujia (2014). Before recommendation of any variety suitable for the region, it is pertinent to evaluate genotypes giving emphasis on the aspects of genotypic suitability and yield. Performance of tomato genotypes varies from place to place due to the varied agro-climatic conditions and thus the growth and yield of a genotype does not remain same for all the regions. In view of the above, the present investigation was conducted to study the performance of different genotypes of tomato under foothill condition of Nagaland so as to ascertain and recommend the genotype best suited for the agro-climatic condition of the foothill of Nagaland.

MATERIALS AND METHODS

A field experiment was carried out during *rabi* season of 2013-2014 at the Experimental Farm of Department of Horticulture, SASRD, Medziphema campus, Nagaland University, Nagaland. The experimental site is located at an altitude of 310 m above mean sea level, with geographical location of 25^{0}45'43"N latitude and 93^{0}33'04"E longitude. The soil of the experimental site was sandy loam in texture having P^{H} 4.7, organic carbon 16.6g kg^{-1} and available N 265, P 17 and K 194 kg ha^{-1}. The experiment was laid out in randomized block design with three replications. Plot size measured 1.8 m x 1.8 m with a spacing of 60 x 45cm. Thirteen genotypes of tomato *viz*., 2012/TODVAR-1, 2012/TODVAR-3, 2012/ TODVAR-4, 2012/TODVAR-5, 2012/TODVAR-6, 2012/TODVAR-7, 2012/TODVAR-8, 2013/ TODVAR-1, 2013/TODVAR-2, 2013/TODVAR-3, 2013/TODVAR-4, H-86 and Nagaland Local were evaluated in the experiment. All genotypes of tomato except Nagaland Local were obtained

from Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh. Seeds were sown in nursery on 4th September, 2013. FYM (20 t ha^{-1}) and NPK (120:60:60 kg ha^{-1}) were applied in the experimental plots. Nitrogen, P and K were applied through urea, single super phosphate and muriate of potash, respectively. FYM was applied at the time of field preparation, 20 days before transplanting of the crop while full dose of P and K and half dose of N were applied two days before transplanting the crop. Remaining half dose of nitrogen was applied 45 days after transplanting. Thirty days old uniform and healthy seedlings were transplanted in the main field. Standard agronomic practices and plant protection measures were adopted as per schedule. Five plants of each plot were randomly selected and duly tagged for recording the observations. Observations were recorded on plant height, branches plant $^{-1}$, leaves plant $^{-1}$, days to fruit ripening, crop duration, fruit length, fruit diameter, fruit plant $^{-1}$, fresh weight of fruit, fruit yield. Vitamin C content was determined by 2, 6-dichlorophenol indophenol visual titration method (A.O.A.C., 1984) and expressed in mg 100 $^{-1}$g of fruit. Total soluble solid (TSS) was determined using hand refractometer and results expressed in ºbrix. The statistical analysis was carried out as per procedure given by Panse and Sukhatme (1978).

RESULTS AND DISCUSSION

Growth characters

Data (Table 1) on growth parameters exhibited significant difference among various genotypes. All the genotypes showed significant variation in plant height at maturity. The plant height varied from 70.07 cm to 96.87 cm. The genotype 2013/TODVAR- 2 produced the tallest plants (96.87 cm) followed by genotype 2013/TODVAR- 4. The minimum value of plant height (70.07 cm) was recorded in genotype 2012/TODVAR-4. The branches varied significantly among different genotypes and maximum branches (13.0) was recorded in 2012/TODVAR- 6 followed by the genotype 2012/TODVAR-1. The minimum branches (7.33) was recorded in genotype 2012/TODVAR- 4. Highest leaves plant^{-1} (70.53) was recorded in genotype 2013/TODVAR- 2 and minimum (40.07) in genotype 2012/TODVAR-3. Days taken to fruit ripen were greatly influenced by different genotypes. The genotype 2012/TODVAR-5 ripened early at 101.33 days after planting while late ripening was found in genotype 2012/TODVAR-7 at 130.33 days after planting. Crop duration was found significant and varied from 139.67 days to 154.00 days. The genotypes Nagaland Local showed the maximum crop duration of 154 days while the minimum in genotype 2012/TODVAR-5 having crop duration of 139.67 days. The wide variation in growth parameters of all the genotypes might be due to their genetic make-up, which indirectly govern the morphology of the plant. Since all the genotypes were grown under the same climatic conditionand same season. These results are in conformity with the finding of Bhati and Kanaujia (2014), Phom *et al.* (2014) and Ralte and Kanaujia (2015).

Table1: Performance of tomato genotypes for growth characters

Genotypes	Plant height (cm)	Branches plant^{-1}	Leaves plant^{-1}	Days to fruit ripening	Crop duration
2012/TODVAR-1	78.73	12.47	60.6	104.00	151.67
2012/TODVAR-3	85.80	8.33	40.07	113.33	152.33
2012/TODVAR-4	70.07	7.33	40.47	128.00	141.00
2012/TODVAR-5	83.53	10.87	54.40	101.33	139.67
2012/TODVAR-6	79.47	13.00	61.83	108.67	144.67
2012/TODVAR-7	73.20	9.73	51.40	130.33	141.67
2012/TODVAR-8	81.33	8.80	55.17	115.00	151.67
2013/TODVAR-1	88.13	11.33	60.73	116.00	153.00
2013/TODVAR-2	96.87	11.07	70.53	121.33	152.67
2013/TODVAR-3	80.20	10.60	54.13	115.00	150.00
2013/TODVAR-4	89.89	9.53	60.13	128.67	149.67
H-86	78.80	7.53	52.07	128.67	151.33
Nagaland Local	77.60	8.27	49.20	128.67	154.00
SE m $\pm$	3.9	1.0	5.1	3.8	1.1
CD (P 0.05)	11.0	3.0	15.0	11.0	3.2

Yield attributes and yield

It is evident from table 2 that there was significant difference in yield attributing characters among various genotypes. All the genotypes showed significant difference in fruit length. The longest fruit length (5.05 cm) was recorded in genotype 2013/TODVAR-1 followed by 2012/TODVAR-7 (5.04 cm) and shortest fruit length (3.56 cm) in genotype 2012/TODVAR-5. Fruit diameter differed significantly among the genotypes. The maximum diameter of the fruit (6.17 cm) was noted in genotype 2013/TODVAR-4 and minimum (4.17 cm) in genotype 2012/TODVAR-8. Significant differences were observed among the genotypes with respect to fruits plant^{-1}. The maximum fruits plant^{-1} (33.47) was recorded in genotype 2012/TODVAR-1 which was significantly superior over other genotypes. Minimum fruits plant^{-1} (11.73) was recorded in genotype 2012/TODVAR-7. There was a significant difference among the genotypes in terms of fresh weight of fruit. The genotype 2013/TODVAR-1 recorded the maximum fresh weight of fruit (89.13 g) followed by genotype H-86 (83.53 g). The minimum fresh weight of fruit was produced in genotype 2012/TODVAR-4 (40.53 g). Significant differences were recorded among various genotypes with respect to fruit yield and genotype 2013/TODVAR-1 produced the highest fruit yield (32.59 tones ha^{-1}) which closely followed by genotype 2012/TODVAR-6 (26.48 tones ha^{-1}) while lowest fruit yield (10.76 tones ha^{-1}) was produced by genotype 2012/TODVAR-7. The genotype 2013/TODVAR-1 proved significantly superior over other genotypes except 2012/TODVAR-6, 2013/TODVAR-2, 2013/TODVAR-4 and Nagaland Local. Higher yield under genotype 2013/TODVAR-1 may be due to longer fruit length and higher fresh weight of fruit. Differences in fruit yield might be due to the genetic constitution of the genotypes. These results are in conformity with the finding of Bhati and Kanaujia (2014), Phom *et al.* (2014) and Ralte and Kanaujia (2015).

Quality parameters

Data (Table 2) revealed that all the genotypes showed significant difference for quality parameters. The maximum vitamin C content (74.58 mg 100^{-1} g) was recorded in the fruit of genotype 2013/TODVAR-1. Genotype 2013/TODVAR-2 recorded the minimum content of vitamin C (38.52 mg 100^{-1} g). Differences in vitamin C content in fruit might be due to the genetic constitution of the genotypes. The maximum TSS content in fruit (6.45 ^{0} Brix) was recorded from the genotype 2012/TODVAR-3 followed by 2013/TODVAR-1 (6.09^{0} Brix). The treatment difference between 2012/TODVAR-3 and 2013/TODVAR-1 was found at par. The minimum TSS content in fruit (4.34^{0} Brix) was recorded from the genotype 2012/TODVAR-5. Differences in TSS content in fruit might be due to the genetic constitution of the genotypes. These results are in conformity with the finding of Bhati and Kanaujia (2014) and Phom *et al.* (2014).

Table 2: Performance of tomato genotypes for yield and quality attributes of fruita

Genotypes	Fruit length (cm)	Fruit diameter (cm)	Fruits plant $^{-1}$	Fresh weight of fruit (g)	Fruit yield (t ha^{-1})	Vitamin C (mg 100g^{-1})	TSS (^{0}Brix)
2012/TODVAR-1	3.93	5.06	33.47	49.73	16.78	40.21	5.83
2012/TODVAR-3	4.63	5.32	16.53	55.87	17.01	41.84	6.45
2012/TODVAR-4	4.01	4.34	18.93	40.53	10.94	45.64	5.51
2012/TODVAR-5	3.56	4.31	17.87	41.40	16.58	50.98	4.34
2012/TODVAR-6	3.65	4.73	17.80	46.13	26.48	49.03	4.58
2012/TODVAR-7	5.04	4.38	11.73	50.27	10.76	56.59	5.62
2012/TODVAR-8	4.58	4.17	17.80	49.33	22.30	45.83	5.45
2013/TODVAR-1	5.05	6.13	19.53	89.13	32.59	74.58	6.09
2013/TODVAR-2	4.23	6.09	13.07	70.27	25.08	38.52	4.87
2013/TODVAR-3	4.49	4.41	17.53	52.60	21.38	56.77	4.56
2013/TODVAR-4	4.48	6.17	14.33	77.13	22.51	64.13	5.75
H-86	4.66	6.15	12.87	83.53	17.96	62.34	4.83
Nagaland Local	4.33	4.49	15.20	55.60	22.88	47.71	5.07
SE m $\pm$	0.23	0.18	3.07	4.34	3.46	6.73	0.42
CD (P 0.05)	0.68	0.52	8.95	12.68	10.1	19.63	1.22

On the basis of results, it may be concluded that genotype 2013/TODVAR-1 was found to be the potential yielder in regard to fruit yield of tomato and 2012/TODVAR-6 was rated second best genotype under existing agro-climatic condition of Nagaland. Therefore, 2013/TODVAR-1 and 2012/TODVAR-6 are recommended for commercial cultivation of tomato under foothill condition of Nagaland.

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