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Evaluation of Tomato Genotypes for Growth, Yield and Quality Traits under Foothills Condition of Nagaland, India

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A B S T R A C T

The goal of this investigation was to evaluation of tomato genotypes viz., TODVAR-1, TODVAR-2, TODVAR-3, TODVAR-4, TODVAR-5, TODVAR-6, TODVAR-7, TODVAR-8 and H -86 (C) for their growth, yield and quality under foothills condition of Nagaland state. This experiment was laid out with nine tomato genotypes and three replications. The results showed that there were significant differences in evaluated parameters among cultivars. Among the genotype, TODVAR-8 was found superior genotype and recorded maximum plant height (64.75 cm), number of branches plant^{-1} (14.22), number of leaves plant^{-1} (47.81), fruit length (4.24 cm), fruit diameter (5.28 cm), number of fruits plant^{-1} (34.01), fresh weight of fruit (37.00 g), yield ha (46.62 tones), ascorbic acid content (52.73 mg 100^{-1} g) and total soluble solids (5.13^{o} Brix). The findings of this study may provide valuable information about nutritional value of studied cultivars for vegetable experts, researchers and growers under foothill condition of Nagaland and other hill or cool growing areas.

Introduction

Tomato (*Lycopersicon esculentum* Mill.) belonging to family solanaceae is one of the most important vegetable, widely grown throughout the world for supplying in the fresh market as well as for processing. In India, it is grown in an area of 8.65 lakh hectares with annual production of 165.26 lakh tones (IHD, 2011). They are the second-most consumed vegetable after potato (FAOSTAT, 2007). Although tomatoes are commonly consumed fresh, over 80% of tomato consumption comes from processed products such as tomato juice, paste, puree, ketchup and sauce (Takeoka *et al*., 2001). It's indicated the potential health benefits of a diet rich in tomatoes and tomato products (Mayeaux *et al*., 2006). Tomato as a source of carotenoids and polyphenols targeted to cancer prevention and red colour of fruit due to lycopene (Marti *et al*., 2016; Boileau *et al*., 2003; Rao *et al*., 1998).

Tomato is a highly adaptive and warm season crop and can be grown successfully in the plains as well as in the hills. Vegetative and reproductive growth at lower temperatures is very limited, and an extended period of plant growth at 12^{0}C or less can result in chilling injury. Moreover, the plant grows best when provided with uniform moisture and well–

drained soil (Gould, 1992). Nagaland, like other North-Eastern states is bestowed with the agro-climatic condition, which is very suitable for tomato cultivation. Lack of proper knowledge about the cultivars best suited to the agro-climatic condition, the potential of tomato is not fully exploited. Before recommendation of any cultivars suitable for the region, it is pertinent to evaluate cultivars giving emphasis on the aspect of genotypic suitability and yield. Varietal performance of tomato varies from place to place due to the varied climatic conditions. Considering all the above mentioned facts, a pertinent need was felt to undertake an experiment on genotype performance of different cultivars of tomato under foothills of Nagaland so as to ascertain and recommend, the cultivars best suited for the agro-climatic condition of the foothills of Nagaland

Materials and Methods

A field experiment was conducted during 2012 - 2013 at the Experimental Farm of SASRD, Medziphema campus, Nagaland University, Nagaland. The field is located at the altitude of 304.8 m above mean sea level with geographical location at 20º 45' 43" N latitude and 93º 53' 04" E longitudes. The soil of the experimental site was sandy loam having soil pH 4.4, organic carbon 1.60 % and available N, P and K content of 305.76, 17.00 and 225.25 kg ha^{-1} respectively. The experiment was laid out in a randomized block design with three replications. Plot size measured 1.8 m x 1.8 m and spacing was maintained at 60 cm x 45cm. Nine genotypes *viz*., TODVAR-1, TODVAR-2, TODVAR-3, TODVAR-4, TODVAR-5, TODVAR-6, TODVAR-7, TODVAR-8 and H -86 (C) were evaluated in the experiment. Seeds were sown in nursery on 13 August, 2012. Thirty days old uniform and healthy seedling were transplanted in the main field. FYM @ 20 t ha^{-1} and NPK @ 120:60:60 kg $hectare^{-1}$ was applied in the experimental plots. Observations were recorded on plant height, number of branches $plant^{-1}$, number of leaves $plant^{-1}$, fruit length, fruit diameter, number of fruits $plant^{-1}$, fresh weight of fruit, yield $hectare^{-1}$, ascorbic acid content and total soluble solids (TSS). Harvesting started about 80 days after transplanting when they were fully red. Fruits were hand-picked carefully at different intervals. Ascorbic acid content of fruit was determined by using 2, 6-Dichlorophenol indophenols visual titration method as given by A.O.A.C. (1984) expressed in mg 100^{-1} g. Total soluble solids (TSS**)** of fruit was estimated from freshly harvested fruits with a hand Refractometer and expressed in degree Brix. The statistical analysis was carried out as per procedure given by Panse and Sukhatme (1978).

Results and Discussion

Growth parameters

Performance of any crop in respect of growth, yield and quality are highly influenced by various factors like genetic constitution of variety, micro-climate of the area and crop management. Improvement in growth characters is considered to be a pre-requisite to increase the yield. The results obtained from the present investigation on growth parameters exhibited significant difference by the genotypes (Table 1). Among the genotypes, TODVAR-8 recorded maximum plant height (64.75 cm), number of branches $plant^{-1}$ (14.22) and number of leaves $plant^{-1}$ (47.81). The minimum plant height (50.08 cm), number of branches $plant^{-1}$ (9.00) and number of leaves $plant^{-1}$ (32.05) were recorded in genotype H- 86 (C). The wide variation in growth parameters of all the genotype might be due to their genetic makeup, which indirectly govern the morphology of the plant that have direct impact on formation of floral buds. Since all

the genotype were grown under the same climatic condition. These results are in conformity with the finding of Basar (1999), Kumar and Subramanian (2007), Swaroop and Suryanarayana (2005) and Ahmed *et al*., (2007).

Table.1 Performance of tomato genotypes for growth, yield and quality characters

Treatment	Plant height (cm)	Number of branches plant^{-1}	Number of leaves plant^{-1}	Fruit length (cm)	Fruit diameter (cm)	Number of fruit plant^{-1}	Fresh weight of fruit (g)	Yield hectare^{-1} (tones)	Vitamin C (mg 100^{-1} g)	TSS (^{0} Brix)
TODVAR-1	50.18	9.08	37.25	3.30	4.15	26.72	33.48	33.14	34.24	4.42
TODVAR-2	54.40	13.23	32.41	3.22	4.52	17.05	30.04	18.97	42.91	5.01
TODVAR-3	51.09	10.26	33.73	3.11	4.26	17.28	24.64	15.76	40.10	4.92
TODVAR-4	61.26	12.56	35.13	3.72	4.80	30.67	23.22	26.38	35.55	4.90
TODVAR-5	51.45	11.61	38.37	3.10	4.61	20.63	23.46	17.93	38.21	4.53
TODVAR-6	56.16	12.03	38.69	3.05	4.52	16.58	36.15	22.21	37.11	4.83
TODVAR-7	50.07	10.88	34.59	3.09	4.65	26.18	18.69	18.12	36.22	4.60
TODVAR-8	64.75	14.22	47.81	4.24	5.28	34.01	37.00	46.62	52.73	5.13
H- 86 (C)	50.08	9.00	32.05	2.96	4.07	20.57	16.29	12.41	33.84	3.97
SE(m)±	2.01	0.68	2.19	0.32	0.26	2.71	2.40	29.33	3.18	0.27
CD *(P=0.05)*	6.24	2.13	6.74	1.02	0.88	8.65	7.32	90.80	9.64	0.88

Yield parameters

It is evident from the table 1 that there is significant difference in yield attributing characters among various genotypes. All the genotypes showed significant effect on fruit length and fruit diameter of tomato. Genotype TODVAR-8 recorded maximum fruit length (4.24 cm) followed by 3.72 cm in genotype TODVAR-4. Genotype H-86(C) recorded minimum fruit length of 2.96 cm. The highest fruit diameter (5.28 cm) was recorded in genotype TODVAR-8 followed by 4.80 cm in genotype TODVAR-4. The lowest diameter (4.07 cm) was recorded in genotype H- 86 (C). Higher vegetative growth specially more number of branches and leaves might have helped in synthesis of greater amount of food material which were letter translocated into developing fruits resulting in increased fruit length and fruit diameter. Genotypes were also differed significantly for number of fruit plant^{-1}. Genotype TODVAR-8 recorded maximum number of fruit (34.01) followed by (30.67) in genotype TODVAR-4. The minimum numbers of fruits plant^{-1} (16.58) were recorded by genotype TODVAR-6. Fresh weight of fruit also varied significantly among different genotypes. The maximum fresh weight of fruit (37.00 g) was recorded in genotype TODVAR-8 while genotype H- 86 (C) recorded minimum fresh weight of fruit (16.29 g). The higher numbers of fruits plant^{-1} might be due to better plant growth. It was revealed that yield per hectare profoundly affected by the varieties. Maximum yield ha (46.62 tonnes) was recorded in genotype TODVAR-8 followed by genotype TODVAR-1 which recorded 33.14 tones yield ha. Genotype TODVAR was found significantly superior yield over other treatments. The minimum yield ha (12.41 tones) was recorded by genotype H- 86 (C). The higher yield might be due to

corresponding response to increased yield attributing characters attained previously under this genotype. These results are in conformity with the finding of Swaroop and Suryanarayana (2005), Ahmed *et al*., (2007), Doreswamy *et al.,* (2011), Dar and Sharma (2011) and Narolia *et al*., (2012).

Quality parameters

Quality of tomato is usually evaluated by vitamin C and total soluble solids content of fruits. Data from table 1 revealed that all the genotype showed significant difference for vitamin C and total soluble solids content of fruits. Highest values of vitamin C content (52.73 mg 100^{-1}g) was obtained in genotype TODVAR-8 followed by 42.91 mg 100^{-1}g in genotype TODVAR-2. The minimum content of vitamin C (33.84 mg 100^{-1}g) was recorded in variety H- 86 (C). Genotype TODVAR-8 gave highest total soluble solids (5.13^0 Brix) closely followed by 5.01^0 Brix in genotype TODVAR-2. The minimum total soluble solids (3.97^0 Brix) recorded in genotype H- 86 (C). The difference among the genotypes in regard to vitamin C and total soluble solids content of fruits might be due to the genetic constitution of the genotypes. These results are in conformity with the finding of Swaroop and Suryanarayana (2005) and Ahmed *et al*., (2007), Shashikanth *et al.,* (2010) and Manna & Paul (2012).

It can be concluded from the experiment that among the genotypes, TODVAR-8 was found superior genotype in term of growth, yield and quality traits. Therefore, the variety TODVAR-8 is recommended for commercial cultivation of tomato under foothills condition of Nagaland.

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