



Research Article

GROWTH PERFORMANCE EVALUATION OF SELECTED COMMERCIALY CULTIVATED TOMATO (*Solanum lycopersicum* L.) VARIETIES UNDER THE SEMI-ARID CONDITIONS OF MADHYA PRADESH, INDIA

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Abstract: Tomato is one of the most important Solanaceous vegetable crops cultivated widely all over the world. The present investigation was conducted with overall objectives to assess the performance evaluation of different commercially cultivated tomato (*Solanum lycopersicum* L.) varieties under the semi-arid condition of Madhya Pradesh, India, at Mansarovar Global University, Sehore, Madhya Pradesh. The yield of tomatoes can be further improved through breeding and management techniques besides crop protection measures. The overall genotypes by environmental interaction of the developed ecotypes need to be evaluated alongside the consumer preferences before the ecotypes are released for commercial cultivation. The experiment was laid out with sixteen treatments of different tomato ecotypes (varieties) including two local checks with three replications in the Randomized Block Design. It was conducted for two years. The result showed that the tomato ecotype VNR(THT)9/2020 significantly influenced the morphological, yield, quality and economic parameters and it was found significantly superior among all the tomato ecotypes. The highest morphological, yield, quality and economic parameters for the ecotype of VNR(THT)9/2020 for both the years as well as in pooled data. Whereas, the minimum morphological, yield, quality and economic parameters for both the years as well as pooled data were observed in the check ecotype of Shree.

Keywords: Tomato, *Solanum lycopersicum* Mill., Commercial ecotypes, VNR

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Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most important Solanaceous vegetable that is said to be native of South America yet widely cultivated all over the world ([1]. The tomato crop is adapted to a wide variety of climates. However, despite its broad adaptation, production is concentrated to limited areas. The tomato yield can be improved through breeding as well as by adopting improved management techniques including various timely agronomic practices, improved cultural operations, balanced input doses of nutritional fertilizers, improved irrigation water management techniques like micro-sprinklers or drip irrigation systems alongwith appropriate crop protection measures including protected cultivation as suggested by many researchers [2-6]. The overall genotypic performance along with environmental interaction of the developed ecotypes needs to be evaluated alongside the consumer preferences before the ecotypes are released for the commercial cultivation [7]. Studying the morphology of the plants also are helpful in the assessment of agronomic practices viz. fertilizer recommendation and dosages with it and also to identify the pest and diseases tolerance [8] and the type of fruits i.e. table or for processing [9]. The morphometrical studies of the tomato plants help in categorizing the plants into determinant, semi-determinate and indeterminate types [10]. To meet the requirements of a successful hybrid, it is necessary to be familiar with the detailed genetic performance of the selected material to be used for hybrid breeding. Therefore, a present study to assess the suitability of a few selected commercial genotypes was planned and conducted for two years and recommendations have been made.

Materials and Methods

The field experiment was conducted with 14 commercially cultivated tomato varieties along with two local checks at the University Farm, Bhopal of the Mansarovar Global University, Sehore, Madhya Pradesh under the semi-arid condition of Madhya Pradesh, India (at about 23° 18' 50" N latitude and 77° 29' 10" E longitude). The texture of the soil is silty clay and the bulk density is approximately 1.56 g/cc. The soils of the experimental farm are Vertisols having low infiltration rate of approximately 11.19 mm/h. The experiment was laid out in the Randomized Block Design with three replications for two consecutive years in rabi seasons of 2020 and 2021. Each replication was comprised of sixteen treatments (viz., VNR(THT)1/2020, VNR(THT)2/2020, VNR(THT)3/2020, VNR(THT)4/2020, VNR(THT)5/2020, VNR(THT)6/2020, VNR(THT)7/2020, VNR(THT)8/2020, VNR(THT)9/2020, VNR(THT)10/2020, VNR(THT)11/2020, VNR(THT)12/2020, VNR(THT)13/2020, VNR(THT)14/2020, Abhilash and Shree) with including two check ecotypes. At the time of nursery preparation, the seeds were treated with the antifungal Thiram, 2.5 gm/kg of seeds and with *Pseudomonas fluorescens* @ 10 g/ kg of seeds; the nursery was raised in trays @ 1 seed per cell. The tray cells were filled with the treated seed and coco peat and kept one above the other and covered with a polythene sheet till germination starts for approximately 5 Days. After 6 days, the trays with germinated seeds were placed on the raised beds inside a shade. Watering was done regularly to the seedlings [Fig-1]. A suitable plant ready for transplanting with good sturdy stem were transplanted between 28-30 days after sowing of nursery.

Table-1 Effect of different commercially cultivated tomato varieties on growth parameters of two year's pooled data

Treatments detail	Plant height (cm)				Number of primary branches			Fruit set percent	Days taken to first flowering	Days taken to 50% flowering	Days taken to first picking	Number of flowers per plant	Number of flowers per cluster	Number of fruits per cluster
	30 DAT	60 DAT	90 DAT	120 DAT	60 DAT	90 DAT	120 DAT							
VNR(THT)1/2020	28.45	60.74	84.09	101.73	2.81	3.84	5.69	65.36	32.93	38.49	66.62	53.46	5.09	4.74
VNR(THT)2/2020	24.61	47.66	63.44	78.44	2.55	3.62	4.84	58.89	36.26	42.20	72.07	36.87	3.51	2.55
VNR(THT)3/2020	27.34	60.07	82.29	100.67	2.78	3.81	5.52	64.36	33.67	39.36	67.24	52.59	5.01	4.67
VNR(THT)4/2020	25.49	50.02	67.08	81.92	2.59	3.66	4.87	59.61	35.97	41.92	71.70	39.41	3.75	2.76
VNR(THT)5/2020	22.78	40.62	52.24	62.52	2.37	3.51	4.46	53.91	40.07	44.83	79.60	25.24	2.40	1.13
VNR(THT)6/2020	26.95	57.62	80.34	97.89	2.74	3.76	5.35	63.19	34.18	40.01	67.91	48.23	4.59	4.24
VNR(THT)7/2020	24.24	44.40	60.84	75.55	2.51	3.58	4.68	57.70	36.57	43.06	74.01	33.13	3.16	2.15
VNR(THT)8/2020	23.78	43.69	59.2	70.97	2.46	3.56	4.61	57.29	37.51	43.34	77.79	29.44	2.80	1.93
VNR(THT)9/2020	30.06	65.09	89.08	109.17	2.92	3.92	6.04	70.75	30.64	36.14	63.35	57.26	5.45	5.42
VNR(THT)10/2020	26.63	55.87	77.62	93.87	2.71	3.73	5.24	62.34	34.81	40.71	68.63	46.20	4.40	3.74
VNR(THT)11/2020	29.62	64.02	88.00	106.68	2.87	3.87	5.90	69.47	31.30	36.80	64.62	55.35	5.27	5.29
VNR(THT)12/2020	26.27	54.02	76.00	90.7	2.66	3.70	5.14	61.47	35.08	41.17	69.32	43.09	4.10	3.56
VNR(THT)13/2020	25.79	51.53	69.99	87.16	2.64	3.69	4.99	60.66	35.27	41.35	70.61	41.60	3.96	2.99
VNR(THT)14/2020	23.41	42.12	56.57	68.71	2.41	3.53	4.55	55.04	37.97	44.26	78.15	27.84	2.65	1.47
Abhilash	29.13	62.48	87.06	104.38	2.86	3.86	5.86	68.45	31.72	37.34	65.93	54.64	5.20	4.88
Shree (Checks)	22.09	39.08	50.12	59.13	2.32	3.44	4.32	52.60	40.79	45.32	80.30	22.21	2.12	0.98
SEM ±	0.061	0.385	0.339	0.357	0.015	0.018	0.051	0.274	0.212	0.214	0.188	0.341	0.033	0.035
CD 5%	0.174	1.09	0.958	1.009	0.042	0.052	0.144	0.775	0.599	0.606	0.53	0.964	0.093	0.10



Fig-1 Nursery of various varieties of tomato

The observations on different aspects such as morphological, yield, quality and economic parameters were recorded and evaluated. The NPK fertilizers were applied @120:50:50 kg/ha. One fourth of Nitrogen and full doses of P and K were applied just before transplanting while the remaining doses of N were applied manually in three equal splits on 45, 60 and 75 DAT(days after transplanting) [11]. The tomato fruits were picked up from 65 DAT till final harvest on 135 DAT. Uniform plant protection measures were also followed in all the treatments. After transplanting, fungicide (Carbendazim 12%+ Mancozeb 63% @ 1.5 kg/ha and Neem oil (@ 4.0 L/ha) was sprayed as the plant protection on 12th and 15th day from the date of transplanting (DAT) respectively. Later on, neem oil and other chemicals namely Imdachlorprid 17.8% SL @ 0.5 L/ha, Dichlorovous 76% EC @ 0.8 L/ha and Carbendazim 12% + Mancozeb 63% @ 1.5 kg/ha apart from Neem oil were applied. Uniform cultural practices including similar plant protection measures were adopted among the treatments during the experiments [Fig-2]. The plant growth parameters were recorded and statistically analysed for different growth stages and reported for the pooled mean data of two years.

Results and Discussion

Plant height and number of primary branches

The results showed that the different tomato ecotypes significantly influenced the growth parameters of tomatoes and the tomato ecotype VNR(THT)9/2020 was found the best ecotype for influencing the plant height of tomatoes and it gave the maximum plant height and number of primary branches in the first year, second year and in pooled at 30, 60, 90 and 120 DAT [Table-1]. However, the minimum plant height and number of primary branches at 30, 60, 90 and 120 DAT in the first year, second year and in pooled was recorded in ecotype Shree (Checks). This type of evaluation of the tomato genotype was conducted by Yonas and Abajebel (2020) [12] and Tujuba *et al.* (2020) [13].



Fig-2 View of the experimental field

Fruit set percentage

It was recorded that the maximum fruit set percentage in the first year, second year and in the pooled data was recorded in tomato ecotype VNR(THT)9/2020 and it was found the best ecotype among all tomato ecotypes for influencing the fruit set percentage in tomatoes, whereas the minimum fruit set percentage in the first year, second year and in pooled was recorded in tomato ecotype Shree (Checks) [Table-1]. This type of tomato variety evaluation was done by Sindhu *et al.* (2020) [14] and Nasrin *et al.* (2020) [15].

Days taken to first and 50 % flowering

It was evident from the above that the minimum days taken to first and 50 % flowering in the first year, second year and in pooled was recorded in tomato ecotype VNR(THT)9/2020 and it was found to be the best ecotype among all tomato ecotypes [Table-1]. However, the minimum days taken to first and 50 % flowering in the first year, second year and in pooled was recorded in tomato ecotype Shree (Check). The similar results had also been obtained by Gemechu and Beyene (2019) [16].

Days to first picking

A perusal of data indicates that the minimum days taken to first picking in the first year, second year and in pooled was observed in tomato ecotype VNR(THT)9/2020 and it was found the best ecotype among all tomato ecotypes [Table-1]. However, the minimum days taken to first picking in the first year, second year and in pooled was recorded in tomato ecotype Shree (Checks). This type of tomato variety evaluation was done by Singh *et al.* (2019) [17] and Esho *et al.* (2019) [18].

Number of flowers per plant and per cluster

It is recorded that the different tomato ecotypes significantly influenced the different growth parameters of tomatoes and the ecotype VNR(THT)9/2020 was found the best ecotype for influencing the number of flowers per plant and per

cluster of tomatoes and it gave the maximum number of flowers per plant and cluster in the first year, second year and in the pool, whereas the minimum number of flowers per plant and per cluster in the first year, second year and in pooled was recorded in tomato ecotype Shree (Checks) [Table-1]. The similar trend of the results is obtained by Rangnamei *et al.* (2018) [19] and Salim *et al.* (2018) [20].

Number of fruits per cluster

The result reported that tomato ecotype VNR(THT)9/2020 was found the best ecotype among all tomato ecotypes for influencing the number of fruits per cluster in tomato [Table-1]. The maximum number of fruits per cluster in the first year, second year and pooled was recorded in tomato ecotype VNR(THT)9/2020. However, the minimum number of fruits per cluster in the first year, second year and pooled was observed in tomato ecotype Shree (Checks). This type of tomato variety evaluation was done by Sharma *et al.* (2015) [21]. In general, no significant incidences of disease or pest occurrences were observed during both the years mainly due to strict and rigorous protection measures.

Conclusion

The growth performance parameters of selected commercial tomato ecotypes were observed and analysed for two consecutive years in an experiment conducted at the University Farm, Mansarovar Global University, Bhopal, Madhya Pradesh. It can be concluded that the tomato ecotype VNR(THT)9/2020 significantly influenced the morphological parameters of tomatoes and it was found significantly superior among all tomato ecotypes. The maximum morphological parameters in the first year, second year and in pooled were recorded for the tomato ecotype VNR(THT)9/2020, whereas the minimum morphological, yield, quality, and economic parameters in the first year, second year and in pooled data were observed in tomato ecotype Shree (Checks). It could be concluded that the tomato ecotype VNR(THT)9/2020 is suitable for the Bhopal region and can be recommended for its cultivation for the benefit of the farming community.

Application of research: Performance evaluation of recent commercial ecotypes helps both the agricultural trainers and the farmers to select a suitable cultivar for the region. The research study therefore recommends the tomato ecotype VNR(THT)9/2020 for commercial cultivation in the Bhopal region.

Research Category: Horticulture

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Cultivar / Variety / Breed name: Sixteen commercial varieties of tomato

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