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## Transgressive segregation in cross 2x7 of F<sub>2</sub> generation of tomato (*Solanum lycopersicum* L.)

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### Abstract

The present investigation was undertaken during Rabi 2018 - 2019 with an objective to study transgressive segregation in F<sub>2</sub> generation to introgress in to genotypes of the selfed progeny derivatives of tomato. The investigation comprised of evaluation of F<sub>2</sub> generation for transgressive segregation for important quantitative traits in two crosses, 2x7 (C<sub>1</sub>) and their parents. These studies helped to find out the percent of transgressive segregation in F<sub>2</sub> generation. In most of the segregation of cross 2x7 in F<sub>2</sub> generation the yield per plant of better parent was found to be transgressed simultaneously with transgression of one or more other yield contributing character. The data on ten quantitative characters were used for studying transgressive segregation of cross 2x7 for F<sub>2</sub> generation. Mean standard deviation were calculated to determine transgressive segregation for characters under investigation. Desirable transgressive segregation was observed for all ten characters except number of locules in fruits. The highest proportion of transgressive segregation were observed for plant height (25.00%) followed by yield per plant (24.90%), number of fruits per plant (22.37%), average number of branches (21.84%), equatorial diameter of fruit (18.68%) and pericarp thickness (17.63%) in cross 2x7 (C<sub>1</sub>) of F<sub>2</sub> generation.

**Keywords:** Tomato, transgressive segregation, quantitative character, yield

### Introduction

Tomato (*Solanum lycopersicum*, L.) is one of the most widely grown vegetable in India and has become popular from the last six decades. It is grown in small home gardens and market gardens for fresh consumption as well as processing purposes. It has become one of the most popular and widely consumed vegetable. The centre of origin is Peru and Mexico in Central and South America. It was domesticated in Europe where exclusive pressure was applied on stigma position within anther cone to become self-pollinated crop and also on red fruit colour than that of original orange fruit (Kallo, 1991) [2]. Tomato has been introduced in India during 19<sup>th</sup> century from Europe. Tomato is considered as "Poor Man's orange" in India. Its World's largest vegetable crop cultivated after potato and sweet potato. Most important tomato growing State Andhra Pradesh (17.9%). Leading tomato producing states are Andhra Pradesh, Karnataka and Madhya Pradesh in India. Karnataka (33t/ha) have a highest productivity. In India tomato is cultivated almost all parts occupying an area of about 814 thousand hectares with the production of 20515 thousand metric tonnes. (Anonymous, 2018) It is cultivated in Bihar, Karnataka, Uttar Pradesh, Orissa, Andhra Pradesh, Maharashtra, Madhya Pradesh and Assam. In Maharashtra tomato is cultivated on an area about 32.2 thousand hectares with the production of 715.3 thousand tonnes. In Maharashtra it is grown in Nashik, Pune, Ahmednagar, Satara, Sangli and Nagpur district (Anonymous, 2018). Transgressive segregation refers to appearance of individuals, in the progeny from a hybrid which exceed either of the two parents of the hybrid with the respect to one or more characters.

### Materials and Methods

The present investigation entitled studies on transgressive segregation in F<sub>2</sub> generation in tomato (*Solanum lycopersicum* L.) was conducted at Tomato Improvement Scheme, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra State, India during Rabi 2018-19. There are 40 plants per plot and the seed of five F<sub>2</sub> plant progenies i. e. five F<sub>2</sub> progenies from cross (2 x 7) along their parents 2 and 7 were obtained from work carried out. F<sub>2</sub> progenies from cross 2 X 7 were selected on the basis of yield per plant and PDI at 75 DAT. Initially five F<sub>2</sub> families along with their two parents were evaluated.

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Thus, seven genotypes were evaluated in the plant spacing 90x30 cm with the plot size 2.7x3.6 m<sup>2</sup> subsequent F<sub>2</sub> generations. The experimental material in F<sub>2</sub> generation consisted 5 progenies and two parents. Initially five F<sub>2</sub> population along with their two parents were evaluated during Rabi 2018-19.

All the genotypes of F<sub>2</sub> populations were evaluated in randomized block design with two replications. In F<sub>2</sub> about 200 plant populations, respectively for each progeny of this cross and their parents were taken for observation and selected to study the transgressive segregation for various yield contributing traits. The data on individual plants for each character was obtained to calculate means, standard deviations and standard error of means, variances (Panse and Sukhatm, 1985) [4].

## Results and Discussion

The present experimental work was undertaken to study the assessment of transgressive segregation of tomato cultivar. The observations on genetical parameters of tomato like plant height (cm), average number of branches per plant, days to first flowering, average fruit weight (g), polar diameter of fruit (cm), equatorial diameter of fruit (cm), pericarp thickness (mm), number of locules per fruit, number of fruits per plant and yield per plant (kg) etc. Means, standard deviation frequency distribution of desirable transgressive segregants of cross 2x7 (C<sub>1</sub>) for 10 characters in F<sub>2</sub> generation have been recorded.

Even though desirable transgressive segregants were observed in all ten traits under study, comparatively lower transgressive segregants were recorded in character such as polar diameter (11.58%), days to first flowering (13.42%) and average weight (14.47) indicating more precise attention while selecting F<sub>2</sub> segregants. The highest percent transgressive segregants were observed in plant height (25%), followed by fruit yield per plant (24.73%) number of fruits/plant (22.37%) average no of branches (21.84%) equatorial diameter (18.68%) and pericarp thickness (17.63%). The higher

transgressive segregants were observed for plant height followed by number of fruits, equatorial diameter fruit and yield per plant in cross 2x7 of F<sub>2</sub> generation (Table 1). The success in obtaining the desired transgressive segregants depend upon the genetic recombination both linked and unlinked alleles (Briggs and Allard, 1953).

The simultaneous transgressive segregants for yield per plant in contribution with other quantitative characters has been observed for plant height (15.42%) followed by number of fruits per plant (15.52%) and average number of branches (13.94%). (Table 2).

Thus, all these characters were improved beyond capacity of their parental genotypes on the basis of high values of transgressive segregants. It was concluded that, when desired intensity (i.e. percent improvement) of a character is not available in the parent, transgressive breeding may be successfully used to extend the limit of expression of a character in particular cross combination.

The result are in conformity with Radkov (1980) [5] he studied yield related characters in French bean during F<sub>2</sub> and F<sub>3</sub> generation and found transgressive segregation for important traits like pod and seed weight per plant. Stommel (2001) [7] developed three tomato breeding line by advancing hybrid derivatives up to F<sub>3</sub> generation. Uma and Slimath (2003) investigated the extent of transgressive segregants for the yield and its major component traits in segregating population of cowpea. They observed that extent of transgressive segregation is the character specific and the extent of transgressive segregation in the seed yield depends on the extent of transgressive segregation in the both the character, viz., pod number and seed weight. This result is in conformity with results reported by Shirkole (2006) [6] observed 18.00% transgressive segregants in F<sub>2</sub> generation of the cross-DH x NBC in tomato. This result are also in conformity with the results reported by Kshirsagar *et al.* (2013) [3]. They observed 10.66% and 11.50% transgressive segregants for cross M-3-1x H-36 in F<sub>3</sub> generation for cross M-3-1x 18-1-1 of F<sub>4</sub> generation respectively.

**Table 1:** Threshold value, frequency and range of values of transgressive segregants for ten quantitative characters in F<sub>2</sub> generation of the cross 2X7

S. N.	Characters	Threshold value (T.S.)	N.D. value	Transgressive segregants		
				Frequency		Range
				Number	Percent	
1.	Plant height (cm)	68.72	0.81	95	25.00	55-110
2.	Average number of branches /plants	4.64	0.81	83	21.84	4-7
3.	Days to first flowering	35.72	0.33	51	13.42	36-31
4.	Average fruit weight (g)	71.20	1.02	55	14.40	50-87
5.	Polar diameter of fruit (cm)	5.23	1.12	44	11.58	4.83-6.84
6.	Equatorial diameter of fruit (cm)	4.56	0.029	71	18.68	4.10-4.84
7.	Pericarp thickness (mm)	4.60	0.022	67	17.63	4.05-5.60
8.	Number of locules	2.33	1.44	00	0.00	0
9.	Number of fruits /plants	22.82	0.85	85	22.37	10-52
10.	Yield / plant (Kg)	1.46	0.28	94	24.73	1.25-3.00

\*Per cent transgressive segregants were calculated on total 380 plants in F<sub>2</sub> generation.

**Table 2:** Frequency and percent of simultaneous transgressive segregants for yield per plant in combination with other ten quantitative character in cross 2X7

Sr. no.	Characters combinations	Transgressive segregants	
		F <sub>2</sub> generation	
	Yield per plant with (Kg)	Frequency	Percent
1.	Plant height (cm)	59	15.42
2.	Average number of branches /plants	53	13.94
3.	Days to first flowering	44	11.58
4.	Average fruit weight (g)	40	10.53
5.	Polar diameter of fruit (cm)	34	8.94
6.	Equatorial diameter of fruit (cm)	40	10.53
7.	Pericarp thickness (mm)	40	10.53
8.	Number of fruits /plants	59	15.52

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