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Transgressive segregation in F_3 generation of intervarietal crosses of tomato (*Solanum lycopersicon* L.)

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Many plant breeders have reported transgressive segregations in hybrid progenies and suggested transgressive segregation may be used as a positive tool in plant breeding. The conventional idea of hybridization is to develop a new hybrid derivative for recombination of desirable characteristics already observed in their parents; perhaps a more appropriate approach is to consider the possibilities of transgressive segregation. Transgressive segregation refers to appearance of individuals, in the progeny from a hybrid, which exceed either of the two parents of the hybrid with respect to one or more characters. Such plants are produced by accumulation of favourable genes from both the produced by accumulation of favourable genes from both the parents as a consequence of segregation and recombination. Success in obtaining the desired transgressive segregants depends on obtaining genetic recombination between both linked and unlinked alleles (Briggs and Allard, 1953). In this regard, the pedigree method of breeding has been designed for the production of transgressive segregants (Singh, 2002). Keeping in view of the importance of transgressive segregants, the present investigation was carried out in F3 generation of interietal crosses or tomato.

The present investigation was conducted at All India Co-ordinated Vegetable Improvement Project, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra State, India during Spring- Summer 2008. The seed of twenty F_2 plant progenies from two crosses i.e. ten F_2 progenies from cross (M-3-1 x 18-1-1) and ten F_2 progenies from cross (M-3-1 x H-36) along with their parents M-3-1, 18-1-1 and H-36 were obtained from Tomato Improvement Project, Department of Horticulture MPKV, Rahuri. F_2 progenies from cross M-3-1 x 18-1-1 and M-3-1 x H-36 were selected on the basis of yield per plant.

Twenty F_3 families along with their parents were evaluated in Randomized Block Design with two replications. Thus twenty three genotypes were grown in F_3 generation. The tomato seeds were sown in December 2007 (F_3) in the nursery and regular irrigation and nutrition was given. The field was ploughed, harrowed, cleaned and leveled to bring it to fine tilth. Ridges and furrows were prepared. Ridges were opened at 90 cm apart. Recommended dose of manures and fertilizers (25 tonnes FYM/ha., 200, 100, 100kg NPK/ha.) was applied in the field. Thirty days after sowing the seeds, seedlings were uprooted from the nursery and transplanted in to the main field at 30 cm distance on one side of ridges. Thirty days after transplanting top dressing with nitrogenous fertilizer was done. Regular earthing up and other cultural practices like staking, weeding, irrigation were carried out as per the requirement.

Observations such as plant height, days to first flowering, days to first harvesting, number of harvesting, harvesting duration, yield per plant, average fruit weight, average fruit diameter (polar and equatorial), pericarp thickness, number of locules per fruits were taken.

Transgressive segregation offers a chance to improve the particular character than both of their parents while advancing hybrid derivative for development of open pollinated lines.

In present study, frequency distribution and proportion of the desirable transgressive segregants in F_3 genetation for eleven traits have been reported separately for two crosses C_1 (M-3-1x18-1-1) & C_2 (M-3-1 x H-36) (Table 1 & 2).

Even though desirable transgressive segregants were observed in all eleven traits under study, in cross C_1 (M-3-1x18-1-1) comparatively lower transgressive segregants were recorded in character such as plant

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Table 1. Threshold value, frequency and range of values of transgressive segregants for eleven quantitative characters in F_3 generation of the cross M-3-1 X 18-1-1

Sr. No.	Characters	Threshold value (T.S.)	N.D. value	Transgressive segregants		
				Frequency		Range
				Number	Percent*	
1.	Plant height (cm)	78.69	1.82	103	4.29	33.53-21.70
2.	Days to first flowering	46.16	1.90	261	10.88	19.82-14.00
3.	Days to first harvesting	85.21	1.91	304	12.66	75.10-70.00
4.	Harvesting duration	56.41	1.41	126	5.25	24.05–8.00
5.	Number of harvesting	8.05	1.41	126	5.25	4.02-2.00
6.	Fruit yield/ plant (kg)	1.54	0.74	364	15.16	2.13-3.27
7.	Av. fruit weight (cm)	85.33	1.21	318	13.25	85.33-104.50
8.	Av. polar diameter (cm)	5.85	1.34	217	9.04	5.85-7.50
9.	Av. equatorial diameter (cm)	5.13	0.82	444	18.50	5.13-7.80
10.	Pericarp thickness (mm)	7.50	1.78	346	14.41	6.95-9.00
11.	Number of locules per fruit	3.26	0.69	000	0.00	0.00-0.00

*Per cent transgressive segregants were calculated on total 2400 plants in F_3 generation

Table 2. Threshold value, frequency and range in values of transgressive segregants for eleven quantitative characters in F_3 generation of the cross M-3-1 X H-36

Sr. No.	Characters	Threshold value (T.S.)	N.D. value	Transgressive segregants		
				Frequency		Range
				Number	Percent*	
1.	Plant height (cm)	78.69	1.63	60	2.50	33.73-14.00
2.	Days to first flowering	44.90	1.71	125	5.21	20.56-15.00
3.	Days to first harvesting	85.32	1.74	116	4.83	75.02-72.00
4.	Harvesting duration	56.41	2.09	137	5.70	24.05-8.00
5.	Number of harvesting	8.04	2.06	135	5.62	4.02-2.00
6.	Fruit yield/ plant (kg)	1.54	0.61	460	16.95	2.13-2.67
7.	Av. fruit weight (cm)	100.63	2.05	256	10.66	100.60-127.70
8.	Av. polar diameter (cm)	5.85	2.35	111	4.62	5.85-6.50
9.	Av. equatorial diameter (cm)	6.26	2.40	208	8.66	5.20-7.20
10.	Pericarp thickness (mm)	7.50	2.26	192	8.00	7.50-9.00
11.	Number of locules per fruit	3.98	0.79	227	9.45	2.26–2.00

* Per cent transgressive segregants were calculated on total 2400 plants in F_3 generation

height (4.29%), harvesting duration (5.25%), number of harvesting (5.25%) and polar diameter (9.04%) indicating more precise attention while selecting F_3 segregents. The highest per cent transgressive segregants were observed in equatorial diameter (18.50%) followed by fruit yield per plant (15.16%) and pericarp thickness (14.41%) (Table 1). Whereas, the desirable transgressive segregants were also observed in all eleven characters in cross C_2 (M-3-1 x H-36) under study, comparatively lower transgressive segregants were recorded in characters such as plant height (2.50%), polar diameter (4.62%), days to first harvesting (4.83%) and days to first flowering (5.21%). The higher per cent of trangressive segregants were observed in fruit yield per plant (16.95%), followed by average fruit weight (10.66%) and number of locules per fruit (9.45%) (Table 2).

Vicente *et al.,* (1993) reported transgressive segregation for eight traits during F_2 generation of interspecific tomato hybrids. Shirkole (2006) reported transgressive segregation for nine characters in three crosses during F_2 generation in tomato. Stommel (2001) developed three tomato breeding line by advancing hybrid derivative up to F_5 generation. Radkov (1980) studied yield related characters in French bean during F_2 and F_3 generations and found transgressive segregants for important traits like pod and seed weight per plant. Khrostovaska *et al.,* (1975), observed transgressive segregation in hybrid derivatives of pea upto 8 generation. Ugale (1980), studied three crosses in chickpea and recorded transgressive segregants in all the crosses for nine characters. Jaylaxmi (2000) studied the frequency of transgressive segregants in 21 crosses in F_2 and F_3 generation of groundnut. Pradeep and Sumalini (2003) studied the transgressive segregation in cotton for F_2 and F_3 generation. Uma and Salimath (2003) investigated transgressive segregants for yield and its major component traits in segregating population of cowpea.

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