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RELATIVE EFFICIENCY OF DIFFERENT SELECTION METHODS IN TOMATO IMPROVEMENT

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Different selection methods are used in tomato improvement. In a self-pollinated crop like tomato, mass, pure-line, bulk and single seed descent method would be of advantage, if used properly. The efficacy of single seed descent method for improvement of economic characters with different heritability values was suggested by Casali and Tigchellaar (1975). Celine (1981) reported that progenies developed through mass selection were superior to those developed through bulking for days to harvest, fruits/plant and total fruit weight/plant. The progenies developed through pure-line selection were superior to bulking for days to fruitset, days to first harvest and percentage of large fruited plants.

Materials and Methods

The present study was conducted to find out the relative efficiency of different selection methods to improve different economic characters of tomato line, CL 32d-0-1-19 GS(LE-79). The four methods of selections used were mass selection— the plants falling in the upper 5% limit for each character/character combinations were selected, pureline— the most promising elite plant for each character/character combination was identified and selfed to develop progenies, single seed descent from elite selection (SSDES)—the largest sized seeds were collected from each of the well developed fruits borne on the most elite plant selected for pure line selection and bulk— the seeds collected randomly from the entire base population. The characters like fruits/plant, yield/plant, locules/fruit and plant, height singly and in combination were employed as treatments, which are as follows: T_1—fruits/plant, T_2—yield/plant, T_3—locules/fruit, T_4—plant height, $T_{1\cdot2}$—fruits/plant and yield/plant, $T_{1\cdot3}$—fruits/plant and locules/fruit. $T_{1\cdot4}$—fruits/plant and plant height, $T_{2\cdot3}$— yield/plant and locules/fruit, $T_{2\cdot4}$—yield/plant and plant height $T_{3\cdot4}$—locules/fruit and plant height, $T_{1\cdot2\cdot3}$—fruits/plant, yield/plant and locules/fruit $T_{1\cdot3\cdot4}$—fruits/plant, locules/fruit and plant height, $T_{2\cdot3\cdot4}$—yield/plant, locules/fruit and plant height, $T_{1\cdot2\cdot4}$—fruits/plant, yield/plant and plant height, and $T_{1\cdot2\cdot3\cdot4}$—fruits/plant, yield/plant, locules/fruit and plant height. The four methods of selection were treated as main plots and superior progenies identified based on character/character combinations were included as subplots in a split-plot design. There were 2377 plants in the base population. The crops were raised in the College of Horticulture, Vellanikkara, Trichur during September to December 1981, September to December 1982, February to May 1983 and September to December 1983.

The data were analysed as suggested by Panse and Sukhatme (1978) and selection responses (realised genetic gain) were estimated as per Singh and Choudhary (1979).

Results and Discussion

Of the four methods of selections, mass, pureline and single seed descent from elite selections (SSDES) were more effective *per se,* to improve fruits/plant, locules/fruit, yield/plant and fruit weight in all the three consecutive generations (Table 1).

SSDES method resulted in progenies with maximum fruits/plant followed by mass selection in the third generation. Three methods of selection differed. significantly from bulk. The realised genetic gain was the highest under SSDES (30.97) in the third generation and that undor mass in the first and second generations (Table 2).

SSDES and mass method had the highest locules/fruit (3.9 each) in the third generation followed by pureline. Bulk method had significantly lower number compared to other methods in all the three generations. The realised genetic gain for mass, pureline and SSDES were at par in all the three generations. Mean yield/plant as well as realised genetic gain for yield/plant was the highest under SSDES. The plants evolved through SSDES had the lowest plant height in all the generations. In the third generation, plants evolved through SSDES were the earliest to flower (53 days). However no significant differences were observed between SSDES and pureline and pureline and mas selections. Realised genetic gain was also the highest (-2.79) for SSDES in the third generation.

Number of days taken for days to first fruitset was the shortest (69.72) undor SSDES in the third generation. For number of days to the first harvest also SSDES was found to be the earliest in the second and third generations (95 and 97 days respectively). Reaiised genetic gain was negative for SSDES in all the three generations,

Mean fruit weight was the maximum in pureline selection in the third generation. The realised genetic gain was the highest for SSDES in the first and second generations and for pureline in the third generation.

In tomato, the genetic complement for different economic characters are either additive or dominant in inheritance. Under such a situation single seed descent from elite selection seems to be more effective as evident from the results.

Summary

Single seed descent from elite selection (SSDES) was found to ba effective to improve different economic characters under simultaneous selection, in tomato as compared to mass, pureline and bulk methods of selection.

Table 1

Moan performance of various characters under different selection methods

Characters	G.I				G. II				G. III			
	M	PL	SSDES	B	M	PL	SSDES	B	M	PL	SSDES	B
Fruits/plant	26.40	23.80	21.30	8.3	18.13	5.70	11.60	4.90	48.17	41.15	52.53	21.86
CD(0.05)		7.66				5,90				11.43		
Locules/fruit	3.90	3.90	3.SO	3.40	3.80	3.60	3.80	3.20	3.90	3.80	3.90	3.40
CD(0.05)		0.18				0.19				0.35		
Yield/plant (kg)	0,77	0.77	0.66	0.21	0.48	0.18	0.30	0.11	1.49	1.51	1.81	0.76
CD(0.05)		0.26				0.15				0.46		
Plant height (cm)	64.30	74.90	58.00	54.40	71.30	67.70	60.90	58.30	75.70	76.60	74.73	64.80
CD (0.05)		11.93				9.94				8.72		
Days to flower	60.30	64.40	61.40	62.80	51.50	51.50	51.40	52.70	54.60	53.97	53.01	55.80
		1.24				1.50				1.34		
Days to fruit set	70.67	71.48	71.04	70.90	64.75	60.87	63.73	66.60	71.48	70.88	69.72	71.10
CD(0.05)		0.59				2.26				0.55		
Days to first harvest	101.60	110.64	101.60	102.60	95.52	103.11	94.89	105.80	99.83	99.12	96.71	97.80
CD (0.05)		4.18				3.42				2.96		
Fruit weight (g)	36.30	44.40	47.30	29.80	36.60	35.70	38.50	26.50	43.90	50.80	48.30	36.50
CD(0.05)		0.32				0.44				0.34		

G = Generation PL = Pureline selection B = Bulk M = Mass selection SSDES = Single seed descent from elite selection

Table 2

Realised genetic gain under different selection methods in three consecutive generations

Characters	G. I			G. II			G. IIII		
	M	PL	SSDES	*M*	PL	SSDES	M	PL	SSDES
Fruits/plant	18.11	15.11	13.01	13.28	0.85	6.75	26.31	19.29	30.97
CD(0.05)		7.66			5.90			11.43	
Locules/fruit	0.50	0.50	0.50	0.60	0.40	0.60	0.50	0,40	0.50
CD(0.5)		0.18			0.19			0.35	
Yield/plant (kg)	0.56	0.56	0.45	0.37	0.06	0.18	0.73	0.75	1.05
CD(0.05)		0.26			0.15			0.46	
Plant height (cm)	9.87	9.40	3.57	13.00	11.80	2.60	10.90	-1.40	9.93
CD(0.05)		11.93			9.S4			8.72	
Days to flower	-2.50	-1.40	-1.40	-1.20	-1.20	-1.30	-1.20	-1.93	-2.79
CD(0.05)		1.24			1.50			1.34	
Days to fruit set	-0.23	0.58	0.14	-1.85	-5.73	-2.87	-0.38	-0.22	-1.38
CD(0.05)		0.59			2.26			0.55	
Days to first harvest	1.00	8.04	-1.00	-3.28	-2.69	-10.91	-2.03	-1.32	-1.09
CD(0.05)		4.18			3.42			2.96	
Fruit weight (g)	6.50	14.60	17.50	10.10	9.20	12.00	7.40	14.30	11.80
CD (0.05)		0.32			0.44			0.34	

G = Generation M = Mass PL = Pureline SSDES = Single seed descent from elite selections

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