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Evaluation of Superior Recombinant Inbreed lines of Tomato for Growth, Yield and Quality Attributes

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Abstract: Sixteen superior recombinant inbred lines (RILs) and two commercial varieties *viz*., Anagha and ArkaVikas were evaluated for growth, yield and quality parameters in tomato in randomized block design with three replications. The line COHBT-29 recorded highest plant height at 60 DAT (93.77 cm), 90 DAT (106.13 cm), number of branches per plant at 90 DAT (10.20). COHBT- 49 recorded highest average fruit weight (90.73 g), equatorial fruit diameter (6.21 cm), number of locules per fruit (5.44) and least number of days for first flowering (29.87 days). Highest number of flower clusters per plant (10.40), fruits per cluster (4.87) and fruits per plant (35.67) are recorded in COHBT-65. COHBT-1 recorded highest fruit yield per plant (1.81 kg) and fruit yield per hectare (43.09 t). COHBT-18 recorded maximum fruit pH (4.53) and highest TSS was noticed in COHBT-29 (5.89). These findings will help to select the best superior RILs for further breeding programme.

Keywords: Tomato, superior RILs, Growth, Yield, Quality

INTRODUCTION

Tomato (*Solanumlycopersicum* L.) is the most economically important and widely grown vegetable crop in the world. It belongs to the Solanaceae family with its diploid chromosome number 2n =24 and believed to have its origin in the mountainous regions of the Andes comprising Peru, Ecuador and Chile. It is universally treated as a protective food because of its rich lycopene content- a powerful antioxidant, valued for anti-cancerous property worldwide (Bose *et al*., 2002) and generally eulogised as poor man's orange because of its nutritive value and attractive appearance. It is also a treasure of vitamin A, C and minerals. Tomatoes are used directly as raw vegetable in sandwiches and salad. It is regarded as No. 1 processing vegetable in the world. Various processed products *viz*., paste, puree, syrup, juice, ketchup, sauce, whole peeled tomato, *etc*. are prepared from tomato. Tomato puree and tomato paste have great export demand.

World-over, tomato cultivation spans over an area of 5.02 million hectare, with a production of 170.75 million tonnes. India is the second largest producer (11.5%) after China (30.7%) followed by U.S.A. (8.1%). In India, an area of 0.81 million hectare is under tomato cultivation with an annual production of 19.67 million tonnes. Average productivity of tomato in India remains low at 24.36 t/ha as against 33.99 t/ha, the world average. Madhya Pradesh, Karnataka, Andhra Pradesh,

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Telangana, Gujarat, Odisha, West Bengal, Bihar and Maharashtra are the leading states in the production of tomato in India (Anon., 2024).

MATERIAL AND METHODS

The experiment has been carried out with eighteen tomato genotypes consisting of sixteen superior recombinant inbred lines and two commercial varieties *viz*., Anagha and ArkaVikas. The experiment was laid out in Randomized Block Design. Thirty days old healthy, uniform seedlings were transplanted with spacing of 60 x 45 cm. The recommended dose of fertilizers at the rate of 120:80:50 kg NPK per hectare with half dose of nitrogen and full dose of phosphorous and potassium was applied as basal dose. Remaining half dose of nitrogen at the rate of 60 kg per hectare was given as top dress. Depending on the weather condition irrigation was provided as and when required. Plants were provided with staking at 45 days after transplanting. Regular cultural practices and plant protection measures were followed throughout the cropping period. Data was recorded for characters *viz*., plant height (cm) at 60 and 90 DAT, number of branches per plant at 60 and 90 DAT, days for first flowering, days for 50 per cent flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, average fruit weight (g), equatorial fruit diameter (cm), polar fruit diameter (cm), fruit yield per plant (kg), fruit yield per hectare (t), number of locules per fruit, pericarp thickness (mm), TSS (^{o} Brix) and pH.

RESULTS AND DISCUSSION

Mean performance of 16 superior RILs and two commercial varieties viz., Anagha and ArkaVikas for growth, yield and quality parameters are presented in Table 1 and table 2 respectively. A significant difference was observed for all the characters studied.

Plant height was maximum in line COHBT-29 (106.13 cm) whereas, remaining lines recorded plant height below 1 m. COHBT-29 (10.20) registered more branches followed by COHBT-52 (9.73). Whereas, lowest was observed in COHBT-5 (5.13). Genotypes with early flowering is preferred in vegetable breeding program. A desirable genotype is one which produces more flowers in the early phase of crop growth that would enable to develop early varieties or hybrids. Days for first flowering ranged from 29.87 to 43.07 days where, COHBT-47 (29.87 days) was earliest for first flowering and COHBT-60 (43.07 days) took maximal days for first flowering. Days for 50 per cent flowering varied from 39.40 to 53.40 days. COHBT-12 took minimal days (39.40 days) followed by COHBT-49 (40.87 days). The wide variation in growth parameters among the superior RILs is due to their genetic makeup.It indirectly governs the plant morphology that has a direct impact on the formation of floral buds as all the lines were cultivated under same climatic condition. The reports of Ahmed *et al*. (2007), Prashanth (2003) and Gongolee*et al*. (2015) in tomato lends support to the present findings.

Maximal flower clusters was registered in COHBT-65 (10.40) followed by COHBT-52 (10.07). The reports ofIshwarappa (2011) and Singh *et al*. (2014) in tomato lends support to this results. COHBT-52 (7.67) trailed by COHBT-65 (7.47) registered top number of flowers per cluster. This results are similar to Biswas*et al*. (2015) and Kumar *et al*. (2017) in tomato.

Maximal fruits per cluster was registered in COHBT-65 (4.87) followed by COHBT-52 (4.27). The reports ofLakshmikanth and Mani (2004), Deepa and Thakur (2008) and Singh *et al*. (2014) lends support to the present findings. Maximal fruits per plant was noticed in COHBT-65 (35.67) trailed by COHBT-52 (35.53). The findings are in covenant with Singh *et al*. (2014), Bhati (2017), Kumar *et al*. (2017) and Spaldon and Hussain (2017) in tomato.

Table 1: *Per se* performance of superior RILs of tomato for growth parameters

Sl. No	*Treatments*	*Plant height (cm)*		*Number of branches*		*Days for first flowering*	*Days for 50 per cent flowering*
		60 DAT	*90 DAT*	*60 DAT*	*90 DAT*		
1	COHBT-1	67.38	82.83	6.20	6.93	34.07	42.60
2	COHBT-4	63.15	79.03	4.73	5.60	42.40	50.73
3	COHBT-5	58.23	72.80	4.00	5.13	33.67	41.27
4	COHBT-8	64.34	78.33	6.93	7.73	37.60	44.60
5	COHBT-12	69.26	85.90	6.80	8.00	31.60	39.40
6	COHBT-18	56.65	72.23	5.00	6.07	41.13	51.27
7	COHBT-29	93.77	106.13	7.13	10.20	37.67	46.73
8	COHBT-47	70.59	90.60	7.60	8.93	38.53	52.13
9	COHBT-49	66.03	82.40	6.60	7.87	29.87	40.87
10	COHBT-50	52.10	69.30	7.47	8.60	39.40	50.07
11	COHBT-52	46.49	63.70	7.47	9.73	34.87	45.07
12	COHBT-55	62.60	77.87	4.93	7.53	36.47	44.80
13	COHBT-59	66.73	82.23	4.93	6.33	31.80	46.60
14	COHBT-60	64.50	78.53	7.07	8.40	41.07	53.40
15	COHBT-65	70.13	85.67	7.02	8.87	34.40	50.27
16	COHBT-69	55.33	71.37	3.73	5.73	43.07	52.73
17	ArkaVikas	71.27	87.77	8.33	8.40	30.87	42.00
18	Anagha	71.50	85.20	8.33	10.20	33.00	44.07
	Mean	65.00	80.66	6.35	7.79	36.19	46.59
	S.Em ±	2.32	2.60	0.31	0.37	1.27	1.64
	C.D (0.05)	6.68	7.48	0.89	1.05	3.64	4.72
	CV (%)	6.19	5.59	8.45	8.14	6.07	6.11

Table 2: *Per se* performance of superior RILs of tomato for yield and quality parameters

Sl. No	*Treatments*	*No. of Flower clusters per plant*	*No. of Flowers per cluster*	*No. of Fruits per cluster*	*No. of Fruits per plant*	***Average fruit weight (g)***	***Equa-torial diameter (cm)***	***Polar diameter (cm)***	***Fruit yield per plant (kg)***	***Fruit yield per hectare (t)***	***No. of locules per fruit***	***Pericarp thickness (mm)***	***TSS (° Brix)***	***pH***
1	COHBT-1	7.13	4.53	2.40	20.87	86.88	5.30	4.35	1.81	43.09	4.22	5.13	5.29	3.95
2	COHBT-4	7.53	6.47	3.67	31.73	45.74	4.26	4.17	1.47	35.00	2.56	4.90	5.84	3.66
3	COHBT-5	5.13	5.33	3.80	23.27	47.12	4.49	4.38	1.11	27.46	2.78	3.80	5.29	4.09
4	COHBT-8	8.87	4.60	2.80	25.87	53.90	4.86	4.31	1.40	33.89	2.78	4.64	5.37	4.31
5	COHBT-12	6.47	4.73	3.73	26.33	52.49	4.74	4.46	1.38	32.53	2.78	3.55	5.34	3.80
6	COHBT-18	5.67	3.47	1.87	16.33	86.40	5.55	4.80	1.42	33.57	5.44	3.31	5.53	4.53
7	COHBT-29	5.87	4.73	2.73	21.53	24.97	2.74	2.99	0.54	12.54	2.00	2.29	5.89	3.83
8	COHBT-47	6.67	4.27	2.20	22.27	36.15	4.35	3.50	0.88	20.79	3.44	3.17	5.17	3.78
9	COHBT-49	6.80	5.53	1.80	17.40	90.73	6.21	5.06	1.39	33.09	5.44	3.29	5.69	4.14
10	COHBT-50	7.07	5.73	3.60	27.87	33.07	3.50	3.48	1.09	25.87	2.56	3.20	5.66	4.37
11	COHBT-52	10.07	7.67	4.27	35.53	36.43	3.39	3.35	1.36	32.30	3.33	2.49	5.63	3.83
12	COHBT-55	7.60	5.07	2.93	25.13	53.43	4.81	4.30	1.46	34.84	3.44	5.36	5.23	3.87
13	COHBT-59	6.07	4.27	2.53	22.93	63.13	4.99	4.36	1.60	38.01	3.44	5.87	4.64	3.65
14	COHBT-60	7.60	5.40	3.20	26.87	54.89	4.13	6.03	1.50	35.63	2.44	4.63	5.22	4.26
15	COHBT-65	10.40	7.47	4.87	35.67	23.71	3.28	3.21	1.10	26.11	2.78	2.32	5.46	3.76
16	COHBT-69	6.73	4.27	2.53	22.27	74.35	4.58	4.11	1.66	39.60	3.89	4.41	5.22	3.78
17	ArkaVikas	6.13	4.27	2.33	20.67	72.07	4.90	4.05	1.58	37.61	4.67	3.62	5.02	4.31
18	Anagha	8.67	4.93	3.27	27.47	36.95	4.07	4.07	1.14	27.14	3.56	3.54	4.98	4.18
	Mean	7.25	5.15	3.03	25.00	54.02	4.45	4.17	1.33	31.62	3.42	3.86	5.36	4.01
	S.Em ±	0.26	0.44	0.21	1.14	1.72	0.16	0.12	0.07	1.69	0.19	0.19	0.13	0.06
	C.D (0.05)	0.75	1.26	0.60	3.27	4.95	0.45	0.35	0.20	4.87	0.54	0.55	0.36	0.16
	CV (%)	6.23	14.73	11.88	7.88	5.52	6.11	5.14	8.96	9.28	9.58	8.55	4.10	2.45

COHBT-49 (90.73 g) followed by COHBT-1 (86.88 g) and COHBT-18 (86.40 g) registered maximum average fruit weight. This may be due to less number of fruits per plant.Hence,it resulted in higher assimilate accumulation, a reason for higher fruit weight. The findings of Deepa and Thakur (2008) and Manna and Paul (2012) in tomato lends support to the present outcome.

Fruit yield per plant ranged from 0.54 kg to 1.81 kg. COHBT-1 (1.81 kg) registered maximum fruit yield.Thisis due to more fruit weight and comparatively top number of fruits per plant. COHBT-69 (1.66 kg) and COHBT-59 (1.59 kg) realised top fruit yield per plant due to higher average fruit weight. Om Prakash and Vijay (2014) reported similar findings in tomato.

Locules number varied from 2.00 to 5.44. COHBT-49 and COHBT-18 (5.44) recorded maximum loculeswhereas, minimum in COHBT-29 (2.00). The results are covenant with Singh *et al*. (2014) and Biswas*et al*. (2015). COHBT- 59 (5.87 mm) followed by COHBT-55 (5.36 mm) and COHBT-1 (5.13 mm) registered maximum pericarp thickness and was minimum in COHBT-29 (2.29 mm). The results are covenant with Singh *et al*. (2014), Spaldon and Hussain (2017) and Sureshkumara*et al*. (2017) in tomato.

TSS is a chief quality parameter which decides the utility of a variety. Among the genotypes evaluated, COHBT-29 (5.89 ^{o}Brix) registered maximum TSSfollowed by COHBT-4 (5.84 ^{o}Brix). Lowest TSS was recorded in COHBT-59 (4.64 ^{o}Brix). The results are in close covenant with findings of Singh *et al*. (2014) and Bhati (2017). Meanwhile, COHBT-18 (4.53) showed maximum fruit pHfollowed by COHBT-50 (4.37) and COHBT-8 (4.31). Lowest pH was noticed in COHBT-59 (3.65). The results are covenant with the findings Aoun*et al*. (2013) and Ghasemi*et al*. (2015) for fruit pH in tomato.

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