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Per se performance of parents and F₁ hybrids for growth and yield traits

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Abstract

A field experiment was conducted during *kharif* 2018 in Randomized Block Design with three replications at College of Horticulture, Bagalkot, University of Horticulture Sciences, Bagalkot. Twelve diverse lines of tomato were crossed with four testers in line x tester mating design. The resultant 48 F₁ hybrids along with 16 parents and two checks were evaluated for growth, yield and seed parameters in tomato. The experiment results revealed that hybrid, L4 X T3 performed best for characters *viz.*, fruit yield per plant (3.53 kg), average fruit weight (93.67 g), yield per plot (52.95 kg), yield per hectare (51.54 t/ha) and number of seeds per fruit (126.67) when compared to all other hybrids. Besides, other hybrid, L12 X T3 also showed superior performance for fruit yield per plant (3.39 kg), yield per plot (50.78 kg) and yield per hectare (49.49 t/ha).

Keywords: Tomato, *per se* performance, line x tester and yield

Introduction

Tomato, *Solanum lycopersicum* L. (2n = 2x = 24), belongs to large and diverse family Solanaceae, which includes more than 3,000 species, occupying a wide variety of habitats (Knapp, 2002) [8]. Tomato is a perennial plant but commonly cultivated as an annual (Rick, 1978) [16], and ranks second to potato in many countries. Tomato is being grown worldwide. India is the second largest producer (11.50 %), (Anon., 2018) [2]. In India it occupies an area of about 0.78 million hectare with the production of 19.37 million tonnes and an average productivity of 28.10 tonnes per hectare. In India, Andhra Pradesh is leading in area and production, whereas Karnataka is leading in productivity. In Karnataka, it occupies an area of 0.63 lakh hectares with a production of 21.38 lakh tonnes with an average productivity of 33.55 tonnes per ha. (Anon., 2017) [1]. Tomato has glorious position among the vegetables and is universally treated as 'Protective food' since it is a rich source of minerals, vitamins and organic acids (Hari, 1997) [6]. In many countries, it is considered as "poor man's orange" because of its attractive appearance and nutritive value (Singh *et al.*, 2004) [19]. The increasing consumption of tomato makes it, a high value crop for generating income to the farmers. Since tomato is an important crop both from production and industry point of view there is a necessity to improve the productivity per unit area to achieve the increased production from a limited land. Improving the productivity through traditional plant breeding method means, it is sustainable, affordable and ecofriendly. Generally, diverse parents are expected to give high hybrid vigour and it is also often possible to combine desired alleles in regular fashion without waiting for longer term as in case of development of an open pollinated cultivars. Usually, the hybrids show better fitness and breeding value as compared to parents from which they are made. Higher yield and better fruit quality are universally desired.

Materials and Methods

The experimental material consists of 12 diverse genotypes of tomato *viz.*, L-24 (L1), L-206 (L2), L-240 (L3), L-98 (L4), L-177 (L5), L-116 (L6), L-207 (L7), L-115 (L8), L-110 (L9), L-143 (L10), L-129 (L11) and L-93 (L12), which were crossed with four testers *viz.*, Pusa Ruby (T1), PKM-1 (T2), Arka Megahli and DMT-2 (T4) in line x tester mating design to obtain 48 F₁ cross combinations. The 48 F₁ hybrids along with parents and two standard checks (Arka Rakshak and Arka Samrat) were evaluated during early *Kharif*, 2018 at Haveli campus, College of Horticulture, Bagalkot, University of Horticulture, Bagalkot.

The experiment was laid out in a Randomized Block Design with three replications. The *per se* performance for growth, yield and seed parameters *viz.*, plant height (cm), number of primary branches per plant, number of secondary branches per plant, number of flower clusters per plant, number of fruit clusters per plant, number of flowers per cluster, number of fruits per cluster, average fruit weight (g), number of fruits per plant, yield per plant (kg), yield per plot (kg), yield per hectare (tonnes) and seed parameters like, number of seeds per fruit, thousand seed weight (g), seed weight per fruit (g) and seed yield per plant (g). The data was subjected to statistical analysis (Panse and Sukhatme, 1985) [14].

Results and Discussion

The results revealed significant variation among genotypes for the characters. High vegetative vigour in the hybrids in terms of increased plant height is desirable. Among parents plant height ranged (Table 1a) from 70.67 to 128.00 cm. The maximum plant height was noticed in T1 (128 cm) followed by L10 (118.67 cm). Among the 48 crosses, L7 X T1 had significantly higher mean for plant height (134.33 cm) as compared to the general mean (97.25 cm). Most of the parents and crosses have shown the highest plant height as compared to the commercial checks, namely Arka Rakshak and Arka Samrat (87.33 cm and 79.00 cm, respectively). The mean values of primary branches per plant among the lines and testers ranged from 3.67 to 6.67. The line, L8 (6.67) produced maximum number primary branches per plant followed by L10 (6.33). Out of 48 F₁ hybrids, L7 X T1 (8.00) produced the maximum number of primary branches per plant as compared to the general mean (5.48) and commercial checks namely, Arka Rakshak and Arka Samrat (4.00 and 4.33). The mean values of secondary branches per plant among the lines and testers ranged from 7.33 to 12.67. Among the lines and testers, T1, L8 (12.67) produced maximum numbers secondary branches per plant followed by L10 (10.67). Out of 48 F₁ hybrids, L7 X T1 (14.67) produced the maximum number of secondary branches per plant followed by the cross combination L7 X T2 (14.00) as compared to the general mean (10.15).

The plants were considered as, indeterminate and semi-determinate growth types respectively in the present study. These indeterminate growth habits were mainly preferred because of their longer harvest duration. The present findings were in agreement with Deepa and Thakur (2008) [4] and Singh *et al.* (2008) in tomato. The increased branching in hybrids was in corresponds with the findings of Kumar *et al.* (1995) [9] but less number of secondary branches per plant in tomato hybrids was observed by Mohammad *et al.* (2013) [11] and Yadav *et al.* (2013) [21].

The total number of flower clusters per plant varied from 32.00 to 54.67 (Table 1a). The line L10 (54.67) followed by L1 (44.67) and L12 (43.67) exhibited the significantly higher number of flower clusters per plant. Among 48 hybrids, the maximum number of flower clusters per plant was registered in L7 X T3 (55.00) followed by L7 X T2 (54.00) compared to general mean (41.24). A significant difference was observed among the genotypes (parents and crosses) for number of flowers per cluster (Table 1a). Among parents, the number of flowers per cluster, ranged from 6.00 for to 8.33. The tester T1 (8.33) was highest number of flowers per cluster followed by line L5 (7.33). Among the hybrids the maximum number of flowers per cluster were recorded in L9 X T1, L9 X T3, L10 X T1 (7.33) as compared to general mean (6.49). Most of the lines, testers and hybrids had greater number of flowers

per cluster than the standard checks, Arka Rakshak and Arka Samrat (6.33 and 6.33, respectively).

Fruit clusters per plant among parents, ranged from 28.00 to 45.00. The line L10 (45.00) followed by L1 (40.33) and L12 (38.67) exhibited the maximum number of fruit clusters per plant. Out of 48 hybrids maximum number of fruit clusters per plant was exhibited by L7 X T2 (45.00) followed by L7 X T3 (44.67). Most of the parents and crosses have shown the highest number of fruit clusters per plant as compared to commercial checks namely, Arka Rakshak and Arka Samrat (28.67 and 30.67, respectively). The total number of fruits per cluster (Table 1a) for all lines, testers and crosses varied significantly from 4.33 to 6.67. Among lines and testers, number fruits per cluster were noticed in T1 (6.67) followed by L8 (6.00). Out of 48 hybrid crosses, 16 crosses surpassed the standard checks, Arka Rakshak and Arka Samrat (5.00 and 4.33, respectively). These results are in close conformity with the observations of Pujari and Kale (1994) [15] and Padmini and Vadivel (1997) [13] who found the highest number of flowers per cluster. Shankar *et al.* (2013) [17] and Vilas *et al.*, (2015) [20] reported similar results.

The average fruit weight among the genotypes ranged from 37.33 to 98.00 g. The significantly maximum average fruit weight was observed in L5 (98.00 g). The cross, L4 X T3 (93.67 g) followed by L5 X T3 (87.67 g) produced fruits with maximum average fruit weight. The fruits having least average weight were born by the cross, L9 X T4 (30.33 g) followed by L9 X T1 (31.00 g). The earlier reports also suggested an increase in average fruit weight of tomato hybrids by Padmini *et al.*, 1997 [13]. Similar results were also observed by Sharma and Thakur (2008), Kumari *et al.* (2011) [10] and Chauhan *et al.* (2014) [3].

The total number of fruits per plant (Table 1b) varied from 56.33 to 85.67. The significant number of fruits were produced by the line L9 (85.67) followed by L10 (79.67). On the other hand, the crosses showed a wide range of variability where, the significant number of fruits per plant was produced by the cross L9 X T3 (79.63). Very few crosses outnumbered the checks, Arka Rakshak and Arka Samrat (62.67 and 60.00 respectively) these results are in agreement with earlier findings of Singh *et al.* (2008), Naorem *et al.* (2012) [12] and Chauhan *et al.* (2014) [3]. However, Kanthaswamy *et al.* (1989) recorded the reduced number of fruits per plant in tomato crosses. This variation in fruit numbers may be due to the presence of favourable as well as unfavourable genes for number of fruits per plant in parents involved in the crosses assessed in this study.

The total fruit yield per plant after the final picking ranged from 1.42 to 3.53 kg (Table 1b). Among the parents, the line L4, (3.44 kg) recorded the maximum total fruit yield per plant. Among crosses, the maximum total fruit yield per plant was registered with cross L4 X T3 (3.53 kg). Twenty two cross combinations out yielded the standard checks, Arka Rakshak and Arka Samrat (3.36 and 2.53 kg, respectively). The highest yield per plot was registered in the cross L4 X T3 (52.95 kg) which was followed by L12 X T3 (50.78 kg). Among the crosses, 24 of them out yielded the standard checks, Arka Rakshak and Arka Samrat (50.35 kg and 37.95 kg, respectively). The significant higher yield per hectare was recorded in the crosses, L4 X T3 (51.54 t/ha) and L12 X T3 (49.49 t/ha). The ultimate goal of any breeding programme is target to achieve maximization of marketable yield. This is also the key factor in adoption or rejection of a variety or hybrid by the farmer. The results obtained in this study find the support of earlier workers (Farzane *et al.*, 2012; Chauhan

et al., 2014) [5, 3] who reported significantly high yield from inter-varietal crosses assessed in their studies.

The number of seeds per fruit ranged from 66.00 to 139.00. The tester T2 (139.00) and the line, L12 (122.33) recorded the significantly higher number of seeds per fruit. Likewise, among crosses, the maximum number of seeds per fruit was recorded in cross L4 X T3 (126.67). Ten crosses out of 48 have shown higher seeds per fruit than standard checks, Arka Rakshak and Arka Samrat (118.00 and 115.00, respectively). The data for seeds per fruit is presented in Table 1b. The thousand seed weight (THSW) ranged from 1.81 (T1) to 3.73 g (T4). The highest value was noted for the line L4 (3.72).

The maximum thousand seed weight (g) among the hybrids was observed in the cross L6 X T4 (3.41g). The cross L6 x T4 (3.41g) expressed maximum thousand seed weight over the commercial check varieties Arka Rakshak and Arka Samrat (3.37 and 1.46 g, respectively). The *per se* performance indicates that the hybrids with high mean value for yield parameter could be utilized for commercial exploitation.

From the present findings, it can be summarized that based on mean worth, top three hybrids for fruit yield per plant were viz., L4 X T3, L12 X T3 and L4 X T4. Hence, these should be utilized for future breeding programmes for desirable trait improvement.

Table 1a: *Per se* performance of lines, testers and crosses for growth and yield parameters in tomato

Sl. No.	Genotypes/F ₁	PH	PB	S B	TFC	FPC	TFRC	FRPC	AFRW
1	L1	111.33	5.00	10.00	44.67	6.00	40.33	5.00	39.33
2	L2	108.33	4.67	8.33	39.00	6.67	33.67	5.33	45.00
3	L3	101.00	4.67	8.33	37.33	6.67	34.00	5.33	49.67
4	L4	94.33	5.00	10.00	40.00	6.67	33.67	5.00	87.33
5	L5	112.67	5.00	10.33	39.00	7.33	34.33	5.00	98.00
6	L6	97.67	4.67	10.00	37.33	7.00	33.00	6.00	69.33
7	L7	94.00	4.33	8.33	34.67	6.00	31.33	5.00	37.67
8	L8	107.33	6.67	12.67	41.67	7.00	35.33	6.00	66.33
9	L9	107.00	5.33	10.33	37.00	6.67	32.67	5.33	37.33
10	L10	118.67	6.33	10.67	54.67	7.00	45.00	5.33	40.33
11	L11	89.00	4.33	8.33	41.00	6.33	36.00	4.67	42.33
12	L12	85.67	4.33	8.00	43.67	6.67	38.67	5.67	78.33
13	T1	128.00	6.33	12.67	37.00	8.33	32.00	6.67	44.00
14	T2	81.67	3.67	7.33	34.33	6.00	28.00	4.67	63.67
15	T3	90.67	5.33	7.67	36.00	6.00	28.33	4.33	70.33
16	T4	70.67	5.33	8.67	32.00	6.00	25.67	4.67	58.33
17	L1 X T1	118.00	6.00	10.00	44.33	6.33	38.33	4.67	40.67
18	L1 X T2	104.67	5.00	9.00	37.00	7.00	33.00	5.00	45.67
19	L1 X T3	109.67	4.33	9.00	35.67	6.00	28.33	5.00	49.33
20	L1 X T4	103.33	4.33	8.67	41.33	6.67	35.33	5.00	40.33
21	L2 X T1	97.00	6.33	12.00	48.67	7.00	39.33	5.00	39.00
22	L2 X T2	82.00	4.67	8.67	41.33	5.67	35.67	4.67	44.33
23	L2 X T3	84.00	5.00	9.00	39.00	6.33	34.00	5.33	45.67
24	L2 X T4	81.00	5.00	8.00	38.33	6.33	32.67	5.00	41.67
25	L3 X T1	96.33	5.33	10.00	35.67	5.33	33.00	4.33	52.33
26	L3 X T2	90.67	5.67	10.00	45.33	6.67	40.33	5.67	55.67
27	L3 X T3	92.00	5.33	9.33	38.67	6.33	34.67	5.00	59.33
28	L3 X T4	90.00	4.33	9.00	36.67	6.33	30.00	4.67	59.67
29	L4 X T1	107.67	4.33	9.00	40.67	6.33	36.00	5.33	75.00
30	L4 X T2	103.00	5.67	10.33	47.00	6.33	41.00	5.00	87.00
31	L4 X T3	93.67	5.00	9.67	39.00	6.00	35.00	5.00	93.67
32	L4 X T4	108.67	5.33	10.33	38.67	5.67	35.33	4.33	83.67
33	L5 X T1	95.33	6.33	11.67	41.33	6.67	33.67	5.67	69.00
34	L5 X T2	81.67	6.00	11.00	36.33	6.67	31.33	5.00	80.67
35	L5 X T3	89.00	6.00	9.00	37.67	6.67	31.33	5.00	87.67
36	L5 X T4	97.00	7.00	10.33	46.33	6.00	40.00	4.33	80.00
37	L6 X T1	132.67	7.00	13.33	48.33	6.33	41.33	5.33	43.67
38	L6 X T2	82.67	6.33	11.67	45.67	7.00	37.33	5.33	52.33
39	L6 X T3	100.67	7.33	12.33	45.00	7.00	37.67	5.67	60.00
40	L6 X T4	125.33	7.00	12.33	44.67	7.00	36.67	5.00	56.67
41	L7 X T1	134.33	8.00	14.67	42.33	6.33	35.67	5.00	38.00
42	L7 X T2	112.67	7.00	14.00	54.00	6.67	45.00	5.00	46.67
43	L7 X T3	109.67	6.33	13.00	55.00	6.33	44.67	4.67	49.67
44	L7 X T4	95.67	6.67	11.33	41.33	6.33	33.00	5.00	49.67
45	L8 X T1	124.67	6.00	14.00	52.67	6.67	41.33	5.33	45.00
46	L8 X T2	86.00	7.00	11.00	48.33	6.67	40.33	5.00	55.00
47	L8 X T3	78.33	7.00	11.00	39.33	6.00	33.33	5.00	57.67
48	L8 X T4	83.33	7.00	12.00	44.00	5.67	35.00	4.33	57.00
49	L9 X T1	101.33	6.00	10.33	49.00	7.33	38.00	5.33	31.00
50	L9 X T2	98.00	5.67	11.67	40.33	7.00	33.33	5.67	36.00
51	L9 X T3	94.33	6.00	11.33	37.33	7.33	31.33	5.67	37.33
52	L9 X T4	90.67	5.33	9.67	38.33	7.00	30.67	5.33	30.33
53	L10 X T1	99.00	4.33	8.33	37.33	7.33	30.33	5.67	32.00

54	L10 X T2	90.00	5.00	8.00	35.67	6.67	31.67	5.67	35.67
55	L10 X T3	77.67	4.67	7.67	35.00	6.33	27.33	4.67	44.00
56	L10 X T4	83.67	5.67	11.33	40.33	7.00	36.33	5.67	42.33
57	L11 X T1	94.33	5.33	10.67	47.33	7.33	41.67	5.33	45.00
58	L11 X T2	84.67	5.00	9.00	38.67	6.00	31.67	5.00	50.00
59	L11 X T3	84.00	5.33	9.33	41.67	7.00	35.67	5.00	51.33
60	L11 X T4	84.67	5.00	9.67	42.33	6.00	37.33	4.67	50.00
61	L12 X T1	113.00	6.33	10.67	51.33	6.33	45.00	5.00	74.67
61	L12 X T2	94.00	4.67	8.33	43.67	6.00	38.67	4.33	77.67
63	L12 X T3	92.33	4.67	11.00	44.00	5.33	38.33	4.33	80.33
64	L12 X T4	97.67	5.33	11.00	41.00	6.00	37.00	5.00	78.00
65	C1	87.33	4.00	8.00	33.33	6.33	28.67	5.00	83.67
66	C2	79.00	4.33	8.00	33.67	6.33	30.67	4.33	85.00
	Mean	97.25	5.48	10.15	41.24	6.49	35.15	5.06	56.92
	CV (%)	5.53	13.94	14.76	10.16	11.40	11.25	15.70	4.60
	SEm±	3.10	0.44	0.86	2.42	0.42	2.28	0.45	1.51
	CD @ 5%	8.61	1.22	2.39	6.71	1.04	6.33	2.32	4.19
	CD@1%	11.32	1.60	3.15	8.81	1.18	8.32	3.45	5.51

PH = Plant height (cm)

TFRC = Total fruit clusters per plant

PB = Number of primary branches

FPC = Number of flowers per cluster

SB = Number of secondary branches

FRPC = Number of fruits per cluster

TFC = Total flower cluster per plant

AFRW = Average fruit weight (g)

Table 1b: *Per se* performance of lines, testers and crosses for yield and seed parameters in tomato

Sl. No.	Genotypes/F ₁	FRPP	YPP	YPPT	YPHA	SPFR	THSW	SWPFR	SYPP
1	L1	78.67	1.44	21.65	21.02	78.33	2.71	0.32	9.42
2	L2	74.67	2.28	34.25	33.29	114.67	3.16	0.40	13.11
3	L3	67.33	2.33	34.90	34.02	105.00	2.97	0.42	10.41
4	L4	64.33	3.44	51.60	50.22	125.33	3.72	0.49	11.64
5	L5	56.33	2.74	41.10	40.00	66.00	3.55	0.36	9.75
6	L6	77.00	3.03	45.40	44.24	90.33	3.49	0.46	12.77
7	L7	74.00	2.55	38.20	37.23	105.67	3.53	0.44	11.95
8	L8	62.33	2.68	40.20	39.13	84.00	3.34	0.43	10.16
9	L9	85.67	2.15	32.20	31.39	98.33	2.82	0.50	10.59
10	L10	79.67	2.74	41.15	40.00	89.67	2.32	0.40	7.92
11	L11	65.33	2.13	32.00	31.10	107.33	2.69	0.53	9.50
12	L12	65.33	3.28	49.20	47.89	122.33	3.03	0.57	10.61
13	T1	63.33	2.41	36.15	35.19	115.00	1.81	0.28	6.24
14	T2	76.33	2.94	44.15	42.92	139.00	3.29	0.50	8.67
15	T3	77.33	2.86	42.90	41.76	108.67	3.70	0.30	6.50
16	T4	72.00	2.97	44.60	43.36	106.33	3.73	0.35	8.96
17	L1 X T1	67.67	1.42	21.25	20.73	81.00	3.08	0.24	8.87
18	L1 X T2	62.00	2.06	30.90	30.08	90.67	3.30	0.29	10.35
19	L1 X T3	66.67	2.17	32.50	31.68	85.33	3.18	0.27	10.42
20	L1 X T4	62.67	2.05	30.70	29.93	83.33	3.14	0.25	8.90
21	L2 X T1	72.33	2.26	33.85	33.00	114.00	2.69	0.30	13.17
22	L2 X T2	77.00	2.34	35.15	34.16	119.67	2.81	0.33	12.68
23	L2 X T3	78.67	2.48	37.20	36.21	114.00	2.83	0.32	12.53
24	L2 X T4	74.67	2.18	32.65	31.83	115.33	2.91	0.33	11.44
25	L3 X T1	64.67	1.74	26.05	25.40	98.67	1.34	0.13	4.55
26	L3 X T2	62.00	2.08	31.20	30.37	105.67	1.43	0.15	4.97
27	L3 X T3	68.67	2.25	33.75	32.85	108.33	1.46	0.15	6.22
28	L3 X T4	70.00	2.07	31.10	30.22	100.00	1.32	0.13	5.63
29	L4 X T1	64.67	2.73	40.95	39.86	124.00	3.15	0.39	10.83
30	L4 X T2	62.00	3.17	47.60	46.28	117.67	2.79	0.33	10.11
31	L4 X T3	69.33	3.53	52.95	51.54	126.67	2.75	0.35	12.49
32	L4 X T4	64.67	3.12	46.80	45.55	125.33	2.76	0.34	11.30
33	L5 X T1	60.00	2.64	39.55	38.54	78.00	2.76	0.21	6.62
34	L5 X T2	63.33	2.74	39.70	40.00	75.00	2.60	0.19	6.86
35	L5 X T3	64.00	2.86	42.95	41.76	74.67	2.67	0.20	6.93
36	L5 X T4	61.00	2.73	40.90	39.86	73.33	2.63	0.19	6.11
37	L6 X T1	72.00	2.67	40.10	38.98	77.33	2.80	0.21	8.90
38	L6 X T2	76.00	3.00	45.00	43.80	81.33	2.79	0.23	8.86
39	L6 X T3	77.33	3.07	46.05	44.82	73.33	3.00	0.21	9.81
40	L6 X T4	67.67	2.86	42.90	41.76	91.67	3.41	0.31	11.65
41	L7 X T1	77.00	2.03	30.45	29.64	94.00	1.86	0.17	8.04
42	L7 X T2	72.00	2.15	32.25	31.39	106.33	2.18	0.23	9.23
43	L7 X T3	76.33	2.16	32.45	31.54	95.67	2.45	0.24	10.01
44	L7 X T4	73.00	2.22	33.25	32.41	97.67	2.48	0.24	10.08

45	L8 X T1	69.00	2.33	34.95	34.02	106.67	2.21	0.23	9.27
46	L8 X T2	71.33	2.95	44.25	43.07	99.33	3.29	0.32	11.78
47	L8 X T3	74.67	3.01	45.10	43.95	104.33	3.31	0.34	12.67
48	L8 X T4	70.33	2.81	42.20	41.03	96.00	3.25	0.31	11.03
49	L9 X T1	72.00	1.33	19.90	19.42	113.67	2.31	0.26	10.14
50	L9 X T2	76.67	1.92	28.80	28.03	106.33	2.14	0.22	10.16
51	L9 X T3	79.67	1.59	23.85	23.21	107.67	2.11	0.22	11.40
52	L9 X T4	76.67	1.62	24.25	23.65	107.67	2.02	0.21	10.42
53	L10 X T1	65.67	2.25	33.80	32.85	98.00	2.93	0.29	10.14
54	L10 X T2	71.00	2.74	41.15	40.00	107.67	3.16	0.33	12.16
55	L10 X T3	73.67	3.14	47.10	45.84	104.00	2.44	0.24	10.41
56	L10 X T4	72.00	3.03	45.50	44.24	103.33	2.22	0.23	9.72
57	L11 X T1	71.33	1.96	29.35	28.62	114.67	3.11	0.35	12.28
58	L11 X T2	74.33	2.72	40.80	39.71	111.33	3.11	0.32	12.87
59	L11 X T3	79.33	2.53	38.00	36.94	100.33	2.87	0.28	12.73
60	L11 X T4	75.33	2.18	32.75	31.83	105.00	2.89	0.30	13.22
61	L12 X T1	67.67	2.67	40.05	38.98	116.33	2.73	0.31	10.60
62	L12 X T2	69.67	2.84	42.65	41.46	125.33	3.18	0.39	13.21
63	L12 X T3	72.00	3.39	50.78	49.49	118.33	3.09	0.36	12.71
64	L12 X T4	71.67	3.14	47.28	45.84	123.67	3.14	0.37	12.90
65	C1	62.67	3.36	50.35	49.06	118.00	3.37	0.38	13.17
66	C2	60.00	2.53	37.95	36.94	115.00	1.46	0.17	8.17
	Mean	70.20	2.53	38.06	36.94	103.08	2.76	0.30	10.12
	CV (%)	3.45	6.85	6.98	8.42	6.37	7.82	12.50	10.31
	SEm±	1.39	0.09	1.53	1.68	3.79	0.12	0.02	0.60
	CD @ 5 %	3.87	0.27	4.25	5.64	10.52	0.34	0.06	1.67
	CD @ 1%	5.09	0.36	5.58	6.12	13.83	0.45	0.08	2.19

FRPP = Number of fruits per plant SPFR = Number of seeds per fruit

YPP = Yield per plant (kg) THSW = 1000 seed weight (g)

YPPT = Yield per plot (kg) SWPFR = Seed weight per fruit (g)

YPHA = Yield per hectare (t) SYPP = Seed yield per plant (g)

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