

PERFORMANCE OF PARENTS AND HYBRIDS FOR YIELD AND YIELD ATTRIBUTING TRAITS IN TOMATO (*SOLANUM LYCOPERSICUM* L.)

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Abstract: A field experiment was conducted during *rabi* season 2017-18 in Randomized Block Design with three replications at Horticultural Research cum Instructional Farm, Department of Vegetable Science, IGKV, Raipur (C.G.). Six diverse and horticulturally superior lines of tomato were crossed with four testers in line x tester mating design. The resultant 24 hybrids (F₁'s) along with their parents (six lines and four testers) were evaluated for eighteen yield and yield attributing traits in tomato. The experiment results revealed that parents 2014/TOLCVRES-3 performed best for characters *viz.*, number of flowers per cluster (6.38), number of fruits per cluster (4.84), pericarp thickness (mm) 6.18 mm and total soluble solid (°Brix) 4.49 °Brix. Fruit diameter (cm), average fruit wt. (g) and fruit length (cm) were observed in parents 2015/TOLCVRES-2 and 2015/TOLCVRES-4. Whereas fruit yield per plant (3.78 kg), days to first fruit harvest (70.99) and dry matter % of fruit (6.21%) recorded in parent H-86. Among all parents, H-86 and 2014/TOLCVRES-3 with the yield of 659.72 q/ha and 611.04 q/ha respectively were found to be better yielders. Among all hybrids PR X 14/TLCV-3, PC X 15/TLCV-2, KA X 15/TLCV-2, KA X 14/TLCV-3 and AV X 14/TLCV-1 were best performing in maximum number of quality and yield attributing traits like days to 50% flowering (27.00), maximum number of fruit cluster per plant (12.42), ascorbic acid (25.01 mg/100g), number of flowers per cluster (7.12), fruit diameter 7.00 cm, average fruit wt. (144.50 g), fruit yield per plant (3.52kg), total soluble solid (5.71 °Brix), and number of locules per fruit (5.24). Fruit yield per hectare was observed in the cross H-86 X 14/TLCV-3 (727.58 q), followed by KA X 14/TLCV-3 (724.13 q) and H-86 X 15/TLCV-4 (705.76 q). Therefore, recommended for generation advancement and selection of desirable progeny lines useful for Chhattisgarh plains.

Keywords: Tomato, Fruit yield, Genotypes, Parents, Hybrids

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is one of the most important and popular vegetable crops in the world. Tomato is popular due to its nutritive and medicinal values. Nuez *et al.* 2004 identified it as the horticultural crop with the highest commercial value. In India; tomato is grown across all agro-ecological zones and occupies an area of about 801 thousand hectares with an annual production of 22.33 million tonnes, respectively (Anon., 2017). Tomato is universally treated as 'Protective Food' since it is very rich in minerals, vitamins, antioxidants, essential amino acids, sugars and dietary fibers which are important ingredients for culinary and table purpose, chutney, pickles, ketchup, soup, juice, puree etc. (Sekhar *et al.*, 2010). Fresh fruit of tomato are in great demand round the year throughout the country.

Generally, both determinate and indeterminate varieties are considered suitable for growing and for commercial production; high yielding superior F₁ hybrids are preferred. Hence, there is continuous need to strengthen the crop improvement programmes in tomato and ultimately developing new varieties/hybrids satisfying to the present day needs of farmers and consumers as well.

The information about mean performance of genotypes is of basic importance for crop improvement. The range of mean values could present a rough estimate about the variation in magnitude of variability present among the genotypes. The characters showing wide range of variation have more scope for improvement. Evaluation of hybrids and its parents helps to identify best combination of parents which are resulting in best hybrid with desirable yield attributing traits. And it also helps us to understand the combining ability of parents.

MATERIALS AND METHODS

The experiment was conducted at AICRP on Vegetable Crops, Department of Vegetable Science, Horticultural Research and Instructional Farm, IGKV, Raipur (C.G.) during *rabi* season 2017-18. The experimental material (Table 1) consists of six lines (*viz.*, Pusa Ruby, Punjab Chhuhara, Arka Vikas, Kashi Anupam, H-86 and H-24) and four testers namely 2015/TOLCVRES-4, 2015/TOLCVRES-2, 2014/TOLCVRES-3, 2014/TOLCVRES-1) using Line x Tester mating design was followed in this study. Thus a total of 24 hybrids were synthesized by making crosses between lines and the testers during March – April 2017 in crossing block. The twenty

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four crosses (F_1 's along with their parents (six lines and four testers) were grown in Randomized Block Design with three replications during *rabi* 2017-18. The recommended package of practices was followed to raise a successful crop and necessary

prophylactic plant protection measures were carried out to safeguard the crop from pests and diseases. The observations for eighteen characters were recorded on five plant basis in each replication. These observations were subjected to statistical analysis.

Table 1. Details of the parents (lines and testers), F_1 hybrids developed through L x T mating design used in the study

S. No.	Parents	Code No.	Source		
Lines					
1	Pusa Ruby	PR	IARI, New Delhi		
2	Punjab Chhuhara	PC	PAU, Ludhiana		
3	Arka Vikas	AV	IIHR, Bengaluru		
4	Kashi Anupam	KA	IIVR, Varanasi		
5	H-86	H-86	IIVR, Varanasi		
6	H-24	H-24	HAU, Hisar		
Testers					
1	2015/TOLCVRES-4	15/TLCV-4	AICRP on Vegetable Crops, Raipur		
2	2015/TOLCVRES-2	15/TLCV-2	AICRP on Vegetable Crops, Raipur		
3	2014/TOLCVRES-3	14/TLCV-1	AICRP on Vegetable Crops, Raipur		
4	2014/TOLCVRES-1	14/TLCV-3	AICRP on Vegetable Crops, Raipur		
List of F_1 hybrids developed through Line x Tester mating design					
S. No.	Crosses (F_1 s)	Code No.	S. No.	Crosses (F_1 s)	Code No.
1	Pusa Ruby X 2015/TOLCVRES-4	PR X 15/TLCV-4	13	Kashi Anupam X 2015/TOLCVRES-4	KA X 15/TLCV-4
2	Pusa Ruby X 2015/TOLCVRES-2	PR X 15/TLCV-2	14	Kashi Anupam X 2015/TOLCVRES-2	KA X 15/TLCV-2
3	Pusa Ruby X 2014/TOLCVRES-3	PR X 14/TLCV-3	15	Kashi Anupam X 2014/TOLCVRES-3	KA X 14/TLCV-3
4	Pusa Ruby X 2014/TOLCVRES-1	PR X 14/TLCV-1	16	Kashi Anupam X 2014/TOLCVRES-1	KA X 14/TLCV-1
5	Punjab Chhuhara X 2015/TOLCVRES-4	PC X 15/TLCV-4	17	H-86 X 2015/TOLCVRES-4	H-86 X 15/TLCV-4
6	Punjab Chhuhara X 2015/TOLCVRES-2	PC X 15/TLCV-2	18	H-86 X 2015/TOLCVRES-2	H-86 X 15/TLCV-2
7	Punjab Chhuhara X 2014/TOLCVRES-3	PC X 14/TLCV-3	19	H-86 X 2014/TOLCVRES-3	H-86 X 14/TLCV-3
8	Punjab Chhuhara X 2014/TOLCVRES-1	PC X 14/TLCV-1	20	H-86 X 2014/TOLCVRES-1	H-86 X 14/TLCV-1
9	Arka Vikas X 2015/TOLCVRES-4	AV X 15/TLCV-4	21	H-24 X 2015/TOLCVRES-4	H-24 X 15/TLCV-4
10	Arka Vikas X 2015/TOLCVRES-2	AV X 15/TLCV-2	22	H-24 X 2015/TOLCVRES-2	H-24 X 15/TLCV-2
11	Arka Vikas X 2014/TOLCVRES-3	AV X 14/TLCV-3	23	H-24 X 2014/TOLCVRES-3	H-24 X 14/TLCV-3
12	Arka Vikas X 2014/TOLCVRES-1	AV X 14/TLCV-1	24	H-24 X 2014/TOLCVRES-1	H-24 X 14/TLCV-1

Table 2. Mean performance of parents (Lines and Testers) in tomato during *rabi*, 2017-18

Parents	Characters																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Lines																		
Pusa Ruby	26.67	11.65	78.13	10.07	5.38	4.44	27.46	71.10	1.58	3.51	4.52	77.23	4.81	4.92	4.44	19.87	3.69	295.98
Punjab Chhuhara	28.67	11.19	61.09	8.39	5.04	4.24	26.16	73.92	1.11	4.46	4.04	40.73	2.47	5.58	4.47	22.15	3.63	313.53
Arka Vikash	27.67	10.85	85.70	10.99	4.51	3.91	31.06	71.99	1.45	3.92	3.84	60.86	4.12	4.78	3.60	21.56	4.23	454.26
Kashi Anupam	27.67	10.23	56.63	8.65	5.04	4.18	19.97	70.99	1.68	5.58	6.05	81.46	5.11	4.94	3.79	21.25	5.03	406.46
H-86	29.00	8.66	48.65	10.01	5.11	3.98	29.99	70.99	3.78	6.14	5.98	107.06	3.27	5.38	3.78	20.76	6.21	659.72
H-24	29.33	9.69	56.27	9.38	5.71	4.38	28.58	73.05	1.57	3.97	5.66	69.39	3.84	4.26	3.01	19.96	5.00	381.41
Mean of lines	28.17	10.38	64.41	9.58	5.13	4.19	27.20	72.01	1.86	4.60	5.01	72.79	3.94	4.98	3.85	20.92	4.63	418.56

Testers																		
2015/TOLCVRES-4	30.67	8.57	39.14	8.63	5.31	4.64	26.11	72.66	2.68	6.17	6.12	97.79	3.81	5.31	3.97	22.64	3.65	524.07
2015/TOLCVRES-2	28.67	10.95	56.22	11.32	5.11	4.58	25.16	71.69	2.67	4.72	6.44	107.06	5.88	5.12	3.83	18.98	3.48	567.40
2014/TOLCVRES-3	28.33	10.16	66.60	9.43	6.38	4.84	26.86	71.75	2.64	5.87	6.26	96.78	4.02	6.18	4.49	24.31	4.28	611.04
2014/TOLCVRES-1	31.33	11.75	57.58	11.43	5.64	4.78	29.11	72.11	1.82	4.93	5.37	66.23	4.95	4.10	3.89	23.64	4.33	440.40
Mean of testers	29.75	10.36	54.88	10.20	5.61	4.71	26.81	72.05	2.45	5.42	6.05	91.97	4.67	5.18	4.05	22.39	3.93	535.73
Mean of parents	28.80	10.37	60.60	9.83	5.32	4.40	27.04	72.02	2.10	4.93	5.43	80.46	4.23	5.06	3.93	21.51	4.35	465.43
CD at 5%	1.40	1.28	6.10	0.95	0.51	0.42	2.54	-	0.19	0.48	0.54	8.17	0.44	0.49	0.38	2.07	0.41	45.88
C.V.	2.81	7.14	5.82	5.62	5.60	5.60	5.43	1.93	5.40	5.72	5.78	5.87	6.10	5.66	5.67	5.59	5.55	5.70

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| 1. Days to 50% flowering | 2. No. of branches per plant | 3. Plant height (cm) |
| 4. Number of fruit cluster per plant | 5. Number of flowers per cluster | 6. Number of fruits per cluster |
| 7. Number of fruits per plant | 8. Days to first fruit harvest | 9. Fruit yield per plant (kg) |
| 10. Fruit length (cm) | 11. Fruit diameter (cm) | 12. Average fruit weight (g) |
| 13. Number of locules per fruit | 14. Pericarp thickness (mm) | 15. Total soluble solids (°Brix) |
| 16. Ascorbic acid content (mg/100g) | 17. Dry matter % of fruit | 18. Fruit yield per hectare (q) |

Table 3. Mean performance of F₁ hybrids of tomato during *rabi*, 2017-18

Hybrids	Characters																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PR X 15/TLCV-4	27.33	11.28	53.73	11.47	6.52	4.92	27.84	70.76	2.36	4.84	5.57	83.31	2.69	6.45	4.333	24.34	5.28	486.30
PR X 15/TLCV-2	29.68	8.32	49.40	7.64	5.72	4.32	33.15	73.26	1.72	4.25	4.85	68.33	3.56	4.92	5.64	20.30	4.33	331.15
PR X 14/TLCV-3	27.00	12.62	54.07	12.42	6.92	5.32	32.40	69.35	3.12	4.89	5.96	101.03	4.02	6.49	4.74	25.01	4.48	671.35
PR X 14/TLCV-1	31.00	11.62	54.43	9.80	6.12	5.32	25.15	72.60	2.21	4.27	5.47	75.52	4.69	6.18	4.34	19.32	4.83	449.94
PC X 15/TLCV-4	30.33	8.95	49.40	9.13	6.92	5.52	27.97	71.0	1.99	4.77	5.39	84.29	3.35	6.31	3.72	20.10	5.08	398.22
PC X 15/TLCV-2	29.33	10.38	52.40	10.13	7.12	6.32	28.87	71.39	2.54	4.58	5.85	96.53	3.68	4.63	4.49	17.47	4.91	531.55
PC X 14/TLCV-3	27.33	9.27	61.47	8.80	5.72	5.12	33.01	71.93	1.67	3.98	4.37	59.11	4.07	4.57	3.79	21.34	5.01	319.03
PC X 14/TLCV-1	29.00	9.95	51.40	9.13	5.92	4.52	28.82	73.51	2.48	4.86	5.39	98.33	4.69	5.81	3.22	19.47	4.93	516.20
AV X 15/TLCV-4	29.33	9.62	55.40	9.80	5.72	5.32	30.48	74.55	2.55	4.98	5.62	92.06	4.23	6.66	4.34	21.34	4.36	533.17
AV X 15/TLCV-2	27.33	10.62	56.33	9.64	6.12	5.12	27.21	71.77	2.22	4.61	5.84	93.74	3.34	5.59	4.87	21.46	4.83	453.98
AV X 14/TLCV-3	30.67	10.62	58.73	9.52	6.52	6.12	27.35	70.45	2.59	5.12	5.94	101.47	3.32	6.62	4.20	19.63	3.74	542.87
AV X 14/TLCV-1	31.00	10.28	57.40	10.14	5.92	4.72	34.74	72.54	1.55	6.38	5.15	69.96	4.34	5.63	4.06	19.88	4.28	289.94
KA X 15/TLCV-4	30.00	11.36	50.73	11.80	6.12	5.52	27.82	73.81	2.38	5.06	5.92	103.93	5.24	5.49	4.15	20.95	5.08	492.77
KA X 15/TLCV-2	29.67	10.95	62.40	9.80	5.92	5.32	24.83	71.45	3.43	5.41	7.00	144.50	5.02	6.81	4.78	23.46	3.68	702.31
KA X 14/TLCV-3	27.67	11.92	53.69	11.44	5.72	4.92	28.82	70.48	3.52	5.72	6.62	132.83	5.21	6.33	5.71	22.59	5.05	724.13
KA X 14/TLCV-1	31.00	7.27	63.10	7.68	4.32	3.72	33.92	75.22	1.31	4.23	4.70	56.57	3.34	4.27	3.26	19.45	3.51	291.76
H-86 X 15/TLCV-4	27.67	9.95	54.07	8.74	6.72	5.12	27.26	72.30	3.37	5.94	6.08	131.37	4.32	4.45	4.42	23.32	4.05	705.76
H-86 X 15/TLCV-2	30.67	12.62	58.40	11.37	6.72	5.92	20.39	73.66	2.62	5.41	6.74	139.52	4.27	6.87	4.02	21.35	4.53	522.33
H-86 X 14/TLCV-3	27.33	13.95	57.72	12.32	6.32	5.72	33.62	71.84	3.46	6.24	6.04	117.94	3.42	6.68	3.99	21.47	5.00	727.58
H-86 X 14/TLCV-1	30.67	7.48	47.40	7.64	5.32	4.72	31.60	73.48	2.71	5.87	5.12	93.21	3.62	6.23	3.77	19.64	4.54	544.96
H-24 X 15/TLCV-4	29.33	10.95	58.07	10.13	6.32	5.72	25.58	72.87	1.65	5.32	5.83	91.69	3.20	6.34	4.17	19.88	4.24	374.93
H-24 X 15/TLCV-2	30.33	12.31	59.38	11.14	6.72	6.32	26.27	73.97	1.94	4.74	5.57	92.37	3.66	5.34	4.14	20.95	4.86	445.24
H-24 X 14/TLCV-3	27.67	10.28	50.73	9.47	6.32	5.32	25.36	73.22	1.49	5.34	5.46	94.50	3.34	5.41	4.20	23.46	5.11	336.96
H-24 X 14/TLCV-1	30.00	11.33	61.64	11.49	5.52	4.92	26.46	71.38	2.74	5.58	6.30	113.01	4.33	7.24	4.51	22.59	4.94	639.98
Mean of hybrids	29.22	10.62	55.36	10.03	6.14	5.25	28.70	72.37	2.40	5.10	5.70	97.30	3.96	5.89	4.29	21.16	4.61	501.35
CD at 5%	1.23	0.97	5.07	0.91	0.57	0.48	2.49	2.11	0.21	0.97	0.67	4.12	0.37	0.57	0.46	1.93	0.42	47.67
C.V.	2.57	5.58	5.55	5.54	5.62	5.63	5.27	1.77	5.52	11.53	7.22	2.57	5.67	5.91	6.51	5.55	5.54	5.76

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| 1. Days to 50% flowering | 2. No. of branches per plant | 3. Plant height (cm) |
| 4. Number of fruit cluster per plant | 5. Number of flowers per cluster | 6. Number of fruits per cluster |
| 7. Number of fruits per plant | 8. Days to first fruit harvest | 9. Fruit yield per plant (kg) |
| 10. Fruit length (cm) | 11. Fruit diameter (cm) | 12. Average fruit weight (g) |
| 13. Number of locules per fruit | 14. Pericarp thickness (mm) | 15. Total soluble solids (°Brix) |
| 16. Ascorbic acid content (mg/100g) | 17. Dry matter % of fruit | 18. Fruit yield per hectare (q) |

RESULTS AND DISCUSSION

The performance of parents and F₁ hybrids for yield and yield related traits were computed and have been given in table 2 & 3.

Mean values for days to 50 % flowering ranged between 26.67 to 31.33 days with an average value 28.80 days. Among the parents, Pusa Ruby (26.67) and Arka Vikas & Kashi Anupam (27.67) were recorded the minimum days 50 % flowering and among the crosses, minimum days to 50 % flowering was observed in PR X 14/TLCV-3 (27.00 days) PR X 15/TLCV-4, PC X 14/TLCV-3, AV X 15/TLCV-2 & H-86 X 14/TLCV-3 (27.33 days). The number of branches per plant in parents ranged from 8.57 (Pusa Ruby) to 11.75 (2015/TOLCVRES-4). Among the crosses, it ranged from 7.27 (KA X 14/TLCV-1) to 13.95 (H-86 X 14/TLCV-3) with an overall average of 10.62. The present result getting support from the findings of Shankar *et al.*, (2014) and Sujeetkumar and Ramanjinigowda (2016).

Plant height exhibited variation among 34 treatments which ranged from 39.14cm to 85.70cm with a mean value 57.98cm. Among the parents, maximum mean values for plant height were recorded in Arka Vikas (85.70cm) and Pusa Ruby (78.13cm) whereas, among 24 F₁s, KA X 14/TLCV-1 (63.10 cm), KA X 15/TLCV-2 (62.40cm) and H-24 X 14/TLCV-1 (61.64 cm) have maximum values for plant height. Results are confirmed with earlier reports of Ravindra Kumar *et al.*, (2012) and Sunil *et al.*, (2013). The mean values of parents for number of fruit cluster per plant varied from 8.39 (Punjab Chhuhara) to 11.43 (2014/TOLCVRES-1) with a grand mean of 9.83. Among hybrids, this character was ranged from 4.32 (KA X 14/TLCV-1) to 7.12 (PC X 15/TLCV-2) with an overall average of 6.14. . Maximum mean number of flowers per cluster among crosses was noted in PC X 15/TLCV-2 (7.12), which is followed by PR X 14/TLCV-3 & PC X 15/TLCV-4 (6.92).

Among the parents, number of flowers per cluster ranged from 4.51 (Arka Vikas) to 6.38 (2014/TOLCVRES-3). Among the hybrids number of flowers per cluster were ranged from 4.32 (KA X 14/TLCV-1) to 7.12 (PC X 15/TLCV-2) with an overall average of 6.14. The results are in close conformity with the findings of Shankar *et al.*, (2014) and Vilas *et al.*, (2015). Among the parents, number of fruits per cluster ranged from 3.91 (Arka Vikas) to 4.84 (2014/TOLCVRES-3) with parental average of 4.40. Among the F₁s, maximum values for number of fruits per cluster were recorded in PC X 15/TLCV-2 & H-24 X 15/TLCV-2 (6.32) followed by AV X 14/TLCV-3 (6.12) and H-86 X 15/TLCV-2 (5.92). The trait number of fruits per plant is very important as it plays an important role in deciding the yield. The maximum number of fruits per plant among parents were recorded in Arka Vikas (31.06) followed by H-86 (29.99). Among hybrids maximum

number of fruits per plant was observed for AV X 14/TLCV-1 (34.74) which is followed by KA X 14/TLCV-1 (33.92), H-86 X 14/TLCV-3 (33.62) and PR X 15/TLCV-2 (33.15).

Mean values for days to first fruit harvest in parent ranged from 70.99 (Kashi Anupam & H-86) to 73.93 (Punjab Chhuhara) days with a parental mean of 72.02. Among the hybrids, minimum days to first fruit harvest were recorded in PR X 14/TLCV-3 (69.35 days) which was followed by AV X 14/TLCV-3 (70.45 days), KA X 14/TLCV-3 (70.48 days) and PR X 15/TLCV-4 (70.76 days). Mean values for fruit yield per plant (kg) was ranged between 1.11 to 3.78 kg and the average value was 2.25kg. Among the parents, maximum values for the same trait were observed in H-86 (3.78 kg) and 2015/TOLCVRES-4 (2.68kg) whereas, among the 24 cross combinations, KA X 14/TLCV-3 (3.52kg) followed by H-86 X 14/TLCV-3 (3.46 kg) and KA X 15/TLCV-2 (3.43 kg) showed maximum values for fruit yield per plant. Same finding for fruit yield per plant was also reported by Sunil *et al.*, (2013) and Kumar *et al.*, (2016).

Fruit length (cm) varied from 3.51(Pusa Ruby) to 6.17 cm (2015/TOLCVRES-4) with an overall mean of 4.93 cm in parents. Although among the 24 cross combinations, maximum values for fruit length were recorded in AV X 14/TLCV-1 (6.38 cm) followed by H-86 X 14/TLCV-3 (6.24 cm) and H-86 X 15/TLCV-4 (5.94 cm). The results are in close conformity with the findings of Gul *et al.*, (2010) and Sunil *et al.*, (2013). Among the parents, maximum values for fruit diameter were recorded in 2015/TOLCVRES-2 (6.44cm), 2014/TOLCVRES-3 (6.26cm) and 2015/TOLCVRES-4 (6.12cm). Among the crosses, this trait varied from 4.37cm to 7.00 cm with overall mean 5.70 cm. Maximum fruit diameter was observed in crosses KA X 15/TLCV-2 (7.00 cm), which was followed by H-86 X 15/TLCV-2 (6.74 cm) and KA X 14/TLCV-3 (6.62 cm). Average fruit weight contributes to total fruit yield as well as consumer preference for specific fruit size is considered as one of the major objectives of breeding programs in tomato. The maximum average fruit weight was recorded among parents in H-86 & 2015/TOLCVRES-2 (107.06g) and 2015/TOLCVRES-4 (97.79g). Among the crosses, maximum average fruit weight was recorded in KA X 15/TLCV-2 (144.50 g) which was followed by H-86 X 15/TLCV-2 (139.52 g), KA X 14/TLCV-3 (132.83g) and H-86 X 15/TLCV-4 (131.37g) with an overall cross mean of 97.30 g. The earlier reports also suggested an increase in average fruit weight of tomato hybrids Padmini and Vadivel (1997) Singh *et al.*, (2012) and Chauhan *et al.*, (2014).

Among all the parents, number of locules per fruit ranged from 2.47 (Punjab Chhuhara) to 5.88 (2015/TOLCVRES-2) with an overall parental mean of 4.23. Among 24 crosses this trait ranged from 2.69 to 5.24 with overall mean 3.96. Highest mean value

for number of locules per fruit was recorded in crosses KA X 15/TLCV-4 (5.24) which was followed by KA X 14/TLCV-3 (5.21) and KA X 15/TLCV-2 (5.02). Pericarp thickness of fruits ranges from 4.10 (2014/TOLCVRES-1) to 6.18 mm (2014/TOLCVRES-3) with an overall parental mean of 5.06 mm. The cross performance ranged from 4.27 (KA X 14/TLCV-1) to 7.24 mm (H-24 X 14/TLCV-1) followed by H-86 X 15/TLCV-2 (6.87 mm), KA X 15/TLCV-2 (6.81mm) and H-86 X 14/TLCV-3 (6.68 mm) with an overall mean 5.89 mm. High total soluble solids (TSS) and low acidity are the major factors well thought-out for manufacture of processed products. Among the parents, highest TSS was recorded in 2014/TOLCVRES-3 (4.49°Brix), Punjab Chuhara (4.47°Brix) and Pusa Ruby (4.44°Brix). Among the crosses, this trait ranged from 3.22 (PC X 14/TLCV-1) to 5.71 °Brix (KA X 14/TLCV-3) which is followed by PR X 15/TLCV-2 (5.64 °Brix), AV X 15/TLCV-2 (4.87 °Brix), KA X 15/TLCV-2 (4.78 °Brix) and PR X 14/TLCV-3 (4.74 °Brix) with an overall cross mean of 4.29 °Brix. Present findings are in accordance with the reports of Shankar *et al.*, (2014) and Basavaraj *et al.*, (2016). Ascorbic acid content is nutritionally an important constituent. Small fruited genotypes are generally richer in ascorbic acid content. Among all the parents, ascorbic acid content ranged from 18.98 to 24.31 mg/100g with an overall parental average of 21.51 mg/100g. Maximum content was recorded by 2014/TOLCVRES-3 (24.31 mg/100g) and Punjab Chuhara (22.15 mg/100g). Among hybrids, this character was varied from 25.01 mg/100g (PR X 14/TLCV-3), which is followed by PR X 15/TLCV-4 (24.34 mg/100g) and KA X 15/TLCV-2 (23.46 mg/100g) with an overall average of 21.16 mg/100g. Among all the parents, dry matter % of fruit ranged from 3.48 to 6.21% with an overall parental average of 4.35%. The highest dry matter % of fruit was recorded by H-86 (6.21%), Kashi Anupam (5.03%) and H-24 (5.00%). Among the crosses, dry matter % of fruit ranged from 3.51% (KA X 14/TLCV-1) to 5.28 % (PR X 15/TLCV-4) with overall mean 4.61 %. Maximum dry matter % of fruit was recorded in crosses PR X 15/TLCV-4 (5.28%), which was followed by H-24 X 14/TLCV-3 (5.11%). Mean values for fruit yield per hectare ranged from 295.98 to 659.72q with an overall parental average of 465.43q. The highest mean value for fruit yield per hectare H-86 (659.72 q), 2014/TOLCVRES-3 (611.04q). Among the crosses this trait ranged from 289.94 to 727.58 q with an overall mean 501.35 q. Maximum fruit yield per hectare was observed in the cross H-86 X 14/TLCV-3 (727.58 q), followed by KA X 14/TLCV-3 (724.13 q), H-86 X 15/TLCV-4 (705.76 q), KA X 15/TLCV-2 (702.31 q) and PR X 14/TLCV-3 (671.35 q). From the present findings, it can be summarized that based on mean worth, top two parents H-86 and 2014/TOLCVRES-3 and top five crosses for fruit yield and other traits were H-86

X 14/TLCV-3, KA X 14/TLCV-3, H-86 X 15/TLCV-4, KA X 15/TLCV-2 and PR X 14/TLCV-3. Hence, these should be utilized for future breeding programmes for desirable trait improvement.

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