Original Research Article

Evaluation of performance of parents and their resultant hybrid for yield and quality traits in brinjal (*Solanum melongena* L.) over season under salt affected soil

Abstract

The present investigation was carried out in order to obtained information based on *per se* performance of parents and their cross combinations for genetic improvement in Brinjal. Ten parents were crossed in diallel fashion excluding reciprocal. Half diallel set of crosses and their all possible 45 F_1's (excluding reciprocals) in brinjal (*Solanum melongena* L.) were evaluated in Randomized Complete Block Design (RBD) with three replications for nineteen yield and yield contributing traits during *Kharif* 2020-21 (Y_1) and 2021-22 (Y_2) at the Main Experiment Station (MES) of Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.) India. The study revealed that highly significant differences were observed for most of the traits under study. Based on the *per se* performance, the parent P_9 (2.61 kg) registered highest fruit yield per plant followed by P_7 (2.49 kg) in both the year and pooled. The *per se* performance of crosses *viz.*, P_2 x P_9 (3.11 kg), P_4 x P_6 (2.66 kg), P_1 x P_8 (2.55 kg) and P_6 x P_7 (2.42 kg) were produced significantly highest fruit yield per plant than the general mean. These hybrids may be subjected to multi-locational and multi-seasonal trials for their release for commercial cultivation.

Key word: *Per se* performance, brinjal, yield, hybrids.

Introduction

Brinjal or eggplant (*Solanum melongena* L. 2n=24) is one of the most cultivated solanaceous vegetable, which is mainly grown for its edible fruit. In India it is known by many regional name *viz.*, Baigan (Hindi), Badanekai (kannada), Vangi (Marathi), Katharikai (Tamil), Vankai (Telugu) while in worldwide it is popularly known as aubergine (France) or guinea squash. It is the most popular and major fruit vegetable crop in India and many other countries of the world. It is a perennial plant but grown as an annual crop in which self-pollination should be found but some time cross pollination also occurs. According to **Zeven and Zhukovsky (1975) [15]** brinjal is claimed to be originated in India and spread to China, which became a secondary center of origin. It is a flexible crop adapted to different agro-climatic regions and can be grown throughout the year. It is an important crop in the tropical regions of world and is being grown commonly in India, China, Turkey, Japan, Italy, Indonesia, Iraq, Syria, Spain and Phillipines.

Its immature fruits are generally used as vegetable and other culinary preparations, unripe fruit is essentially consumed as cooked vegetable in various forms and the dried shoots are used as firewood in rural areas. Brinjal is consumed by many ways like salad, bhaji, stuffed brinjal, bhartha, pickles etc., has make the brinjal is more popular vegetables in India. Its fruits are widely consumed in various culinary preparations and are rich source of protective nutrients (Hedges and Lister, 2007) [6].

Globally, India ranked second in vegetable production next to China and contributed 10.80 M ha and 196.26 MT to global vegetable area and production, respectively. In India, brinjal occupies an area of 0.758 million hectares with 13.154 million tonnes of annual production which have the 17.5 tonnes per hectare productivity (**Anonymous, 2021) [2].** In Uttar Pradesh brinjal is existence in cultivation on an area of 0.080 million hectare with annual production of 2.75 million tonnes with 34.40 tonnes per hectare productivity. In Uttar Pradesh, Agra, Meerut, Lucknow, Kanpur, Aligarh, Chitrakoot and Gorakhpur district share more area and production in the state **(Anonymous 2018) [1]**.

The peel of brinjal have a great amount of anthocyanin. A higher anthocyanin and low glyco-alkaloid content are considered essential for good fruit quality. These antioxidant act as anti-ageing agent. In particular antioxidant found in brinjal helps prevent skin cancer. Brinjal is also a good source of bone building vitamin K and magnesium as well as heart healthy copper which give nourishment to your scalp and keep it healthy. White brinjal are highly beneficial for regulation of blood sugar levels in human body and also controls absorption of glucose. This makes them the best option for people suffering from diabetes.

A number of cultivars are under cultivation depending upon the yield, consumer preference about the colour, size and shape of the fruit. But it is not possible to have one common cultivar to suit different localities and local preferences. It is therefore required to improve the locally preferred cultivars for yield and adaptation or development of new hybrid combinations. Earlier, egg plant breeding was relied both on mass selection and pure line selection from land races for the development of improved varieties. Brinjal, being native to India and often cross pollinated crop, possesses considerable diversity for plant type, fruit colour, fruit shape, fruit size, yield and other quality traits (Ravali *et al.*, 2017) [9], which offers much scope for improvement through heterosis breeding.

The estimation of heterosis for yield and its component traits would be useful to identify the best hybrid combination for exploitation of superior hybrids. The exploitation of hybrid vigour has become a potential tool for improvement in eggplant Bavage *et al*., 2005 [3] and Dharwad *et al*., 2011 [4]. The selection of parents is the important step in heterosis breeding which could combine well and produce desirable hybrids. Several research workers reported the importance of genetic diversity in crops Reddy *et al*., 2017 [10], Triveni *et al*., 2017 [14], and Srivatsava *et al*., 2019 [14] with this perception, the present investigation was carried out with the objective of studying the *per se* performance of hybrids and parents for yield and quality traits.

Materials and Methods

The present investigation was carried out at the main experiment station, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya (UP), India, during *Kharif*, 2020-21 (Y_1) and 2021–22 (Y_2). The experimental farm falls under humid subtropical climate and is located between 24.47° and 26.56°N latitude and 82.12° and 83.58°E longitude at an altitude of 113 m above mean sea level. The experimental farm had saline alkali soil with pH above 8.

The experimental materials comprised of ten promising and diverse inbreds and varieties of brinjal selected on the basis of genetic variability from the germplasm stock maintained in the department. The selected parental lines *i.e.*; Balfahava (P_1), Punjab Sadabahar (P_2), NDB-3 (P_3), NDB-2 (P_4), NDB White-1 (P_5), Pusa Kranti (P_6), Pant Samrat (P_7), Mukta Keshi (P_8), NDB Sel-1 (P_9) and Co-2 (P_{10}) were crossed in all possible cross combinations, excluding reciprocals, during the year, 2019-20 to get 45 F_1's for the study of heterobeltiosis and economic heterosis.

The experiments were conducted in a Randomized Complete Block Design (RBD) with three replications to assess the performance of 45 F_1's hybrids and their 10 parental lines of brinjal. The crop was planted in two rows spaced at 75 cm apart with a plant to plant spacing of 60 cm. The experiments were transplanted on 12 August, 2020 and 17 August, 2021.

Observations were recorded for nineteen economic traits including biochemical traits, *viz.* days to 50% flowering, days to first fruit harvest, leaf length (cm), leaf width (cm), plant height (cm), number of primary branches per plant, harvest duration (days), fruit length (cm), fruit equatorial circumference (cm), number of fruits per plant, average fruit weight (kg), marketable fruit yield per plant (kg), unmarketable fruit yield per plant (kg), reducing sugars (%), non-reducing sugar (%), total sugars (%), chlorophyll content (mg/g), total phenol content and total fruit yield per plant (kg). *Per se* performance were evaluated for parents and hybrids following method suggested by Panse and Sukatme, 1987 [8] for analysis of variance of experimental for nineteen yield and yield contributing traits.

Result and discussion

The success of any breeding programme depends on the identification of suitable parents and selection of proper breeding methodology for the improvement of a specific trait. The selection of parents with high *per se* performance would be of merit in producing better hybrids and hence the parents selected for crossing programme were evaluated based on their per se performance.

Perusal of Table-1 and 2 revealed that the mean squares due to genotypes, parents and hybrids were found highly significant for all the traits in both the seasons (Y_1, Y_2) and over seasons (pooled) except plant height and primary branches per plant in the parents during the year 2020-21 (Y_1) while, days to 50% flowering in the parents during the year 2021-22 (Y_2). The mean squares due to parents *vs.* hybrids also found significant for all the traits studied during both the seasons (Y_1, Y_2) and over seasons (pooled) except plant height, fruit equatorial circumference, unmarketable fruit yield per plant and chlorophyll content during the year 2020-21 (Y_1) while, days to first fruit harvest, fruit equatorial circumference and number of fruits per plant during the year 2021-22 (Y_2).

The pooled analysis of variance (Table-2) divided in the source of variation into environments, replication, environments x replication, genotypes and environments x genotypes were found highly significant for all the traits under study except primary branches per plant, reducing sugars, non-reducing sugar and total sugars. Mean squares due to replication and environments x replication were found significant for only one traits *i.e.* primary branches per plant in replication and number of fruits per plant in environments x replication under the study. The mean squares due to genotypes and environments x genotypes were found highly significant for all the traits under study during over season pooled.

Among the parents highest *per se* performance (Table-3) for most desirable traits total fruit yield per plant were exhibited by parents P_9 and P_7 in both the season (Y_1, Y_2) and in over season (pooled). The above mentioned genotypes may be used as donor parents in hybridization programme for developing high yielding varieties of respective groups. Some other genotypes exhibiting very high mean performance for the characters other than total fruit yield per plant are also listed in Table-3. In this context, none of the parents found significantly early for days to 50 % flowering and days to first fruit harvest.

For quality traits, most desirable parents P_3 followed by P_1 and P_7 for reducing sugars in both the season (Y_1, Y_2) as well as in over season pooled recorded higher values over the grand mean. Maximum non-reducing sugar among the parents was observed in parent P_{10} in Y_1, Y_2 and in over season pooled. Maximum total sugars was exhibited by parents P_3 followed by P_1 and P_9 in both the season (Y_1, Y_2) as well as in over season pooled. Parents P_4 and P_8 in Y_1 and in over season pooled while, none of the parents in Y_2 showed significant chlorophyll content among the parents over the grand mean. Parental line P_9 in Y_1 while, the parents P_4 and P_7 in Y_2 and P_4 in over season pooled were exhibited maximum total phenol content over the grand mean.

Among the hybrids highest mean performance (Table-3) for most desirable traits total fruit yield per plant were exhibited by cross combination P_2 x P_9 followed by P_6 x P_7, P_7 x P_8, P_7 x P_9 and P_1 x P_7 in Y_1, P_2 x P_9 followed by P_6 x P_7, P_7 x P_8, P_7 x P_{10} and P_8 x P_9 in Y_2 while, crosses P_2 x P_9 followed by P_4 x P_6, P_1 x P_8, P_6 x P_7 and P_7 x P_{10} in over season pooled. Some other crosses exhibiting very high mean performance for the characters other than total fruit yield per plant are also listed in Table-3**.** In this context, the most desirable cross combination which produced significantly early 50 % flower than the grand mean were P_6 x P_7 followed by P_3 x P_7, P_8 x P_9 in Y_1, P_6 x P_7 in Y_2 and P_5 x P_6 in over season pooled. Cross combination P_3 x P_8 followed by P_6 x P_7 and P_8 x P_9 in Y_1, P_6 x P_7 and P_1 x P_2 in Y_2 and P_8 x P_9 followed by P_5 x P_6 and P_7 x P_9 in over season pooled found significantly early for days to first fruit harvest.

Among the crosses, quality traits *viz.* reducing sugars, non-reducing sugar, total sugars, chlorophyll content and total phenol content were more anticipated traits would be useful to identify the best hybrid combination for exploitation of superior hybrids. Out of forty five crosses, top three cross combination P_2 x P_4 followed by P_2 x P_9, P_3 x P_6 in Y_1; P_2 x P_4 ffollowed by P_2 x P_9, P_3 x P_6 in Y_2 and P_2 x P_4 followed by P_2 x P_9 and P_8 x P_{10} in over season pooled produced significantly high reducing sugars than the general mean. The cross combination P_4 x P_6 followed by P_3 x P_{10} and P_3 x P_9 in Y_1; P_3 x P_9 followed by P_3 x P_{10} and P_4 x P_6 in Y_2 and P_3 x P_8 followed by P_3 x P_{10} and P_4 x P_6 in over season pooled exhibited significantly high non-reducing sugars than the general mean. Cross combination for total sugars were P_3 x P_6 followed by P_1 x P_5 and P_2 x P_6 in Y_1; P_3 x P_6 followed by P_1 x P_4 and P_3 x P_4 in Y_2 and P_3 x P_6 followed by P_4 x P_4 and P_2 x P_9 in over season pooled showed significantly highest total sugars than the general mean. Crosses which produced significantly highest chlorophyll content than the general mean were P_5 x P_6 followed by P_3 x P_7 and P_3 x P_9 in Y_1; P_5 x P_8 followed by P_3 x P_9 and P_3 x P_7 in Y_2; P_3 x P_9 followed by P_5 x P_6 and P_1 x P_5 in over season pooled. The crosses that produced significantly maximum total phenol content than the general mean were P_3 x P_8 followed by P_1 x P_8 and P_2 x P_7 in Y_1; P_1 x P_7 followed by P_2 x P_3 and P_4 x P_8 in Y_2 and P_5 x P_6 followed by P_5 x P_7 and P_2 x P_{10} in over season pooled. The superiority of *per se* performance of parents and F_1 for various traits in seasons and over season pooled have also been reported by earlier workers Kanchana, *et al.* 2021 [7]; Tripathy, *et al.* 2021 [13]; Timmareddygari, *et al.* 2021 [12]; Gadhiya, *et al.* 2016 [5].

Conclusion

It may be concluded from the present study that, on the basis of *per se* performance, four F_1 crosses *viz.* P_2 x P_9 followed by P_4 x P_6, P_1 x P_8 and P_6 x P_7 were identified as superior crosses for total fruit yield plant. These F_1 crosses may be recommended for multi-locational trials for commercialization of the crop.

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Table-1: ANOVA (mean squares) for a set of 10 x 10 diallel crosses for different traits in brinjal during year, 2020-21 (Y_1)

Source of variation	d.f	days to 50% flowering	Days to first fruit harvest	Leaf length	Leaf width	Plant height	Primary branches per plant	Crop duration	Fruit length	Fruit equatorial circumference	Number of fruits per plant
Replications	2	0.90	2.14	3.03	0.21	14.74	1.28	4.12	0.09	1.52	0.58
Genotypes	54	13.06**	14.38**	7.13**	5.63**	164.05**	2.16**	21.90**	22.38**	16.91**	95.07**
Parents	9	7.37*	15.22**	2.69**	2.01**	82.73	0.41	16.54**	37.60**	47.22**	127.15**
Hybrids	44	13.37**	14.14**	7.88**	6.08**	184.11**	2.41**	21.90**	18.86**	11.10**	90.30**
Parents *vs*. Hybrids	1	50.43**	17.29**	13.88**	18.55**	13.91	7.04**	69.98**	40.49**	0.06	16.46**
Error	108	4.19	5.84	0.81	0.15	45.50	0.21	9.33	0.34	0.50	1.55

Source of variation	d.f	Average fruit weight	Marketable fruit yield per plant	Unmarketable fruit yield per plant	Reducing sugar	Non reducing sugar	Total sugar	Chlorophyll content	Total Phenol content	Total fruit yield per plant
Replications	2	13.59	0.027	0.014	0.004	0.001	0.001	0.084	0.003	0.006
Genotypes	54	1759.66**	0.563**	0.085**	0.180**	0.025**	0.196**	0.078**	0.107**	0.733**
Parents	9	4004.24**	0.546**	0.031**	0.235**	0.032**	0.369**	0.088**	0.060**	0.633**
Hybrids	44	1303.25**	0.577**	0.098**	0.160**	0.021**	0.162**	0.078**	0.113**	0.768**
Parents *vs*. Hybrids	1	1640.80**	0.119**	0.000	0.557**	0.153**	0.127**	0.010	0.282**	0.108**
Error	108	27.72	0.011	0.003	0.002	0.001	0.003	0.005	0.002	0.014

*, ** Significant at 5 per cent and 1 per cent probability levels, respectively.

Table-1: ANOVA (mean squares) for a set of 10 x 10 diallel crosses for different traits in brinjal during year, 2021-22 (Y_2)(Contd.)

Source of variation	d.f	Days to 50% flowering	Days to first fruit harvest	Leaf length	Leaf width	Plant height	Primary branches per plant	Crop duration	Fruit length	Fruit equatorial circumference	Number of fruits per plant
Replications	2	0.26	0.51	1.13	0.25	3.40	0.15	4.82	0.89	0.56	0.80
Genotypes	54	9.27**	10.75**	7.76**	3.91**	183.58**	3.25**	25.32**	18.47**	14.71**	76.95**
Parents	9	5.10	9.94**	3.86**	1.43**	18.63**	1.87**	11.69**	31.78**	46.74**	114.46**
Hybrids	44	9.74**	11.05**	8.51**	4.14**	221.10**	3.38**	26.49**	15.20**	8.49**	71.00**
Parents *vs.* Hybrids	1	26.40**	4.61	9.72**	16.18**	17.48**	9.93**	96.72**	42.40**	0.25	0.98
Error	108	4.35	3.99	1.16	0.21	34.42	0.12	11.36	0.57	0.44	1.34

Source of variation	d.f	Average fruit weight	Marketable fruit yield per plant	Unmarketable fruit yield per plant	Reducing sugar	Non reducing sugar	Total sugar	Chlorophyll content	Total Phenol content	Total fruit yield per plant
Replications	2	26.39	0.002	0.011	0.006	0.003	0.001	0.024	0.005	0.009
Genotypes	54	1868.54**	0.563**	0.069**	0.168**	0.025**	0.188**	0.068**	0.107**	0.694**
Parents	9	5426.36**	0.477**	0.017**	0.264**	0.034**	0.407**	0.053**	0.167**	0.528**
Hybrids	44	1173.29**	0.586**	0.081**	0.139**	0.020**	0.145**	0.071**	0.096**	0.733**
Parents *vs.* Hybrids	1	438.50**	0.302**	0.013**	0.579**	0.148**	0.142**	0.092**	0.030**	0.494**
Error	108	26.93	0.006	0.002	0.003	0.001	0.004	0.004	0.002	0.009

*, ** Significant at 5 per cent and 1 per cent probability levels, respectively.

Table-2: ANOVA (mean squares) for a set of 10 x 10 diallel crosses for different traits in brinjal during over season pooled.

Source of variation	d.f	Days to 50% flowering	Days to first fruit harvest	Leaf length	Leaf width	Plant height	Primary branches per plant	Crop duration	Fruit length	Fruit equatorial circumference	Number of fruits per plant
Environment	1	163.10**	598.05**	5.56**	15.14**	108.10**	0.50	2581.60**	1.30**	1.65**	20.68**
Replication	2	1.09	0.55	1.96	0.37	47.51	1.11**	11.28	0.62	0.75	0.80
Env. x Rep.	2	0.20	0.07	1.03	0.06	19.36	0.35	0.22	0.31	0.08	3.53**
Genotypes	54	11.41**	14.42**	6.87**	4.77**	157.02**	2.19**	26.47**	28.82**	29.24**	107.19**
Env. x geno.	54	10.52**	8.66*	7.35**	3.52**	175.21**	2.35**	19.36**	12.39**	8.01**	78.01**
Error	216	4.38	4.83	0.91	0.16	36.52	0.16	10.46	0.47	0.39	1.51

Source of variation	d.f	Average fruit weight	Marketable fruit yield per plant	Unmarketable fruit yield per plant	Reducing sugar	Non reducing sugar	Total sugar	Chlorophyll content	Total Phenol content	Total fruit yield per plant
Environment	1	57.43**	0.662**	0.597**	0.001	0.000	0.002	0.157**	0.048**	2.419**
Replication	2	31.28	0.017	0.020	0.014	0.003	0.006	0.076	0.006	0.001
Env. x Rep.	2	12.30	0.009	0.000	0.000	0.001	0.001	0.016	0.001	0.012
Genotypes	54	2923.14**	0.591**	0.077**	0.271**	0.034**	0.315**	0.088**	0.102**	0.793**
Env. X geno.	54	1052.30**	0.418**	0.067**	0.107**	0.021**	0.116**	0.061**	0.112**	0.485**
Error	216	25.52	0.008	0.002	0.003	0.001	0.003	0.005	0.002	0.010

*, ** Significant at 5 per cent and 1 per cent probability levels, respectively.

Table-3 Mean performance, general mean, range, coefficient of variation and critical difference for nineteen characters of diallel set of 45 F_1's and their 10 parents in Y_1 (2020-21), Y_2 (2021-22) and pooled

Sr. No.	Genotypes	Days to 50% flowering			Days to first fruit harvest			Leaf length (cm)		
		Y_1	Y_2	Pooled	Y_1	Y_2	Pooled	Y_1	Y_2	Pooled
1	$P_1 \times P_2$	46.67	45.00	48.33	67.67	64.67	68.50	13.01	13.43	12.69
2	$P_1 \times P_3$	47.33	45.67	47.68	70.67	67.67	69.00	13.51	13.50	13.10
3	$P_1 \times P_4$	48.00	46.00	49.50	72.67	67.67	68.17	12.84	11.61	12.29
4	$P_1 \times P_5$	48.67	45.67	47.33	70.82	69.67	70.67	11.49	14.45	13.89
5	$P_1 \times P_6$	51.00	49.00	48.83	71.91	70.33	70.33	13.59	13.34	13.32
6	$P_1 \times P_7$	48.67	46.67	49.68	72.19	71.00	70.33	13.39	13.33	11.99
7	$P_1 \times P_8$	50.67	48.67	50.00	70.67	69.33	71.33	12.99	13.07	13.02
8	$P_1 \times P_9$	47.67	48.33	48.83	69.00	67.67	67.67	13.05	9.50	13.04
9	$P_1 \times P_{10}$	49.67	50.33	49.67	70.33	70.33	70.67	13.28	12.91	13.37
10	$P_2 \times P_3$	50.33	49.67	51.00	70.73	69.67	72.50	12.20	12.08	11.83
11	$P_2 \times P_4$	49.00	47.00	46.83	72.00	69.00	68.33	9.94	9.76	11.38
12	$P_2 \times P_5$	46.33	50.33	48.83	69.00	69.33	70.00	14.29	14.61	14.06
13	$P_2 \times P_6$	52.33	51.33	49.67	72.01	70.33	71.50	14.36	14.09	13.47
14	$P_2 \times P_7$	49.67	48.33	48.50	70.67	69.00	69.91	14.65	13.96	12.72
15	$P_2 \times P_8$	49.00	49.67	52.33	72.34	68.67	70.29	11.92	12.19	12.89
16	$P_2 \times P_9$	47.00	45.67	47.17	68.33	67.00	69.60	12.83	12.92	13.15
17	$P_2 \times P_{10}$	47.00	48.67	49.67	71.67	69.67	70.17	11.82	11.62	12.30
18	$P_3 \times P_4$	47.33	46.33	47.00	70.00	67.33	68.17	14.78	15.23	14.14
19	$P_3 \times P_5$	48.67	46.33	48.00	71.63	68.33	69.33	16.20	16.63	14.95
20	$P_3 \times P_6$	46.67	47.33	48.83	68.63	66.33	68.53	11.87	11.86	12.03
21	$P_3 \times P_7$	45.33	48.00	48.50	67.67	66.67	69.33	12.82	13.24	11.69
22	$P_3 \times P_8$	45.67	47.00	46.67	65.67	66.00	67.50	10.45	10.77	12.53
23	$P_3 \times P_9$	46.67	45.00	48.67	72.33	69.00	70.50	14.65	14.57	14.45
24	$P_3 \times P_{10}$	47.00	48.67	49.17	71.51	68.00	69.33	9.74	10.08	12.37
25	$P_4 \times P_5$	52.33	49.67	49.33	71.00	69.67	71.00	13.78	13.41	12.66
26	$P_4 \times P_6$	50.00	49.33	48.17	71.67	70.67	69.50	12.55	12.24	12.53
27	$P_4 \times P_7$	50.67	48.33	47.67	73.00	69.00	70.33	12.08	12.16	11.99
28	$P_4 \times P_8$	50.33	48.33	47.83	72.67	69.00	69.50	12.81	13.11	13.95
29	$P_4 \times P_9$	52.67	50.00	49.33	71.93	70.33	70.98	12.49	12.33	14.26
30	$P_4 \times P_{10}$	49.67	47.67	47.17	70.74	68.00	68.32	11.03	11.55	11.71
31	$P_5 \times P_6$	47.67	45.67	45.50	68.05	65.33	66.50	14.56	16.46	14.64
32	$P_5 \times P_7$	53.00	51.00	48.33	72.00	69.33	67.50	12.95	12.91	11.68
33	$P_5 \times P_8$	47.67	45.67	46.17	67.33	68.33	70.33	16.34	14.20	14.43
34	$P_5 \times P_9$	52.00	49.67	48.33	74.82	69.00	70.25	13.79	17.03	13.38
35	$P_5 \times P_{10}$	52.33	49.67	51.00	71.78	71.33	71.17	17.51	13.37	13.57
36	$P_6 \times P_7$	45.33	44.67	47.33	66.00	63.67	67.67	15.23	15.73	14.14
37	$P_6 \times P_8$	50.00	50.00	50.33	69.00	66.33	69.67	14.07	15.53	13.81
38	$P_6 \times P_9$	49.00	49.00	49.67	67.19	66.00	69.33	14.33	13.81	13.31
39	$P_6 \times P_{10}$	50.33	47.67	50.17	68.31	66.67	69.30	14.58	13.50	13.00
40	$P_7 \times P_8$	49.00	46.00	47.83	69.00	65.00	67.87	15.50	15.24	13.13
41	$P_7 \times P_9$	49.67	46.00	46.83	68.98	65.00	66.53	14.12	13.35	13.96
42	$P_7 \times P_{10}$	47.67	47.00	50.00	67.42	66.33	69.17	13.24	13.60	13.28
43	$P_8 \times P_9$	45.33	46.00	46.83	66.03	65.00	66.17	14.51	14.87	15.60
44	$P_8 \times P_{10}$	51.00	48.67	50.33	72.67	69.67	72.24	11.27	12.39	13.09
45	$P_9 \times P_{10}$	50.00	47.67	50.00	68.65	66.67	69.39	13.66	13.25	15.38
F_1 Hybrid mean		**48.93**	**47.90**	**48.61**	**70.19**	**68.05**	**69.43**	**13.34**	**13.31**	**13.20**
Parents										
1	P_1	51.67	48.67	50.17	72.33	70.00	71.17	11.95	11.61	11.78
2	P_2	49.67	49.00	49.33	70.33	69.33	69.83	12.69	12.63	12.66
3	P_3	53.00	50.00	51.50	68.67	67.33	68.00	12.96	13.57	13.26
4	P_4	49.00	50.67	49.83	71.67	68.67	70.17	13.33	13.69	13.51
5	P_5	48.67	48.00	48.33	70.33	67.00	68.67	13.30	13.97	13.64
6	P_6	49.67	47.33	48.50	69.67	65.67	67.67	10.65	10.71	10.68
7	P_7	51.33	49.67	50.50	73.33	69.67	71.50	12.97	13.32	13.14
8	P_8	49.33	48.33	48.83	67.67	67.33	67.50	12.58	12.23	12.41
9	P_9	49.00	47.00	48.00	71.00	68.00	69.50	13.82	13.61	13.72
10	P_{10}	52.33	50.67	51.50	75.33	72.00	73.67	11.57	11.42	11.49
Parental mean		**50.37**	**48.93**	**49.64**	**71.03**	**68.50**	**69.76**	**12.58**	**12.67**	**12.62**
Grand mean		49.19	48.08	48.82	70.34	68.13	69.49	13.20	13.19	13.09
CV		4.16	4.33	3.60	3.43	2.93	2.67	6.83	8.17	6.27
CD 5%		3.27	3.33	2.84	3.86	3.19	2.99	1.44	1.72	1.34
Range	**Lowest**	**45.33**	**44.67**	**45.5**	**65.67**	**63.67**	**66.17**	**9.74**	**9.50**	**10.68**
	Highest	**53.00**	**51.33**	**52.33**	**75.33**	**72.00**	**73.67**	**17.51**	**17.03**	**15.06**

Table-3. Contd…

Sr. No.	Genotypes	Leaf width (cm)			Plant height (cm)			Primary branches /plant		
		Y_1	**Y_2**	**Pooled**	**Y_1**	**Y_2**	**Pooled**	**Y_1**	**Y_2**	**Pooled**
1	$P_1 \times P_2$	8.46	8.42	7.87	72.63	76.27	78.72	5.13	5.30	5.61
2	$P_1 \times P_3$	7.90	7.80	8.06	74.15	73.78	75.00	5.33	5.53	5.70
3	$P_1 \times P_4$	9.11	7.25	7.69	72.31	76.26	68.49	6.46	6.58	6.11
4	$P_1 \times P_5$	7.50	9.09	8.20	71.15	73.78	71.98	6.07	6.25	5.84
5	$P_1 \times P_6$	7.75	7.71	8.14	68.31	70.26	72.06	5.92	6.01	6.17
6	$P_1 \times P_7$	7.84	7.64	7.01	92.94	71.36	71.52	5.95	5.86	5.95
7	$P_1 \times P_8$	7.54	8.38	7.68	69.50	68.56	86.21	6.16	7.74	6.53
8	$P_1 \times P_9$	7.56	9.46	8.81	72.85	69.21	74.98	5.96	6.49	6.41
9	$P_1 \times P_{10}$	7.66	7.53	8.29	70.13	90.06	71.50	6.18	5.87	6.04
10	$P_2 \times P_3$	7.56	8.43	7.89	74.42	68.29	83.00	5.96	6.47	6.38
11	$P_2 \times P_4$	6.03	6.65	7.56	83.77	71.62	76.56	5.92	6.29	5.71
12	$P_2 \times P_5$	8.07	8.77	8.34	74.34	95.62	73.55	5.88	7.48	6.40
13	$P_2 \times P_6$	9.19	9.17	9.14	71.89	80.48	83.10	6.54	6.69	6.57
14	$P_2 \times P_7$	10.78	9.46	8.48	69.47	72.94	74.61	5.88	6.08	6.07
15	$P_2 \times P_8$	7.54	8.20	7.98	94.17	93.88	74.92	6.18	7.87	6.90
16	$P_2 \times P_9$	9.55	7.92	7.88	76.95	78.06	83.02	4.68	4.68	5.32
17	$P_2 \times P_{10}$	7.62	6.84	7.19	72.11	81.53	79.00	5.00	5.18	5.68
18	$P_3 \times P_4$	7.77	6.91	7.24	74.26	73.10	75.03	5.86	5.98	5.97
19	$P_3 \times P_5$	9.77	9.96	8.81	68.50	68.50	69.15	6.15	6.15	6.17
20	$P_3 \times P_6$	9.26	8.24	7.90	78.48	77.21	75.99	3.64	3.71	4.84
21	$P_3 \times P_7$	8.28	8.35	7.19	72.16	68.17	88.77	5.86	5.41	5.67
22	$P_3 \times P_8$	7.16	7.26	7.67	95.99	77.56	76.96	6.08	6.15	6.01
23	$P_3 \times P_9$	11.17	10.27	9.73	84.82	93.76	81.69	4.42	4.57	5.55
24	$P_3 \times P_{10}$	6.55	6.72	8.75	69.25	79.57	71.09	4.50	5.23	5.55
25	$P_4 \times P_5$	7.38	8.62	8.08	70.44	91.49	84.07	6.92	6.70	6.44
26	$P_4 \times P_6$	6.98	8.09	8.82	68.40	72.71	74.38	6.08	6.50	5.59
27	$P_4 \times P_7$	7.91	8.81	8.22	72.84	73.97	74.30	5.38	5.57	5.28
28	$P_4 \times P_8$	8.36	10.50	9.13	68.90	71.82	73.30	4.96	4.66	5.26
29	$P_4 \times P_9$	10.16	11.39	10.58	72.60	76.48	68.73	6.03	6.27	6.21
30	$P_4 \times P_{10}$	8.24	8.80	9.09	95.31	72.34	75.64	5.79	6.49	5.07
31	$P_5 \times P_6$	7.87	9.20	8.74	66.92	68.97	80.14	6.46	4.82	5.34
32	$P_5 \times P_7$	8.63	8.63	7.90	76.15	72.79	84.17	5.69	6.16	6.12
33	$P_5 \times P_8$	9.03	9.13	10.15	77.05	88.12	74.20	4.88	7.46	5.94
34	$P_5 \times P_9$	7.51	10.78	8.66	75.62	72.35	74.47	3.68	6.55	5.52
35	$P_5 \times P_{10}$	12.76	7.66	7.52	78.26	63.57	71.14	5.63	4.59	5.75
36	$P_6 \times P_7$	11.52	10.97	8.97	85.19	79.68	73.67	5.30	5.78	5.93
37	$P_6 \times P_8$	11.34	8.06	7.99	72.36	71.84	82.22	3.64	4.15	4.77
38	$P_6 \times P_9$	9.75	9.75	9.05	76.06	78.94	74.38	4.79	4.81	4.88
39	$P_6 \times P_{10}$	8.85	9.84	10.00	79.89	91.60	81.29	4.21	3.64	4.83
40	$P_7 \times P_8$	11.06	10.88	9.56	71.43	79.87	85.15	6.37	6.31	6.05
41	$P_7 \times P_9$	8.90	8.81	8.34	93.08	89.98	66.34	4.88	4.85	5.66
42	$P_7 \times P_{10}$	7.91	9.33	8.98	69.22	75.00	83.12	4.88	5.06	5.38
43	$P_8 \times P_9$	9.31	9.38	9.20	79.28	65.76	74.02	3.71	3.83	4.35
44	$P_8 \times P_{10}$	8.18	8.22	7.87	72.89	90.09	72.43	4.59	5.22	4.45
45	$P_9 \times P_{10}$	8.93	8.80	10.78	70.79	70.99	72.75	3.46	3.80	4.71
F_1 Hybrid mean		**8.63**	**8.17**	**8.46**	**75.94**	**76.77**	**76.37**	**5.40**	**5.71**	**5.70**
Parents										
1	P_1	7.32	7.80	7.56	81.17	76.95	79.06	5.91	6.43	6.17
2	P_2	8.32	8.21	8.27	76.22	78.27	77.25	5.88	5.69	5.79
3	P_3	8.13	8.36	8.24	66.71	70.05	68.38	5.65	5.71	5.68
4	P_4	7.31	7.13	7.22	72.60	76.90	74.75	5.44	5.62	5.53
5	P_5	8.56	8.84	8.70	75.56	75.68	75.62	6.32	6.87	6.59
6	P_6	6.37	6.90	6.64	73.84	77.53	75.68	6.04	7.32	6.68
7	P_7	6.99	7.28	7.13	82.36	76.81	79.58	5.31	5.06	5.19
8	P_8	8.17	8.17	8.17	81.66	78.25	79.95	6.33	6.69	6.51
9	P_9	9.06	8.84	8.95	71.37	74.94	73.15	6.20	6.61	6.41
10	P_{10}	7.35	7.50	7.43	70.39	73.91	72.15	6.28	7.43	6.86
Parental mean		**7.76**	**7.90**	**7.83**	**75.19**	**75.92**	**75.55**	**5.94**	**6.34**	**6.14**
Grand mean		8.47	8.57	8.35	75.80	76.62	76.22	5.50	5.81	5.78
CV		4.61	5.33	4.09	8.89	7.65	7.03	8.31	5.91	5.78
CD 5%		0.62	0.73	0.57	10.79	9.38	8.68	0.73	0.55	0.53
Range	**Lowest**	**6.03**	**6.65**	**6.64**	**66.71**	**63.57**	**66.34**	**3.46**	**3.64**	**4.35**
	Highest	**12.76**	**11.39**	**1.78**	**95.99**	**95.62**	**88.77**	**6.92**	**7.87**	**6.90**

Table-3. Contd…

Sr. No.	Genotypes	Crop duration (Days)			Fruit length (cm)			Fruit equatorial circumference (cm)		
		Y_1	Y_2	Pooled	Y_1	Y_2	Pooled	Y_1	Y_2	Pooled
1	$P_1 \times P_2$	194.00	198.00	196.17	15.82	16.32	13.69	12.45	11.83	12.82
2	$P_1 \times P_3$	193.00	198.00	192.50	13.56	13.56	15.02	10.51	10.90	9.26
3	$P_1 \times P_4$	188.67	200.33	196.83	16.58	16.77	16.92	14.71	11.47	9.26
4	$P_1 \times P_5$	195.67	193.67	191.83	16.64	16.48	17.84	12.59	13.14	10.82
5	$P_1 \times P_6$	189.67	193.67	193.67	15.45	15.71	13.37	13.66	13.36	12.74
6	$P_1 \times P_7$	185.33	196.00	193.00	12.29	15.30	14.16	13.96	12.64	14.26
7	$P_1 \times P_8$	191.33	190.00	190.33	13.35	12.93	11.90	15.20	13.55	14.67
8	$P_1 \times P_9$	191.33	196.00	195.00	15.11	13.90	13.64	12.30	14.36	15.76
9	$P_1 \times P_{10}$	194.67	199.67	196.33	13.09	12.99	13.72	16.12	15.69	16.72
10	$P_2 \times P_3$	196.00	200.67	194.67	16.97	16.57	11.92	7.75	8.29	10.44
11	$P_2 \times P_4$	192.00	197.33	195.83	18.47	18.14	16.98	12.59	12.62	12.53
12	$P_2 \times P_5$	193.67	196.00	194.50	13.89	15.53	14.55	12.59	10.75	10.63
13	$P_2 \times P_6$	191.67	196.67	194.83	13.26	13.95	15.26	16.44	15.93	15.32
14	$P_2 \times P_7$	188.00	198.33	196.50	14.20	13.89	15.27	10.01	12.66	12.62
15	$P_2 \times P_8$	190.67	195.67	194.33	17.04	16.81	16.13	14.56	14.56	14.11
16	$P_2 \times P_9$	190.00	195.00	191.33	16.72	16.21	14.25	11.63	12.29	13.13
17	$P_2 \times P_{10}$	192.00	197.33	194.83	12.74	12.95	13.15	12.94	13.27	14.24
18	$P_3 \times P_4$	188.67	194.00	192.67	18.72	17.92	16.52	10.56	11.29	11.79
19	$P_3 \times P_5$	191.33	196.33	195.50	18.29	17.64	15.37	9.39	10.05	13.09
20	$P_3 \times P_6$	188.33	193.33	194.00	17.62	17.13	17.05	9.94	10.98	9.36
21	$P_3 \times P_7$	189.00	194.00	193.00	14.35	13.83	16.15	11.67	11.56	12.07
22	$P_3 \times P_8$	198.00	168.67	199.00	13.13	13.47	13.68	11.32	11.61	12.10
23	$P_3 \times P_9$	190.67	198.67	195.17	16.70	16.10	14.68	10.96	12.29	14.37
24	$P_3 \times P_{10}$	193.67	198.67	194.50	15.34	14.85	14.52	11.95	12.19	11.10
25	$P_4 \times P_5$	195.00	200.00	195.33	17.29	16.55	16.80	11.35	11.20	12.88
26	$P_4 \times P_6$	191.67	197.00	193.50	18.19	17.46	17.09	11.76	12.06	11.84
27	$P_4 \times P_7$	196.67	200.67	197.50	17.07	16.74	14.74	11.60	11.76	12.35
28	$P_4 \times P_8$	194.67	199.33	195.67	13.17	13.03	15.88	13.14	12.50	11.53
29	$P_4 \times P_9$	192.33	197.00	194.17	16.04	15.29	16.79	12.55	12.23	10.81
30	$P_4 \times P_{10}$	194.00	198.00	193.17	13.99	13.99	15.80	12.14	12.13	11.03
31	$P_5 \times P_6$	190.67	200.33	194.67	16.37	11.17	12.76	13.98	12.91	12.29
32	$P_5 \times P_7$	191.33	196.33	197.17	14.74	14.66	13.90	15.10	15.10	13.31
33	$P_5 \times P_8$	196.33	195.67	193.17	11.65	16.37	16.54	13.49	13.46	12.31
34	$P_5 \times P_9$	194.00	198.00	195.83	13.82	12.09	13.71	12.78	13.23	12.59
35	$P_5 \times P_{10}$	193.33	199.33	197.17	12.09	13.53	15.41	13.14	13.36	12.36
36	$P_6 \times P_7$	191.33	196.67	194.17	17.19	19.27	18.73	13.21	12.88	12.32
37	$P_6 \times P_8$	195.33	199.33	199.83	12.63	12.93	15.00	12.46	15.96	13.78
38	$P_6 \times P_9$	192.33	196.67	195.67	13.02	12.54	12.85	13.99	13.96	13.55
39	$P_6 \times P_{10}$	195.67	200.33	196.33	12.89	13.30	14.67	15.99	12.34	12.44
40	$P_7 \times P_8$	197.00	201.67	197.83	17.26	16.48	15.23	10.88	10.51	11.33
41	$P_7 \times P_9$	192.67	194.67	192.67	12.85	12.85	14.61	12.17	16.61	15.30
42	$P_7 \times P_{10}$	189.67	196.67	195.67	12.85	12.67	13.17	16.85	12.11	13.61
43	$P_8 \times P_9$	197.00	201.00	198.67	10.89	11.23	11.44	13.89	14.29	13.89
44	$P_8 \times P_{10}$	190.33	195.33	194.67	7.72	11.16	12.49	14.74	15.28	14.03
45	$P_9 \times P_{10}$	197.33	201.33	197.33	8.92	8.44	10.26	13.88	13.36	13.25
F_1 Hybrid mean		**192.58**	**196.70**	**195.03**	**14.67**	**14.68**	**14.74**	**12.78**	**12.77**	**12.66**
Parents										
1	P_1	194.33	199.33	196.83	11.05	11.29	11.17	13.82	13.88	13.85
2	P_2	187.00	194.33	190.67	16.47	16.79	16.63	7.63	7.32	7.47
3	P_3	193.33	198.00	195.67	17.07	17.20	17.13	7.04	7.44	7.24
4	P_4	190.00	194.00	192.00	19.20	17.45	18.32	8.49	8.16	8.33
5	P_5	192.33	198.00	195.17	11.03	10.90	10.96	12.13	11.63	11.88
6	P_6	190.00	194.33	192.17	13.03	13.63	13.33	15.88	15.16	15.52
7	P_7	190.33	195.00	192.67	10.88	11.98	11.43	15.78	15.65	15.71
8	P_8	192.00	197.00	195.50	13.39	12.99	13.19	17.15	16.91	17.03
9	P_9	191.00	195.33	193.17	14.44	14.32	14.38	17.74	17.99	17.87
10	P_{10}	189.00	194.00	191.50	7.27	7.14	7.30	12.58	12.52	12.55
Parental mean		**190.93**	**195.93**	**193.53**	**13.38**	**13.36**	**13.38**	**12.82**	**12.66**	**12.74**
Grand mean		192.28	196.56	194.76	13.43	14.44	14.49	12.78	12.75	12.68
CV		1.58	1.70	1.33	4.06	5.24	3.79	5.52	5.22	4.36
CD 5%		4.88	5.93	4.19	0.93	1.21	0.89	1.13	1.06	0.90
Range	**Lowest**	**185.33**	**168.27**	**190.33**	**7.27**	**7.14**	**7.3**	**7.04**	**7.32**	**7.24**
	Highest	**198.00**	**201.67**	**199.83**	**19.20**	**19.27**	**18.73**	**17.74**	**17.99**	**17.87**

Table-3. Contd…

Sr. No.	Genotypes	Number of fruits /plant			Average fruit weight (g)			Marketable fruit yield per plant (kg)		
		Y_1	**Y_2**	**Pooled**	**Y_1**	**Y_2**	**Pooled**	**Y_1**	**Y_2**	**Pooled**
1	$P_1 \times P_2$	16.90	16.57	16.24	108.47	108.69	115.56	1.04	1.00	1.29
2	$P_1 \times P_3$	20.24	22.58	26.28	80.07	80.44	65.04	1.24	1.21	1.03
3	$P_1 \times P_4$	31.20	22.92	27.88	78.12	84.71	69.86	1.48	1.33	1.18
4	$P_1 \times P_5$	22.55	28.42	27.06	83.77	77.93	67.06	1.34	1.44	1.12
5	$P_1 \times P_6$	23.18	23.18	23.02	78.54	78.42	77.85	1.09	1.09	1.20
6	$P_1 \times P_7$	31.69	26.55	22.47	102.87	76.95	92.21	1.81	1.39	1.43
7	$P_1 \times P_8$	23.88	28.60	24.27	112.46	95.78	109.72	1.92	1.82	1.87
8	$P_1 \times P_9$	23.83	22.88	19.35	76.26	107.39	117.03	1.37	1.93	1.73
9	$P_1 \times P_{10}$	31.36	30.93	24.17	58.46	63.07	107.32	1.13	1.19	1.59
10	$P_2 \times P_3$	34.63	34.75	32.90	45.75	43.58	56.90	0.94	0.97	0.97
11	$P_2 \times P_4$	26.62	25.58	21.24	66.33	65.16	86.82	1.17	1.23	1.13
12	$P_2 \times P_5$	21.81	31.62	25.93	111.35	63.77	71.92	1.92	1.45	1.34
13	$P_2 \times P_6$	21.83	22.77	26.99	73.69	78.61	78.36	1.20	1.22	1.35
14	$P_2 \times P_7$	33.22	22.58	22.57	63.90	111.03	97.40	1.43	1.93	1.64
15	$P_2 \times P_8$	21.32	21.52	22.35	79.73	80.39	79.47	1.42	1.45	1.27
16	$P_2 \times P_9$	35.88	35.62	33.65	101.30	102.35	102.61	2.40	2.46	2.13
17	$P_2 \times P_{10}$	27.84	29.11	26.50	60.59	60.95	86.70	1.16	1.21	1.56
18	$P_3 \times P_4$	36.45	36.91	30.37	51.75	51.93	64.10	1.28	1.30	1.34
19	$P_3 \times P_5$	18.29	18.26	24.81	81.49	79.53	69.00	1.15	1.18	1.16
20	$P_3 \times P_6$	18.27	18.68	26.66	82.38	83.17	64.46	1.21	1.25	1.09
21	$P_3 \times P_7$	31.73	26.61	26.61	55.99	63.86	65.9	1.34	1.39	1.28
22	$P_3 \times P_8$	19.34	19.76	20.78	85.13	85.65	98.50	1.13	1.19	1.55
23	$P_3 \times P_9$	18.26	20.15	20.99	109.15	110.52	92.11	1.44	1.48	1.34
24	$P_3 \times P_{10}$	25.26	24.96	29.09	58.95	59.91	61.90	0.83	0.86	1.14
25	$P_4 \times P_5$	22.21	22.48	21.90	67.47	68.44	74.08	0.92	0.93	1.18
26	$P_4 \times P_6$	25.48	24.87	30.38	76.56	76.10	88.70	1.34	1.43	1.91
27	$P_4 \times P_7$	19.65	20.19	24.02	75.70	76.94	68.77	1.18	1.23	1.19
28	$P_4 \times P_8$	17.31	17.43	26.94	101.53	103.35	77.55	1.44	1.46	1.37
29	$P_4 \times P_9$	16.46	17.67	17.98	73.41	72.20	76.85	0.81	0.84	1.00
30	$P_4 \times P_{10}$	22.11	23.47	20.87	67.36	65.60	73.99	0.91	0.92	1.06
31	$P_5 \times P_6$	21.92	17.21	24.47	105.34	91.13	73.56	1.66	1.24	1.29
32	$P_5 \times P_7$	19.53	20.35	19.85	104.25	103.44	94.28	1.39	1.41	1.27
33	$P_5 \times P_8$	16.78	26.79	22.52	91.38	105.32	107.23	1.20	1.69	1.57
34	$P_5 \times P_9$	25.18	20.65	22.95	101.99	68.53	63.74	2.28	0.93	0.88
35	$P_5 \times P_{10}$	19.86	25.55	23.88	70.08	102.33	84.90	0.90	2.30	1.61
36	$P_6 \times P_7$	30.34	27.76	26.62	115.21	116.07	96.32	2.18	2.22	1.78
37	$P_6 \times P_8$	26.23	23.78	21.71	87.10	84.97	80.34	1.72	1.21	1.20
38	$P_6 \times P_9$	20.88	26.42	21.86	103.43	104.47	103.00	1.84	1.91	1.68
39	$P_6 \times P_{10}$	23.80	26.68	21.57	82.49	89.03	81.22	1.17	1.74	1.28
40	$P_7 \times P_8$	21.88	23.31	22.71	127.14	127.81	97.58	2.28	2.34	1.62
41	$P_7 \times P_9$	21.41	19.35	20.63	135.60	84.33	94.83	2.26	0.92	1.29
42	$P_7 \times P_{10}$	16.63	21.80	20.67	84.50	122.87	113.56	0.89	2.28	1.84
43	$P_8 \times P_9$	24.27	24.02	20.40	116.35	114.84	103.11	2.28	2.33	1.77
44	$P_8 \times P_{10}$	18.35	18.56	21.87	95.95	96.57	99.28	1.35	1.38	1.83
45	$P_9 \times P_{10}$	25.52	26.36	23.11	73.54	77.12	73.60	1.28	1.34	1.12
F_1 Hybrid mean		**23.81**	**24.14**	**23.97**	**85.84**	**85.89**	**82.67**	**1.42**	**1.44**	**1.38**
Parents										
1	P_1	15.92	17.59	16.75	122.43	128.97	125.70	1.58	1.64	1.61
2	P_2	29.98	32.73	31.36	49.65	43.19	46.42	0.84	0.88	0.86
3	P_3	32.85	33.85	33.55	55.02	47.93	51.48	1.03	1.02	1.03
4	P_4	25.69	27.51	26.60	56.19	52.33	54.26	0.80	0.83	0.81
5	P_5	22.86	23.44	23.15	77.27	75.42	76.35	1.32	1.30	1.31
6	P_6	18.38	20.41	19.39	107.47	97.33	102.40	1.47	1.45	1.46
7	P_7	19.94	21.92	20.93	123.66	123.99	123.83	1.92	1.85	1.89
8	P_8	15.82	17.58	16.70	126.68	123.86	125.27	1.53	1.53	1.53
9	P_9	17.41	18.74	18.08	151.57	160.72	156.15	1.99	1.89	1.94
10	P_{10}	31.05	29.60	30.33	70.23	47.45	58.84	0.97	0.94	0.95
Parental mean		**22.99**	**24.33**	**23.68**	**94.02**	**90.12**	**92.07**	**1.35**	**1.33**	**1.33**
Grand mean		23.66	24.17	23.92	87.33	86.66	84.38	1.40	1.42	1.37
CV		5.25	4.79	4.30	6.02	5.98	5.28	7.40	5.32	5.79
CD 5%		1.99	1.85	1.67	8.42	8.30	7.45	0.16	0.12	0.13
Range	**Lowest**	**15.82**	**16.57**	**16.24**	**45.75**	**43.19**	**46.42**	**0.80**	**0.83**	**0.81**
	Highest	**36.45**	**36.91**	**33.65**	**151.57**	**160.72**	**156.15**	**2.40**	**2.46**	**2.13**

Table-3. Contd…

Sr. No.	Genotypes	Unmarketable fruit yield per plant (kg)			Reducing sugar			Non reducing sugar		
		Y_1	Y_2	Pooled	Y_1	Y_2	Pooled	Y_1	Y_2	Pooled
1	$P_1 \times P_2$	0.79	0.81	0.60	1.22	1.24	1.28	0.53	0.53	0.51
2	$P_1 \times P_3$	0.43	0.50	0.55	1.14	1.15	1.15	0.45	0.40	0.38
3	$P_1 \times P_4$	0.53	0.58	0.53	0.69	1.25	1.31	0.41	0.59	.55
4	$P_1 \times P_5$	0.55	0.57	0.55	1.24	0.78	0.91	0.63	0.39	0.44
5	$P_1 \times P_6$	0.48	0.53	0.43	0.95	0.99	0.68	0.53	0.55	0.39
6	$P_1 \times P_7$	0.87	0.60	0.51	0.94	1.09	1.09	0.58	0.62	0.57
7	$P_1 \times P_8$	0.38	0.79	0.69	1.17	0.95	1.10	0.55	0.58	0.55
8	$P_1 \times P_9$	0.56	0.46	0.48	1.07	1.18	1.21	0.65	0.53	0.46
9	$P_1 \times P_{10}$	0.47	0.57	0.62	0.97	1.01	1.10	0.60	0.60	0.55
10	$P_2 \times P_3$	0.51	0.58	0.53	1.23	1.21	1.13	0.51	0.49	0.55
11	$P_2 \times P_4$	0.44	0.52	0.65	1.33	1.38	1.30	0.41	0.41	0.47
12	$P_2 \times P_5$	0.26	0.56	0.49	0.98	0.69	0.91	0.63	0.52	0.49
13	$P_2 \times P_6$	0.36	0.48	0.51	1.30	1.30	0.99	0.52	0.48	0.45
14	$P_2 \times P_7$	0.46	0.35	0.45	0.63	1.06	1.15	0.53	0.63	0.63
15	$P_2 \times P_8$	0.25	0.35	0.42	1.08	1.14	1.05	0.52	0.52	0.52
16	$P_2 \times P_9$	0.98	1.09	0.98	1.32	1.35	1.14	0.46	0.46	0.52
17	$P_2 \times P_{10}$	0.62	0.73	0.56	1.00	1.04	1.10	0.63	0.63	0.59
18	$P_3 \times P_4$	0.66	0.74	0.65	1.21	1.23	1.15	0.60	0.60	0.62
19	$P_3 \times P_5$	0.28	0.48	0.47	0.88	0.90	0.93	0.41	0.41	0.50
20	$P_3 \times P_6$	0.24	0.39	0.45	1.32	1.30	1.26	0.56	0.57	0.54
21	$P_3 \times P_7$	0.35	0.46	0.45	0.74	0.74	1.03	0.51	0.55	0.48
22	$P_3 \times P_8$	0.52	0.61	0.44	0.99	0.97	0.97	0.49	0.49	0.56
23	$P_3 \times P_9$	0.61	0.72	0.54	0.73	0.80	1.05	0.67	0.67	0.60
24	$P_3 \times P_{10}$	0.72	0.80	0.63	0.69	0.75	0.69	0.67	0.64	0.58
25	$P_4 \times P_5$	0.51	0.65	0.45	0.54	0.62	0.85	0.49	0.49	0.51
26	$P_4 \times P_6$	0.36	0.52	0.75	0.67	0.86	1.09	0.69	0.63	0.54
27	$P_4 \times P_7$	0.24	0.34	0.48	0.99	1.04	1.02	0.48	0.45	0.54
28	$P_4 \times P_8$	0.32	0.40	0.53	0.78	0.80	1.00	0.50	0.50	0.55
29	$P_4 \times P_9$	0.34	0.42	0.35	0.97	0.98	0.93	0.58	0.58	0.49
30	$P_4 \times P_{10}$	0.52	0.62	0.43	0.91	0.90	1.11	0.44	0.41	0.49
31	$P_5 \times P_6$	0.74	0.36	0.36	0.60	0.82	0.78	0.59	0.30	0.41
32	$P_5 \times P_7$	0.37	0.41	0.46	0.66	0.71	0.85	0.58	0.53	0.51
33	$P_5 \times P_8$	0.30	0.81	0.71	0.80	0.62	0.68	0.30	0.60	0.63
34	$P_5 \times P_9$	0.28	0.48	0.60	0.60	0.64	0.66	0.57	0.59	0.63
35	$P_5 \times P_{10}$	0.42	0.35	0.43	0.65	0.63	0.59	0.60	0.57	0.53
36	$P_6 \times P_7$	0.90	0.92	0.64	0.85	0.83	0.75	0.47	0.47	0.58
37	$P_6 \times P_8$	0.60	0.77	0.50	1.13	1.01	1.00	0.56	0.51	0.49
38	$P_6 \times P_9$	0.48	0.54	0.43	0.79	0.88	0.83	0.64	0.63	0.56
39	$P_6 \times P_{10}$	0.71	0.66	0.50	1.04	1.10	1.04	0.54	0.54	0.56
40	$P_7 \times P_8$	0.59	0.64	0.58	1.18	1.11	1.01	0.44	0.44	0.44
41	$P_7 \times P_9$	0.49	0.59	0.67	0.98	0.75	0.68	0.40	0.49	0.54
42	$P_7 \times P_{10}$	0.53	0.55	0.46	0.77	0.94	0.80	0.49	0.40	0.49
43	$P_8 \times P_9$	0.39	0.46	0.38	1.14	1.05	0.92	0.56	0.56	0.43
44	$P_8 \times P_{10}$	0.37	0.45	0.37	1.31	1.29	0.94	0.45	0.44	0.51
45	$P_9 \times P_{10}$	0.60	0.61	0.51	0.87	0.92	0.78	0.53	0.52	0.56
F_1 Hybrid mean		**0.50**	**0.57**	**0.52**	**0.96**	**0.98**	**0.97**	**0.53**	**0.52**	**0.52**
Parents										
1	P_1	0.39	0.54	0.47	1.33	1.37	1.35	0.50	0.50	0.50
2	P_2	0.59	0.63	0.61	1.16	1.21	1.18	0.36	0.36	0.36
3	P_3	0.48	0.52	0.50	1.36	1.36	1.36	0.50	0.52	0.51
4	P_4	0.53	0.57	0.55	1.05	1.07	1.06	0.49	0.49	0.49
5	P_5	0.34	0.43	0.38	0.37	0.36	0.37	0.24	0.23	0.24
6	P_6	0.42	0.46	0.44	1.08	1.04	1.06	0.52	0.51	0.51
7	P_7	0.58	0.62	0.60	1.24	1.31	1.28	0.43	0.43	0.43
8	P_8	0.50	0.54	0.82	1.23	1.24	1.24	0.38	0.33	0.36
9	P_9	0.68	0.67	0.68	1.20	1.27	1.24	0.50	0.49	0.49
10	P_{10}	0.48	0.52	0.50	1.05	1.09	1.07	0.61	0.58	0.60
Parental mean		**0.50**	**0.55**	**0.55**	**1.10**	**1.13**	**1.12**	**0.45**	**6.51**	**0.44**
Grand mean		0.50	0.57	0.53	0.98	1.01	1.00	0.52	0.51	0.50
CV		10.48	8.53	8.11	4.76	5.75	4.39	6.26	6.51	4.45
CD 5%		0.08	0.07	0.07	0.07	0.09	0.07	0.05	0.05	0.05
Range	**Lowest**	**0.24**	**0.34**	**0.35**	**0.37**	**0.36**	**0.37**	**2.24**	**0.23**	**0.24**
	Highest	**0.98**	**1.09**	**0.98**	**1.36**	**1.38**	**1.36**	**0.69**	**0.67**	**0.63**

Table-3. Contd…

Sr. No.	Genotypes	Total sugar			Chlorophyll content (mg/g)			Total Phenol content		
		Y_1	Y_2	Pooled	Y_1	Y_2	Pooled	Y_1	Y_2	Pooled
1	$P_1 \times P_2$	1.75	1.77	1.80	1.38	1.47	1.35	1.38	1.19	1.06
2	$P_1 \times P_3$	1.59	1.55	1.53	1.09	1.19	0.70	0.94	0.82	0.97
3	$P_1 \times P_4$	1.10	1.84	1.86	1.39	1.32	1.30	1.19	1.13	1.13
4	$P_1 \times P_5$	1.87	1.18	1.35	1.29	1.40	1.45	0.83	1.15	1.03
5	$P_1 \times P_6$	1.48	1.54	1.08	1.13	1.17	1.17	0.99	1.08	0.95
6	$P_1 \times P_7$	1.52	1.71	1.65	1.40	0.98	1.14	1.12	1.44	1.14
7	$P_1 \times P_8$	1.72	1.53	1.60	1.32	1.42	1.28	1.42	1.12	1.12
8	$P_1 \times P_9$	1.72	1.71	1.66	0.93	1.38	1.41	0.83	0.76	0.83
9	$P_1 \times P_{10}$	1.57	1.61	1.65	1.22	1.27	1.12	0.79	1.16	1.15
10	$P_2 \times P_3$	1.74	1.70	1.68	1.03	1.07	1.14	1.21	1.41	1.09
11	$P_2 \times P_4$	1.74	1.79	1.77	1.03	1.09	1.24	1.12	0.94	1.16
12	$P_2 \times P_5$	1.60	1.21	1.40	1.42	1.34	1.21	0.86	0.99	0.96
13	$P_2 \times P_6$	1.82	1.78	1.44	1.23	1.25	1.31	0.86	0.91	1.05
14	$P_2 \times P_7$	1.16	1.69	1.78	1.29	1.47	1.38	1.41	0.90	0.86
15	$P_2 \times P_8$	1.60	1.66	1.57	1.22	1.26	1.20	1.32	0.84	0.92
16	$P_2 \times P_9$	1.78	1.80	1.66	1.31	1.39	1.39	0.88	1.21	1.16
17	$P_2 \times P_{10}$	1.63	1.67	1.70	1.05	1.11	1.21	1.08	1.12	1.27
18	$P_3 \times P_4$	1.80	1.83	1.77	1.11	1.16	1.04	1.09	0.86	0.84
19	$P_3 \times P_5$	1.29	1.31	1.44	1.01	1.07	1.15	0.94	0.86	0.82
20	$P_3 \times P_6$	1.88	1.87	1.80	1.22	1.28	1.16	1.11	0.94	1.07
21	$P_3 \times P_7$	1.25	1.29	1.52	1.48	1.48	1.25	1.35	1.09	1.11
22	$P_3 \times P_8$	1.48	1.46	1.53	1.34	1.35	1.39	1.44	0.88	0.87
23	$P_3 \times P_9$	1.40	1.47	1.65	1.45	1.51	1.37	0.86	1.16	1.01
24	$P_3 \times P_{10}$	1.36	1.38	1.27	1.17	1.21	1.25	0.76	0.88	1.15
25	$P_4 \times P_5$	1.03	1.11	1.36	1.06	1.09	1.15	1.25	0.82	1.07
26	$P_4 \times P_6$	1.35	1.48	1.63	1.00	1.08	1.19	1.16	1.32	1.10
27	$P_4 \times P_7$	1.47	1.48	1.55	1.22	1.28	1.17	0.94	0.87	0.97
28	$P_4 \times P_8$	1.28	1.29	1.55	1.31	1.29	1.20	0.87	1.35	1.22
29	$P_4 \times P_9$	1.55	1.56	1.42	1.38	1.41	1.21	1.13	1.21	1.07
30	$P_4 \times P_{10}$	1.35	1.31	1.60	1.33	1.31	1.27	0.98	0.94	1.02
31	$P_5 \times P_6$	1.19	1.12	1.19	1.49	1.44	1.46	0.88	1.26	1.30
32	$P_5 \times P_7$	1.24	1.24	1.36	1.36	1.40	1.37	1.19	1.13	1.28
33	$P_5 \times P_8$	1.10	1.22	1.31	1.41	1.54	1.49	1.21	1.01	0.94
34	$P_5 \times P_9$	1.17	1.23	1.29	1.03	0.95	1.06	1.32	1.19	0.98
35	$P_5 \times P_{10}$	1.25	1.20	1.12	0.91	1.09	1.07	0.82	0.94	1.10
36	$P_6 \times P_7$	1.32	1.30	1.33	1.43	1.44	1.22	0.94	0.86	1.01
37	$P_6 \times P_8$	1.69	1.52	1.50	1.35	1.25	1.24	1.17	1.32	1.13
38	$P_6 \times P_9$	1.43	1.51	1.40	1.37	1.41	1.36	1.16	1.17	1.02
39	$P_6 \times P_{10}$	1.58	1.64	1.59	1.22	1.39	1.38	0.99	0.99	1.06
40	$P_7 \times P_8$	1.62	1.55	1.45	1.09	1.12	1.22	0.88	1.33	1.15
41	$P_7 \times P_9$	1.37	1.24	1.22	1.03	1.21	1.35	1.17	1.19	1.04
42	$P_7 \times P_{10}$	1.26	1.33	1.29	1.20	1.08	1.22	1.23	0.99	1.09
43	$P_8 \times P_9$	1.71	1.61	1.36	1.42	1.42	1.41	1.34	1.17	1.19
44	$P_8 \times P_{10}$	1.76	1.73	1.45	1.32	1.35	1.19	1.19	1.22	1.27
45	$P_9 \times P_{10}$	1.40	1.44	1.34	1.39	1.42	1.17	0.99	0.88	0.85
F_1 Hybrid mean		**1.49**	**1.50**	**1.49**	**1.24**	**1.28**	**1.24**	**1.08**	**1.07**	**1.05**
Parents										
1	P_1	1.82	1.87	1.85	1.23	1.26	1.25	0.94	0.78	0.86
2	P_2	1.51	1.57	1.54	0.96	0.97	0.97	1.12	1.12	1.12
3	P_3	1.88	1.88	1.88	1.28	1.31	1.30	1.13	0.83	0.98
4	P_4	1.53	1.56	1.55	1.49	1.34	1.42	0.91	1.42	1.16
5	P_5	0.62	0.59	0.60	1.17	1.18	1.18	0.83	0.94	0.88
6	P_6	1.60	1.55	1.57	1.30	1.32	1.31	0.84	1.12	0.98
7	P_7	1.67	1.74	1.71	1.15	1.18	1.17	1.12	1.38	1.25
8	P_8	1.61	1.57	1.59	1.43	1.35	1.39	0.90	0.83	0.86
9	P_9	1.69	1.76	1.73	0.97	1.02	1.00	1.15	1.12	1.13
10	P_{10}	1.66	1.67	1.67	1.21	1.24	1.23	0.78	0.79	0.79
Parental mean		**1.56**	**1.57**	**1.56**	**1.22**	**1.21**	**1.22**	**0.97**	**1.03**	**1.00**
Grand mean		1.50	1.51	1.51	1.24	1.27	1.24	1.06	1.06	1.04
CV		3.83	4.11	3.23	5.60	5.10	4.58	4.28	4.46	3.06
CD 5%		0.09	0.09	0.08	0.11	0.10	0.09	0.07	0.07	0.05
Range	**Lowest**	**0.62**	**0.59**	**0.60**	**0.91**	**0.95**	**0.7**	**0.76**	**0.76**	**0.79**
	Highest	**1.88**	**1.88**	**1.88**	**1.49**	**1.54**	**1.49**	**1.44**	**1.44**	**1.30**

Table-3. Contd…

Sr. No.	Genotypes	Total fruit yield per plant (kg)		
		Y_1	Y_2	Pooled
1	$P_1 \times P_2$	1.83	1.81	1.90
2	$P_1 \times P_3$	1.67	1.71	1.57
3	$P_1 \times P_4$	2.06	1.91	1.71
4	$P_1 \times P_5$	1.89	2.04	1.69
5	$P_1 \times P_6$	1.57	1.62	1.64
6	$P_1 \times P_7$	2.68	1.99	1.95
7	$P_1 \times P_8$	2.30	2.60	2.55
8	$P_1 \times P_9$	1.94	2.39	2.21
9	$P_1 \times P_{10}$	1.60	1.76	2.21
10	$P_2 \times P_3$	1.44	1.55	1.50
11	$P_2 \times P_4$	1.60	1.75	1.79
12	$P_2 \times P_5$	2.18	2.00	1.84
13	$P_2 \times P_6$	1.57	1.70	1.88
14	$P_2 \times P_7$	1.89	2.28	2.09
15	$P_2 \times P_8$	1.67	1.80	1.68
16	$P_2 \times P_9$	3.38	3.54	3.11
17	$P_2 \times P_{10}$	1.78	1.94	2.12
18	$P_3 \times P_4$	1.94	2.04	1.99
19	$P_3 \times P_5$	1.43	1.66	1.63
20	$P_3 \times P_6$	1.45	1.64	1.54
21	$P_3 \times P_7$	1.66	1.78	1.69
22	$P_3 \times P_8$	1.64	1.80	1.99
23	$P_3 \times P_9$	2.06	2.21	1.89
24	$P_3 \times P_{10}$	1.55	1.66	1.77
25	$P_4 \times P_5$	1.42	1.58	1.62
26	$P_4 \times P_6$	1.70	1.95	2.66
27	$P_4 \times P_7$	1.42	1.57	1.68
28	$P_4 \times P_8$	1.76	1.86	1.90
29	$P_4 \times P_9$	1.15	1.26	1.35
30	$P_4 \times P_{10}$	1.42	1.54	1.50
31	$P_5 \times P_6$	2.40	1.60	1.63
32	$P_5 \times P_7$	1.76	1.82	1.73
33	$P_5 \times P_8$	1.50	2.50	2.28
34	$P_5 \times P_9$	2.56	1.41	1.48
35	$P_5 \times P_{10}$	1.32	2.65	2.03
36	$P_6 \times P_7$	3.08	3.14	2.42
37	$P_6 \times P_8$	2.32	1.97	1.70
38	$P_6 \times P_9$	2.32	2.45	2.10
39	$P_6 \times P_{10}$	1.88	2.41	1.78
40	$P_7 \times P_8$	2.87	2.98	2.28
41	$P_7 \times P_9$	2.75	1.51	1.96
42	$P_7 \times P_{10}$	1.41	2.83	2.30
43	$P_8 \times P_9$	2.67	2.79	2.15
44	$P_8 \times P_{10}$	1.72	1.83	2.20
45	$P_9 \times P_{10}$	1.87	1.94	1.63
F_1 Hybrid mean		**1.91**	**2.02**	**1.91**
Parents				
1	P_1	1.99	2.10	2.05
2	P_2	1.43	1.51	1.47
3	P_3	1.51	1.55	1.53
4	P_4	1.33	1.40	1.37
5	P_5	1.65	1.73	1.69
6	P_6	1.90	1.91	1.91
7	P_7	2.50	2.47	2.49
8	P_8	2.03	2.07	2.05
9	P_9	2.67	2.56	2.61
10	P_{10}	1.45	1.46	1.46
Parental mean		**1.84**	**1.87**	**1.86**
Grand mean		1.90	1.99	1.90
CV		6.24	4.71	4.93
CD 5%		0.19	0.15	0.16
Range	**Lowest**	**1.15**	**1.26**	**1.35**
	Highest	**3.38**	**3.54**	**3.11**