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Estimating the extent of heterosis in Bitter gourd for vegetative and quality characters

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Abstract
A trail was conducted in Horticulture Research Scheme (Vegetable), V.N.M.K.V., Parbhani that consists of various treatments. Those treatments were tested using randomized block design. Among Crosses used, many of the crosses had shown significant heterosis over their respective better parent and also over standard check for the different traits studied. The hybrids also varied or showed difference in different parameters.

Keywords: Bitter gourd, heterosis, vegetative, quality and fruit

1. Introduction
Momordica charantia (bitter melon, bitter apple, bitter gourd, bitter squash, balsam pear) is a tropical and subtropical vine of cucurbitaceous family. This is herbaceous, tendril-bearing vine grows up to 5 m (16 ft) in length. It bears simple, alternate leaves 4 to12 cm across, with 3 to 7 deeply separated lobes. Each plant bears separate yellow colour male and female flowers. The fruit has a distinct warty exterior and an oblong shape. It is hollow in cross-section, with a relatively thin layer of flesh surrounding a central seed cavity filled with large, flat seeds and pith. The green fruits are superior with regard to nutritive value and very well be compared with any other vegetable. The potentiality of bitter gourd in our country is very low due to poor performance of varieties. One of the methods to improve different characters in bitter gourd is heterosis breeding.

2. Details Experimental
A trail for Estimating the extent of heterosis in Bitter gourd for vegetative and fruit quality characters was conducted in Horticulture Research Scheme (Vegetable), V.N.M.K.V, Parbhani with an objective of finding out the most desirable F_1s in bitter gourd. The results obtained along with relevant discussion are presented in this paper.

3. Results and Discussion
3.1 Vine length (m) (%)
The heterosis over mid parent ranged from -26.46 per cent to 31.38 per cent among 40 hybrids, 15 hybrids were found to be positively significant for heterotic effect. Hybrid IC-470535 X Arka Harit (31.38%) showed maximum positive significant heterosis when compare with check-1 and 2. Heterosis over better parent ranged from -32.01 per cent to 24.79 per cent. Among 40 hybrids, 10 hybrids were found to be positively significant. Hybrid IC-085616 X Arka Harit (24.79%) had shown maximum positively significant heterosis as compare to check-2 respectively. Check parent-1 one heterosis was ranged from -24.25 per cent to 26.83 per cent.
Significant and higher magnitude of heterosis over mid parent, the better parent and commercial check was observed for vine length. In earlier studies, heterosis was reported for vine length by Narasannar *et al*. (2014) [4], Muthaiah *et al*. (2017) [3] have reported positive heterosis for plant height.

Table 1: Magnitude of heterosis in the bitter gourd hybrids over mid parent, better Parent and standard check for vine length (m)

Genotypes	Mean	Mid Parent	Better Parent	Standard Checks	
				Check-1	Check-2
IC-085620 X Phule Hirkani	3.96	-1.33	-4.51	-1.08	-2.30
IC-085620 X CO-1	5.07	22.54 **	15.22 **	26.83 **	25.27 **
IC-085620 X Konkan Tara	4.28	2.96	-3.60	7.08	5.76
IC-085620 X Phule green gold	4.03	-3.28	-9.57	0.75	-0.49
IC-085620 X Arka Harit	4.50	14.41 **	12.78 *	12.50	11.11
IC-505639 X Phule Hirkani	3.24	-18.33 **	-21.88 **	-19.08 **	-20.08 **
IC-505639 X CO-1	3.88	-5.21	-11.88 *	-3.00	-4.20
IC-505639 X Konkan Tara	3.33	-19.04 **	-25.06 **	-16.75 **	-17.78 **
IC-505639 X Phule green gold	3.03	-26.46 **	-32.01 **	-24.25 **	-25.19 **
IC-505639 X Arka Harit	3.96	1.97	-0.67	-0.92	-2.14
IC-85647 X Phule Hirkani	3.87	-3.65	-6.68	-3.33	-4.53
IC-85647 X CO-1	4.74	14.48 **	7.72	18.58 **	17.12 **
IC-85647 X Konkan Tara	3.99	-4.24	-10.28 *	-0.33	-1.56
IC-85647 X Phule green gold	5.07	21.58 **	13.76 **	26.75 **	25.19 **
IC-85647 X Arka Harit	4.25	8.04	6.60	6.33	5.02
IC-085617 X Phule Hirkani	4.15	1.92	0.16	3.75	2.47
IC-085617 X CO-1	4.87	15.91 **	10.60 *	21.75 **	20.25 **
IC-085617 X Konkan Tara	4.47	5.80	0.53	11.67	10.29
IC-085617 X Phule green gold	4.24	0.20	-4.94	5.92	4.61
IC-085617 X Arka Harit	4.66	16.56 **	16.42 **	16.42 *	14.98 *
IC-085616 X Phule Hirkani	4.24	3.97	2.25	5.92	4.61
IC-085616 X CO-1	4.68	11.30 *	6.28	17.00 **	15.56 *
IC-085616 X Konkan Tara	4.35	2.88	-2.18	8.67	7.33
IC-085616 X Phule green gold	4.29	1.38	-3.74	7.25	5.93
IC-085616 X Arka Harit	5.00	25.05 **	24.79 **	25.00 **	23.46 **
IC-085618 X Phule Hirkani	3.97	-3.13	-4.10	-0.67	-1.89
IC-085618 X CO-1	5.03	18.94 **	14.31 **	25.83 **	24.28 **
IC-085618 X Konkan Tara	4.69	10.31 *	5.55	17.25 **	15.80 *
IC-085618 X Phule green gold	3.88	-8.81	-12.86 *	-2.92	-4.12
IC-085618 X Arka Harit	5.04	25.13 **	24.06 **	25.92 **	24.36 **
IC-505629 X Phule Hirkani	3.94	0.25	-4.99	-1.58	-2.80
IC-505629 X CO-1	3.62	-10.85 *	-17.87 **	-9.58	-10.70
IC-505629 X Konkan Tara	3.90	-4.42	-12.30 *	-2.58	-3.79
IC-505629 X Phule green gold	4.58	12.08 *	2.69	14.42 *	13.00 *
IC-505629 X Arka Harit	4.95	28.57 **	24.06 **	23.75 **	22.22 **
IC-470535 X Phule Hirkani	3.93	5.88	-5.07	-1.67	-2.88
IC-470535 X CO-1	3.03	-21.11 **	-31.11 **	-24.17 **	-25.10 **
IC-470535 X Konkan Tara	4.56	18.07 **	2.70	14.08 *	12.67 *
IC-470535 X Phule green gold	3.94	1.68	-11.67 *	-1.58	-2.80
IC-470535 X Arka Harit	4.78	31.38 **	19.80 **	19.50 **	18.02 **
S.E.		0.14	0.17	0.17	
CD.95.%		0.29	0.34	0.34	
CD.99.%		0.39	0.45	0.45	

* Significant at 5% level ** significant at 1% level

Table 2: Magnitude of heterosis in the bitter gourd hybrids over mid parent, better parent and standard check for number of branches

Genotypes	Mean	Mid Parent	Better Parent	Standard Checks	
				Check-1	Check-2
IC-085620 X Phule Hirkani	21.14	25.43 **	24.47 **	24.40 **	21.51 **
IC-085620 X CO-1	21.42	32.00 **	28.06 **	26.02 **	23.10 **
IC-085620 X Konkan Tara	21.10	33.03 **	26.13 **	24.12 **	21.25 **
IC-085620 X Phule green gold	20.85	25.38 **	24.63 **	22.65 **	19.81 **
IC-085620 X Arka Harit	22.08	31.55 **	31.08 **	29.93 **	26.92 **
IC-505639 X Phule Hirkani	19.61	14.57 *	13.70 *	15.38 *	12.70 ns
IC-505639 X CO-1	21.59	30.95 **	25.18 **	27.02 **	24.08 **
IC-505639 X Konkan Tara	21.85	35.58 **	26.71 **	28.57 **	25.59 **
IC-505639 X Phule green gold	21.66	28.25 **	25.57 **	27.42 **	24.46 **
IC-505639 X Arka Harit	19.17	12.46 *	11.15	12.79	10.17
IC-85647 X Phule Hirkani	21.10	22.97 **	21.75 **	24.14 **	21.26 **
IC-85647 X CO-1	21.73	31.49 **	25.41 **	27.87 **	24.90 **
IC-85647 X Konkan Tara	19.72	22.05 **	13.81 *	16.04 *	13.35
IC-85647 X Phule green gold	17.97	6.13	3.67	5.71	3.26
IC-85647 X Arka Harit	21.44	25.47 **	23.72 **	26.14 **	23.22 **
IC-085617 X Phule Hirkani	21.28	25.58 **	25.27 **	25.20 **	22.30 **

IC-085617 X CO-1	19.34	18.54 **	14.42 *	13.79	11.15
IC-085617 X Konkan Tara	20.53	28.72 **	21.44 **	20.77 **	17.97 *
IC-085617 X Phule green gold	16.88	0.99	-0.14	-0.69	-2.99
IC-085617 X Arka Harit	18.68	10.72	10.53	9.92	7.38
IC-085616 X Phule Hirkani	22.24	30.47 **	30.04 **	30.83 **	27.80 **
IC-085616 X CO-1	21.87	33.25 **	27.89 **	28.67 **	25.69 **
IC-085616 X Konkan Tara	20.25	26.21 **	18.42 **	19.14 *	16.38 *
IC-085616 X Phule green gold	17.43	3.69	1.95	2.57	0.19
IC-085616 X Arka Harit	18.48	8.86	8.05	8.71	6.19
IC-085618 X Phule Hirkani	21.38	24.90 **	23.97 **	25.77 **	22.85 **
IC-085618 X CO-1	23.23	40.92 **	34.72 **	36.67 **	33.51 **
IC-085618 X Konkan Tara	24.96	54.89 **	44.77 **	46.87 **	43.47 **
IC-085618 X Phule green gold	25.76	52.54 **	49.37 **	51.54 **	48.03 **
IC-085618 X Arka Harit	22.10	29.64 **	28.15 **	30.01 **	26.99 **
IC-505629 X Phule Hirkani	22.69	33.91 **	33.56 **	33.48 **	30.38 **
IC-505629 X CO-1	21.00	28.74 **	24.28 **	23.55 **	20.69 **
IC-505629 X Konkan Tara	21.66	35.84 **	28.17 **	27.42 **	24.46 **
IC-505629 X Phule green gold	23.66	41.60 **	40.05 **	39.22 **	36.00 **
IC-505629 X Arka Harit	22.52	33.50 **	33.30 **	32.52 **	29.44 **
IC-470535 X Phule Hirkani	21.07	23.16 **	22.31 **	23.95 **	21.07 **
IC-470535 X CO-1	22.44	36.19 **	30.27 **	32.01 **	28.95 **
IC-470535 X Konkan Tara	20.27	25.85 **	17.69 *	19.26 *	16.49 *
IC-470535 X Phule green gold	23.34	38.31 **	35.51 **	37.32 **	34.14 **
IC-470535 X Arka Harit	20.05	17.72 **	16.43 *	17.98 *	15.25 *
S.E.		0.80	0.93	0.93	
CD.95.%		1.60	1.85	1.85	
CD.99.%		2.13	2.46	2.46	

* Significant at 5% level ** significant at 1% level

3.2 Number of branches per vine (%)

The heterosis over mid parent ranged from 0.99 per cent to 54.89 per cent among 40 hybrids, 35 hybrids were found to be positively significant for heterotic effect. Hybrid IC-085618 X Konkan Tara (54.89%) showed maximum positive significant heterosis when compare with check-1 and 2. Heterosis over better parent ranged from -0.14 per cent to 49.37 per cent. Among 40 hybrids, 34 hybrids were found to be positively significant. Hybrid IC-085618 X Phule green gold (49.37%) had shown maximum positively significant heterosis as compare to check-2 respectively. Check parent-1 one heterosis was ranged from -0.69 per cent to 51.54 per cent. Standard heterosis for number of branches was also reported by Narasannar *et al*. (2014) [4] and Muthaiah *et al*. (2017) [3].

Table 3: Magnitude of heterosis in the bitter gourd hybrids over mid parent, better parent and standard check for Fruit thickness (mm)

Genotypes	Mean	Mid Parent	Better Parent	Standard Checks	
				Check-1	Check-2
IC-085620 X Phule Hirkani	4.79	-13.30 **	-26.19 **	6.60	10.79 **
IC-085620 X CO-1	5.50	18.99 **	17.34 **	22.48 **	27.29 **
IC-085620 X Konkan Tara	7.26	51.51 **	44.53 **	61.57 **	67.93 **
IC-085620 X Phule green gold	6.44	20.94 **	5.75 *	43.32 **	48.96 **
IC-085620 X Arka Harit	5.24	-19.31 **	-37.81 **	16.54 **	21.13 **
IC-505639 X Phule Hirkani	4.70	-17.35 **	-27.58 **	4.60	8.71 *
IC-505639 X CO-1	7.25	51.53 **	48.53 **	61.42 **	67.77 **
IC-505639 X Konkan Tara	5.85	18.10 **	16.46 **	30.19 **	35.31 **
IC-505639 X Phule green gold	5.44	-0.79	-10.62 **	21.14 **	25.91 **
IC-505639 X Arka Harit	6.83	2.63	-18.92 **	51.93 **	57.90 **
IC-85647 X Phule Hirkani	6.27	-2.31	-3.44	39.47 **	44.95 **
IC-85647 X CO-1	4.92	-10.79 **	-22.40 **	9.50 **	13.80 **
IC-85647 X Konkan Tara	4.80	-15.58 **	-24.34 **	6.75	10.95 **
IC-85647 X Phule green gold	4.91	-20.94 **	-22.50 **	9.35 **	13.65 **
IC-85647 X Arka Harit	5.01	-32.16 **	-40.54 **	11.42 **	15.81 **
IC-085617 X Phule Hirkani	5.79	4.57	-10.73 **	28.93 **	34.00 **
IC-085617 X CO-1	5.66	21.91 **	20.61 **	25.89 **	30.84 **
IC-085617 X Konkan Tara	4.95	2.98	-1.46	10.16 **	14.49 **
IC-085617 X Phule green gold	5.16	-3.37	-15.27 **	14.84 **	19.35 **
IC-085617 X Arka Harit	5.44	-16.37 **	-35.39 **	21.07 **	25.83 **
IC-085616 X Phule Hirkani	5.28	4.04	-18.64 **	17.51 **	22.13 **
IC-085616 X CO-1	6.16	47.62 **	31.41 **	37.17 **	42.56 **
IC-085616 X Konkan Tara	6.06	39.65 **	20.70 **	34.94 **	40.25 **
IC-085616 X Phule green gold	5.99	22.80 **	-1.70	33.23 **	38.47 **
IC-085616 X Arka Harit	5.85	-3.20	-30.56 **	30.12 **	35.24 **
IC-085618 X Phule Hirkani	6.36	12.34 **	-2.05	41.47 **	47.03 **
IC-085618 X CO-1	4.83	1.44	-0.00	7.42 *	11.64 **

IC-085618 X Konkan Tara	6.22	26.23 **	23.76 **	38.35 **	43.79 **
IC-085618 X Phule green gold	4.92	-9.86 **	-19.21 **	9.50 **	13.80 **
IC-085618 X Arka Harit	5.37	-18.92 **	-36.22 **	19.51 **	24.21 **
IC-505629 X Phule Hirkani	5.63	10.22 **	-13.30 **	25.22 **	30.15 **
IC-505629 X CO-1	5.34	26.91 **	13.79 **	18.77 **	23.44 **
IC-505629 X Konkan Tara	6.43	47.01 **	27.94 **	43.03 **	48.65 **
IC-505629 X Phule green gold	6.42	30.82 **	5.36 *	42.80 **	48.42 **
IC-505629 X Arka Harit	7.17	18.18 **	-14.81 **	59.64 **	65.92 **
IC-470535 X Phule Hirkani	5.61	-0.47	-13.56 **	24.85 **	29.76 **
IC-470535 X CO-1	3.82	-19.42 **	-20.21 **	-15.06 **	-11.72 **
IC-470535 X Konkan Tara	5.49	12.03 **	9.36 **	22.26 **	27.06 **
IC-470535 X Phule green gold	5.72	5.15 *	-6.13 *	27.23 **	32.23 **
IC-470535 X Arka Harit	4.35	-34.11 **	-48.34 **	-3.19	0.62
S.E.		0.07	0.09	0.09	
CD.95.%		0.15	0.18	0.18	
CD.99.%		0.20	0.24	0.24	

* Significant at 5% level ** significant at 1% level

3.3 Fruit thickness (%)

The heterosis over mid parent ranged from -34.11 per cent to 51.53 per cent among 40 hybrids, 18 hybrids were found to be positively significant for heterotic effect. Hybrid IC-505639 X CO-1 (51.53%) showed maximum positive significant heterosis. Heterosis over better parent ranged from -48.34 per cent to 48.53 per cent. Among 40 hybrids, 13 hybrids were found to be positively significant. Hybrid IC-505639 X CO-1 (48.53%) had shown maximum positively significant heterosis. Check parent-2 heterosis was ranged from -11.72 per cent to 67.93 per cent. Heterosis for flesh thickness has also been reported by Narasannar *et al*. (2014) [4], Ahmad Alhariri *et al*. (2018) [1] in bitter gourd.

Table 4: Magnitude of heterosis in the bitter gourd hybrids over mid parent, better parent and standard check for Fruit diameter(cm)

Genotypes	Mean	Mid Parent	Better Parent	Standard Checks	
				Check-1	Check-2
IC-085620 X Phule Hirkani	3.69	8.91 **	6.76	12.40 **	5.33
IC-085620 X CO-1	3.89	15.73 **	12.55 **	18.50 **	11.05 **
IC-085620 X Konkan Tara	4.11	17.97 **	16.86 **	25.41 **	17.52 **
IC-085620 X Phule green gold	3.90	13.14 **	13.03 **	19.00 **	11.52 **
IC-085620 X Arka Harit	4.15	17.05 **	14.00 **	26.63 **	18.67 **
IC-505639 X Phule Hirkani	4.06	19.72 **	17.24 **	23.68 **	15.90 **
IC-505639 X CO-1	4.21	25.14 **	21.58 **	28.25 **	20.19 **
IC-505639 X Konkan Tara	4.07	16.62 **	15.63 **	24.09 **	16.29 **
IC-505639 X Phule green gold	3.89	12.55 **	12.33 **	18.50 **	11.05 **
IC-505639 X Arka Harit	3.94	10.93 **	8.14 *	20.12 **	12.57 **
IC-85647 X Phule Hirkani	3.72	11.87 **	11.48 **	13.52 **	6.38
IC-85647 X CO-1	3.87	17.21 **	15.87 **	17.99 **	10.57 **
IC-85647 X Konkan Tara	3.68	7.29 *	4.55	12.20 **	5.14
IC-85647 X Phule green gold	3.75	10.41 **	8.70 *	14.23 **	7.05 *
IC-85647 X Arka Harit	3.80	8.74 **	4.21	15.75 **	8.48 *
IC-085617 X Phule Hirkani	3.81	11.93 **	9.40 *	15.85 **	8.57 *
IC-085617 X CO-1	4.41	31.02 **	27.06 **	34.55 **	26.10 **
IC-085617 X Konkan Tara	3.91	11.73 **	10.98 **	19.11 **	11.62 **
IC-085617 X Phule green gold	3.81	10.12 **	9.69 **	16.16 **	8.86 *
IC-085617 X Arka Harit	3.89	9.32 **	6.77	18.60 **	11.14 **
IC-085616 X Phule Hirkani	3.66	8.40 *	6.61	11.48 **	4.48
IC-085616 X CO-1	3.54	5.78	3.21	7.93 *	1.14
IC-085616 X Konkan Tara	3.80	9.26 **	7.86 *	15.75 **	8.48 *
IC-085616 X Phule green gold	3.67	6.74 *	6.48	11.89 **	4.86
IC-085616 X Arka Harit	3.89	10.08 **	6.86	18.70 **	11.24 **
IC-085618 X Phule Hirkani	4.10	20.77 **	18.04 **	25.00 **	17.14 **
IC-085618 X CO-1	3.69	9.65 **	6.33	12.60 **	5.52
IC-085618 X Konkan Tara	4.23	21.07 **	20.27 **	29.07 **	20.95 **
IC-085618 X Phule green gold	3.72	7.61 *	7.20	13.52 **	6.38
IC-085618 X Arka Harit	3.88	8.95 **	6.40	18.19 **	10.76 **
IC-505629 X Phule Hirkani	3.87	12.65 **	8.80 *	18.09 **	10.67 **
IC-505629 X CO-1	3.69	8.16 *	3.65	12.50 **	5.43
IC-505629 X Konkan Tara	3.73	5.37	4.78	13.72 **	6.57
IC-505629 X Phule green gold	3.68	5.04	3.37	12.20 **	5.14
IC-505629 X Arka Harit	4.07	12.91 **	11.62 **	23.98 **	16.19 **
IC-470535 X Phule Hirkani	3.57	11.49 **	7.74 *	8.94 *	2.10
IC-470535 X CO-1	3.66	15.15 **	12.16 **	11.59 **	4.57
IC-470535 X Konkan Tara	3.47	4.94	-1.42	5.79	-0.86

IC-470535 X Phule green gold	3.29	0.71	-4.45	0.41	-5.90
IC-470535 X Arka Harit	3.23	-4.01	-11.25 **	-1.42	-7.62 *
S.E.		0.10	0.11	0.11	
CD.95.%		0.20	0.23	0.23	
CD.99.%		0.26	0.31	0.31	

* Significant at 5% level ** significant at 1% level

3.4 Fruit diameter (%)

The heterosis over mid parent ranged from -4.01 per cent to 31.02 per cent among 40 hybrids, 34 hybrids were found to be positively significant for heterotic effect. Hybrid IC-085617 X CO-1 (31.02%) showed maximum positive significant heterosis when compare with check-2. Heterosis over better parent ranged from -11.25 per cent to 27.06 per cent. Among 40 hybrids, 23 hybrids were found to be positively significant. Hybrid IC-085617 X CO-1 (27.06%) had shown maximum positively significant heterosis as compare to check-2 respectively. Check parent-1 heterosis was ranged from -1.42 per cent to 34.55 per cent. In earlier studies of bitter gourd Bhatt *et al.* (2017) [2] also found similar results.

Table 5: Magnitude of heterosis in the bitter gourd hybrids over mid parent, better parent and standard check for Ascorbic acid (mg/100g)

Genotypes	Mean	Mid Parent	Better Parent	Standard Checks	
				Check-1	Check-2
IC-085620 X Phule Hirkani	100.81	1.94	0.34	4.97 **	7.04 **
IC-085620 X CO-1	102.77	2.89 **	0.31	7.01 **	9.12 **
IC-085620 X Konkan Tara	100.97	1.02	-1.58	5.14 **	7.21 **
IC-085620 X Phule green gold	98.42	2.07 *	1.14	2.49	4.50 **
IC-085620 X Arka Harit	104.44	2.64 **	-1.65	8.75 **	10.89 **
IC-505639 X Phule Hirkani	101.33	-0.88	-2.56 *	5.52 **	7.59 **
IC-505639 X CO-1	102.20	-0.99	-1.73	6.42 **	8.51 **
IC-505639 X Konkan Tara	102.34	-0.92	-1.59	6.57 **	8.66 **
IC-505639 X Phule green gold	103.42	3.66 **	-0.55	7.69 **	9.81 **
IC-505639 X Arka Harit	104.45	-0.62	-1.64	8.76 **	10.90 **
IC-85647 X Phule Hirkani	100.88	1.71	0.41	5.05 **	7.11 **
IC-85647 X CO-1	100.00	-0.18	-2.39 *	4.13 **	6.18 **
IC-85647 X Konkan Tara	103.30	3.05 **	0.70	7.57 **	9.68 **
IC-85647 X Phule green gold	97.33	0.63	-0.59	1.35	3.34 *
IC-85647 X Arka Harit	104.31	2.21 *	-1.78	8.62 **	10.75 **
IC-085617 X Phule Hirkani	102.14	0.02	-1.58	6.36 **	8.45 **
IC-085617 X CO-1	103.17	0.05	-0.58	7.43 **	9.54 **
IC-085617 X Konkan Tara	102.89	-0.29	-0.86	7.14 **	9.24 **
IC-085617 X Phule green gold	102.89	3.25 **	-0.85	7.14 **	9.25 **
IC-085617 X Arka Harit	106.01	0.98	-0.17	10.39 **	12.56 **
IC-085616 X Phule Hirkani	102.83	2.16 *	1.97	7.08 **	9.18 **
IC-085616 X CO-1	103.60	1.92	1.12	7.88 **	10.00 **
IC-085616 X Konkan Tara	102.45	0.72	-0.14	6.68 **	8.77 **
IC-085616 X Phule green gold	102.22	4.10 **	1.36	6.44 **	8.53 **
IC-085616 X Arka Harit	107.00	3.36 **	0.75	11.42 **	13.60 **
IC-085618 X Phule Hirkani	103.07	0.89	-0.75	7.33 **	9.44 **
IC-085618 X CO-1	103.76	0.59	-0.08	8.05 **	10.17 **
IC-085618 X Konkan Tara	104.54	1.28	0.66	8.85 **	10.99 **
IC-085618 X Phule green gold	102.75	3.07 **	-1.06	6.99 **	9.09 **
IC-085618 X Arka Harit	108.65	3.46 **	2.31 *	13.14 **	15.36 **
IC-505629 X Phule Hirkani	94.77	-1.48	-5.67 **	-1.31	0.63
IC-505629 X CO-1	99.68	2.56 *	-2.71 *	3.79 **	5.83 **
IC-505629 X Konkan Tara	98.02	0.78	-4.45 **	2.07	4.08 **
IC-505629 X Phule green gold	94.11	0.41	-1.49	-2.00	-0.07
IC-505629 X Arka Harit	98.26	-0.82	-7.48 **	2.32	4.32 **
IC-470535 X Phule Hirkani	103.10	1.14	-0.30	7.36 **	9.47 **
IC-470535 X CO-1	103.94	0.98	0.51	8.24 **	10.36 **
IC-470535 X Konkan Tara	105.77	2.69 **	2.28 *	10.14 **	12.30 **
IC-470535 X Phule green gold	100.03	0.56	-3.27 **	4.16 **	6.20 **
IC-470535 X Arka Harit	104.85	0.05	-1.26	9.18 **	11.33 **
S.E.		0.80	0.93	0.93	
CD.95.%		1.60	1.85	1.85	
CD.99.%		2.13	2.46	2.46	

* Significant at 5% level ** significant at 1% level

3.5 Ascorbic acid (mg/100g) (%)

The heterosis over mid parent ranged from -1.48 per cent to 4.10 per cent among 40 hybrids, 14 hybrids were found to be positively significant for heterotic effect. Hybrid IC-085616 X Phule green gold (4.10%) showed maximum positive significant heterosis. Heterosis over better parent ranged from -7.48 per cent to 2.31 per cent. Among 40 hybrids, 2 hybrids were found to be positively significant. Hybrid IC-085618 X

Arka Harit (2.31%) had shown maximum positively significant heterosis. Check parent-2 heterosis was ranged from -0.07 per cent to 15.36 per cent. These results are in accordance with the result showed by earlier workers pandey *et al.* (2010) [5] and Bhatt *et al.* (2017) [2].

4. Conclusions

Among different crosses many of the crosses had shown significant heterosis over their respective better parent and also over standard check for the traits studied. The ideal hybrid or parent producing maximum vine length with more number of branches will provide good amount of flowers which, directly influence the yield of the plant. So, selections of those hybrids which are having good vegetative growth are advised.

5. References

1. Ahmad Alhariri A, Behera TK, Munshi AD, Bharadwaj C, Jat GS. Exploiting Gynoecious Line for Earliness and Yield Traits in Bitter Gourd (*Momordica charantia* L.). International Journal of Current Microbiology and Applied Sciences 2018;7(11):922-928.
2. Bhatt L, Singh SP, Soni AK, Samota MK. Studies on Heterosis in Bitter Gourd *(Momordica charantia* L.). International Journal of Current Microbiology and Applied Sciences 2017;6:4069-4077.
3. Muthaiah K, Gasti VD, Mallesh S, Sunilkumar MK, Mangi Vittal. Heterosis studies for growth and yield related parameters in ridge gourd [*Luffa acutangula* L. *roxb.*]. International Journal of Agriculture Sciences 2017;9:4335-4337.
4. Narasannavar GVD, Malghan SS, Kumara BR. Gene action and Combining Ablity analysis for yield and yield related traits in ridge gourd (*Luffa acutangula* (L.) Roxb.) Global Journal of Science Frontier Research: D Agriculture and Veterinary 2014;14:110 -112.
5. Pandey, Jha, Kumar, Rai. Genetics and heterosis of quality and yield of pumpkin. Indian Journal of Horticulture 2010;67(3):333-338.