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Studies on heterosis for fruit yield and quality attributing characters in ridge gourd (*Luffa acutangula* (L.) Roxb.)

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Abstract
The present investigation was conducted on heterosis for fruit yield quality attributing characters in ridge gourd. Forty five F_1 hybrids were generated by half diallel (excluding reciprocals) mating design. These F_1 hybrids along with ten parents were evaluated in randomized block design with two replications at College farm, College of Horticulture, Venkataramannagudem during *Rabi*, 2018. Observations were recorded for five randomly selected and tagged plants from each treatment for fruit yield and quality attributing characters *viz.*, number of fruits per vine, fruit length, fruit diameter, average fruit weight, fruit flesh thickness, number of seeds per fruit, fruit yield per vine, total soluble solids, ascorbic acid content, carotene content, total sugars, reducing sugars, non reducing sugars and fiber content. The values of F_1 hybrids averaged over two replications were used for estimating heterosis. The top four heterotic cross combinations *viz.*, VRG-24 x VRG-13, VRG-24 x VRG-16, Swarna Manjari x Arka Prasan and Swarna Manjari x VRG-16 were identified as promising for fruit length, average fruit weight and fruit yield per vine.

Keywords: Ridge gourd, heterosis, half diallel, yield, quality

Introduction
Ridge gourd (*Luffa acutangula* (L.) Roxb.) family Cucurbitaceae and genus *Luffa*. Its chromosome number is 2n=2x=26. Local names of ridge gourd in India are Dodka (Marathi), Beerakaya (Telugu), Turai (Hindi), Peerkankai (Tamil), Sirola (Gujarati), Heerekayi (Kannada) and Peechanga (Malayalam) *etc.*,. It is also called as angled gourd, angled loofah, Chinese okra, silky gourd and ribbed gourd (Muthaiah *et al*., 2017) [6]. It is considered to be the old world species and is native of tropical Africa and South-East Asian region including India.

During recent years, the commercial exploitation of hybrid vigour and selection of parents on the basis of combining ability have expanded a new alley in crop improvement. Ridge gourd being monoecious in sex expression can be profitably utilized for the production of F_1 hybrid seeds at cheaper rates, as the monoecious nature of crop eliminates emasculation and higher number of hybrid seeds per cross make it more economical.The term Heterosis refers to a phenomenon in which F_1 shows increase or decrease in vigour over the parents. Shull (1908) [11] referred to this phenomenon as the stimulus of heterozygosity and hybrid vigour. The attempts of commercial production of F_1 hybrids in vegetables in general and the cucurbits in particular was started as early as 1935 in Japan and 1940 in USA (Singh and Swarup, 1971) [12]. For developing promising varieties through hybridization, the choice of parents is a matter of great concern to the plant breeder. A high yielding genotype may or may not transmit its superiority to its progenies. Therefore, the success of a breeding programme is determined by useful gene combinations in the form of high combining inbred.

Materials and methods
The present investigation was carried out at College of Horticulture, Venkataramannagudem, Dr. Y. S. R. Horticultural University, Andhra Pradesh, India during *rabi* and *summer*, 2018-19. The experimental material consisted of ten parental lines viz., VRG-11, VRG-23, VRG-24, VRG-25, Swarna Manjari, Arka Prasan, VRG-13, VRG-14, VRG-15 and VRG-16 of these were crossed in diallel fashion excluding reciprocals during *Rabi*, 2018. The resultant 45 F_1 hybrids along with ten parents and two checks were evaluated in randomized block design with two replications with spacing of 1.2 x 1.0 m during *Summer*, 2019. Observations were recorded on five randomly selected plants from each plot for growth and yield parameters *viz.*,

number of fruits per vine, fruit diameter (cm), fruit length (cm), fruit flesh thickness (mm), average fruit weight (g), number of seeds per fruit, fruit yield per vine (kg), total soluble solids (°B), ascorbic acid content (mg/100g), carotene content (µg/100g), total sugars (%), reducing sugars (%), non reducing sugars (%), fiber content (g/100g). The values of F_1averaged over two replications were used for estimating heterosis. The magnitude of heterosis was calculated as percentage increase or decrease of F_1 mean over the mean of better parent (BP) (Turner, 1953 and Hays *et al.* (1955) [13, 4] and per cent superiority over standard checks were calculated. The analysis of variance, for all the characters under study, was carried out by the method suggested by Panse and Sukhatme (1985) [9].

Results and discussion

Analysis of variance for yield and yield component in (Table 1.). In the analysis of mean squares the differences due to the treatments were significant for all the characters studied. The treatment means were further sub divided into parents, hybrids and parents versus hybrids. The parents showed significant difference for all the characters studied except for fruit diameter. The hybrids showed significant difference for all the characters studied. The parents versus hybrids showed significant differences for the characters fruit length, fruit flesh thickness and number of seeds per fruit and other characters are non significant.

Per cent average heterosis over mid parent, heterobeltiosis over better parent and standard heterosis in Tables 2, 3, 4, 5, 6. The cross combination VRG-25 x Swarna Manjari (57.14) and VRG-14 x VRG-16 (50.47) expressed highest positive significant heterosis over mid and better parents respectively and the cross combination VRG-25 x Swarna Manjari (107.78), (28.97) expressed highest positive significant heterosis over the checks Aarti and Chitra respectively for number of fruits per vine (Table 2.). Similar results are reported by Poshiya *et al*. (2015) [10], Chittora *et al*. (2018) [2] Nandhini *et al*. (2018) [7] and Narasannavar *et al*. (2018) [8]. The cross combination VRG-23 x VRG-24 (34.06) expressed highest positive significant heterosis over mid parent and VRG-23 x Swarna Manjari (22.35) and VRG-25 x VRG-14 (15.58) expressed highest positive heterosis over better parent and over the check Chitra respectively no cross combination had positive standard heterosis over the check Aarti for fruit diameter (Table 2.). Similar results are reported by Nandhini *et al*. (2018) [7] and Narasannavar *et al*. (2018) [8]. The cross combination VRG-24 x VRG-13 (42.56), (26.58) expressed positive significant heterosis over mid parent, over better parent and VRG-24 x VRG-13 (95.38), (36.56) expressed highest positive significant heterosis over two checks Aarti and Chitra respectively for fruit length (Table 2.). These results are conformity with the findings of Nandhini *et al*. (2018) [7] and Narasannavar *et al*. (2018) [8].

The cross combinations VRG-11 x VRG-16 (105.10), VRG-11 x VRG-14 (87.52), VRG-24 x VRG-14 (135.63), (26.31) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for fruit flesh thickness (Table 3.). Similar results are reported by Chittora *et al*. (2018) [2] and Narasannavar *et al*. (2018) [8]. The cross combination VRG-24 x VRG-13 (141.29), (126.03), (174.51), (95.09) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for average fruit weight (Table 3.). Similar results are reported by Nandhini *et al*. (2018) [7] and Narasannavar *et al*. (2018) [8]. The cross combination VRG-24 x VRG-13 (164.78), (161.81), (60.53), (90.67) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for number of seeds per fruit (Table 3.). These results are conformity with the findings of Chittora *et al*. (2018) [2], Nandhini *et al*. (2018) [7] and Narasannavar *et al*. (2018) [8]. The cross combination VRG-24 x VRG-13 (132.21), (93.59), (53.82), (104.23) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for fruit yield per vine (Table 4.). These results are conformity with the findings of Chittora *et al*. (2018) [2] Nandhini *et al*. (2018) [7] and Narasannavar *et al*. (2018) [8].

The cross combinations VRG-11 x VRG-13 (56.31), VRG-13 x VRG-14 (36.43), VRG-14 x VRG-16 (38.92), (35.08) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for total soluble solids (Table 4.). Similar results are reported by Chittora *et al*. (2018) [2]. The cross combinations Arka Prasan x VRG-15 (9.19), VRG-14 x VRG-16 (0.30), VRG-14 x VRG-16 (10.92), (47.25) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for ascorbic acid content (Table 4.). Similar results are reported by Chittora *et al*. (2018) [2]. The cross combinations VRG-13 x VRG-14 (119.25), (102.09), VRG-23 x VRG-16 (108.00), (108.17) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for carotene content (Table 5.). These results are conformity with the findings of Daleep *et al*. (2018) [3] in bitter gourd and Kumar *et al*. (2018) [5] in pumpkin.

The cross combination VRG-11 x Arka Prasan (61.28), (52.15), (5.06), (37.15) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for total sugars (Table 5.). These results are conformity with the findings of Chittora *et al*. (2018) [2]. The cross combination VRG-11 x Arka Prasan (67.49), (58.82), (11.22), (48.61) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for reducing sugars (Table 5.). These results are conformity with the findings of Daleep *et al*. (2018) [3] in bitter gourd. The cross combinations VRG-23 x VRG-15 (75.12), Arka Prasan x VRG-14 (53.07), VRG-23 x VRG-15 (39.81), (75.21) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for non reducing sugars (Table 6.). These results are conformity with the findings of Daleep *et al*. (2018) [3] in bitter gourd. The cross combinations Swarna Manjari x Arka Prasan (39.64), (29.71), VRG-25 x VRG-15 (16.95), (38.00) expressed highest positive significant heterosis over mid parent, better parent and over the checks Aarti and Chitra respectively for fiber content (Table 6.). These results are conformity with the findings of Bairwa *et al*. (2017) [1] in ridge gourd.

Table 1: Analysis of variance for yield and quality attributing characters in 10x10 half diallel of ridge gourd

Source	Df	Number of fruits per vine	Fruit diameter (cm)	Fruit length (cm)	Fruit flesh thickness (mm)	Average fruit weight (g)	Number of seeds per fruit	Fruit yield per vine (kg)	Total soluble solids (^{O}B)
Mean Sum of Squares									
Treatments	54.00	9.69 **	3.80 *	38.95 **	11.66 **	4311.67 **	2811.96 **	0.94 **	0.92 **
Parents	9.00	6.35 *	3.84	21.75 *	9.38 **	2824.90 **	570.04 **	0.42 **	0.72 **
Hybrids	44.00	10.52 **	3.88 *	40.86 **	11.04 **	4713.69 **	3050.49 **	1.07 **	0.98 **
Parent Vs. Hybrid	1.00	3.29	0.23	110.03 **	59.86 **	3.70	12493.63 **	0.02	0.12
Error	54.00	2.56	2.29	9.55	0.00	299.61	48.05	0.09	0.12

Table 1: Cont…

Source	Df	Vitamin –C (mg/100g)	Carotene content (µg/ 100g)	Total sugars (%)	Reducing sugars (%)	Non- reducing sugars (%)	Fibre content (g/ 100g)
Mean Sum of Squares							
Treatments	54.00	0.64 **	65654.59 **	1.88 **	1.38 **	0.52 **	0.42 **
Parents	9.00	0.64 **	63808.48 **	0.69 **	0.45 **	0.50 **	0.32 **
Hybrids	44.00	0.48 **	65681.13 **	2.14 **	1.58 **	0.54 **	0.43 **
Parent Vs. Hybrid	1.00	7.37 **	81101.58 **	1.11 **	1.02 **	0.04	0.72 **
Error	54.00	0.20	2376.05	0.03	0.03	0.08	0.06

* and ** Significance at 5% and 1% level respectively.

Table 2: Estimation of average heterosis, heterobeltiosis and standard heterosis for yield attributing characters in 10x 10 half diallel of ridge gourd

Pedigree/Cross	NFV				FD				FL			
	AH	HB	SH		AH	HB	SH		AH	HB	SH	
			Aarti	Chitra			Aarti	Chitra			Aarti	Chitra
VRG-11 X VRG-23	-37.75 **	-38.56 **	4.44	-35.17 **	-2.49	-8.47	-16.67	-3.62	-4.87	-14.65	7.44	-24.91 *
VRG-11 X VRG-24	-47.26 **	-48.32 **	-14.44	-46.90 **	14.67	-2.62	-11.34	2.54	-36.11 **	-37.67 **	-21.54	-45.16 **
VRG-11 X VRG-25	-17.56	-22.82 *	27.78	-20.69	-11.50	-12.04	-19.92 *	-7.39	-1.19	-7.72	16.15	-18.82
VRG-11 X Swarna Manjari	-8.95	-21.48	30.00	-19.31	14.74	7.71	-1.94	13.41	-49.16 **	-50.76 **	-33.85 *	-53.76 **
VRG-11 X Arka Prasan	-13.74	-24.16 *	25.56	-22.07	-0.77	-2.96	-7.58	6.88	1.87	-5.07	19.49	-16.49
VRG-11 X VRG-13	-5.07	-12.08	45.56 *	-9.66	-10.80	-15.35	-22.93 *	-10.87	-42.72 **	-48.01 **	-19.74	-43.91 **
VRG-11 X VRG-14	-24.41 *	-35.57 **	6.67	-33.79 **	-5.75	-8.12	-16.35	-3.26	-22.59 *	-25.17 *	0.92	-29.46 *
VRG-11 X VRG-15	-30.66 **	-36.24 **	5.56	-34.48 **	-9.22	-12.59	-20.43 *	-7.97	-25.65 *	-25.66 *	-6.41	-34.59 **
VRG-11 X VRG-16	-34.38 **	-43.62 **	-6.67	-42.07 **	2.33	-0.07	-9.02	5.22	-16.04	-21.35	13.33	-20.79
VRG-23 X VRG-24	-20.27 *	-22.88 *	31.11	-18.62	34.06 **	20.39	-3.82	11.23	-11.65	-18.93	-2.92	-32.15 **
VRG-23 X VRG-25	-27.21 **	-32.68 **	14.44	-28.97 *	-31.51 **	-35.33 **	-41.85 **	-32.75 **	-2.21	-6.34	2.31	-28.49 *
VRG-23 X Swarna Manjari	-23.37 *	-34.64 **	11.11	-31.03 **	22.35 *	22.35	-2.26	13.04	-8.97	-20.61	6.67	-25.45 *
VRG-23 X Arka Prasan	-9.77	-21.57 *	33.33	-17.24	-8.05	-15.46	-19.49 *	-6.88	-10.32	-13.92	-6.41	-34.59 **
VRG-23 X VRG-13	6.43	-2.61	65.56 **	2.76	10.85	9.58	-10.40	3.62	-28.83 **	-41.36 **	-9.49	-36.74 **
VRG-23 X VRG-14	-20.16	-32.68 **	14.44	-28.97 *	21.66 *	17.03	-1.19	17.03	-15.28	-26.24 *	-0.51	-30.47 **
VRG-23 X VRG-15	-7.91	-16.34	42.22 *	-11.72	-13.74	-15.99	-29.20 **	-18.12	-6.47	-16.09	5.64	-26.16 *
VRG-23 X VRG-16	16.92	-0.65	68.89 **	4.83	-1.13	-5.05	-17.61	-4.71	15.34	-2.31	40.77 *	-1.61
VRG-24 X VRG-25	11.36	6.29	68.89 **	4.83	18.37	1.05	-9.15	5.07	10.64	5.78	26.67	-11.47
VRG-24 X Swarna Manjari	8.37	-4.90	51.11 **	-6.21	27.51 *	14.51	-8.52	5.80	-13.62	-18.32	9.74	-23.30 *
VRG-24 X Arka Prasan	8.59	-2.80	54.44 **	-4.14	8.88	-9.21	-13.53	0.00	14.70	9.42	31.03	-8.42
VRG-24 X VRG-13	3.70	-2.10	55.56 **	-3.45	28.62 *	14.33	-6.52	8.12	42.56 **	26.58 *	95.38 **	36.56 **
VRG-24 X VRG-14	0.81	-12.59	38.89 *	-13.79	18.16	2.54	-11.34	2.54	-15.41	-20.15	7.69	-24.73 *
VRG-24 X VRG-15	-5.22	-11.19	41.11 *	-12.41	9.32	-4.09	-19.17 *	-6.52	-2.92	-5.30	19.23	-16.67
VRG-24 X VRG-16	-26.40 *	-35.66 **	2.22	-36.55 **	14.17	-1.08	-14.16	-0.72	12.73	3.20	48.72 **	3.94
VRG-25 X Swarna Manjari	57.14 **	43.85 **	107.78 **	28.97 *	-10.70	-15.68	-24.19 *	-12.32	-7.58	-16.22	12.56	-21.33
VRG-25 X Arka Prasan	2.06	-4.62	37.78 *	-14.48	-10.32	-12.83	-16.98	-3.99	6.59	6.34	16.15	-18.82
VRG-25 X VRG-13	-8.17	-9.23	31.11	-18.62	-2.92	-7.32	-16.67	-3.62	-28.79 **	-39.20 **	-6.15	-34.41 **
VRG-25 X VRG-14	5.53	-4.62	37.78 *	-14.48	13.32	11.15	-0.06	15.58	-16.81	-24.71 *	1.54	-29.03 *
VRG-25 X VRG-15	22.35 *	20.00	73.33 **	7.59	-25.36 **	-27.70 *	-34.99 **	-24.82 *	-30.21 *	-34.83 **	-17.95	-42.65 **
VRG-25 X VRG-16	-7.17	-15.38	22.22	-24.14 *	-3.55	-5.23	-14.79	-1.45	-21.46	-30.96 **	-0.51	-30.47 **
Swarna Manjari X Arka Prasan	-10.41	-12.39	10.00	-31.72 **	-3.76	-11.51	-15.73	-2.54	15.61	4.58	40.51 *	-1.79
Swarna Manjari X VRG-13	-10.64	-17.32	16.67	-27.59 *	11.24	9.96	-10.09	3.99	-21.31 *	-26.41 *	13.59	-20.61

* and ** Significance at 5% and 1% levels. AH= average heterosis, HB= heterobeltiosis, SH= standard heterosis. NFV= Number of fruits per vine, FD= Fruit diameter, FL= Fruit length

Table 2: Cont….

Swarna Manjari X VRG-14	9.86	8.33	30.00	-19.31	8.47	4.35	-9.77	4.35	-32.19 **	-32.32 **	-8.72	-36.20 **
Swarna Manjari X VRG-15	-12.45	-18.40	13.33	-29.66 **	6.49	3.72	-12.59	1.09	-26.90 *	-29.20 *	-4.87	-33.51 **
Swarna Manjari X VRG-16	13.49	12.96	35.56	-15.86	-10.53	-14.08	-25.44 **	-13.77	12.34	8.54	56.41 **	9.32
Arka Prasan X VRG-13	0.00	-5.51	33.33	-17.24	-5.20	-11.91	-16.10	-2.97	-8.19	-21.76 *	20.77	-15.59

Arka Prasan X VRG-14	3.67	0.00	25.56	-22.07	-10.00	-14.14	-18.23	-5.43	19.58	7.98	45.64 **	1.79
Arka Prasan X VRG-15	-10.92	-15.20	17.78	-26.90 *	-8.55	-13.82	-17.92	-5.07	-13.01	-18.94	2.05	-28.67 *
Arka Prasan X VRG-16	31.82 *	28.32	61.11 **	0.00	-9.26	-13.29	-17.42	-4.49	-25.56 *	-34.70 **	-5.90	-34.23 **
VRG-13 X VRG-14	-21.55	-28.35 *	1.11	-37.24 **	-11.73	-14.13	-25.75 **	-14.13	-17.73	-22.92 *	18.97	-16.85
VRG-13 X VRG-15	20.63	19.69	68.89 **	4.83	-4.91	-6.32	-21.05 *	-8.70	-19.30	-26.74 *	13.08	-20.97
VRG-13 X VRG-16	13.68	4.72	47.78 **	-8.28	-4.46	-7.22	-19.49 *	-6.88	-12.37	-15.28	30.77	-8.60
VRG-14 X VRG-15	23.48	13.60	57.78 **	-2.07	-5.69	-6.88	-19.49 *	-6.88	-0.10	-3.42	30.26	-8.96
VRG-14 X VRG-16	51.89 **	50.47 **	78.89 **	11.03	11.75	11.55	-3.20	11.96	-8.46	-11.39	27.69	-10.75
VRG-15 X VRG-16	16.38	8.00	50.00 **	-6.90	-5.86	-7.22	-19.49 *	-6.88	-9.21	-14.95	22.56	-14.34
* and ** Significance at 5% and 1% level respectively.												

Table 3: Estimation of average heterosis, heterobeltiosis and standard heterosis for yield attributing characters in 10x 10 half diallel of ridge gourd

Pedigree/Cross	AFW				FFT				NSF			
	AH	HB	SH		AH	HB	SH		AH	HB	SH	
			Aarti	Chitra			Aarti	Chitra			Aarti	Chitra
VRG-11 X VRG-23	-37.62 **	-50.09 **	0.87	-28.32 **	13.73 **	5.17 **	33.47 **	-28.45 **	-9.27	-17.76 *	-40.65 **	-29.51 **
VRG-11 X VRG-24	-29.46 **	-46.22 **	8.69	-22.76 *	29.79 **	16.29 **	58.31 **	-15.14 **	-36.11 **	-37.49 **	-61.67 **	-54.48 **
VRG-11 X VRG-25	-27.28 **	-44.41 **	12.35	-20.16	-32.19 **	-39.72 **	-16.45 **	-55.21 **	8.57	-1.22	-29.30 **	-16.03 *
VRG-11 X Swarna Manjari	-32.56 **	-47.05 **	7.01	-23.95 *	58.86 **	56.16 **	68.36 **	-9.75 **	-7.76	-17.05 *	-39.07 **	-27.63 **
VRG-11 X Arka Prasan	-13.95	-37.45 **	26.41	-10.16	-9.19 **	-27.36 **	30.56 **	-30.01 **	12.55	8.96	-31.73 **	-18.92 **
VRG-11 X VRG-13	-45.03 **	-56.00 **	-11.08	-36.81 **	76.95 **	54.93 **	67.03 **	-10.46 **	2.15	1.06	-39.42 **	-28.05 **
VRG-11 X VRG-14	-45.87 **	-58.93 **	-17.00	-41.02 **	97.48 **	87.52 **	102.16 **	8.37 **	-12.65 *	-30.87 **	-30.42 **	-17.36 **
VRG-11 X VRG-15	-40.69 **	-55.69 **	-10.46	-36.37 **	9.04 **	-3.88 **	35.80 **	-27.20 **	-1.41	-13.07	-33.22 **	-20.68 **
VRG-11 X VRG-16	-47.57 **	-57.97 **	-15.05	-39.63 **	105.10 **	51.85 **	63.70 **	-12.24 **	129.27 **	121.64 **	39.28 **	65.42 **
VRG-23 X VRG-24	-13.16	-18.61	-1.26	-29.83 **	49.73 **	44.66 **	96.93 **	5.57 **	29.04 **	19.33 **	-13.87 **	2.29
VRG-23 X VRG-25	-11.86	-17.09	0.58	-28.52 **	-13.86 **	-17.50 **	14.37 **	-38.69 **	58.16 **	57.50 **	13.67 *	35.01 **
VRG-23 X Swarna Manjari	-6.29	-8.63	10.85	-21.23 *	21.14 **	10.27 **	39.95 **	-24.98 **	58.67 **	57.29 **	15.54 **	37.23 **
VRG-23 X Arka Prasan	-8.37	-19.55	-2.40	-30.64 **	-36.40 **	-45.75 **	-2.49	-47.73 **	57.63 **	47.23 **	6.26	26.21 **
VRG-23 X VRG-13	-24.15 *	-24.20 *	-7.94	-34.57 **	79.78 **	47.25 **	86.88 **	0.18	49.80 **	37.11 **	-1.04	17.53 **
VRG-23 X VRG-14	-20.93	-26.40 *	-10.71	-36.54 **	64.75 **	45.29 **	84.39 **	-1.16	33.24 **	14.39 **	15.14 **	36.75 **
VRG-23 X VRG-15	-17.84	-25.10 *	-9.13	-35.43 **	-20.84 **	-24.87 **	6.15 **	-43.10 **	-1.20	-4.19	-26.39 **	-12.58 *
VRG-23 X VRG-16	-24.40 *	-24.60 *	-8.04	-34.65 **	76.21 **	24.08 **	57.48 **	-15.58 **	68.08 **	57.21 **	13.46 *	34.76 **
VRG-24 X VRG-25	9.86	9.44	17.00	-16.85	-0.85	-1.74	36.21 **	-26.98 **	86.05 **	72.72 **	23.62 **	46.82 **
* and ** Significance at 5% and 1% level respectively. AH= average heterosis, HB= heterobeltiosis and SH= standard heterosis. AFW= Average fruit weight, FFT= Fruit flesh thickness, NSF= Number of seeds per fruit												

Table 3: Cont….

VRG-24 X Swarna Manjari	20.71	15.91	33.59 *	-5.06	82.37 **	60.95 **	119.10 **	17.45 **	14.16 *	4.72	-23.07 **	-8.63
VRG-24 X Arka Prasan	20.38	12.22	19.06	-15.39	1.34	-10.95 **	60.05 **	-14.20 **	34.22 **	32.79 **	-16.80 **	-1.19
VRG-24 X VRG-13	141.29 **	126.03 **	174.51 *	95.09 **	-52.33 **	-61.99 **	-48.26 **	-72.26 **	164.78 **	161.81 **	60.53 **	90.67 **
VRG-24 X VRG-14	-10.69	-11.34	-5.94	-33.16 **	102.21 **	73.09 **	135.63 **	26.31 **	-25.75 **	-40.26 **	-39.87 **	-28.58 **
VRG-24 X VRG-15	65.47 **	60.62 **	70.40 **	21.10 *	-1.92	-3.70 **	36.05 **	-27.07 **	1.96	-8.33	-29.58 **	-16.36 **
VRG-24 X VRG-16	71.66 **	60.43 **	95.66 **	39.05 **	19.13 **	-17.75 **	11.96 **	-39.98 **	138.78 **	135.89 **	48.23 **	76.06 **
VRG-25 X Swarna Manjari	-24.05 *	-26.80 *	-15.63	-40.04 **	-6.53 **	-18.15 **	13.46 **	-39.18 **	-6.96	-8.15	-32.53 **	-19.86 **
VRG-25 X Arka Prasan	26.63 *	17.63	25.76	-10.63	-36.86 **	-44.09 **	0.50	-46.13 **	32.44 **	24.19 **	-11.12 *	5.57
VRG-25 X VRG-13	-11.82	-17.10	0.69	-28.45 **	38.73 **	9.89 **	52.33 **	-18.34 **	65.04 **	51.63 **	8.52	28.89 **
VRG-25 X VRG-14	24.74 *	23.36	31.89 *	-6.27	46.05 **	24.09 **	72.01 **	-7.79 **	14.34 **	-2.17	-1.54	16.94 **
VRG-25 X VRG-15	-21.38	-23.97	-18.71	-42.23 **	63.68 **	62.14 **	129.07 **	22.80 **	-14.35 *	-17.28 *	-36.45 **	-24.52 **
VRG-25 X VRG-16	-14.64	-19.91	-2.32	-30.58 **	96.95 **	35.29 **	87.54 **	0.53	98.13 **	86.05 **	33.16 **	58.15 **
Swarna Manjari X Arka Prasan	28.14 *	15.05	32.61 *	-5.76	-15.86 **	-33.55 **	19.44 **	-35.98 **	112.68 **	97.04 **	44.74 **	71.91 **
Swarna Manjari X VRG-13	1.69	-0.90	20.35	-14.47	56.57 **	39.15 **	44.93 **	-22.31 **	-0.16	-9.34	-33.41 **	-20.99 **
Swarna Manjari X VRG-14	13.56	8.28	24.80	-11.31	78.27 **	72.09 **	79.24 **	-3.92 **	-15.22 **	-26.68 **	-26.20 **	-12.35 *
Swarna Manjari X VRG-15	3.51	-3.40	11.34	-20.88 *	55.47 **	35.04 **	90.78 **	2.27 **	40.16 **	37.09 **	5.32	25.09 **
Swarna Manjari X VRG-16	89.85 **	84.63 **	125.18 **	60.03 *	77.42 **	32.85 **	38.37 **	-25.82 **	106.01 **	91.12 **	40.40 **	66.75 **
Arka Prasan X VRG-13	63.70 **	43.66 **	74.48 **	24.00 *	21.82 **	-11.65 **	58.80 **	-14.87 **	28.53 **	25.75 **	-21.22 **	-6.43
Arka Prasan X VRG-14	30.86 *	22.83	28.42	-8.74	-28.79 **	-45.19 **	-1.50	-47.20 **	-15.39 **	-31.36 **	-30.92 **	-17.95 **
Arka Prasan X VRG-15	-0.74	-4.79	-4.92	-32.43 **	4.84 **	-6.38 **	68.27 **	-9.80 **	17.70 **	6.85	-17.92 **	-2.51
Arka Prasan X VRG-16	-21.87	-31.56 **	-16.52	-40.68 **	26.11 **	-18.76 **	46.01 **	-21.73 **	77.05 **	76.78 **	11.09 *	31.94 **
VRG-13 X VRG-14	-6.36	-12.87	5.82	-24.80 *	31.37 **	20.57 **	16.86 **	-37.36 **	-4.85	-24.09 **	-23.60 **	-9.26
VRG-13 X VRG-15	-22.83 *	-29.69 *	-14.61	-39.31 **	12.63 **	-11.41 **	25.17 **	-32.90 **	20.78 **	7.51	-17.40 **	-1.90
VRG-13 X VRG-16	4.81	4.58	27.56	-9.35	79.24 **	46.97 **	19.02 **	-36.20 **	5.52	3.09	-35.22 **	-23.06 **
VRG-14 X VRG-15	5.13	2.78	7.45	-23.64 *	0.42	-15.34 **	19.60 **	-35.89 **	-18.76 **	-28.37 **	-27.91 **	-14.38 *
VRG-14 X VRG-16	69.10 **	57.03 **	91.52 **	36.11 **	73.76 **	33.33 **	29.24 **	-30.72 **	-26.24 **	-40.09 **	-39.70 **	-28.39 **
VRG-15 X VRG-16	16.97	6.37	29.73 *	-7.80	89.51 **	29.51 **	82.97 **	-1.91 *	52.28 **	38.42 **	6.34	26.30 **
* and ** Significance at 5% and 1% level respectively.												

Table 4: Estimation of average heterosis, heterobeltiosis and standard heterosis for yield and quality attributing characters in 10x 10 half diallel of ridge gourd

Pedigree/Cross	FYV				TSS				AC			
	AH	HB	SH		AH	HB	SH		AH	HB	SH	
			Aarti	Chitra			Aarti	Chitra			Aarti	Chitra
VRG-11 X VRG-23	15.54	-11.64	-11.78	17.12	-10.76	-11.90	-11.65	-14.09	-7.80	-12.11	-2.51	29.42 *
VRG-11 X VRG-24	7.92	-17.38	-17.52	9.51	-15.06	-18.49	-11.08	-13.54	1.83	-9.74	0.11	32.90 *
VRG-11 X VRG-25	-23.38 *	-32.85 **	-32.96 **	-10.99	4.05	-5.38	-5.11	-7.73	-3.34	-12.99	-3.49	28.12 *
VRG-11 X Swarna Manjari	-16.28	-23.29 *	-23.41 *	1.69	-22.36 **	-26.40 **	-17.61	-19.89	-15.01 *	-19.06 *	-0.76	31.74 *
VRG-11 X Arka Prasan	5.51	-12.92	-13.06	15.43	3.35	1.93	5.11	2.21	-5.27	-15.16	-5.90	24.93
VRG-11 X VRG-13	-41.21 **	-47.21 **	-47.29 **	-30.02 *	56.31 **	29.75 **	30.11 **	26.52 **	-10.01	-14.57	-5.24	25.80
VRG-11 X VRG-14	-19.11 *	-24.72 *	-24.84 *	-0.21	14.69	2.83	3.13	0.28	-30.31 **	-30.41 **	-22.82 *	2.46
VRG-11 X VRG-15	-18.31	-30.62 **	-30.73 **	-8.03	0.43	0.28	0.57	-2.21	-15.71 *	-16.92	-5.13	25.94
VRG-11 X VRG-16	-12.90	-21.37 *	-21.50 *	4.23	-30.55 **	-37.16 **	-22.16 *	-24.31 *	-34.19 **	-37.01 **	-30.13 **	-7.25
VRG-23 X VRG-24	22.71	22.52	-35.03 **	-13.74	-38.19 **	-41.41 **	-36.08 **	-37.85 **	-24.85 **	-30.40 **	-30.02 **	-7.10
VRG-23 X VRG-25	22.39	4.24	-21.66 *	4.02	11.53	2.62	0.28	-2.49	-22.15 *	-26.71 **	-26.31 **	-2.17
VRG-23 X Swarna Manjari	9.13	-10.73	-25.80 *	-1.48	-34.42 **	-38.58 **	-31.25 **	-33.15 **	-34.83 **	-40.69 **	-27.29 **	-3.48
VRG-23 X Arka Prasan	20.54	9.31	-28.98 **	-5.71	-22.77 *	-24.79 *	-22.44 *	-24.59 *	-8.75	-14.55	-14.08	14.06
VRG-23 X VRG-13	-27.56 *	-39.68 **	-52.07 **	-36.36 **	-27.90 *	-39.53 **	-40.91 **	-42.54 **	-16.36	-16.72	-16.27	11.16
VRG-23 X VRG-14	-2.29	-21.11	-32.17 **	-9.44	16.03	5.23	2.84	0.00	-30.61 **	-33.76 **	-26.75 **	-2.75
VRG-23 X VRG-15	-9.35	-20.32	-44.43 **	-26.22	-22.70 *	-23.58 *	-23.58 *	-25.69 *	-29.74 **	-33.94 **	-24.56 *	0.14
VRG-23 X VRG-16	-29.51 *	-41.58 **	-53.03 **	-37.63 **	-1.03	-11.47	9.66	6.63	-29.73 **	-30.03 **	-29.04 **	-5.80
VRG-24 X VRG-25	2.36	-12.71	-34.39 **	-12.90	12.63	-1.30	7.67	4.70	-7.01	-8.61	-18.89	7.68
VRG-24 X Swarna Manjari	16.49	-4.60	-20.70 *	5.29	-5.91	-7.11	3.98	1.10	-26.73 **	-37.76 **	-23.69 *	1.30
VRG-24 X Arka Prasan	7.15	-2.70	-36.78 **	-16.07	-10.31	-12.76	-4.83	-7.46	-15.54	-16.54	-26.75 **	-2.75
VRG-24 X VRG-13	132.21 **	93.59 **	53.82 **	104.23 **	-6.32	-24.74 *	-17.90	-20.17 *	-15.67	-21.58 *	-21.83 *	3.77
VRG-24 X VRG-14	-7.67	-25.37 *	-35.83 **	-14.80	6.02	-8.33	0.00	-2.76	-15.13	-24.68 **	-16.70	10.58
VRG-24 X VRG-15	40.86 **	23.97	-13.54	14.80	-17.93 *	-21.35 *	-14.20	-16.57	-18.73 *	-28.87 **	-18.78	7.83
VRG-24 X VRG-16	103.10 **	68.51 **	35.51 **	79.92 **	-17.07 *	-22.02 **	-3.41	-6.08	-3.27	-10.76	-9.50	20.14
VRG-25 X Swarna Manjari	-55.33 **	-57.47 **	-64.65 **	-53.07 **	-37.63 **	-45.94 **	-39.49 **	-41.16 **	-8.99	-21.55 **	-3.82	27.68 *
VRG-25 X Arka Prasan	-6.36	-12.71	-34.39 **	-12.90	-33.44 **	-40.22 **	-38.35 **	-40.06 **	0.31	-0.25	-11.46	17.54
VRG-25 X VRG-13	-14.32	-16.63	-33.76 **	-12.05	41.00 **	27.34 *	4.55	1.66	-8.46	-13.47	-13.76	14.49
VRG-25 X VRG-14	2.96	-3.52	-17.04	10.15	-31.46 **	-32.53 *	-44.60 **	-46.13 **	-26.18 **	-33.46 **	-26.42 **	-2.32
VRG-25 X VRG-15	-36.48 **	-38.77 **	-53.98 **	-38.90 **	-3.59	-12.22	-12.22	-14.64	-10.49	-20.46 *	-9.17	20.58
VRG-25 X VRG-16	-11.36	-14.26	-31.05 **	-8.46	-26.07 **	-38.53 **	-23.86 *	-25.97 *	-2.76	-8.83	-7.53	22.75

* and ** Significance at 5% and 1% level respectively. AH= average heterosis, HB= heterobeltiosis and SH= standard heterosis. FYV= Fruit yield per vine, TSS= Total soluble solids, AC= Ascorbic acid content

Table 4: Cont….

Swarna Manjari X Arka Prasan	63.44 **	45.59 **	21.02 *	60.68 **	-20.74 *	-23.86 *	-14.77	-17.13	-18.84 *	-30.37 **	-14.63	13.33
Swarna Manjari X VRG-13	13.61	11.11	-7.64	22.62	42.58 **	13.45	26.99 *	23.48 *	-21.22 **	-28.58 **	-12.45	16.23
Swarna Manjari X VRG-14	-9.79	-11.30	-23.73 *	1.27	25.52 **	7.36	20.17	16.85	-30.06 **	-33.48 **	-18.45	8.26
Swarna Manjari X VRG-15	-1.67	-9.58	-24.84 *	-0.21	-14.21	-18.78 *	-9.09	-11.60	-18.67 *	-21.46 **	-3.71	27.83 *
Swarna Manjari X VRG-16	47.22 **	44.83 **	20.38 *	59.83 **	-32.53 **	-35.78 **	-20.45	-22.65 *	-11.40	-19.06 *	-0.76	31.74 *
Arka Prasan X VRG-13	19.07	8.22	-14.01	14.16	32.21 **	8.54	11.93	8.84	-7.98	-13.47	-13.76	14.49
Arka Prasan X VRG-14	29.32 *	13.52	-2.39	29.60 *	24.42 *	10.19	13.64	10.50	-11.83	-20.93 *	-12.55	16.09
Arka Prasan X VRG-15	3.31	-0.23	-30.41 **	-7.61	-0.42	-1.93	1.14	-1.66	9.19	-3.44	10.26	46.38 **
Arka Prasan X VRG-16	-38.66 **	-44.55 **	-55.41 **	-40.80 **	-22.15 **	-28.67 **	-11.65	-14.09	-6.98	-13.24	-12.01	16.81
VRG-13 X VRG-14	19.73	15.19	-0.96	31.50 *	48.93 **	36.43 **	8.52	5.52	-1.77	-6.61	3.28	37.10 **
VRG-13 X VRG-15	-41.52 **	-45.09 **	-56.37 **	-42.07 **	26.50 *	5.11	5.11	2.21	-5.77	-11.76	0.76	33.77 *
VRG-13 X VRG-16	-1.79	-2.38	-21.50 *	4.23	12.71	-13.53	7.10	4.14	-9.12	-9.90	-8.62	21.30
VRG-14 X VRG-15	-17.59	-25.37 *	-35.83 **	-14.80	36.08 **	22.16 *	22.16 *	18.78	-17.63 *	-18.93 *	-7.42	22.90
VRG-14 X VRG-16	-14.64	-17.41	-28.98 **	-5.71	36.59 **	12.16	38.92 **	35.08 **	4.63	0.30	10.92	47.25 **
VRG-15 X VRG-16	-11.98	-17.82	-33.92 **	-12.26	10.66	0.00	23.86 *	20.44 *	-9.47	-14.53	-2.40	29.57 *

* and ** Significance at 5% and 1% level respectively.

Table 5: Estimation of average heterosis, heterobeltiosis and standard heterosis for quality attributing characters in 10x 10 half diallel of ridge gourd

Pedigree/Cross	CC				TS				RS			
	AH	HB	SH		AH	HB	SH		AH	HB	SH	
			Aarti	Chitra			Aarti	Chitra			Aarti	Chitra
VRG-11 X VRG-23	5.61	-2.76	28.79 *	28.90 *	11.70 **	0.89	-23.40 **	0.00	-6.32	-10.19 *	-38.55 **	-17.88 **
VRG-11 X VRG-24	-53.27 **	-53.93 **	-38.99 **	-38.94 **	-8.50 **	-17.03 **	-37.56 **	-18.49 **	-1.45	-4.63	-36.00 **	-14.48 **
VRG-11 X VRG-25	-76.12 **	-79.99 **	-60.80 **	-60.77 **	-18.43 **	-31.43 **	-38.37 **	-19.54 **	-29.15 **	-39.55 **	-46.28 **	-28.21 **
VRG-11 X Swarna Manjari	26.91 **	10.24	46.00 **	46.13 **	38.21 **	34.27 **	-12.81 **	13.82 **	38.59 **	38.59 **	-13.01 **	16.25 **
VRG-11 X Arka Prasan	-75.32 **	-75.82 **	-66.62 **	-66.60 **	61.28 **	52.15 **	5.06 *	37.15 **	67.49 **	58.82 **	11.22 **	48.61 **
VRG-11 X VRG-13	-23.27 *	-41.87 **	-23.01 *	-22.95 *	8.71 **	-3.42	-23.87 **	-0.62	1.33	0.00	-35.53 **	-13.85 **
VRG-11 X VRG-14	21.18 *	-13.08	15.12	15.21	29.29 **	19.40 **	-13.69 **	12.68 **	31.73 **	24.66 **	-12.35 **	17.13 **
VRG-11 X VRG-15	-4.80	-24.68 **	-0.24	-0.16	30.33 **	17.39 **	-10.32 **	17.08 **	2.40	-3.21	-31.76 **	-8.82
VRG-11 X VRG-16	-53.37 **	-60.89 **	-48.20 **	-48.16 **	-6.22 *	-16.09 **	-34.93 **	-15.05 **	20.87 **	12.16 *	-29.59 **	-5.92
VRG-23 X VRG-24	-9.03	-15.11	9.22	9.31	24.00 **	23.45 **	-6.27 *	22.36 **	21.14 **	19.97 **	-17.91 **	9.70 *
VRG-23 X VRG-25	-61.04 **	-69.43 **	-40.13 **	-40.09 **	7.60 **	-0.75	-10.79 **	16.46 **	10.25 **	-2.44	-13.29 **	15.87 **
VRG-23 X Swarna Manjari	-28.47 **	-32.90 **	-25.21 *	-25.14 *	40.16 **	30.02 **	-1.28	28.87 **	60.34 **	53.72 **	5.18	40.55 **

VRG-23 X Arka Prasan	-55.73 **	-59.99 **	-44.78 **	-44.74 **	-19.53 **	-23.18 **	-41.67 **	-23.86 **	-17.22 **	-18.17 **	-42.70 **	-23.43 **
VRG-23 X VRG-13	10.06	-11.29	-1.11	-1.03	11.72 **	9.67 **	-13.55 **	12.85 **	11.06 *	7.85	-26.20 **	-1.39
VRG-23 X VRG-14	34.70 **	2.12	-13.83	13.92	20.84 **	17.94 **	-10.45 **	16.90 **	38.72 **	36.86 **	-3.77	28.59 **

* and ** Significance at 5% and 1% level respectively. AH= average heterosis, HB= heterobeltiosis, SH= standard heterosis. CC= Carotene content, TS= Total sugars, RS= Reducing sugars

Table 5: Cont….

VRG-23 X VRG-15	21.92 *	3.14	14.96	15.06	12.70 **	12.36 **	-14.16 **	12.06 **	-7.33	-8.69	-35.63 **	-13.98 **
VRG-23 X VRG-16	106.79 **	86.60 **	108.00 **	108.17 **	-29.79 **	-30.52 **	-46.12 **	-29.67 **	-22.53 **	-30.85 **	-52.69 **	-36.78 **
VRG-24 X VRG-25	-11.10	-26.34 **	45.25 **	44.37 **	-12.29 **	-19.43 **	-27.58 **	-5.46	-13.47 **	-24.07 **	-32.52 **	-9.82 *
VRG-24 X Swarna Manjari	-7.56	-18.70 *	4.60	4.69	33.81 **	24.64 **	-6.20 *	22.45 **	22.50 **	18.54 **	-20.45 **	6.30
VRG-24 X Arka Prasan	25.82 **	21.56 *	67.76 **	67.90 **	9.53 **	5.02	-20.97 *	3.17	22.75 **	20.19 **	-15.83 **	12.47 **
VRG-24 X VRG-13	-12.64	-33.16 **	-14.00	-13.93	17.99 **	15.31 **	-9.10 **	18.66 **	40.69 **	37.92 **	-7.45 *	23.68 **
VRG-24 X VRG-14	31.95 **	-4.52	22.85 *	22.95 *	2.56	0.54	-21.34 **	-1.23	5.90	3.49	-27.24 **	-2.77
VRG-24 X VRG-15	-3.24	-22.62 *	-0.44	-0.35	-25.03 **	-25.60 **	-43.16 **	-25.79 **	-5.07	-7.35	-34.68 **	-12.72 **
VRG-24 X VRG-16	-12.07	-25.38 **	-3.99	-3.91	11.47 **	9.83 **	-14.83 **	11.18 **	65.68 **	49.16 **	0.09	33.75 **
VRG-25 X Swarna Manjari	-57.04 **	-67.81 **	-36.96 **	-36.91 **	-23.17 **	-33.83 **	-40.53 **	-22.36 **	-37.73 **	-46.87 **	-52.78 **	-36.90 **
VRG-25 X Arka Prasan	-76.58 **	-80.04 **	-60.91 **	-60.87 **	-15.06 **	-24.91 **	-32.50 **	-11.88 **	-25.03 **	-32.98 **	-40.43 **	-20.40 **
VRG-25 X VRG-13	-19.93 **	-46.02 **	5.71	5.80	-23.10 **	-27.83 **	-35.13 **	-15.32 **	-15.80 **	-27.36 **	-35.44 **	-13.73 **
VRG-25 X VRG-14	-50.02 **	-67.67 **	-36.68 **	-36.63 **	-3.28	-12.75 **	-21.58 **	2.38	-23.27 **	-31.28 **	-38.93 **	-18.39 **
VRG-25 X VRG-15	-21.78 **	-45.49 **	6.76	6.85	-24.74 **	-30.38 **	-37.42 **	-18.31 **	-31.87 **	-38.92 **	-45.71 **	-27.46 **
VRG-25 X VRG-16	-77.39 **	-83.52 **	-67.73 **	-67.70 **	-9.06 **	-15.30 **	-23.87 **	-0.62	-12.23 **	-29.59 **	-37.42 **	-16.37 **
Swarna Manjari X Arka Prasan	-2.02	-16.35	15.45	15.54	7.90 *	4.69	-27.71 **	-5.63	-4.90	-9.83 *	-36.85 **	-15.62 **
Swarna Manjari X VRG-13	23.21	4.64	2.18	2.26	-0.84	-9.58 **	-28.73 **	-6.95 *	-10.22 *	-11.40 *	-42.88 **	-23.68 **
Swarna Manjari X VRG-14	94.34 **	54.43 **	50.80 **	50.92 **	-20.59 **	-24.63 **	-45.52 **	-28.87 **	-34.42 **	-37.94 **	-56.36 **	-41.69 **
Swarna Manjari X VRG-15	14.49	2.46	0.05	0.13	45.99 **	35.04 **	3.17	34.68 **	34.51 **	27.14 **	-10.37 **	19.77 **
Swarna Manjari X VRG-16	13.55	8.94	6.38	6.46	-4.12	-11.91 **	-31.69 **	-10.83 **	11.97 *	3.90	-34.78 **	-12.85 **
Arka Prasan X VRG-13	65.57 **	23.71 **	70.73 **	70.87 **	26.68 **	18.82 **	-6.34 **	22.27 **	37.77 **	32.30 **	-7.35 *	23.80 **
Arka Prasan X VRG-14	-68.23 **	-77.49 **	-68.94 **	-68.91 **	11.07 **	8.58 *	-21.51 **	2.46	-10.68 *	-10.86 *	-37.32 **	-16.25 **
Arka Prasan X VRG-15	-61.49 **	-69.99 **	-58.58 **	-58.54 **	8.11 **	2.91	-21.38 **	2.64	-12.81 **	-13.10 **	-38.74 **	-18.14 **
Arka Prasan X VRG-16	-61.61 **	-68.33 **	-56.29 **	-56.25 **	32.93 **	25.65 **	-2.56	27.20 **	47.14 **	30.01 **	-8.95 **	21.66 **
VRG-13 X VRG-14	119.25 **	102.09 **	37.87 **	37.98 **	-3.61	-7.61 *	-27.17 **	-4.93	-9.37 *	-13.14 **	-38.93 **	-18.39 **
VRG-13 X VRG-15	-60.41 **	-62.70 **	-71.23 **	-71.21 **	26.32 **	24.38 **	-1.96	27.99 **	47.07 **	40.78 **	-0.75	32.62 **
VRG-13 X VRG-16	38.30 **	21.74	9.21	9.30	4.10	3.25	-18.61 **	6.25 *	59.17 **	45.91 **	-5.94	25.69 **
VRG-14 X VRG-15	63.89 **	43.08 **	10.36	10.45	-0.41	-3.09	-25.96 **	-3.35	-0.54	-0.67	-29.97 **	-6.42
VRG-14 X VRG-16	-6.32	-23.11	-31.03 **	-30.97 **	-18.27 **	-21.04 **	-38.77 **	-20.07 **	12.61 **	-0.67	-30.16 **	-6.68
VRG-15 X VRG-16	-13.23	-19.32	-27.62 *	-27.56 *	-21.77 **	-22.35 **	-39.78 **	-21.39 **	-12.75 **	-23.13 **	-45.81 **	-27.58 **

* and ** Significance at 5% and 1% level respectively.

Table 6: Estimation of average heterosis, heterobeltiosis and standard heterosis for quality attributing characters in 10x 10 half diallel of ridge gourd

Pedigree/Cross	Non reducing sugars				Fibre content			
	MP	BP	SH		MP	BP	SH	
			Aarti	Chitra			Aarti	Chitra
VRG-11 X VRG-23	50.78 **	21.00	14.69	41.52 *	-10.48	-12.56	-36.27 **	-24.80 *
VRG-11 X VRG-24	-23.53	-38.86 **	-41.47 **	-27.78	-10.64	-20.75 *	-28.81 **	-16.00
VRG-11 X VRG-25	8.86	-11.79	-18.48	0.58	-23.93 **	-38.62 **	-30.51 **	-18.00
VRG-11 X Swarna Manjari	47.31 *	33.67	-5.92	16.08	12.61	4.60	-15.25	0.00
VRG-11 X Arka Prasan	44.55 *	34.52	-10.43	10.53	0.00	0.00	-30.51 **	-18.00
VRG-11 X VRG-13	22.42	-8.25	5.45	30.12	-12.28	-20.32	-32.20 **	-20.00
VRG-11 X VRG-14	23.24	7.36	-17.06	2.34	-35.42 **	-43.64 **	-47.46 **	-38.00 **
VRG-11 X VRG-15	75.12 **	42.60 **	30.09 *	60.53 **	-9.28	-21.43 *	-25.42 **	-12.00
VRG-11 X VRG-16	-15.33	-40.00 **	-17.54	1.75	7.55	1.29	-20.34 *	-6.00
VRG-23 X VRG-24	29.10 *	28.47	22.99	51.75 **	14.17	3.40	-7.12	9.60
VRG-23 X VRG-25	2.03	0.75	-4.50	17.84	-18.03 *	-32.63 **	-23.73 **	-10.00
VRG-23 X Swarna Manjari	-0.14	-13.00	-17.54	1.75	21.15 *	15.06	-6.78	10.00
VRG-23 X Arka Prasan	2.79	-12.50	-17.06	2.34	11.90	9.30	-20.34 *	-6.00
VRG-23 X VRG-13	12.77	2.89	18.25	45.91 **	28.76 **	19.52	1.69	20.00
VRG-23 X VRG-14	15.43	4.75	-0.71	22.51	0.00	-10.91	-16.95	-2.00
VRG-23 X VRG-15	50.32 **	47.50 **	39.81 **	72.51 **	1.01	-10.71	-15.25	0.00
VRG-23 X VRG-16	-24.90 *	-36.55 **	-12.80	7.60	-6.04	-9.48	-28.81 **	-16.00
VRG-24 X VRG-25	-9.82	-11.39	-15.17	4.68	-23.21 **	-31.14 **	-22.03 *	-8.00
VRG-24 X Swarna Manjari	56.06 **	35.40 *	29.62 *	59.94 **	-8.73	-13.21	-22.03 *	-8.00
VRG-24 X Arka Prasan	-18.54	-30.94 *	-33.89 *	-18.42	-9.79	-20.00 *	-28.14 **	-15.20
VRG-24 X VRG-13	-17.66	-24.54 *	-13.27	7.02	-19.77 *	-21.89 *	-29.83 **	-17.20
VRG-24 X VRG-14	-4.11	-13.37	-17.06	2.34	-3.70	-5.45	-11.86	4.00
VRG-24 X VRG-15	-61.98 **	-62.87 **	-64.45 **	-56.14 **	-28.44 **	-30.36 **	-33.90 **	-22.00 *
VRG-24 X VRG-16	-59.15 **	-65.34 **	-52.37 **	-41.23 *	-13.48	-18.87	-27.12 **	-14.00
VRG-25 X Swarna Manjari	10.92	-2.31	-9.72	11.40	-33.33 **	-42.81 **	-35.25 **	-23.60 *
VRG-25 X Arka Prasan	9.99	-5.38	-12.56	7.89	-27.64 **	-41.62 **	-33.90 **	-22.00 *

VRG-25 X VRG-13	-36.69 **	-42.89 **	-34.36 *	-19.01	-31.62 **	-40.12 **	-32.20 **	-20.00
VRG-25 X VRG-14	43.85 **	32.05 *	22.04	50.58 **	10.02	0.30	13.56	34.00 **
VRG-25 X VRG-15	-9.16	-9.74	-16.59	2.92	12.38	3.29	16.95	38.00 **
VRG-25 X VRG-16	-4.12	-19.83	10.19	35.96 *	-31.10 **	-41.62 **	-33.90 **	-22.00 *
Swarna Manjari X Arka Prasan	39.10 *	35.35	-4.74	17.54	39.64 **	29.71 **	5.08	24.00 *
Swarna Manjari X VRG-13	15.35	-7.01	6.87	31.87	-44.90 **	-46.22 **	-54.24 **	-46.00 **
Swarna Manjari X VRG-14	10.75	5.83	-18.25	0.88	-39.69 **	-43.64 **	-47.46 **	-38.00 **
Swarna Manjari X VRG-15	69.79 **	50.39 **	37.20 **	69.30 **	-27.55 **	-32.86 **	-36.27 **	-24.80 *
* and ** Significance at 5% and 1% level respectively. AH= average heterosis, HB= heterobeltiosis and SH= standard heterosis								

Table 6: Cont….

Swarna Manjari X VRG-16	-26.80 *	-44.66 **	-23.93	-6.14	-0.21	-1.67	-20.34 *	-6.00
Arka Prasan X VRG-13	6.01	-16.29	-3.79	18.71	5.26	-4.38	-18.64 *	-4.00
Arka Prasan X VRG-14	64.42 **	53.07 **	18.25	45.91 **	2.08	-10.91	-16.95	-2.00
Arka Prasan X VRG-15	54.95 **	34.03 *	22.27	50.88 **	36.08 **	17.86	11.86	32.00 **
Arka Prasan X VRG-16	11.27	-17.41	13.51	40.06 *	-3.89	-9.48	-28.81 **	-16.00
VRG-13 X VRG-14	6.54	-10.93	2.37	26.32	-39.16 **	-41.82 **	-45.76 **	-36.00 **
VRG-13 X VRG-15	-7.82	-17.32	-4.98	17.25	-7.72	-12.50	-16.95	-2.00
VRG-13 X VRG-16	-60.75 **	-63.97 **	-50.47 **	-38.89 *	5.18	1.20	-13.90	1.60
VRG-14 X VRG-15	-0.14	-7.79	-15.88	3.80	-13.51	-14.29	-18.64 *	-4.00
VRG-14 X VRG-16	-63.13 **	-71.21 **	-60.43 **	-51.17 **	-25.84 **	-31.64 **	-36.27 **	-24.80 *
VRG-15 X VRG-16	-34.09 **	-45.17 **	-24.64	-7.02	9.38	0.00	-5.08	12.00
* and ** Significance at 5% and 1% level respectively.								

Conclusion

The present investigation reveals that the cross combinations combinations *viz.,* VRG-24 x VRG-13, VRG-24 x VRG-16, Swarna Manjari x Arka Prasan and Swarna Manjari x VRG-16 were identified as promising for fruit length, average fruit weight and fruit yield per vine.

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