

Original Research Article

Mean Performance of Parents and Hybrids for Fruit Yield and Quality Attributing Characters in Ridge Gourd (*Luffa acutangula* (L.) Roxb.)

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ABSTRACT

Keywords

Ridge gourd, Mean performance, High yielding, Breeding programmes, Yield, Quality

The present investigation was carried out to know the mean performance of parents and hybrids for growth and yield attributing traits in ridge gourd at College of Horticulture, Venkataramannagudem, during 2018-19. Among the ten parents used for study VRG-11, Swarna Manjari, VRG-13 and VRG-24 were high yielding of 3.31, 2.61, 2.49 and 1.66 kg per vine, respectively. The hybrids VRG-24 x VRG-13, VRG-24 x VRG-16, Swarna Manjari x Arka Prasan and Swarna Manjari x VRG-16 recorded highest yield of 4.83, 4.25, 3.80 and 3.78 kg per vine, respectively in ridge gourd. Based on their mean performance parents can be used for further breeding programmes and hybrids could be exploited for cultivation.

Introduction

Ridge gourd (*Luffa acutangula* (L.) Roxb.) belongs to the family Cucurbitaceae and genus *Luffa*. Its chromosome number is $2n=2x=26$. It is also called as angled gourd, angled loofah, Chinese okra, silky gourd and ribbed gourd (Muthaiah *et al.*, 2017). Gourds are the important items in the human diet especially in India. The tender green or immature fruits are cooked as vegetable and used in preparations of chutney and curries. It is considered to be the old world species and is native of tropical Africa and South-East Asian region including India.

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.

Further, the crop being cultivated at wider spacing, the hybrid seed rate per hectare for commercial vegetable crops would be low and cost effective. Thus, ridge gourd offers greater scope for exploitation of hybrid vigour on commercial scale to increase the production/productivity. The genotypes performing well can be released as a variety or can be used further in heterosis breeding programme.

Materials and Methods

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 F₁ 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 attributing traits *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⁻¹), carotene content (µg 100g⁻¹), total sugars (%), reducing sugars (%), non reducing sugars (%) and fiber content (g 100g⁻¹) to see the mean performance of parents and hybrids.

Results and Discussions

In the analysis of mean squares the differences due to the treatments were significant for all the characters studied (Table-1). 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, number of seeds per fruit and other characters are non significant.

The results from *per se* performance (Table-2) of parents and hybrids revealed that, for the character number of fruits per vine,

parents took 15.30 (VRG-23) to 10.50 (VRG-14) and cross combinations took 18.70 (VRG-25 x Swarna Manjari) to 7.70 (VRG-11 x VRG-24). These results are conformity with the findings of Abusaleha and Dutta (1994), Rao *et al.* (2000) and Shaha and Kale (2003). For fruit length, average fruit weight and fruit yield per vine, the parents took 30.10 (VRG-13) to 19.50 (VRG-23), 246.12 (VRG-11) to 111.70 (Arka Prasan) and 3.13 (VRG-11) to 1.66 (VRG-23 and VRG-24) respectively, and cross combinations took 38.10 (VRG-24 x VRG-13) to 15.30 (VRG-11 x VRG-15), 334.33 (VRG-24 x VRG-13) to 99.00 (VRG-25 x VRG-15) and 4.83 (VRG-24 x VRG-13) to 1.11 (VRG-25 x Swarna Manjari). These results are conformity with the findings of Abusaleha and Dutta (1994) and Shaha and Kale (2003). For fruit diameter, fruit flesh thickness and number of seeds per fruit, the parents took 15.20 (Arka Prasan) to 10.15 (VRG-24), 10.82 (Arka Prasan) to 3.12 (VRG-16) and 135.50 (VRG-14) to 78.97 (VRG-11) respectively, and cross combinations took 16.15 (VRG-23 x VRG-14) to 9.28 (VRG-23 x VRG-25), 14.18 (VRG-24 x VRG-14) to 15.30 (VRG-11 x VRG-24) and 216.11 (VRG-24 x VRG-13) to 79.90 (VRG-11 x VRG-23). These results are conformity with the findings of Abusaleha and Dutta (1994) and Shaha and Kale (2003).

For the character total soluble solids, ascorbic acid content and carotene content, the parents took 4.36 (VRG-16) to 2.33 (VRG-13), 5.61 (Swarna Manjari) to 3.92 (VRG-24) and 852.63 (VRG-25) to 250.52 (VRG-14) respectively, and cross combinations took 4.89 (VRG-14 x VRG-16) to 1.95 (VRG-25 x VRG-14), 5.08 (VRG-14 x VRG-16) to 3.20 (VRG-11 x VRG-16) and 905.58 (VRG-23 x VRG-16) to 125.25 (VRG-13 x VRG-15). These results are conformity with the findings of Kumara *et al.*, (2001) and Acharya *et al.*, (2018) in bitter gourd.

Table.1 Analysis of variance for fruit yield and quality attributing traits 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 ⁻¹)	Carotene content (µg 100 g ⁻¹)	Total sugars (%)	Reducing sugars (%)	Non- reducing sugars (%)	Fibre content (g 100 g ⁻¹)
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 *Per se* performance of parents and hybrids for fruit yield and quality attributing traits in 10x10 half diallel of ridge gourd

Pedigree/Cross	Yield parameters							Quality parameters						
	NFV	FD	FL	FFT	AFW	NSF	FYV	TSS	AC	CC	TS	RS	NRS	FC
VRG-11 X VRG-23	9.40	13.30	20.95	8.03	122.85	9.40	2.77	3.11	4.46	560.73	5.68	3.26	2.42	1.88
VRG-11 X VRG-24	7.70	14.15	15.30	9.53	132.37	7.70	2.59	3.13	4.58	265.63	4.63	3.39	1.23	2.10
VRG-11 X VRG-25	11.50	12.78	22.65	5.03	136.83	11.50	2.10	3.34	4.42	170.64	4.57	2.85	1.72	2.05
VRG-11 X Swarna Manjari	11.70	15.65	12.90	10.13	130.33	11.70	2.40	2.90	4.54	635.66	6.46	4.61	1.98	2.50
VRG-11 X Arka Prasan	11.30	14.75	23.30	7.86	153.95	11.30	2.73	3.70	4.31	145.31	7.79	5.90	1.89	2.00
VRG-11 X VRG-13	13.10	12.30	15.65	10.05	108.30	13.10	1.65	4.58	4.34	335.18	5.64	3.42	2.22	1.55
VRG-11 X VRG-14	9.60	13.35	19.68	12.17	101.08	9.60	2.36	3.63	3.53	501.18	6.40	4.65	1.75	2.20
VRG-11 X VRG-15	9.50	12.70	18.25	8.17	119.05	9.50	2.17	3.54	4.34	434.31	6.65	3.62	2.74	2.35
VRG-11 X VRG-16	8.40	14.52	22.10	9.85	103.45	8.40	2.46	2.74	3.20	225.50	4.82	3.73	1.74	2.74
VRG-23 X VRG-24	11.80	15.35	18.93	11.85	120.25	11.80	2.04	2.25	3.20	475.53	6.95	4.35	2.59	2.25
VRG-23 X VRG-25	10.30	9.28	19.95	6.88	122.50	10.30	2.46	3.53	3.37	260.63	6.61	4.60	2.01	2.75
VRG-23 X Swarna Manjari	10.00	15.60	20.80	8.42	135.00	10.00	2.33	2.42	3.33	325.63	7.32	5.58	1.74	2.35
VRG-23 X Arka Prasan	12.00	12.85	18.25	5.87	118.86	12.00	2.23	2.73	3.93	240.40	4.32	3.04	1.75	3.00
VRG-23 X VRG-13	14.90	14.30	17.65	11.25	112.12	14.90	1.50	2.08	3.83	430.52	6.41	3.91	2.49	2.45
VRG-23 X VRG-14	10.30	16.15	19.40	11.10	108.75	10.30	2.13	3.62	3.35	495.57	6.64	5.10	2.09	2.50
VRG-23 X VRG-15	10.80	11.30	20.60	6.39	110.66	12.80	1.74	2.69	3.45	500.52	6.36	3.41	2.95	2.10
VRG-23 X VRG-16	15.20	13.15	27.45	9.48	112.00	15.20	1.47	3.86	3.25	905.58	3.99	2.51	1.84	2.30
VRG-24 X VRG-25	15.20	14.50	24.70	8.20	142.50	15.20	2.06	3.79	3.71	628.01	5.37	3.58	1.79	2.30
VRG-24 X Swarna Manjari	13.60	14.60	21.40	13.19	162.70	13.60	2.49	3.66	3.49	455.41	6.95	4.22	2.73	2.12
VRG-24 X Arka Prasan	13.90	13.80	25.55	9.63	145.00	13.90	1.98	3.35	3.35	730.39	5.86	4.46	1.39	2.07

Table.2 Cont....

VRG-24 X VRG-13	14.00	14.92	38.10	3.11	334.33	14.00	4.83	2.89	3.58	374.42	6.74	4.91	1.83	2.60
VRG-24 X VRG-14	12.50	14.15	21.00	14.18	114.55	12.50	2.01	3.52	3.81	534.86	5.61	3.86	1.75	1.95
VRG-24 X VRG-15	12.70	12.90	23.25	8.19	207.53	12.70	2.71	3.02	3.72	433.47	4.21	3.46	0.75	2.15
VRG-24 X VRG-16	9.20	13.40	29.00	6.74	238.30	9.20	4.25	3.40	4.14	418.01	6.31	5.31	1.00	1.91
VRG-25 X Swarna Manjari	18.70	12.10	21.95	6.83	102.75	18.70	1.11	2.13	4.40	274.46	4.41	2.50	1.90	1.95
VRG-25 X Arka Prasan	12.40	13.25	22.65	6.05	153.16	12.40	2.06	2.17	4.05	170.20	5.00	3.16	1.84	2.00
VRG-25 X VRG-13	11.80	13.30	18.30	9.17	122.62	11.80	2.08	3.68	3.95	460.25	4.81	3.42	1.38	3.35
VRG-25 X VRG-14	12.40	15.95	19.80	10.35	160.62	12.40	2.60	1.95	3.37	275.68	5.81	3.24	2.57	3.45
VRG-25 X VRG-15	15.60	10.37	16.00	13.79	99.00	15.60	1.44	3.09	4.16	464.79	4.64	2.88	1.76	1.95
VRG-25 X VRG-16	11.00	13.60	19.40	11.29	118.96	11.00	2.16	2.68	4.23	140.51	5.64	3.32	2.32	3.10
Swarna Manjari X Arka Prasan	9.90	13.45	27.40	7.19	161.50	9.90	3.80	3.00	3.91	502.63	5.36	3.35	2.01	1.35
SwarnaManjar X VRG-13	10.50	14.35	22.15	8.72	146.58	10.50	2.90	4.47	4.01	444.86	5.28	3.03	2.25	1.55
Swarna Manjari X VRG-14	11.70	14.40	17.80	10.79	152.00	11.70	2.39	4.23	3.73	656.52	4.04	2.31	1.72	1.88
Swarna Manjari X VRG-15	10.20	13.95	18.55	11.48	135.60	10.20	2.36	3.20	4.41	435.57	7.65	4.75	2.89	2.35
Swarna Manjari X VRG-16	12.20	11.90	30.50	8.33	274.25	12.20	3.78	2.80	4.54	463.13	5.06	3.46	1.60	2.40
Arka Prasan X VRG-13	12.00	13.39	23.55	9.56	212.50	12.00	2.70	3.94	3.95	743.30	6.94	4.91	2.03	2.45
Arka Prasan X VRG-14	11.30	13.05	28.40	5.93	156.40	11.30	3.06	4.00	4.00	135.24	5.82	3.32	2.49	3.30
Arka Prasan X VRG-15	10.60	13.10	19.90	10.13	115.80	10.60	2.18	3.56	5.05	180.34	5.83	3.25	2.58	2.10
Arka Prasan X VRG-16	14.50	13.18	18.35	8.79	101.66	14.50	1.40	3.11	4.03	190.32	7.22	4.83	2.39	1.60
VRG-13 X VRG-14	9.10	11.85	23.20	7.03	128.87	9.10	3.11	3.82	4.73	600.24	5.40	3.24	2.16	2.45
VRG-13X VRG-15	15.20	12.60	22.05	7.53	104.00	15.20	1.37	3.70	4.61	125.25	7.27	5.26	2.00	2.54
VRG-13 X VRG-16	13.30	12.85	22.50	7.16	155.35	13.30	2.46	3.77	4.18	475.47	6.03	4.99	1.04	2.40
VRG-14 X VRG-15	14.20	12.85	25.40	7.20	130.86	14.20	2.01	4.30	4.24	480.46	5.49	3.71	1.77	

Table.2 Cont....

VRG-14 X VRG-16	16.10	15.45	24.90	7.78	233.25	16.10	2.23	4.89	5.08	300.29	4.54	3.70	0.83	1.88
VRG-15 X VRG-16	13.50	12.85	23.90	11.01	158.00	13.50	2.07	4.36	4.47	315.13	4.46	2.87	1.59	2.80
Hybrid mean	12.11	13.50	21.92	8.92	144.82	12.15	2.37	3.34	4.01	407.06	5.76	3.85	1.94	2.29
VRG-11	14.90	14.53	24.54	6.49	246.12	14.90	3.13	3.53	5.08	576.63	4.54	3.33	1.21	2.05
VRG-23	15.30	12.75	19.50	7.64	147.75	15.30	1.66	3.44	4.60	480.29	5.63	3.63	2.00	2.15
VRG-24	14.30	10.15	23.35	8.19	129.20	14.30	1.66	3.84	3.92	560.18	5.58	3.56	2.02	2.65
VRG-25	13.00	14.35	21.30	8.34	130.20	13.00	2.36	2.89	4.06	852.63	6.66	4.71	1.95	3.34
Swarna Manjari	10.80	12.75	26.20	6.27	140.37	10.80	2.61	3.94	5.61	425.13	4.81	3.33	1.48	2.39
Arka Prasan	11.30	15.20	21.20	10.82	111.70	11.30	2.04	3.63	4.02	600.86	5.12	3.71	1.40	2.05
VRG-13	12.70	13.05	30.10	4.87	147.91	12.70	2.49	2.33	4.56	279.06	5.84	3.42	2.42	2.51
VRG-14	10.50	13.80	26.30	5.83	127.33	10.50	2.70	2.80	5.06	250.52	5.36	3.73	1.63	2.75
VRG-15	12.50	13.45	24.55	8.50	121.62	12.50	2.19	3.52	5.23	335.90	5.66	3.74	1.92	2.80
VRG-16	10.70	13.85	28.10	3.12	148.54	10.70	2.52	4.36	4.64	390.57	5.75	2.85	2.90	2.32
Parent mean	12.60	13.39	24.51	7.01	145.07	12.60	2.34	3.42	4.68	475.18	5.50	3.60	1.89	2.50
Aarti	9.00	15.96	19.50	6.02	121.79	9.00	3.14	3.52	4.58	435.37	7.41	5.30	2.11	2.95
Chitra	14.50	13.80	27.90	11.23	171.37	14.50	2.36	3.62	3.45	435.01	5.68	3.97	1.71	2.50
Check mean	11.75	14.88	23.70	8.63	146.58	11.75	2.75	3.57	4.02	435.19	6.55	4.64	1.91	2.73
Grand mean	12.21	13.53	22.43	8.57	144.75	12.21	2.38	3.36	4.12	420.40	5.73	3.83	1.93	2.34
SE±m	1.13	1.06	2.14	0.06	12.28	1.13	0.22	0.24	0.31	34.12	0.12	0.12	0.19	0.18
C. D at 5%	3.22	3.01	6.08	0.18	34.81	3.22	0.64	0.70	0.88	96.66	0.34	0.34	0.56	0.53
C. D at 1%	4.29	4.00	8.09	0.24	46.33	4.29	0.86	0.93	1.18	128.67	0.45	0.46	0.75	0.71

NFV= Number of fruits per vine, FD= Fruit diameter, FL= Fruit length, FFT= Fruit flesh thickness, AFW= Average fruit weight, NSF= Number of seeds per fruit, FYV= Fruit yield per vine, TSS= Total soluble solids, AC= Ascorbic acid content, CC= Carotene content, TS= Total sugars, RS= Reducing sugars, NRS= Non reducing sugars, FC= Fiber content.

For total sugars, reducing sugars and non reducing sugars, parents took 6.66 (VRG-25) to 4.54 (VRG-11), 4.71 (VRG-25) to 2.85 (VRG-16) and 2.90 (VRG-16) to 1.21 (VRG-11) respectively, and cross combinations took 7.79 (VRG-11 x Arka Prasan) to 4.04 (Swarna Manjari x VRG-14), 4.99 (VRG-13 x VRG-14) to 2.31 (Swarna Manjari x VRG-14) and 2.95 (VRG-23 x VRG-15) to 0.75 (VRG-24 x VRG-15). These results are conformity with the findings of Kumara *et al.*, (2001) and Acharya *et al.*, (2018) in bitter gourd. For fiber content, parents took 2.80 (VRG-15) to 2.05 (VRG-11, Arka Prasan) and cross combination took 3.45 (VRG-25 x VRG-15) to 1.35 (Swarna Manjari x VRG-13). Similar results are reported by Acharya *et al.*, (2018) in bitter gourd.

In conclusion, among ten parents studied VRG-25 and VRG-24 are identified as good general combiners as they made significant contribution towards fruit yield and quality attributing traits. The cross combination, VRG-25 x Swarna Manjari recorded highest number of fruits per vine.

The cross combination, VRG-24 x VRG-13 for fruit length, average fruit weight and fruit yield per vine. These studies were prerequisite for breeding programmes.

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