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Research Note

Exploitation of hybrid vigour in ridge gourd (*Luffa acutangula* Roxb L.)

V.A. Lodam, P.P. Patil and D.T. Desai
Department of Genetics and Plant Breeding,
Navsari Agricultural University, Navsari-396 450
Email: vaibhavlodam84@gmail.com

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Abstract
A study was conducted for accessing hybrid vigour of 28 crosses of ridge gourd over standard parent during late *Kharif* 2008 at N.A.U., Navsari. These hybrids were generated by half diallel mating design of eight diverse ridge gourd genotypes. Highly significant difference existed between genotypes for all studied traits. None of the hybrid showed consistent heterosis for all studied traits. In crosses, maximum heterosis was observed for fruit yield per vine followed by primary branches per vine. The highest economic heterosis was observed for fruit yield in ARGS 98-06 x ARGS 00-03 (63.81%) which was followed by ARGS 02-14 x ARGS 03-18 (37.38%), ARGS 04-23 x ARGS 00-03 (34.76%), ARGS 00-03 x ARGS 03-18 (31.67%), ARGS 02-14 x ARGS 98-06 (28.33%), ARGS 04-23 x ARGS 98-06 (26.67%) and SKNRG 21 x ARGS 03-18 (25.00%). These cross combination also showed heterosis for one or more yield contributing traits. Therefore, three hybrids *viz.*, ARGS 98-06 x ARGS 00-03, ARGS 02-14 x ARGS 03-18 and ARGS 04-23 x ARGS 00-03 were identified for evaluation at multi-location and for commercial exploitation.

Keys words: Ridge gourd, fruit yield, heterosis, yield components

Ridge gourd (*Luffa acutangula* Roxb) L.) is an important cucurbitaceous vegetable crop of India. Locally it is called as "Turia" (Gujarati) and in Sanskrit "Koshataki". It is grown commercially as a summer and rainy season crop. It is communally used for vegetable and fibre extraction. The fruits of ridge gourd are delicious and possess good medicinal properties. The edible portion of fruit contains protein, fat, minerals, fibre, carbohydrate, vitamin-A, thiamine, riboflavin, nicotinic acid, vitamin C, oxalic acid (Rahman *et al*. 2008). Seed of ridge gourd contains 18.3 to 24.3% oil and 18 to 25% protein.

In different parts of the country, still local strains of ridge gourd are commercially grown by farmers which result into very low yield. Poor performance of local varieties is due to genetic impurities. No doubt, there are few improved varieties of ridge gourd available in our country and are exploited commercially. Therefore, more emphasis should be paid toward the development of high yield varieties or hybrids. Exploitation of hybrid vigour has been recognized as an important tool for making genetic improvement of yield and its attributing characters in ridge gourd by several earlier workers. Therefore, a study was conducted to evaluate the heterosis of 28 hybrids population of ridge gourd.

The experimental material use for the present investigation comprised of eight genetically diverse parents *viz*. ARGS 02-14, ARGS-04-23, SKNRG 21, ARGS 02-15, ARGS 98-06, Pusa Nasdar, ARGS 00-03 and ARGS 03-18. All these accession were collected from Main Vegetable Research Station, Anand Agricultural University, Anand. These parents were crossed by half diallel mating design excluding the reciprocals. The resulting 28 hybrids along with 8 parents (total entries 36) were grown in randomized block design (RBD) with three replications during *Kharif*-2008 at Regional Horticultural Research Station, Navsari Agricultural University, Navsari. Rows were space planted 2m apart and inter plant distance was kept at 1m. All the recommended agronomic package of practices was followed to grow a healthy crop. In each replication, five competitive plants were identified randomly for recording data on first female flowering node, sex ratio, main

vine length (m), primary branches per vine, fruit length (cm), fruit girth (cm), average fruit weight (g) and fruit yield per vine (Kg).The standard procedures were followed for analysis of variance (Gomez and Gomez, 1984) and estimation of heterosis over standard variety Pusa Nasdar (SV) as per method of Fonseca and Patterson (1968).

From the ANOVA, it was observed that the mean squares due to hybrids as well as parents were significant for all the characters (Table 1). This revealed the presence of genetic variability among the hybrids as well as parents under study. The variance due to parents against hybrids was found significant for all the traits except for first female flowering node and sex ratio. Thus, performance of parents and hybrids was completely different from each other for all the traits and existence of overall heterosis was evident from significance of parents *vs*. hybrids.

The primary objective of heterosis breeding is to achieve a quantum jump in yield of crop plants. Heterosis over standard parent for eight characters is presented in Table 2. The results indicated that the phenomenon of heterosis was of a general occurrence for almost all the characters under study. Several workers reported substantial heterosis for various agronomic characters by Mole *et al*. (2001) and Gautham *et al*. (2004).

In the present study, none of the hybrid was found consistently superior to others for all the characters.Cross combination ARGS 02-14 x ARGS 03-18 produced the highest significant standard heterosis for fruit yield per vein and also positive economic heterosis for yield components traits *viz* sex ratio, main vein length, fruit length, fruit girth and average fruit weight. Similarly, in theremaining crosses showing economic heterosis for fruit yield also exhibited heterosis for at least one or more yield contributing characters. This supports the long held view that total yield could be the result of "combinational heterosis" (Harberg, 1952) i.e., expression of heterosis due to favorable combination of yield components in a hybrid. Patel and Desai (2008), Rehana *et al*. (2009), Sharma, *et al*. (2012) and Mule *et al*. (2012) reported that those crosses which are superior in yield also exhibited heterosis in one or more yield contributing component traits. On the basis of above results, these cross combinations could be recommended for commercial exploitation of heterosis. This should be tested over other locations and years to further confirm its worth.

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Table 1. Analysis of variance for various characters in ridge gourd

Sources of variation	d. f.	1st female flowering node	Sex ratio	Main vine length (m)	Primary branches/vine	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Fruit yield/ vine (Kg)
Replication	2	0.23	3.17	0.11	2.31	5.83	3.61	41.71	0.09
Genotype	35	9.96**	179.57**	4.49**	7.33**	73.48**	11.14**	2699.18**	0.40**
Parents	7	17.19**	212.74**	4.47**	6.64**	116.32**	10.12**	2047.41**	0.23**
Hybrids	27	8.44**	177.45**	4.18**	7.24**	61.41**	11.20**	2877.05**	0.24**
Parents *vs.* Hybrids	1	0.21	4.56	12.86**	14.46**	99.21**	16.55**	2459.22**	5.80**
Error	70	0.70	14.16	0.26	0.78	5.46	2.07	125.78	0.03

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

Table 2. Estimates of heterosis (%) over standard variety (SV) for various characters in ridge gourd

Hybrids	1st female flowering node	Sex ratio	Main vine length (m)	Primary branches/ vine	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Fruit yield/vine (Kg)
ARGS 02-14 x ARGS 04-23	2.22	-20.25	-33.30**	-24.39*	-2.65	21.31*	-3.89	-1.90
ARGS 02-14 x SKNRG 21	3.78	-9.26	-51.53**	-47.28**	-19.12**	13.11	-7.70	-5.71
ARGS 02-14 x ARGS 02-15	5.78	5.68	-42.61**	-11.61	-18.56**	9.02	-4.02	9.52
ARGS 02-14 x ARGS 98-06	10.00*	42.59**	-18.18*	-24.78*	-27.07**	17.49	14.38*	28.33*
ARGS 02-14 x Puas Nasdar	4.00	0.37	4.55	-5.33	15.48*	-7.10	12.57*	5.24
ARGS 02-14 x ARGS 00-03	16.89**	-3.70	-35.80**	8.94	-8.49	19.13	20.42**	-4.29
ARGS 02-14 x ARGS 03-18	5.11	-33.33**	-21.02**	-29.06*	-12.24	43.44**	22.93**	37.38**
ARGS 04-23 x SKNRG 21	4.89	-18.89	-44.32**	4.00	-16.31*	-22.13*	-27.28**	20.24
ARGS 04-23 x ARGS 02-15	12.00*	1.98	-13.07	-12.56	-12.31	13.66	-22.48**	-5.95
ARGS 04-23 x ARGS 98-06	13.78**	-8.64	-37.50**	-16.28	-1.50	1.64	-19.69**	26.67*
ARGS 04-23 x Puas Nasdar	14.67**	-23.93*	11.36	-2.33	16.54*	-0.27	-13.82*	2.86
ARGS 04-23 x ARGS 00-03	23.56**	-2.38	-22.16**	36.11**	-4.90	27.60**	-11.24	34.76**
ARGS 04-23 x ARGS 03-18	7.11	-0.63	-10.74	-32.78**	13.95*	4.92	-40.98**	12.86
SKNRG 21 x ARGS 02-15	-21.78**	21.73	-38.64**	-6.67	-20.34**	13.93	2.60	-30.71**
SKNRG 21 x ARGS 98-06	-9.78*	8.40	-21.59**	2.22	-33.05**	5.74	11.57*	5.48
SKNRG 21 x Puas Nasdar	3.56	40.25**	10.23	-23.33	27.41**	20.77*	25.04**	12.38
SKNRG 21 x ARGS 00-03	-23.78**	68.64**	-16.48*	5.00	11.91	42.35**	-13.15*	6.67
SKNRG 21 x ARGS 03-18	-3.33	-7.78	-1.70	-45.94**	1.18	21.31*	-24.47**	25.00*
ARGS 02-15 x ARGS 98-06	10.44*	17.90	-15.91*	-15.39	-19.54**	11.75	8.97	-1.90
ARGS 02-15 x Puas Nasdar	10.67*	45.43**	-8.24	58.33**	8.24	-13.39	-10.72	4.76
ARGS 02-15 x ARGS 00-03	3.11	39.75**	-36.36**	33.33**	-5.48	32.24**	17.17**	-34.29**
ARGS 02-15 x ARGS 03-18	0.22	-8.52	-3.47	20.00	7.42	9.56	-21.12**	5.48
ARGS 98-06 x Puas Nasdar	17.33**	-27.63*	11.36	-10.00	5.38	12.30	15.15**	10.48
ARGS 98-06 X ARGS 00-03	10.89*	-38.41**	-22.22**	23.33	19.44**	34.97**	32.30**	63.81**
ARGS 98-06 x ARGS 03-18	-9.33*	-11.74	-4.55	-41.67**	14.55*	-3.28	21.71**	10.71
Puas Nasdar x ARGS 00-03	20.22**	67.52**	-30.11**	26.11*	0.11	19.40*	14.40*	-14.05
Puas Nasdar x ARGS 03-18	14.44**	23.21*	-25.00**	-25.00*	13.12*	12.57	-23.02**	-1.67
ARGS 00-03 x ARGS 03-18	5.56	11.86	34.09**	-15.56	-5.59	37.70**	-12.36*	31.67**

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