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Studies on Heterosis for Yield and Yield Contributing Characters in Ridge Gourd (*Luffa acutangula* L.)

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Abstract

Half diallel analysis was carried out during *kharif*- 2016 at Instructional-Cum-Research Farm, Department of Horticulture, College of Agriculture, Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani to study the heterosis *per cent* for yield and yield contributed characters. The 21 F_1 hybrids along with their seven parent ware evaluated. Observation were recorded on five randomly selected tagged plant from each treatment for yield and yield attributing character viz., length of vine, no. of nodes plant^{-1}, length of fruit, diameter of fruit, no. of fruit vine^{-1}, wt. of fruit, no. of fruit vine^{-1}, wt. of fruit, wt. of fruit vine^{-1}, fruit yield ha^{-1}. The values of F_1 averaged over replications were used for estimating heterosis. Manifestation of heterosis of higher order for number of fruit vine^{-1}, length of fruit, weight of fruit, weight of fruit vine^{-1} and fruit yield ha^{-1}. The maximum heterosis over better parent for fruit yield ha^{-1} was observed to be 38.58% and that over useful heterosis was found 84.42%. Three potential heterosis cross combinations viz. Arka Sujat×Krishna-51, Krishna-51×Kranti-30 and Krishna-51×Swati Green were identified as for promising for fruit yield per ha^{-1} The significant heterosis crosses involved high×high, low×high, low×low and high×low performance of parents. They have also exhibited higher additive variance. Hence, they may be exploited for development of hybrid in ridge gourd.

Keywords: Ridge gourd (*Luffa acutangula* L.), genotype, heterosis

1. Introduction

Ridge gourd (*Luffa acutangula* L.) is one of the popular vegetable crops belonging to the family cucurbitaceae. It is extensively cultivated throughout India; but it is more popular in south and east part of India. Ridge gourd has good nutritive value. Heterosis breeding has been a recognized practical tool in providing the breeder a means for increasing the yield and other economic traits.

The hybrid vigour or the superiority of the hybrids (F_1) over parents may be manifested in terms of high productivity, uniformity, improved quality, built in resistance, environmental condition, earliness etc. However, it never happens that each hybridization is accompanied by the manifestation of hybrid vigour. Only certain pair of parents gives heterotic progeny. Therefore, for development of an effective heterosis breeding programme in ridge gourd one needs to elucidate the genetic variance nature and magnitude of quantitively inherited traits and estimate parents in hybrid combinations. The hybrid vigour is at the maximum in hybrid (F_1). The attempts of commercial production of hybrids (F_1) in vegetables in general and the cucurbits in particular was started as a early as 1935 in Japan and 1940 in USA (Singh and Swarup, 1971) .

Heterosis for yield and yield contributing characters has been reported in ridge gourd by Mole et al. (2001), Hedau and Sirohi (2004), Naliyadhara et al. (2007), Karmakar (2011), Kumar et al (2011) Narasannavar et al. (2014), Radha Rani (2014) and Kannan et al. (2015).

2. Materials and Methods

The inbred lines of seven genotypes namely Kokan Harita (P_1), Arka sujat (P_2), Pusa Nasdar (P_3), Krishna-51(P_4), Jaipuri(P_5), Krishna-30 (P_6), Swati Green (P_7) were selected for the purpose of crossing programme and sown in crossing block at Instructional-Cum Research Farm, Department of Horticulture, College of Agriculture, Latur. The 21 F_1 hybrids along with their seven parent ware evaluated. Observation were recorded on five randomly selected tagged plant from each treatment for yield and yield attributing character viz. ,length of vine, no. of nodes plant^{-1}, length of fruit, diameter of fruit, no. of fruit vine^{-1}, wt. of fruit, no. of fruit vine^{-1}, wt. of fruit, wt. of fruit vine^{-1}, fruit yield ha^{-1}. The values of F_1 averaged over 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) and per cent superiority over standard hybrid check were calculated. The analysis of variance, for all traits under study, was carried out

the method suggested by Panse and Sukhatme (1985).

3. Result and Discussion

Analysis of variance for yield and yield component in Table 1. The treatment means were further sub divided in to parents, crosses and parent versus crosses. The parents showed significant differences for the characters like length of vine, days required to first harvest, length of fruit, diameter of fruit,

Table 1: Analysis of variance for yield and yield component

Source	d.f.	Length of vine (cm)	No. of nodes plant^{-1}	No. of female flower vine^{-1}	Days required to first harvest	Length of fruit (cm)	Diameter of fruit (cm)	No. of fruits vine^{-1}	Wt.of fruit (g)	Wt. of fruit vine^{-1} (kg)	Fruit yield ha^{-1} (q)
Treatment	27	4687.57**	6.456**	5.44**	4.85**	20.95**	0.087	3.89**	282.64**	0.17**	3285.31**
Parent	6	2930.47**	0.472	3.60	5.11**	11.22*	0.096**	1.13	266.42**	0.27**	3346.03**
Crosses	20	5449.00**	8.436**	4.28**	4.98**	23.91**	0.088*	3.25**	295.45**	0.14**	3276.40**
P×C	1	22562.71**	2.751	39.72**	0.72	20.06**	1.94**	33.17**	123.58**	0.10	3099.18**
Error	27	174.10	2.269	2.08	1.26	3.19	0.047	0.86	1.23	0.06	276.38

weight of fruit, wt. of fruit vine^{-1} and wt. of fruit ha^{-1} and other characters are non-significant. The crosses showed significant for all characters.

Per cent heterosis over better parent and standard hybrid in Table 2. The cross combination Kokan Harita×Kranti-30 (30.70%) exhibited highest positive significant heterosis over better parents and the cross combination Kokan Harita×Jaipuri (39.86%) recorded significantly highest positive heterosis over

Table 2: Per cent heterosis over better parent and standard hybrid check for yield and yield component

Parent/ Crosses	Length of vine (cm)		No. of nodes plant^{-1}		No. of female flower vine^{-1}		Days required to first harvest		Length of fruit (cm)	
	BP	SH	BP	SH	BP	SH	BP	SH	BP	SH
Kokan Harita×Arka Sujat	-8.39*	5.49	-5.71	-6.13	16.15	20.28*	-2.13	2.99	45.88**	52.36**
Kokan Harita×Pusa Nasdar	29.60**	37.00**	10.99**	10.50**	-0.03	14.12	0.17	5.97**	4.80	11.75
Kokan Harita×Krishna-51	-20.87**	1.11	-6.15	-6.56	-2.92	13.97	-5.67**	-0.75	6.50	12.85
Kokan Harita×Jaipuri	15.75**	39.86**	30.11**	29.54**	19.23*	22.73*	-0.71	-4.48*	-33.68**	-11.42
Kokan Harita×Kranti-30	30.70**	32.90**	6.37*	5.91*	-4.02	-1.19	-4.96**	3.12	29.83**	35.60**
Kokan Harita×Swati Green	26.15**	25.39**	-6.81	-7.22	8.69	11.89	-4.96**	-2.12	-14.92	-11.14
Arka Sujat×Pusa Nasdar	11.11**	27.94**	3.30	2.84	4.27	19.03*	-4.38*	-2.24	-3.43	2.98
Arka Sujat×Krishna-51	-25.88**	-5.30	-2.86	-3.28	9.86	28.98**	-2.92	-0.75	15.31	22.19*
Arka Sujat×Jaipuri	-11.63**	6.78	3.30	2.84	11.83	15.81	-3.65*	-1.49	-29.96**	-6.44
Arka Sujat×Kranti-30	-27.46**	-16.47**	-2.86	-3.28	17.60*	21.78*	-2.19	1.12	9.77	7.79
Arka Sujat×Swati Green	-11.15**	2.31	-4.84	-5.25	25.89**	30.36**	-5.84**	-3.73*	43.61**	41.03**
Pusa Nasdar×Krishna-51	-18.04**	4.71	2.20	1.75	-0.31	17.03	1.49	1.49	-2.14	4.36
Pusa Nasdar×Jaipuri	-15.40**	2.23	0.22	-0.22	1.07	15.38	-1.49	-1.49	12.53	50.31**
Pusa Nasdar×Kranti-30	-9.75*	-4.60	-0.22	-0.66	6.49	21.57*	-0.75	-0.75	7.86	15.02
Pusa Nasdar×Swati Nreen	12.00**	18.39**	4.62**	4.16	-11.22	1.35	-0.75	0.75	1.40	8.13
Krishna-51×Jaipuri	-5.88	20.26**	1.76	1.31	-0.94	16.30	1.50	1.48	-8.53	22.19*
Krishna-51×Kranti-30	-23.13**	-1.78	-16.48*	-16.85*	-3.03	13.85	0.75	-2.99	-11.68	-6.41
Krishni-51×Swati Green	-6.59	19.35**	-7.47	-7.88	0.21	17.65	-2.26	-0.75	-4.03	1.69
Jaipuri×Kranti-30	-36.18**	-22.88**	2.86	2.41	32.50**	32.66**	-2.20	1.20	-24.93**	0.28
Jaipuri×Swati Green	-29.56**	-14.88**	-4.18	-4.60	10.77	10.91	0.75	2.99	-28.97**	-5.12
Kranti-30 x Swati Green	8.66	10.48*	-1.76	-2.19	3.35	0.12	3.76	2.90	36.80**	-5.12

Continue...

Parent/ Crosses	Length of vine (cm)		No. of nodes plant^{-1}		No. of female flower vine^{-1}		Days required to first harvest		Length of fruit (cm)	
	BP	SH	BP	SH	BP	SH	BP	SH	BP	SH
SEd±	13.19	13.19	1.50	1.50	1.44	1.44	1.12	1.12	1.78	1.78
CD (*p*=0.05)	27.07	27.07	3.09	3.09	2.96	2.96	2.30	2.30	3.67	3.67
CD (*p*=0.01)	36.55	36.55	4.17	4.17	4.00	4.00	3.11	3.11	4.95	4.95

Table 2: Continue...

Parent/ Crosses	Diameter of fruit (cm)		No. of fruits vine^{-1}		Wt. of fruit (g)		Wt. of fruit vine^{-1} (kg)		Fruit yield ha^{-1} (q)	
	BP	SH	BP	SH	BP	SH	BP	SH	BP	SH
Kokan Harita×Arka Sujat	-17.90*	2.11	2.10	15.05*	4.85**	33.06**	10.85*	64.96**	4.36	74.71**
Kokan Harita×Pusa Nasdar	-8.79	-0.38	3.01	16.08*	-0.51	26.27**	-33.07**	-0.39	-3.59	61.41**
Kokan Harita×Krishna-51	-4.57	4.22	6.99	20.57**	2.27*	29.79**	10.85*	64.96**	6.33	78.02**
Kokan Harita×Jaipuri	8.63*	23.22**	8.53	22.30**	-17.56**	4.63	-21.96	16.14	-20.38**	33.30**
Kokan Harita×Kranti-30	8.44*	18.43*	-3.39	12.21	-17.33**	4.92	-20.90	17.72	-23.01**	28.90*
Kokan Harita×Swati Green	3.69	13.24	1.47	14.34	-15.44**	7.32	-21.16	17.32	-18.62**	36.24**
Arka Sujat×Pusa Nasdar	0.31	24.76**	18.84*	27.74**	8.93**	30.26**	-4.93	36.61*	-4.18	42.56**
Arka Sujat×Krishna-51	-17.28*	2.88	47.43**	53.82**	10.93**	32.65**	5.14	37.01*	38.58**	84.42**
Arka Sujat×Jaipuri	-3.09	20.54*	6.87	17.65**	7.20**	28.20**	-4.83	24.02	14.62	52.53**
Arka Sujat×Kranti-30	-22.53**	-3.65	12.21	30.34**	-12.88**	4.18	3.02	34.25	4.26	38.74**
Arka Sujat×Swati Green	-10.49	11.32	18.58*	26.24**	-1.19	18.16**	-3.32	25.98	9.56	45.79**
Pusa Nasdar×Krishna-51	1.49	4.61	17.45*	26.24**	-22.17**	-9.14**	-15.07	22.05	-6.59	38.97**
Pusa Nasdar×Jaipuri	-0.68	12.67	1.72	11.98	-9.64**	6.87	-30.14*	0.39	-25.99**	10.10
Pusa Nasdar×Kranti-30	8.01	11.32	19.00**	38.22**	-11.35**	4.85	-8.22	31.98	-8.19	36.59**
Pusa Nasdar×Swati Nreen	9.17*	14.20	7.26	15.29*	-18.62**	-3.74**	-39.45**	-12.99	-36.34**	-5.30
Krishna-51×Jaipuri	-9.81	2.30	10.31*	21.43**	17.87**	25.93**	19.41**	11.42	-19.60*	-5.86
Krishna-51×Kranti-30	3.17	6.33	3.12	19.78*	3.79**	10.89**	22.08**	15.35	35.58**	43.20**
Krishni-51×Swati Green	6.61	11.52	17.32*	24.90**	-2.90**	3.74	9.72	-6.69	21.59*	37.48**
Jaipuri×Kranti-30	-13.20	-1.54	3.66	20.41**	3.74**	10.40**	6.25	0.39	-10.61	4.67
Jaipuri×Swati Green	-4.40	8.45	1.00	11.19	11.53**	8.82	7.12	-6.69	3.26	20.90
Kranti-30 x Swati Green	0.18	4.80	-2.17	13.63	0.04	6.46	4.58	-1.18	-6.04	6.24
SEd±	0.21	0.21	0.93	0.93	1.11	1.11	0.21	0.21	16.26	16.26
CD (*p*=0.05)	0.44	0.44	1.90	1.90	2.27	2.27	0.44	0.44	34.11	34.11
CD (*p*=0.01)	0.59	0.59	2.57	2.57	3.07	3.07	0.59	0.59	46.06	46.06

standard check for length of vine Similarly result recorded by Shaha and Kale (2003), Hedau and Sirohi (2004).

The cross combinations Kokan Harita×Jaipuri (30.11%) exhibited positively highest significant heterosis over better parents and the cross combination Kokan Harita×Jaipuri (29.54%) recorded significantly highest positive heterosis over standard check for number of nodes vine^{-1}. The cross combination Jaipuri×Kranti-30 (32.50%) exhibited highest significant heterosis over better parent and the cross combination Jaipuri×Kranti-30 (32.66%) recorded significantly highest positive heterosis over standard check for number of female flower. The cross combination Kokan Harita×Krishna-51 (-5.84%) exhibited highest significant negetive heterosis over better parents and the cross combination Kokan Harita×Jaipuri (-4.48%) recorded significantly highest negative heterosis over standard check for days required to first harvest. Similarly result recorded by Narasannavar et al. (2014)

The cross combination Kokan Harita×Arka Sujat (45.88%) exhibited highest positive significant heterosis over better parents and the cross combination Kokan Harita×Arka Sujat

(52.36%) recorded significantly highest positive heterosis over standard check for length of fruit. The cross combination Pusa nasdar×Swati Green (9.17%) exhibited highest significant heterosis over better parents and the cross combination Arka sujat×Pusa Nasdar (24.76%) recorded significantly highest positive heterosis over standard check for diameter of fruit. The cross combination Arka Sujat×Krishni-51 (47.43%) exhibited highest significant heterosis over better parents and the cross combination Arka Sujat×Krishna-51 (53.82%) recorded significantly highest positive heterosis over standard check for number of fruits vine^{-1}. The cross combination Krishni-51×Jaipuri (17.87%) exhibited highest significant heterosis over better parents and the cross combination Kokan Harita×Arka Sujat (33.06%) recorded significantly highest positive heterosis over standard check for weight of fruit. The cross combination Ktrishna-51×Kranti- 30 (22.08%) exhibited highest significant heterosis over better parents and the cross combination Kokan Harita×Arka Sujat (64.96%) recorded significantly highest positive heterosis over standard check for weight of fruit vine^{-1}. Similarly result recorded by Mole et al. (2001), Choudhary et al (2011); Reddy et al. (2013).

The cross combination Arka Sujat×Krishna-51 (38.58%) exhibited highest significant heterosis over better parents and the cross combination Arka Sujat×Krishna-51 (84.42%) recorded significantly highest positive heterosis over standard check for weight of fruit yield ha^{-1}. similarly, result recorded by Naliyadhara et al. (2007), Karmakar (2011), Kumar et al (2011), Lodam et al. (2014)

4. Conclusion

Cross combination Arka Sujat×Krishna-51, Krishna-51×Kranti-30 and Krishna-51×Swati Green has shown best result for maximum fruit yield ha^{-1} and the cross combination Kokan Harita×Jaipuri, Kokan Harita×Kranti-30, Arka Sujat×Swati Green has shown good result for yield contributing characters.

5. Referances

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