Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-6: 2347-2350

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7692 **Special Issue-6 pp. 2347-2350**
Journal homepage: http://www.ijcmas.com

Original Research Article

Study of Heterosis in Cowpea for Yield and Yield Contributing Characters

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Keywords

Line x Tester, heterosis, heterobeltosis, Cowpea and grain yield

A B S T R A C T

The Line x Tester method of analysis was followed involving three female lines *viz*, C-152, GC-3, Pusa-do-phasali & five male lines viz. Konkan safed, VCM-8, DFC-1, Pusa falguni & Wali-4 for study of heterosis for various yield characters. The F_1's and their parents were evaluated in randomized block design with three replications. Observation were recorded on days to 50% flowering, pod length, no. of seeds/pod, 100 seed weight, number of pods/plant and seed yield /plant. The high magnitude of heterosis for grain yield per plant indicated that the crosses GC-3 x Wali-4 (79.18), C-152 x Wali-4 (66.49) and Pusa-do-phasali x Wali-4 (64.49) exhibited high percentage of heterobeltosis.

Introduction

Cowpea (*Vigna unguiculata* (L.) walp), is being cultivated in India from ancient times. Vavilov (1951) recognized India and Africa as the primary center of origin, while China is considered as secondary center of origin of cowpea. Now cowpea is well adapted crop, cultivated around the world primarily as a pulse, but also as a vegetable (both for the green peas and grain) and cover crop as well as for fodder. Cowpea is considered more tolerant to drought than even soybean and mungbean, due to its deep tap root. By the nature the plant is a vine, hence the best breeding opportunities for modern agriculture system is with the more determinate and bush types, although for forage and cover crop applications, the vine characteristics is preferred (James Quinn, 2006). India is the leading produces of cowpea. It is grown in central and peninsular regions. In order to replace the old outdated genetically eroded varieties, there is urgent need to develop new varieties with high yielding ability which may be achieved by systemic research programme, where agronomically superior and biotic and abiotic stress tolerant types can be developed. The Line x Tester analysis technique (Kempthorne, 1957) provides a systematic approach to assess the heterosis and combing ability of parents and crosses for different quantitative characters. An added advantage of this method is that it gives overall picture of the material under investigation in single generation and more number of genotypes can be studied at a time. This study was undertaken in order to determine the heterosis of crosses through 3x5, LxT crosses.

Materials and Methods

The present investigation on "study of heterosis in cowpea for yield and yield contributing characters" was conducted at the Pulses improvement project, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist.: Ahmednagar. The experiment material for the present investigation consisted of eight diverse genotypes. These selected eight genotypes possess good amount of variation for pod length, days to 50 % flower, number of seeds/ pod, 100 seed weight, number of pods /plant along with seed yield / plant. The eight genotypes used in the present study were Konkan safed, C-152, VCM-8, DFC-1, GC-3, Pusa falguni, Pusa-do-phasali, Wali-4.Lines: C-152, GC-3, Pusa-do- phasali. Tester: Konkan safed, VCM-8, DFC-1, Pusa falguni, Wali-4.

The experiment was laid in randomized block design with three replications. The treatment consist of fifteen crosses (F_1s) and eight parents in the experiment. The variety VCM-8 was used as standard check for comparison. The hybrids with the check and parents were sown in adjacent separate blocks as suggested by Arunachalam (1974). Each treatment was randomized in each block and sown in rows of 5m length at 45 x 15 cm spacing.

Results and Discussion

The mean sum of squares due to treatments, parents, crosses and Line x Tester interaction were highly significant for all the characters. The parents vs crosses were also highly significant for all the characters. However mean sum of squares due to lines were significant only for days to 50% flowering, while testers were significant for two characters viz, days to 50 % flowering and pod length. (Table 1). The heterosis for yield contributing characters is as fallows

Days to 50 % flowering

Out of 15 crosses only three crosses viz, C-152 x DFC-1 (-5.64 %), GC-3 x DFC-1 (-20.27%) and Pusa-do-phasali x Konkan safed (-4.97%) recorded significant negative heterosis over better parent while the none of the cross showed significant negative heterosis over standard check (VCM-8).

Pod length (cm)

The cross Pusa-do-phsali x DFC-1 exhibited highest heterosis (5.05%) over better parent followed by GC-3 x DFC-1 (3.44%) and Pusa-do-phasali X Pusa falguni (2.60%). The cross C-152 x Wali-4 recorder highest heterosis (47.69%) over standard check followed by GC-3 x Wali-4 (46.62%) and Pusa-do-phasali x Wali-4 (46.62%).

Number of seeds / pod

Three crosses *viz*, C-152 x VCM 8 (4.95%), C-152 x DFC-1 (2.48%) and GC-3 X Pusa falguni (1.50%) showed significant positive heterosis over better parent. All of the 15 crosses exhibited significant positive heterosis over standard check. The cross C-152 x DFC-1 recorded high magnitude of heterosis (38.44%) over standard check followed by Pusa-do-phasali x Wali-4 (36.20%) and C-152 x VCM-8 (33.27%).

100 seed weight (g)

The cross Pusa-do-phasali x VCM-8 recorded highest heterosis (61.30%) over better parent followed by Pusa-do-phasali x Pusa falguni (37.51%) and C-152 x VCM-8 (37.40%).

Table.2 Heterobeltosis & standard heterosis for yield and yield contributing characters in LXT of cowpea

Sr No	Hybrids	Days to 50% flowering		Pod length (cm)		No. of seed/pod		100 seed weight(g)		No. of pods/plant		Seed yield/ plant (g)	
		BP	SC	BP	SP	BP	SP	BP	SP	BP	SC	BP	SC
1	C-152 x Konkan safed	41.60**	57.21**	-14.08**	14.57**	-9.97**	14.31**	7.51**	57.22**	14.91**	18.54**	27.13**	113.82**
2	C-152 x VCM-8	11.70**	11.70**	0.86**	24.84**	4.95**	33.27**	37.40**	63.48**	23.04**	26.92**	8.55**	144.88**
3	C-152 x DFC-1	-5.64**	61.35**	1.48**	25.61*	2.48**	38.44**	19.66**	68.57**	-4.58**	-1.57**	55.88**	105.77**
4	C-152 x Pusa falguni	34.60**	47.57**	-3.90**	18.94**	-3.59**	22.41**	21.90**	45.04**	13.76**	17.35**	42.96**	88.73**
5	C-152 x Wali-4	19.75**	104.79**	2.12**	47.69**	-6.68**	27.58**	5.35**	78.83**	-3.34**	-0.29**	66.49**	119.79**
6	GC-3 x Konkan safed	2.47	13..77**	-17.76**	9.66**	-9.97**	8.10**	-0.49	45.50**	13.71**	12.03**	-9.74**	51.79**
7	GC-3 x VCM-8	18.61**	18.61**	-1.85**	13.49**	-1.36**	18.44**	- 30.38**	-9.90**	58.08**	58.08**	19.38**	58.61**
8	GC-3 x DFC-1	- 20.27**	19.30**	3.44**	19.63*	-6.38**	26.46**	- 17.60**	16.07**	47.93**	41.51**	36.92**	81.91**
9	GC-3 x Pusa falguni	3.77*	13.77**	-7.02**	7.51**	1.50**	21.89**	- 25.89**	-4.08**	69.74**	68.73**	26.58**	68.18**
10	GC-3 x Wali-4	29.48**	93.77**	1.37**	46.62**	- 16.77**	13.79**	7.35**	82.28**	25.36**	19.92**	79.18**	138.06**
11	Pusa-do-phasali x Konkan safed	-4.97**	5.50**	-8.68**	21.77**	- 17.59**	9.82**	-2.11**	43.14**	16.28**	38.75**	26.57**	112.87**
12	Pusa-do-phasali x VCM-8	0.68	0.68	-13.30**	-0.53	- 24.51**	0.60**	61.30**	61.30**	24.54**	48.61**	55.13**	119.03**
13	Pusa-do-phasali x DFC-1	5.98**	22.05**	5.05**	21.01**	- 12.76**	17.84**	15.08**	62.12**	- 17.27**	-1.28**	24.94**	76.42**
14	Pusa-do-phasali x Pusa falguni	1.88	11.70**	2.60**	17.71*	- 14.61**	13.79**	37.51**	33.51**	23.96**	47.92**	60.09**	126.04**
15	Pusa-do-phasali x Wali-4	70.64**	96.52**	1.37**	46.62**	-0.37	36.20**	- 15.99**	45.50**	16.19**	38.65**	64.46**	132.57**
	S.E. ±	1.53	1.53	0.29	0.29	0.21	0.21	0.43	0.43	0.18	0.18	0.56	0.56
	L SD at 5%	3.13	3.13	0.60	0.60	0.43	0.43	0.89	0.89	0.38	0.38	1.16	1.16
	LSD at 1%	4.23	4.23	0.81	0.81	0.58	0.58	1.20	1.20	0.51	0.51	1.57	1.57

Table.1 ANOVA for yield and yield contributing characters in L X T of Cowpea

Sr. No.	sources	D.F.	Days to 50% flowering	Pod length (cm)	No. of seeds/pod	100 seed weight (g)	No. of pods/plant	Seed yield/plant (g)
1	Replications	2	12.88	0.95**	0.66**	0.40	0.03	0.21
2	Treatments	22	977.50**	9.90**	5.12**	32.19**	23.03**	83.59**
3	Parents	7	1255.88**	9.61**	6.50**	31.94**	12.10**	29.45**
4	Parents vs crosses	1	106.26**	1.43**	1.40**	101.28**	210.63**	1221.27**
5	Crosses	14	900.54**	10.65**	4.70**	27.38**	15.09**	29.40**
6	Lines	2	867.48**	3.27	7.73	62.67	33.66	65.56
7	Testers	4	2505.07**	30.95**	5.59	28.53	20.23	29.05
8	LX T	8	16.54**	2.34**	3.50**	17.98**	7.89**	20.54**
9	Error	44	5.18	0.11	0.11	0.23	0.06	0.38

The cross GC-3 x Wali-4 recorded highest heterosis (82.28%) over standard check for 100 seed weight followed by C-152 x Wali-4 (78.83%) and C-152 x DFC-1 (68.57).

Number of pods / plant

The cross GC-3 x Pusa falguni recorded highest heterosis (69.74%) over better parent followed by GC-3 x VCM-8 (58.08%) and GC-3 x DFC-1 (47.93%). The cross GC-3 x Pusa falguni recorded highest heterosis (68.73%) over standard check followed by GC-3 x VCM-8 (58.08%) and Pusa-do-phasali x VCM-8 (48.61%).

Seed yield / plant (g)

Out of 15 crosses studied 14 crosses produced significant positive heterosis over better parent. The cross GC-3 x Wali-4 recorded highest magnitude of heterosis (79.18%) over better parent followed by C-152 x Wali-4 (66.49%) and Pusa-do-phasali x Wali-4 (64.46%). All the fifteen cross combination exhibited significant heterosis over standard check. The cross C-152 x VCM-8 recorded highest heterotic effect (144.88%) over standard check followed by GC-3 x Wali-4 (138.06%) and Pusa-do-phasali x Wali-4 (132.57%), (Table 2).

The comparative data of heterosis and for grain yield per plant indicated that the crosses GC-3 x Wali-4, C- 152 x Wali 4,C-152 x VCM-8, GC-3 x Wali 4, Pusa-do-phasali x VCM-8, Pusa-do-phasali x Pusa falguni and Pusa-do-phasali x Wali-4 exhibited high percentage of heterosis.

References

Arunachalam, V. 1974. The Fallacy behind the use of modified L X T design. *Indian J. Genet.* 24 (2): 280-297.

Bennett-Lartey, S.O. and Ofori, K. 1999. Heterosis in cowpea landraces from Ghana. *Ghana Jnl. Agric. Sci.*, 32 (1): 27-30.

Chikkadeviah, C.K.M., Thirumalachar, D.R. and Shivshankar, G. 1980. Heterosis in cwpea. *Current Res.*, 9 (4): 59-60.

Hazar, P., Das, P.K. and som, M.G. (1993). Analysis of heterosis for pod yield and its components in relation to genetic divergence of the parents and specific combining ability of the crosses in cowpea. *Indian J. Genet.*, 53 (4): 418-423.

James Quinn. 2006. Cowpea a versatile legume for hot, dry conditions. Published by *Jafferson Institute, Colombia.* Indian edition.

Kempthorne, O. 1957. “An Introduction to genetical statistics” John willey and sons Inc, *New York, pp.* 458- 471.

Mote, M.S., Bendale, V.W., Bhave, S.G., Jadhav, B.B. and Sawant, S.S. 2006. Heterosis and combining ability studies for seed yield in cowpea (*Vigna unguiculata* (L.) walp.) *J. Maharashtra agric. Univ.*, 31 (2): 159-162.

Patel, B.C. 1988. Heterosis and combining ability study in cowpea. Unpublished M.sc. (Agri.) thesis, GAU, Sardar Krishinagar.