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STUDY OF HETEROSIS IN INDIAN MUSTARD (*BRASSICA JUNCEA*)

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Heterosis over the mid parent, better parent and commercial, check variety pusa bold was estimated for plant height, days to maturity, number of branches plant^{-1}, number^{-1} of siliquae plant^{-1}, seed yield plant^{-1} (gm) and 1000 seed wt. (g) in 17 crosses of *Brassica juncea.* The crosses ACN-9 X MCN-126 and ACN-9 X MCN-128 were the best performer for seed yield and number of siliquae plant^{-1}. the maximum magnitude of significant positive heterosis for all the three types were also exhibited by these crosses and hence can be exploited for further utilization in breeding programme.

Keywords : *Brassica juncea;* Heterosis; Mean performance.

Introduction

Mustard is a highly self pollinated crop and the scope for exploitation of hybrid vigour will depend upon the direction and magnitude of heterosis and the type of gene action involved for developing superior F1 hybrids. Study of heterosis has a direct influence on the breeding methodology to be employed for varietal improvement. However, in order to isolate desirable crosses, it is imperative to have prior information about heterosis of the parents involved. The present study is an attempt in this direction.

Material and Methods

Seventeen elite genotypes namely MCN-116, MCN-128, MCN-121, MCN-127, MCN-126, MCN-125, MCN-129, MCN-122, MCN-136, MCN-124, MCN-135. MCN-131, MCN-134, MCN-123, MCN-132, MCN-142 and Pusa bold were crossed with ACN-9, during 2001-02 to produce 17 cross

Table 1. Mean performance of crosses.

Sr. No	Crosses	Plant Height (cm)	Days to maturity	Number of branches/plant	Number of siliquae/plant	Seed yield/ plant (g)	1000 seed wt. (g)
1.	ACN-9 x MCN-116	130.6	95.9	5.1	325.80	10.50	3.61
2.	ACN-9 x MCN-128	146.6	93.1	6.6	421.60	16.07	3.83
3.	ACN-9 x MCN-121	137.3	95.2	5.1	282.40	11.30	3.66
4.	ACN-9 x MCN-127	129.2	88.9	7.3	418.60	13.86	3.66
5.	ACN-9 x MCN-126	161.2	93.0	7.0	479.00	17.00	3.93
6.	ACN-9 x MCN-125	159.8	94.3	5.8	377.40	13.80	3.87
7.	ACN-9 x MCN-129	156.82	96.7	6.0	278.40	11.75	3.69
8.	ACN-9 x MCN-122	159.30	93.9	6.8	377.10	13.10	3.92
9.	ACN-9 x MCN-136	122.1	92.5	4.6	221.80	7.54	3.87
10.	ACN-9 x MCN-124	165.9	96.1	6.3	268.00	13.24	3.98
11.	ACN-9 x MCN-135	108.1	92.5	5.7	269.40	8.53	3.76
12.	ACN-9 x MCN-131	156.0	96.6	5.8	381.00	14.16	2.93
13.	ACN-9 x MCN-134	130.0	92.2	5.4	301.60	11.00	3.74
14.	ACN-9 x MCN-123	149.0	93.2	6.5	392.50	14.11	3.97
15.	ACN-9 x MCN-132	146.0	95.8	4.1	163.25	8.33	3.54
16.	ACN-9 x MCN-142	134.6	93.7	5.2	187.50	8.42	3.95
17.	ACN-9 x Pusa bold	141.6	92.9	4.9	215.70	8.78	3.86

Table 2. Heterosis over mid parent (H_1), better parent (H_2) and check variety (H_3) in crosses of Indian mustard.

Sr. No	Crosses	Plant height (m)			Days to maturity			Number of branches plant^{-1}		
		H_1	H_2	H_3	H_1	H_2	H_3	H_1	H_2	H_3
1.	ACN-9 x MCN-116	10.63	-1.95	-1.14	-0.52	-1.03	-6.53**	15.91	-5.56	34.21
2.	ACN-9 x MCN-128	20.91*	5.01	10.98	-2.21**	-3.92**	-9.08**	41.94**	22.22	73.68**
3.	ACN-9 x MCN-121	16.45	3.31	3.94	-1019	-1.75	-7.03**	20.00	-5.55	34.21
4.	ACN-9 x MCN-127	13.78	4.03	-2.20	-7.06**	-8.26**	-13.18**	58.70**	35.19*	92.11**
5.	ACN-9 x MCN-126	48.91**	41.90*	22.03*	-2.46**	-4.02**	-9.18**	53.85**	29.63	84.21**
6.	ACN-9 x MCN-125	37.76**	23.78*	20.97*	-1.51	-2.68**	-7.91**	45.00**	7.41	52.63**
7.	ACN-9 x MCN-129	33.18**	18.27	18.71	-0.82	-1.43	-5.57**	37.93**	11.11	57.89*
8.	ACN-9 x MCN-122	41.10**	29.62**	20.59*	-2.34**	-3.10**	-8.30**	47.82**	25.93	78.95**
9.	ACN-9 x MCN-136	2.01	-10.55	-7.57	-4.34**	-4.54**	-9.67**	13.58	-14.81	21.05
10.	ACN-9 x MCN-124	42.04**	26.93**	25.59**	-1.69*	-2.54**	-6.15**	46.51**	16.67	65.79**
11.	ACN-9 x MCN-135	-13.38	-26.31**	-18.09	-4.19**	-4.54**	-9.67**	31.03*	5.56	50.5*
12.	ACN-9 x MCN-131	35.12**	21.88*	18.09	-4.07**	-7.56**	-5.66**	26.09	7.41	52.63**
13.	ACN-9 x MCN-134	11.11	-0.84	-1.59	-5.77**	-6.68**	-9.96**	36.71*	0	42.11
14.	ACN-9 x MCN-123	34.36**	25.32*	12.79	-2.20**	-3.82**	-8.98**	44.44**	20.37	71.05**
15.	ACN-9 x MCN-132	30.18**	20.26	10.52	-1.94*	-2.74**	-6.45**	1.23	-24.07	7.89
16.	ACN-9 x MCN-142	13.40	0.07	1.89	-4.73**	-6011**	-8.50**	25.30	-0.37	36.84
17.	ACN-9 x Pusa bold	20.51*	7.19	7.19	-6.77**	-9.28**	-9.28**	6.52	20.74	28.95
	SE (diff.)	10.74	12.41	12.41	0.77	0.89	0.89	0.62	0.87	0.87
	CD at 5%	21.80	25.19	25.19	1.56	1.81	1.81	1.26	1.77	1.77
	CD at 1%	29.21	33.76	33.76	2.09	2.42	2.42	1.69	2.37	2.37

Table 2. (Contd.)

Sr. No	Crosses	Number of Branches plant^{-1}			Seed yield Plant^{-1} (g)			1000 seed weight (g)		
		H_1	H_2	H_3	H_1	H_2	H_3	H_1	H_2	H_3
1.	ACN-9 x MCN-116	138.50**	67.24*	105.94*	163.81**	94.80*	108.74*	18.36**	12.81*	12.81*
2.	ACN-9 x MCN-128	195.23**	116.42*	116.49**	268.57**	198.14**	219.48**	0.78	-12.95**	19.68**
3.	ACN-9 x MCN-121	107.26**	44.96	78.50*	155.65**	109.64**	124.65**	-19.77**	-36.96**	-10.31*
4.	ACN-9 x MCN-127	207.68**	114.88**	164.60**	245.63**	157.14**	175.54**	4.57	-3.68	14.37**
5.	ACN-9 x MCN-126	237.56**	145.89**	202.78**	355.76**	215.39**	237.97**	20.92**	19.09**	22.81**
6.	ACN-9 x MCN-125	186.56**	93.73**	138.55**	268.98**	156.02**	174.35**	0.51	-14.00**	20.93**
7.	ACN-9 x MCN-129	103.21**	42.91	75.97**	188.69**	117.99**	133.59**	1.62	-14.18**	15.31**
8.	ACN-9 x MCN-122	184.92**	93.58**	138.36**	253.09**	143.07**	160.43**	4.53	-8.83*	22.50**
9.	ACN-9 x MCN-136	60.26	13.86	40.20	96.35	39.88	49.9	0.51	-14.00**	20.93**
10.	ACN-9 x MCN-124	124.64**	37.57	69.40	243.89*	145.64**	163.22**	-0.50	-17.08**	24.37**
11.	ACN-9 x MCN-135	85.92*	38.29	70.29*	109.58*	58.25	69.58	12.23**	7.42	17.50**
12.	ACN-9 x MCN-131	166.43**	95.58**	143.83**	255.77**	162.70**	181.51**	-2.33	-8.43	-8.43
13.	ACN-9 x MCN-134	131.82**	54.82	90.64*	172.27**	104.08*	118.68**	-13.02**	-30.74**	16.87**
14.	ACN-9 x MCN-123	169.80*	101.48**	148.10**	246.68**	161.78**	180.51**	16.76**	10.27*	24.06**
15.	ACN-9 x MCN-132	16.31	-16.19	3.19	98.33**	54.54	65.60	-27.75**	-46.36**	10.62*
16.	ACN-9 x MCN-142	35.77	-3.74	18.52	98.11*	56.21	67.39	-8.13**	-26.85**	23.43**
17.	ACN-9 x Pusa bold	22.20	10.72	36.34	68.52	62.89	74.55	20.62**	20.62**	20.62**
	SE (diff.)	47.29	54.61	54.61	1.86	2.10	2.10	0.137	0.16	0.16
	CD at 5%	95.99	110.85	110.85	3.78	4.26	4.26	0.26	0.32	0.32
	CD at 1%	128.62	148.53	148.53	5.06	5.71	5.71	0.35	0.43	0.43

combinations. The parents and 17 cross combinations were grown in randomised block design with two replication during 2002-03. The observations were recorded on five randomly selected plants in each no. of branches plant^{-1}, no. of siliquae plant^{-1}, seed yield plant^{-1} and 1000 seed weight. The magnitude of heterosis over mid parent (H_1), better parent (H_2) and check variety (H_3) Pusa bold were estimated following the standard procedures.

Result and Discussion

The data on heterosis over mid parent, better parent and over check variety are presented in Table 2 and *per se* performance in Table 1. As observed from the table a number for hybrids expressed heterosis for seed yield and its component. The maximum magnitude of heterosis was accorded for seed yield plant^{-1} (355.76%) followed by number of siliquae plant^{-1} (237.56%). Further it was observed that the magnitude of positive heterosis was higher than the negative heterosis for all the characters studied.

The cross ACN-9 X MCN-126 (17 gm plant^{-1}) ranked 1st for yield *per se* performance followed by ACN-9 X MCN-128 (16.07 gm plant^{-1}). These two crosses also maintained their ranks in respect of number of siliquae plant^{-1}. These two crosses also maintained their ranks in respect of no. of siliquae plant^{-1}. These top yielding crosses also exhibited significant and positive heterosis for seed yield plant^{-1}, number of siliquae plant^{-1} and 1000 seed weight.

This type of result was also observed by Thakur and Bhateria[1] where they found high magnitude of superior heterosis for the above characters i.e. seed yield plant^{-1}, no. of siliquae plant^{-1} and 1000 seed weight.

The major attributes responsible for high heterosis for seed yield were number of siliquae plant^{-1} and 1000 seed weight. Considerable heterosis for grain yield in oilseed *Brassica* were also observed by Singh *et al*[2]. and Shrivastava and Rai[3].

In this study the best hybrids with maximum heterosis for all the three characters considered above which could be of some value in hybrid breeding have been spotted utilizing the elite experimental material of India Mustard (including the national check) for their further utilization in heterosis breeding work in this crop in years to come.

References

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