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HETEROSIS FOR YIELD AND ITS CONTRIBUTING CHARACTERS IN MUNGBEAN (*Vigna radiata* (L.) WILCZEK)

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ABSTRACT

Twenty eight crosses resulting from 8 x 8 diallel excluding reciprocal were studied to know the magnitude of heterosis over better parent and standard variety for yield and its components in mungbean. The highest heterosis to the extent of 80.76% over standard variety and 72.39% over better parent for seed yield per plant was observed in the cross Narendra Mung-1 x PS-16 which exhibited high heterosis percentage for yield and yield components. The promising hybrids viz. Pusa Baisakhi x Pusa bold (vishal), Pusa Baisakhi x Pant M-3, Narendra Mung-1 x PS-16, Pusa Baisakhi x Pusa-105, Pusa Baisakhi x ML-613 were identified which have increased potential to exploit the hybrid vigour or to isolate the desirable segregants.

KEYWORDS : Mungbean, Teterosis Analysis

Mungbean (*Vigna radiata* (L) Wilczek) (2n=2x=22) is a third important pulse crop after bengalgram and redgram. The present yield potential of improved varieties is not enough to attract the farmers or consumers because of relatively smaller seed size, low yield potential and susceptibility to disease. Study of heterosis in mungbean is important for the plant breeder to find out the superior crosses in first generation itself. In addition to this, the magnitude of heterosis provides basis for determining genetic diversity and also serves as guide to the choice of desirable parents. An attempt was, therefore made to know the magnitude of heterosis over better parent and standard variety for seed yield and its components in elite Indian mungbean genotypes. (Gwande et al., 2001 and Joseph and Kumar, 2000).

MATERIALS AND METHODS

Eight parents Pusa Baisakhi, Pant mung-2, Pant M-3, Pusa bold (vishal), Pusa-105, ML-613, Narendra Mung-1 and PS.-16 were crossed in a diallel fashion (excluding reciprocals). An experiment, comprising 8 parents $28F_1$'s and $28F_1$'s was conducted in a randomized block design with there replications at research farm, Post Graduate College Gazipur during kharif 2012. All the 64 treatments were grown in single progeny row of 3m length with spacing of 30 cm between row and 15 cm. between plants. The experimental plots were surrounded by non experimental guard rows to avoid any possible border effect. Observations were recorded on 13 characers viz days to 50% flowering , days to first picking maturity, plant height (cm), primary branches per plant, number of nodes on main stem, number of clusters per plant, number of pods per cluster, pod length (cm), number of pods per plant, number of seeds per pod, 100-seed weight (g), protein content in seed and seed yield per plant on five randomly selected plants from each plot in each replications. The data were subjected to analysis of variance for mean performance (Panse and Sukhatme, 1995) and heterosis over better parent (BP) and standard variety (SV) were calculated and tested as specified by Hays, (1955).

RESULTS AND DISCUSSION

Presence of adequate variability among the genotypes were revealed through highly significant differences among themselves for all the traits studied. The parent and hybrid also manifested highly significant differences for most of the traits except for primary branches per plant. The parent vs crosses also showed significant differences for all the characters except plant height and protein content in seeds implied the presence of heterosis in the cross combinations. Many crosses exceeded their performance beyond the lower and upper limit of parents for various characters in desirable direction (Table,1).

Based on the mean performance, the best crosses identified for each character were Pusa Baisakhi x Pant M-3 (Plant height), Pant Mung-2 x ML-613 (primary branches per plant), ML-613 x PS-16 (number of nodes on main

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Table 1 : Range of Heterosis% For 13 Characters In Mungbean

Characters	BP	SV
Days to 50% flowering	-4.57 to 17.71%	-5.92 to -19.53%
Day to first picking maturity	-0.15 to -6.69%	-0.62 to -6.37%
Plant height	-0.23 to 4.69%	-0.15 to 3.85%
Primary branches/ plant	-10.71 to 45.20%	-3.54 to 60.21%
No. of nodes on main stem	- 0.04 to 8.79%	-1.72 to 28.85%
No. of clusters/ plant	-2.85 to 26.04	3.66 to 34.93%
No. of pods/ Cluster	-2.83 to 40.58%	-3.09 to 51.86%
Pod length	-0.05 to 5.43%	-0.14 to 11.84%
No. of pods/ plant	20.89 to 37.87%	18.52 to 39.69%
No. of seeds/ pod	-4.59 to 27.47%	-2.06 to 32.70%
100-seed weight	-1.47 to 12.25	-0.20 to 16.72%
Protein content in seed	- 0.16 to 7.97	-0.47 to 9.21%
Seed yield/ plant	32.65 to 86.21	26.22 to 80.76%

BP= Better parent, SV= Standard variety

stem), Pusa bold (vishal) x Narendra Mung-1 (number of clusters per plant), Pant M-3 x ML-613 (number of pods per cluster), Pant mung-2 x ML-613 (pod length), Pusa Baisakhi x Pusa-105 (number of pods per plant), Pusa Baisakhi x Narendra Mung-1 (number of seeds per pod), Pusa Baisakhi x Pusa bold (vishal) (100 seed weight), Pusa baisakhi x Pusa bold (vishal) (Protein content in seeds) and Pusa Baisakhi x Pusa bold (vishal) (seed yield per plant) Table-2.

The negative heterosis is desirable for days to 50% flowering and days to first picking maturity. Only one cross Pusa bold (vishal) x PS-16 (days to 50% flowering), Ml-613 x Narendra Mung-1 (days to first picking maturity) respectively showed significant negative heterosis over better parent and over standard variety. The parents Pusa bold (vishal) and PS-16, ML-613 and Narendra Mung-1 were early maturing. This suggested that while selecting parents and crosses for days to 50% flowering and days to first picking maturity due to consideration should be given to mean performance of parents and F1's rather than the magnitude of heterosis. These findings are in agreement with Naidu and Styanarayan (1993).

Out of 28 hybrides the Pusa Baisakhi x Pant M-3 showed the highest better parent heterosis (4.69%) and standard variety (3.85) for plant height. Highest significant better parent heterosis and standard variety heterosis were observed for Pant mung-2 x ML-613 (pod length), Pusa Baisakhi x Pusa-105 (number of pods per plant), Pusa Baisakhi x Narendra Mung-1 (number of seeds per pod), Pusa bold (vishal) x Pusa Baisakhi x Pusa bold (vishal), (protein content in seeds). These findings were in accordance with earlier reports by Kumar et. al. (2007), Dethe and Patil (2008), Rout et al. (2010). Similarly the significant better parent heterosis observed for the hybrids Pant mung-2 x ML-613(primary branches per plant), ML-613 x PS-16 (number of nodes on main stem), Pusa bold (vishal) x Narendra Mung-1) (number of clusters per plant), Pant M-3 x ML-613 (number of pods per cluster), Pusa baisakhi x Pusa bold (vishal)(100 seed weight and seed yield per plant). Whereas, the significant standard variety heterosis observed for the hybrids Pusa Baisakhi x Pant mung-2 (Primary branches per plant), Pant M-3 x PS-16 (number of nodes on main stem), Pusa bold (vishal) x PS-16 (number of clusters per plant), Pant M-3 x Pusa-105 (no. of pods per cluster), Narendra Mung-1 x PS-16 (100-seed weight and seed yield per plant). Deth and Patil (2008) also reported the similar conclusions.

In the present investigation the five crosses manifested significant positive heterosis over better parent and standard variety viz. Pusa Baisakhi x Pusa bold (vishal), Pusa Baisakhi x Pant M-3, Narendra Mung-1 x PS-16, Pusa Baisakhi x Pusa-105, Pusa Baisakhi x ML-613 for all the 13 characters including seed yield per plant. (Table 3). Seed yield is the complex character decides the economic worth of the hybrids. The high expression of heterosis for seed yield was evident in the present investigation. Similar results were reported earlier by Kumar(2007), Deth and Patil (2008), Rout et al. (2010) . This would clearly indicate that heterosis for yield was through heterosis for individual yield components or additive or synergistic effects of the component characters or alternatively due to the multiplicative effect of partial dominance of component characters. The different magnitude of heterosis for various characters in F1 over the parental means in the present investigation indicated over all dominance or positively

Table 2: Crosses Showing Maximum Heterosis Over Better Parent (BP) And Standard Variety (SV) Maximum Beneficial Heterosis.

Characters	Over BP		Over SV	
	Cross	Heterosis%	Cross	Heterosis%
Days to 50% flowering	Pusa bold (vishal) x PS -16	- 4.57	Pusa bold (vishal) x PS - 16	- 5.92
Day to first picking maturity	ML - 613 x Narendra Mung -1	- 0.15	ML - 613 x Narendra Mung -1	- 0.62
Plant height	Pusa Baisakhi x Pant M - 3	4.69	Pusa Baisakhi x Pant M -3	3.85
Primary branches/ plant	Pant mung - 2 x ML-613	45 .2	Pusa Baisakhi x Pant mung-2	60.21
No. of nodes on main stem	ML - 613 x PS -16	8.79	Pant M - 3 x PS - 16	28.85
No. of clusters/ plant	Pusa bold (vishal) x Narendra Mung-1	26.04	Pusa bold (vishal) x PS - 16	34.93
No. of pods/ Cluster	Pant M - 3 x ML - 613	40.58	Pant M - 3 x Pusa - 105	51.86
Pod length	Pant mung - 2 x ML- 613	5.43	Pant mung - 2 x ML - 613	11.84
No. of pods/ plant	Pusa Baisakhi x Pusa-105	37.87	Pusa Baisakhi x Pusa - 105	39.69
No. of seeds/ pod	Pusa Basakhi x Narendra Mung-1	27.47	Pusa Basakhi x Narendra Mung -1	32.69
100 - seed weight	Pusa Basakhi x Pusa bold (vishal)	12.25	Narendra Mung - 1 x PS -16	16.72
Protein content in seed	Pusa Basakhi x Pusa bold (vishal)	7.97	Pusa Basakhi x Pusa bold (vishal)	9.21
Seed yield/ plant	Pusa Basakhi x Pusa bold (vishal)	86.21	Narendra Mung - 1 x PS -16	80.76

Table 3: Heterosis% for 13 characters in some selected promising crosses of mungbean

		Days to 50% flowering	Days to first peacking maturity	Plant height	Primary branches/ plant	No. of nodes on main stem	No. of clusters/ plant	No. of pods/ cluster	Pod length	No. of pods/ plant	No. of seeds/ pod	100 seed weight	Protein content in seed	Seed yield / Plant
Pusa Baisakhi xPusa bold (vishal)	BP	-8.67**	-5.82**	4.13**	29.25**	-17.47**	0.71	28.53**	-8.64**	37.09**	15.65**	12.25**	7.97**	86.21**
	SV	-6.86**	-5.80**	1.70**	40.87**	-13.64**	18.48**	18.48**	-5.77**	26.22**	-19.19**	-22.17**	9.21**	48.25**
Pusa Baisakhi xPant M-3	BP	-8.97**	-4.42**	4.69**	37.50**	-19.00**	1.41	2.83	-3.91*	29.52**	17.41**	-7.65**	-0.16	84.54**
	SV	-10.47**	-4.48**	3.85**	3.09	-21.29**	22.39**	12.46**	-11.95**	28.17**	-9.21**	-24.03**	-3.45**	61.86**
Narendra Mung-1 x PS-16	BP	-7.58**	-2.64**	-3.08**	3.93	-6.64**	15.38**	14.44**	-7.17**	23.89**	20.39**	-3.56*	-7.47**	72.39**
	SV	7.73**	-3.54**	-2.71**	-3.54	9.58**	27.37**	41.10**	-9.59**	21.20**	13.44**	16.72**	-3.13**	80.76**
Pusa Baisakhi x Pusa-105	BP	-7.56**	-3.84**	1.09**	20.88**	4.30*	-2.85*	5.66*	4.05*	37.09**	3.82	-9.80**	4.41**	67.73**
	SV	-6.26**	-4.14**	0.83*	11.53**	10.76**	5.44**	27.64**	-4.78**	26.22**	-25.43**	-11.54**	0.70	48.63**
Pusa Baisakhi xML-613	BP	-8.40**	-6.58**	0.26	12.50**	-5.87**	3.56**	5.66*	-1.23	34.74**	0.00	-11.96**	-0.16	67.11**
	SV	-6.03**	-4.22**	0.16	-3.64*	13.95**	6.59**	11.99**	1.68	25.25**	0.00	-5.47**	0.84	53.43**
S.E. BP and S.V		0.54	0.48	0.38	0.29	0.36	0.55	0.30	0.34	0.76	0.43	0.23	0.40	0.49

** Signficant at 1 % respectively, * Signficant at 5 % respectively,

acting genes and increased diversity between the parental genotypes in the expression of heterosis. A few modifier genes with negative effects might also be involved in the expression of heterosis.

The cross combination Pusa Baisakhi x Pusa bold (vishal), Pusa Baisakhi x Pant M-3, Narendra Mung-1 x PS-16, Pusa Baisakhi x Pusa-105, Pusa Baisakhi x ML-613. exhibited significant better parent heterosis and standard variety heterosis for seed yield per plant including its components. Though this study focused the scope for exploiting heterosis, but being self pollinated legume crop, it can only be made use of through isolation of transgressive sergeants in subsequent generations. Further selection of crosses should not rest only on the per se performance or heterosis for seed yield, but the performance of parents and their hybrids for yield and its attributing traits should also be considered.

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