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HETEROSIS FOR YIELD AND YIELD COMPONENTS IN MUNGBEAN [*VIGNA RADIATA* (L.) WILCZEK]

M. REDDI SEKHAR,* K. RAJA REDDY AND C. RAJA REDDY

Department of Genetics and Plant Breeding, S. V. Agricultural College Tirupati, A.P. 517502

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ABSTRACT

Study of heterosis in 28 different hybrids of mungbean resulting from 8 x 8 diallel, excluding reciprocals indicated a pronounced hybrid vigour for yield and most of the yield components. Heterosis to the extent of 75.9 and 50.3% over the midparent and better parent, respectively, was recorded for grain yield per plant. Crosses between high x high and high x low gca parents exhibited greater heterosis. Heterosis for yield was generally accompanied by heterosis for yield components. Six hybrids were identified as promising for many desirable traits and they may be of much use in exploiting hybrid vigour in mungbean.

Key words: Heterosis, mungbean.

Mungbean is one of the important pulse crops and an excellent source of easily digestible proteins. The magnitude of heterosis provides a basis for determining genetic diversity and also serves as a guide to the choice of desirable parents [1]. The information on heterosis for yield and its attributes in hybrids of mungbean involving 8 diverse parents is presented.

MATERIALS AND METHODS

A set of 8 x 8 diallel crosses excluding reciprocals were made with 8 mungbean cultivars (PS 16, LGG 450, LGG 407, ML 267, Pusa 105, PDM 54, K 851 and RMG 275). The 28 F_1s and eight parents were grown in randomized block design with three replications. Each entry was grown in one row of 4 m length. The spacing was 40 cm between and 15 cm within the rows. Observations were recorded on five random plants for days to maturity, plant height (cm), clusters/plant, pods/cluster, pods/plant, pod length (cm), seeds/pod, 100-seed

*Present address: Research Scholar, Division of Genetics I.A.R.I., New Delhi 110012.

weight (g) and grain yield/plant (g). Heterosis was estimated over the midparent (MP) and better parent (BP).

RESULTS AND DISCUSSION

The estimates of mean squares were highly significant for all the nine characters, indicating large diversity of parents. The range for mean performance and heterosis and the most heterotic crosses identified on the basis of these two parameters are presented in Table 1. The highest range was noted for pods/plant in both parents and crosses, whereas the range of MP and BP heterosis was high for grain yield/plant, pods/plant, pods/cluster, seeds/pod, and plant height. A perusal of the top heterotic crosses revealed that none of the crosses was top heterotic for all the traits simultaneously. The cross ML 267 x K 851 showed higher potential for grain yield/plant, pods/plant, and pods/cluster.

Out of the 28 crosses studied, ten most promising combinations were identified and their heterotic expression for different characters analysed (Table 2). Of the ten promising crosses seven showed positive heterosis and three crosses exhibited negative heterosis for grain yield. This may be attributed to presence of non-additive gene effects for grain yield as also reported earlier [2]. The crosses LGG 450 x ML 267 and PDM 54 x RMG 275 expressed highest MP and BP heterosis for days to maturity. The highest MP (75.3) as well BP (50.3) heterosis was recorded for grain yield in the cross ML 267 x K 851. The crosses LGG 407,x K 851, PS 16 x PDM 54, LGG 407 x PDM 54 and LGG 407 x RMG 275 also displayed high and significant positive heterosis for grain yield. These crosses were also noted for high heterosis for yield components in particular, pods/plant, seeds/pod, pods/cluster, and plant height.

In general, high x high and high x low gca crosses involving diverse parents showed higher magnitude of heterosis. This means that parents with diverse origin should be used for heterosis breeding. There seems to be a general dominance bias for more pods, since 16 out of 28 crosses showed positive MP heterosis of which 9 significantly exceeded the BP values. MP and BP heterosis was positively significant in 15 and 9 crosses for seeds/pod, respectively. The magnitude and direction of heterosis for pod length was low and negative, indicating lack of genetic variability in the parents for this character. In case of clusters/plant, 27 and 10 crosses exhibited high MP and BP heterosis, respectively. The magnitude and high incidence of heterosis in these crosses were indicative of high degree of dominance or epistasis, or both. Similar results were reported by earlier workers [3, 4].

The negative heterosis observed in some of the crosses may be attributed to nonallelic interaction which can either increase or decrease the expression of heterosis (Table 2). In most cases, significant positive heterosis for grain yield was associated with heterosis for pods/cluster, pods/plant, clusters/plant and seeds/pod. This indicate that heterosis for

Table 1. Range, heterosis and most heterotic crosses for nine characters in mungbean

Character	Range		Heterosis (%)		Best parent	Best hybrids	
	parents	crosses	MP	BP		based on performance	based on BP heterosis
Days to maturity	57.0–69.7	53.3–67.3	-11.7–1.6	-6.4–6.1	RMG 275	PDM 54 x RMG 275	PDM 54 x RMG 275
Plant height (cm)	32.3–43.6	29.1–55.7	-17.7–35.2	-24.3–27.7	LGG 407	LGG 407 x PDM 54	LGG 407 x PDM 54
Clusters per plant	5.6–10.8	6.7–13.1	-26.3–80.3	-34.3–67.0	LM 267	ML 267 x Pusa 105	LGG 407 x RMG 275
Pods per cluster	3.4–7.7	2.2–10.6	-44.8–134.9	-59.0–180.8	PDM 54	ML 267 x K 851	ML 267 x K 851
Pods per plant	26.3–53.3	30.0–77.3	-11.8–121.8	-33.1–101.4	PDM 54	PS 16 x PDM 54	ML 267 x K 851
Pod length (cm)	5.7–6.6	5.5–7.8	-11.2–28.3	-12.3–20.3	PS 16	LGG 407 x K 851	LGG 407 x K 851
Seeds per pod	9.1–10.9	6.3–11.7	-39.5–25.2	-39.6–24.0	LGG 450	LGG 450 x PDM 54	LGG 407 x K 851
100-seed weight (g)	3.3–5.1	3.3–4.6	-14.5–10.4	-20.4–8.3	K 851	PS 16 x K 851	LGG 450 x ML 267
Grain yield per plant (g)	10.0–20.5	20.9–27.8	-29.4–25.3	-32.8–50.3	PDM 54	ML 267 x K 851	ML 267 x K 651

Table 2. Heterosis for nine characters in promising crosses of mungbean

Character	Heterosis type	Heterosis in promising crosses (%)										LSD	
		PS 16 x PDM 54	PS 16 x K 851	LGG 407 x PDM 54	LGG 407 x K 851	LGG 407 x RMG 275	LGG 450 x ML 267	LGG 450 x PDM 54	ML 267 x Pusa 105	ML 267 x K 851	PDM 54 x RMG 275	5%	1%
Days to maturity	MP	-4.4**	-5.0**	0.2	-1.6	-10.2**	-11.7**	-11.3**	-3.1**	-5.0**	-8.6**	1.6	2.2
	BP	-3.3**	-3.4**	6.1**	5.6**	-1.7	-5.9**	-3.9**	0.0	-2.8**	-6.4**	1.9	2.5
Plant height	MP	2.1	10.4**	35.2**	21.8**	12.9**	13.9**	24.6**	13.7**	5.5**	16.3**	2.7	3.7
	BP	-3.5*	-2.1	27.7**	8.0**	-1.7	10.0**	22.4**	11.5**	-2.9	6.7**	3.2	4.2
Clusters per plant	MP	6.3**	3.5**	80.3**	52.7**	76.3**	28.2**	16.5**	53.7**	-26.3**	45.7**	1.3	1.7
	BP	-4.6**	1.1	63.3**	28.2**	67.0**	8.0**	12.6**	21.6**	34.9**	39.1**	1.5	2.0
Pods per cluster	MP	62.9**	39.8*	-20.0**	7.5**	-13.9**	11.4**	-21.5**	-42.5**	195.0**	-24.2**	0.9	1.2
	BP	20.8**	30.0**	-20.0**	-20.0**	-31.7**	-5.3**	-36.0	-48.8**	180.8**	-39.9**	1.0	1.4
Pods per plant	MP	80.6**	48.1**	46.8**	11.2**	60.0**	47.2**	-8.2**	-7.3**	121.8*	12.6**	5.1	6.7
	BP	44.9**	43.7**	33.0**	50.1**	28.6**	45.1**	-23.1**	19.2**	101.4**	-15.9**	5.8	7.8
Pod length	MP	-3.4**	6.1**	11.4**	28.3**	4.4**	1.1**	-5.2**	-1.8**	14.7**	-11.2**	0.5	0.6
	BP	-5.8**	5.2**	0.1**	20.3**	0.6*	0.9**	-6.0**	-4.2**	13.8**	-12.3**	0.5	0.7
Seeds per pod	MP	0.3**	-3.8**	9.9**	25.2**	12.5**	7.5**	9.1**	-10.6**	22.7**	-8.6**	0.2	0.3
	BP	-0.8**	-8.4**	2.6	24.0*	7.8**	0.0	7.5**	-15.0**	22.6**	-11.0**	0.2	0.3
100-seed weight	MP	-14.5**	-2.0**	-7.6**	-8.3**	3.8**	10.4**	-14.5**	-1.3**	-4.2**	1.4**	0.1	0.2
	BP	-18.7**	-9.4**	-9.0**	-17.9**	2.3**	8.3**	-16.5**	-3.0**	-15.8**	-1.6**	0.2	0.2
Grain yield per plant	MP	46.0**	16.7**	33.9**	60.5**	70.9**	23.4**	-3.1*	-29.4**	75.3**	13.8**	3.1	4.1
	BP	31.5**	5.2**	30.2**	35.0**	29.6**	20.5**	-10.0**	-32.8**	50.3**	-15.3**	3.6	4.8

*,**Significant at 5% and 1% levels, respectively.

yield was through heterosis for individual yield components. Similar observations on high heterosis for grain yield were reported by Singh and Jain [5].

In general, the varieties PDM 54, K 851, LGG 407 and ML 267 were promising parents giving high heterosis for most of the traits. The present study suggested that exploitation of six hybrids, namely, ML 267 x K 851, LGG 407 x K 851, PS 16 x PDM 54, LGG 407 x PDM 54, LGG 407 x RMG 275 and LGG 450 x ML 267, could be more rewarding for breeding programme of mungbean.

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