# studies on combining ability and heterosis for yield and yield components is greengram (Vigna radiata (L.) Wilczek)

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Abstract: Combining ability and heterosis for eight quantitative characters were studied through line x tester analysis involving five lines and four testers. The combining ability analysis revealed that variances due to hybrids, lines, testers and line x tester interaction were significant for all eight characters studied. The ratio of additive and dominance genetic variance (σA²: σD²) indicated that preponderance of non additive type of gene action for all the traits except number of branches per plant. The parents VGG 77, MI 267, Vamban 2 and KM 2 were found to be the best general combiners for most of the characters. The crosses with high sca effects were identified for each character. The hybrids ML 682 x Vamban 2 and VGG 77 x Vamban 1 recorded significant standard heterosis for all the traits except number of branches per plant. Three hybrids viz. K 851 x Vamban 1, VGG 77 x Vamban 1 and VGG 77 x KM 2 can be exploited in recombination breeding. Four cross combinations viz. ML 682 x Vamban 2, VGG 77 x Vamban 1, VGG 80 x KM 2 and ML 267 x Vamban 2 can be utilised for heterosis breeding.

Key words: Combining ability, Heterosis, Line x tester, Sca, Recombination breeding, Heterosis breeding, Greengram.

#### troduction

Greengram is an important grain legume 1 India. Choice of the best parents is pre rquisite in any crop breeding programmes. valuation of parents for their transmission ptential for yield and yield components will ave a way for better selection. Since all available arents with high order of performance may pt be able to transmit their superior traits to their progenies. Therefore, selection of Esirable parents based on their combining ability increasingly used now a days in crop improvement rogrammes. Among the different methods, adopted te line x tester analysis has been recommended ir early evaluation of parents, because of its implicity in both experimentation and analysis Ohillon, 1975). Such studies in greengram te useful in assessing the heterotic ability of arents and this aid in selecting parents, which n crossing would give rise to more desirable egregants with increased yielding ability.

## laterials and Methods

Experimental material for the study amprised of five lines viz. K 851 (L,), VGG

77 (L<sub>2</sub>), VGG 80 (L<sub>2</sub>), ML 267 (L<sub>4</sub>) and ML 682 (Ls) and four testers viz. CO 6 (T1), KM 2 (T<sub>2</sub>), Vamban 1 (T<sub>3</sub>) and Vamban 2 (T<sub>4</sub>). Crosses were effected in line x tester mating design and F,'s were evaluated during 2002, at Agricultural College and Research Institute, Madurai. The 20 F,'s were raised in randomized block design with two replications. Each entry was raised in three metre row with 45 x 15 cm spacing. For estimating heterosis, parents were raised in adjacent plot with above mentioned spacing. Observations were recorded in the five randomly selected plants both in parents and hybrids on days to 50 per cent flowering, plant height, number of branches per plant, number of clusters per plant, number of pods per plant, number of seeds per pod, 100 seed weight and single plant yield. The data were subjected to combining ability analysis following the method proposed by Kempthorne (1957). Heterosis was worked out over better parent and standard parent.

### Results and Discussion

The analysis of variance of combining ability revealed significant diversity among hybrids,

Table 1. Analysis of variance of combining ability for grain yield and its component traits

				y	Aean square	cs			
Source	df	Days to 50 per cent flowering	Plant height	No. of branches per plant	No. of clusters per plant	No. of pods per plant	No. of seeds per pod	100 sced weight	Single plant yield
Replication	1	0.22	0.74	0.01	0.005	0.82	0.02	0.001	0.01
Hybrids	19	21.94*	149.80*	3.09*	10.68*	72.26*	2.03*	0.41*	14.97*
Lines	4	44.31*	77.47*	10.72*	7.01*	60.38*	1.25*	0.47*	14.70*
Testers	3	6.95*	255.4*	2.44*	1.52*	2.90*	4.32*	0.49*	6.12*
Line x Tester	12	18.22*	147.5*	0.70*	14.19*	93.56*	1.71*	0.37*	17.27*
Error	19	0.75	0.45 .	0.03	0.02	0.63	0.006	0.003	0.01

<sup>\*</sup> Significant at 5 per cent level

Table 2. General combining ability (gca) effects of parents for grain yield and its component traits

Parents	Days to 50 per cent flowering	Plant height (cm)	No. of branches per plant	No. of clusters per plant	No. of pods per plant	No. of seeds per pod	100 seed weight (g)	Single plant yield (g)
K 851	-0.62*	-4.16*	1.08*	-0.02	-0.31	-0.53*	-0.09*	-0.26*
VGG 77	-3.00	4.32*	0.84*	0.53*	3.00*	0.58*	0.35*	1.90*
VGG 80	2.88	-1.36*	-1.74*	-1.59*	-4.43*	0.02	-0.33*	-1.65*
ML 267	-1.50	0.88*	0.38*	0.77*	0.92*	-0.02	0.05*	0.69*
ML 682	0.00	0.32	-0.56*	0.30*	0.82*	-0.05*	0.03*	-0.68*
SEd	0.30	0.23	0.06	0.05	0.27	0.03	0.02	0.04
Co 6	-0.72	-3.07*	-0.67*	-0.51*	-0.77*	-0.29*	-0.17*	-0.65*
KM 2	-0.42*	-1.80*	-0.08	0.44*	0.40	-0.50*	0.06*	-0.17*
Vamban 1	-0.03*	-2.66*	0.35*	0.01	0.02	-0.17*	-0.18*	-0.32*
Vamban 2	1.17	7.54*	0.40*	0.06	0.35	0.96*	0.29*	1.13*
SEd	0.27	0.21	0.05	0.04	0.25	0.02	0.02	0.03

<sup>\*</sup>Significant at 5 per cent level

lines, testers and line x tester interaction. The estimates of dominance genetic variance (σD2) was higher than additive genetic variance (σA2) for all the traits except number of branches per plant, which revealed the predominance of non additive gene action (Table 1). This was in accordance with the findings of Mansuria (1991) for days to 50 per cent flowering, Jiji Joseph and Santhoshkumar (2000) for plant height, number of pods per plant, number of seeds per pod, 100 seed weight. Tiwari et al. (1993) for number of branches per plant, Ram (1997) for number of clusters per plant and Kute et al. (1999) for single plant yield. To exploit dominance gene action of these traits heterosis, breeding or hybridization followed

by selection in later generation is recommended for the improvement of all these traits in greengram.

The gca effects (Table 2) indicated that among the lines, VGG 77 and MI 267 were good general combiners for single plant yield. The lines VGG 77 and MM 267 also served as best combiners for other yield contributing characters in addition to single plant yield. These lines may help to produce high yielding segregants through their contribution of additive genes. Among the testers, Vamban 2 was found to be the good general combiner for plant height, number of branches per plant, number of seeds per pod, 100 seed weight and single plant yield. Besides this, KM 2 exhibited high

ca effects for days to per cent flowering, number of clusters per plant and 100 seed weight. These testers nay contribute desirable genes for increasing the grain yield in any preeding programme.

The estimation of sca effects (Table 3) ndicated that the cross, VGG 80 x KM 2 significant howed ositive sca effects for ant height, number of ranches per plant, lumber of clusters per plant, number of pods per plant, number of seeds per pod, 100 seed weight and single plant yield. NM 682 x Vamban 2 recorded significant positive sca effects for days to 50 per cent flowering, plant height, number of clusters per plant, number of pods per plant, number of seeds per pod, 100 seed weight and single plant yield. Besides above two crosses the following hybrids viz. K 851 x CO 6, K 851 x KM 2, VGG 77 x CO 6, VGG 77 x KM 2, VGG 77 x Vamban I, ML 267 x CO 6; ML 267 x Vamban 1, ML 267 x Vamban 2 and ML 682 x Vambanl were also found to be best specific combiners for single plant yield.

nt height branches clusters pods seeds weight (cm) per plant (g) (g)		Days to	Plant	No. of	No. of	No. of	No. of	100 seed	Single
x Co 6         0.47*         -5.10*         per plant         per plan	Livhride	50 ner cent	height	branches	clusters	spod	seeds	weight	plant
x Co 6         0.47*         -5.10*         0.28*         1.09*         3.99*         0.55*         0.10*           x KM 2         -0.83*         -3.15*         -0.26*         2.33*         1.11         -0.16*         0.05           x KM 2         -0.83*         -1.39*         -0.43*         -3.07*         -6.22*         0.16*         0.05           x Vamban 1         1.29         6.86*         0.41*         -0.35*         1.11         -0.17*         0.10*           x Vamban 2         -0.92*         6.86*         0.41*         -0.35*         1.12         -0.77*         0.10*           77 x Vamban 2         -1.70         -1.61*         0.03         -0.47*         -1.33*         -0.26*         0.03           77 x Vamban 2         -1.70         -1.61*         0.03         -1.45*         -5.59*         -0.42*         -0.10*           77 x Vamban 2         -1.70         -1.61*         0.50*         -1.45*         -5.59*         -0.42*         -0.36*           80 x Co 6         0.22*         -1.45*         -5.59*         -0.42*         -0.36*         -0.24*           80 x Co 6         0.22*         -7.10*         -0.76*         0.76*         -1.45*         -5.59* </td <td>en locus</td> <td>flowering</td> <td>(E)</td> <td>per plant</td> <td>per plant</td> <td>per plant</td> <td>per pod</td> <td>(g)</td> <td>yield (g)</td>	en locus	flowering	(E)	per plant	per plant	per plant	per pod	(g)	yield (g)
X CO 6         0.47         -0.26*         2.33*         1.11         -0.16*         0.05           X KM 2         0.83*         -3.15*         -0.26*         2.33*         1.11         -0.16*         0.05*           X Vamban 1         1.29         6.86*         0.41*         -0.35*         1.12         -0.25*         -0.25*           A Vamban 1         -0.92*         6.86*         0.41*         -0.35*         1.12         -0.50*         -0.17*           77 X Co 6         0.60*         3.59*         -0.43*         -0.31*         3.15*         -0.50*         -0.17*           77 X Co 6         0.60*         3.59*         -0.31*         3.15*         -0.26*         -0.17*           77 X Vamban 1         -3.10         8.84*         -0.13         2.23*         3.76*         1.18*         0.49*           77 X Vamban 1         -3.10         8.84*         -0.13         2.23*         3.76*         -0.12*         -0.17*           77 X Vamban 2         -1.51*         0.53*         -1.45*         -5.59*         -0.19*         -0.24*           80 X Vamban 1         0.03*         -7.10*         -0.76*         -0.28*         -0.19*         -0.19*           80 X Vamb		*****	\$ 10\$	*300	1 00*	3.99*	0.55*	0.10*	1.50*
x KM 2         -0.283*         -3.15*         -0.20*         -0.35*         -1.11         -0.25*         -0.25*           x Vamban 1         1.29         1.39*         -0.43*         -0.37*         -0.52*         0.37*         -0.25*           x Vamban 2         0.92*         6.86*         0.44*         -0.35*         -0.17*         0.10*           77 x Cob         0.60*         3.59*         -0.39*         -0.47*         -1.33*         -0.26*         0.017*           77 x Cob         0.60*         3.59*         -0.39*         -0.47*         -1.18*         0.02*           77 x Vamban 1         -3.10         8.84*         -0.13         2.23*         3.76*         1.18*         0.49*           77 x Vamban 1         -3.10         8.84*         -0.13         2.23*         3.76*         1.18*         0.49*           77 x Vamban 2         -1.68*         0.52*         -1.45*         -5.58*         -0.19*         -0.24*           77 x Vamban 2         0.02*         -1.59*         0.24*         -1.00         -0.66*         -0.24*           80 x Vamban 1         0.03*         -7.14*         -0.76*         0.24*         -1.00         -0.19*           80 x Vamban 2	K 851 x Co 6	0.4/	27.7	97.0	****	:	0.16#	500	0.44*
x Vamban 1 129 1.39* -0.43* -3.07* -6.22* 0.57* -0.25*	K 851 x KM 2	-0.83*	-3.15*	-0.26	7.33*		0.10	3000	1 70*
X. Vamban 2         -0.92*         6.86*         0.41*         -0.35*         1.12         -0.77*         0.10*           77 x Co 6         0.60*         3.59*         -0.47*         -1.33*         -0.50*         -0.17*         0.10*           77 x Co 6         0.60*         3.59*         -0.39*         -0.47*         -1.33*         -0.50*         -0.17*           77 x Vamban 1         -3.10         8.84*         -0.13         2.23*         3.76*         1.18*         0.49*           77 x Vamban 2         -1.00         -0.13         -1.59*         -5.59*         -0.26*         -0.36*           77 x Vamban 2         -1.03         -1.45*         -5.59*         -0.19*         -0.27*           80 x Vamban 1         0.03*         -7.10*         -0.76*         -0.19*         -0.24*           80 x Vamban 2         -1.17*         -7.14*         -0.10         -2.58*         -6.38*         -0.79*         -0.24*           80 x Vamban 2         -1.17*         -7.14*         -0.10         -2.58*         -6.38*         -0.79*         -0.55*           67 x KM 2         1.80         -5.84*         -0.47*         -2.58*         -0.19*         -0.11*         0.07           67 x	V 851 v Vamhan 1	1 20	1.39*	-0.43*	-3.07*	-6.22*	0.3/*	-0.25°	-1.70
X vanioal 2         X vanioal 2         X vanioal 3	C modular V 100 V	*000	*98.9	0.41*	-0.35*	1.12	+V.O	0.10*	-0.25
77 x KM2	N 851 X Validan 4	*070	3 50*	*05.0	-0.47*	-1.33*	-0.50*	-0.17*	0.85*
77 x Vamban 1 -3.10 8.84* -0.13 2.23* 3.76* 1.18* 0.49* 77 x Vamban 2 -1.50* -0.13* 2.23* 3.76* 1.18* 0.49* 77 x Vamban 2 -1.00* -0.50* -1.59* -0.19* -0.27* 0.50* -1.59* -0.19* -0.27* 0.53* 3.94* 11.06* 1.64* 0.85* 0.24* 0.53* 3.94* 11.06* 1.64* 0.85* 0.24* 0.03* -7.10* -0.76* 0.24* -1.00 -0.66* 0.24* 0.33* 0.33* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.24* 0.03* 0.0	=	0.00	17.1	200	-0.31*	3.15*	-0.26*	0.03	0.53*
-3.10         8.84*         -0.15         -1.25         -0.35*         -0.42*         -0.36*           420         -10.82*         0.50*         -1.45*         -5.59*         -0.42*         -0.36*           0.02*         -3.30*         0.33*         -1.59*         -3.68*         -0.19*         -0.27*           0.03*         -7.10*         -0.76*         0.24*         -1.00         -0.66*         -0.27*           1.03*         -7.14*         -0.76*         0.24*         -1.00         -0.66*         -0.24*           2.17*         -7.14*         -0.76*         0.24*         -1.00         -0.66*         -0.24*           2.21*         0.03         2.13*         5.90*         -0.11*         0.33*           3.90         -5.84*         -0.47*         -2.58*         -6.38*         -0.11*         0.34*           1.80         -5.84*         -0.47*         -4.25*         -11.15*         -0.86*         -0.16*           1.80         -5.84*         -0.47*         -4.25*         -11.15*         -0.86*         -0.18*           2.50         -2.00*         -0.76*         1.85*         3.99*         1.03*           2.50*         -2.90*         -	_	0.1-	10.1-	20.0	2.23	3 76*	1.18*	0.49*	1.02*
420       -10.82*       0.50*       -1.45*       -5.39*       -0.19*       -0.27*         0.22*       -3.30*       0.53*       -1.59*       -3.68*       -0.19*       -0.27*         0.92*       17.54*       0.53*       -1.59*       -0.19*       -0.27*         0.92*       17.54*       0.53*       -0.19*       -0.27*         0.92*       -7.10*       -0.76*       0.24*       -0.10         1       -1.17*       -7.14*       -0.10       -2.58*       -6.38*       -0.79*       -0.24*         2.21*       0.03       2.13*       5.90*       -0.79*       -0.35*       -0.35*         1.80       -5.84*       -0.47*       -2.58*       -11.15*       -0.86*       -0.65*         1.80       -5.84*       -0.47*       -4.25*       -11.15*       -0.86*       -0.65*         1.80       -0.22*       1.20*       0.27*       1.26*       -0.07       -0.01         2.50       -0.20*       -0.76*       1.16*       -4.88*       -0.25*       -0.02         1       2.90       -2.90*       -0.18       -1.70*       -0.82*       -0.93*       -0.93*         2       -5.30       -0.47	~	-3.10	8.84"	5.15	67.7	200	*07	0.26	*0£ C
0.22*         -3.30*         0.33*         -1.59*         -3.68*         -0.19*         -0.27*           0.92*         17.54*         0.53*         3.94*         11.06*         1.64*         0.85*           0.92*         17.54*         0.53*         3.94*         11.06*         -0.66*         -0.24*           0.03*         -7.14*         -0.10         -2.58*         -6.38*         -0.79*         -0.24*           1.80         -5.84*         -0.47*         -2.58*         -6.38*         -0.79*         -0.35*           1.80         -5.84*         -0.47*         -2.58*         -6.38*         -0.11*         0.34*           1.80         -5.84*         -0.47*         -4.25*         -11.15*         -0.86*         -0.65*           1.80         -5.84*         -0.47*         -4.25*         -11.16*         -0.86*         -0.65*           2.50         -5.84*         -0.47*         -1.36*         -1.16*         -0.86*         -0.65*           2.50         -5.20*         -0.27*         -1.16*         -4.88*         0.25*         -0.29*           2.50*         -2.90*         0.12         -0.170*         -1.10*         -0.37*         -0.37*         -0.29*	VGG 77 x Vamban 2	420	-10.82*	0.50*	-1.45*	6.6-	-0.42	000	1001
0.92*         17.54*         0.53*         3.94*         11.06*         1.64*         0.85*           0.03*         -7.10*         -0.76*         0.24*         -1.00         -0.66*         -0.24*           -1.17*         -7.14*         -0.10         -2.58*         -6.38*         -0.79*         -0.24*           -3.90         2.21*         0.03         2.13*         5.90*         -0.11*         0.34*           -3.90         -5.84*         -0.47*         -2.58*         -6.38*         -0.11*         0.34*           1         -1.10*         -0.22         1.20*         0.27*         1.26*         -0.07         0.05*           2         3.20         3.84*         -0.47*         -0.27*         1.26*         -0.07         0.01           2         2.60         2.60*         -0.25*         -1.16*         -4.88*         0.25*         -0.29*           -0.20*         -6.95*         0.18         -1.70*         -4.17*         -0.37*         -0.29*           2         -5.30*         -0.05         2.53*         6.85*         0.95*         0.30*           2         -5.30         0.47         0.11         0.10         0.56*         0.05	VGG 80 x Co 6	0.22*	-3.30*	0.33*	-1.59*	-3.68	-0.19	-170-	-1.00
0.03*         -7.10*         -0.76*         0.24*         -1.00         -0.66*         -0.24*           -1.17*         -7.14*         -0.10         -2.58*         -6.38*         -0.79*         -0.35*           -3.90         2.21*         0.03         2.13*         5.90*         -0.11*         0.34*           -3.90         -5.84*         -0.47*         -4.25*         -11.15*         -0.86*         -0.65*           1         -1.10*         -0.22         1.20*         0.27*         1.26*         -0.07         0.01           2         3.20         3.84*         -0.76*         1.85*         3.99*         1.03*         0.30*           2.60         2.60*         -0.25*         -1.16*         -4.88*         0.25*         0.01           1         2.90         -2.90*         0.18         -1.70*         -4.17*         -0.37*         -0.29*           2         -5.30         0.12         0.33*         2.20*         -0.82*         0.05*           2         -5.30         0.47         0.11         0.10         0.56*         0.05         0.05	NA A CO	*000	17.54*	0.53*	3.94*	11.06*	1.64*	0.85*	5.39
2 -1.17* -7.14* -0.10 -2.58* -6.38* -0.79* -0.35* -3.90	100 00 V	*000	110*	*92.0-	0.24*	-1.00	<b>*99.0-</b>	-0.24*	-I.38*
-1.17 -7.14 0.03 2.13* 5.90* -0.11* 0.34* -3.90 2.21* 0.03 2.13* 5.90* -0.11* 0.34* -0.65* -0.65* -0.65* -0.65* -0.65* -0.65* -0.76* 1.20* 0.27* 1.26* -0.07 0.01 0.30* 0.25* 0.30* 0.30* 0.26* 0.25* 0.30* 0.30* 0.25* 0.30*	VGG 80 x Vamban I	50.0		5 5	*85 6	*86 9-	*62.0-	-0.35*	-2.95*
-3.90 2.21** 0.03 2.15** 0.05**  1.80 -5.84** -0.47** 4.25** -11.15** -0.86** -0.65**  1.80 -5.84** -0.47** 4.25** -11.15** -0.07 0.01  2.50 -5.84** -0.76** 1.85** 1.26** 0.30**  2.60 2.60** -0.25** -1.16** 4.88** 0.25** 0.01  1.290 2.60** 0.18 -1.70** 4.17** -0.37** -0.29**  2.530 7.25** 0.05 2.53** 6.85** 0.95** 0.30**  2.60 0.47 0.11 0.10 0.56** 0.05	VGG 80 x Vamban 2	-1.1/-	-7.14	0.10	****	*00.5	*110	0 34*	*90.0
1.80         -5.84*         -0.47*         4.25*         -11.15*         -0.80         -0.00           1         -1.10*         -0.22         1.20*         0.27*         1.26*         -0.07         0.01           2         3.20         3.84*         -0.76*         1.85*         3.99*         1.03*         0.30*           2.60         2.60*         -0.25*         -1.16*         4.88*         0.25*         0.01           -0.20*         -6.95*         0.18         -1.70*         4.17*         -0.37*         -0.29*           1         2.90         -2.90*         0.12         0.33*         2.20*         -0.82*         0.02           2         -5.30         7.25*         -0.05         2.53*         6.85*         0.95*         0.30*           0.61         0.47         0.11         0.10         0.56*         0.05         0.05	ML 267 x Co 6	-3.90	2.21*	0.03	2.13	2000	*200	*590	473*
1         -1.10*         -0.22         1.20*         0.27*         1.26*         -0.07         0.01           2         3.20         3.84*         -0.76*         1.85*         3.99*         1.03*         0.30*           2.60         2.60*         -0.25*         -1.16*         -4.88*         0.25*         0.01           -0.20*         -6.95*         0.18         -1.70*         -4.17*         -0.37*         -0.29*           1         2.90         -2.90*         0.12         0.33*         2.20*         -0.82*         0.02*           2         -5.30         7.25*         -0.05         2.53*         6.85*         0.95*         0.30*           0.61         0.47         0.11         0.10         0.56*         0.05         0.05	ML 267 x KM 2	1.80	-5.84*	-0.47*	4.25	-11.15	00.0	200	1 964
2         3.20         3.84*         -0.76*         1.85*         3.99*         1.03*         0.30*           2.60         2.60*         -0.25*         -1.16*         -4.88*         0.25*         0.01           -0.20*         -6.95*         0.18         -1.70*         -4.17*         -0.37*         -0.29*           1         2.90         -2.90*         0.12         0.33*         2.20*         -0.82*         0.02           2         -5.30         7.25*         -0.05         2.53*         6.85*         0.95*         0.05           0.61         0.47         0.11         0.10         0.56*         0.05         0.05	MI. 267 x Vamban I	-1.10*	-0.22	1.20*	0.27*	1.26*	-0.0	0.01	1.00
682 x Co 6 2.60 2.60* -0.25* -1.16* 4.88* 0.25* 0.01 682 x KM 2 -0.20* -6.95* 0.18 -1.70* 4.17* -0.37* -0.29* 682 x KM 2 -0.20* -2.90* 0.12 0.33* 2.20* -0.82* -0.02 682 x Vamban 1 2.90 7.25* -0.05 2.53* 6.85* 0.95* 0.30* 682 x Vamban 2 -5.30 7.25* 0.05 0.05	C nedmely w 73C IM		3 84*	-0.76	1.85*	3.99*	1.03*	0.30	7.11.7
682 x Vamban 1 2.90 -5.30 0.12 0.33* 2.20* -0.37* -0.29* 682 x Vamban 2 -5.30 7.25* -0.05 2.53* 6.85* 0.05 0.05 0.05	ML 201 A Vaillouin		*09 6	4500	*91 1-	4.88*	0.25*	10:0	-2.04*
682 x Vamban 1 2.90 -0.20* -0.95* 0.12 0.33* 2.20* -0.82* -0.02 682 x Vamban 2 -5.30 7.25* 0.47 0.11 0.10 0.56* 0.05	789	8	2.00	0.0	100	A 17*	-0.37*	*0.20*	-1.63*
682 x Vamban 1 2.90 -2.90* 0.12 0.33* 2.20* -0.02 0.30* 682 x Vamban 2 -5.30 7.25* 0.47 0.11 0.10 0.56* 0.05 0.05	682	-0.20	-6.95	0.18	0.1.		*000	200	*61.0
682 x Vamban 2 -5.30 7.25* -0.05 2.53* 6.85* 0.95* 0.50* 0.50* 0.05	ML 682 x Vamban 1	2.30	-2.90*	0.12	0.33*	2.201	-0.02	20.00	2.40*
0.61 0.47 0.11 0.10 0.56* 0.05			7.25*	-0.05	2.53*	6.85	10.93	0.50	000
			0.47	0.11	0.10	0.56*	0.05	0.00	0.00

Significant at 5 per cent level

Standard heterosis for yield and its components indicated that among the hybrids, ML 682 x Vamban 2 and VGG 77 x Vamban I recorded significant standard heterosis for all the traits except number of branches per plant. It was followed by VGG 80 x -- KM 2 and ML 267 x Vamban 2 for six traits except days to 50 per cent flowering and number of branches per plant. Similar results were also reported by Jiji Joseph and Santhoshkumar (2000) and Loganathan et al. (2001). Heterosis for single plant yield was associated with heterosis for plant height, number of clusters per plant, number of pods per plant, number of seeds per pod and 100 seed weight in all the above four high yielding crosses. This indicated that heterosis for single plant yield was through heterosis for individual yield components. Similar observations were reported by Singh and Jain (1970) and Reddy Sekhar et al. (1994).

Hybrids involving parents with significant gca effects and non significant sca ettects are useful in recombination breeding. Three hybrids viz. K 851 x Vamban 1, VGG 77 x Vamban 1 and VGG 77 x KM 2 can be exploited in recombination breeding for improvement of earliness, number of branches per plant and 100 seed weight respectively.

Based on sca effects and standard heterosis four cross combinations viz. ML 682 x Vamban 2, VGG 77 x Vamban 1, VGG 80 x KM 2 and ML 267 x Vamban 2 were found to be superior for yield and its components and these hybrids can be utilised for heterosis breeding.

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