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HETEROSIS FOR YIELD AND YIELD ATTRIBUTING TRAITS IN GROUNDNUT (*ARACHIS HYPOGAEA* L.)*

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ABSTRACT

Three lines and seven testers were crossed in a line x tester fashion to estimate heterosis over mid parent, better parent for yield and its attributing characters in groundnut. The prevailence of heterosis over both mid parent and better parent in majority of crosses indicated the influence of both additive and non-additive gene action. The cross R-2001-2 x GPBD-5 exhibited higher and significant heterosis for most of the characters like number of flowers, number of mature pods, total number of pods, pod yield and kernel yield per plant followed by ICGV-00451 x SEL-1 for immature pods, shelling per cent and 100 kernel weight and ICGV-00350 x ICGV-00451 for sound mature kernels and oil content.

Key words: Gene action, Groundnut, Mid parent heterosis.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is known as a "wonder legume" for its flowering, pegging and pod formation pattern. It is highly self pollinated crop. It is native to South America and is presently cultivated throughout the tropical and warm temperate regions of the world. India is considered to be the secondary centre of origin in view of greater variability observed for the characters in cultivated species under diverse agroclimatic conditions. Lack of requisite variability in cultivated groundnut has led to near genetic uniformity among the improved cultivars (Cherry and Ory 1973). The magnitude of heterosis provides a basis for genetic diversity and guide to the choice of desirable parents for developing superior crosses so as to exploit hybrid vigour and /or for part of building better gene pool to be employed in population improvement. In groundnut, the utility of heterosis *per se* may not be much useful, but the cross combination showing higher hybrid vigour can be used in isolating high yielding pure lines. Study of heterosis will have a direct bearing on the breeding methodology to be employed for varietal improvement. The present investigation was therefore, planned to estimate the extent of heterosis over better parent, mid parent and standard parents in 21 crosses for 13 quantitative characters.

MATERIALS AND METHODS

The experimental material for the present investigation was generated by crossing three genotypes *viz.*, ICGV-91114, ICGV-00350 and R-2001-2 as lines with seven testers *viz.*, TPT-25, TAG-24, TMV-2, KRG-1, Sel-1, ICGV-00451 and GPBD-5 in line x tester design and obtained 21 crosses. The resulting 21 crosses were sown along with the parents and two checks *viz.*, GPBD-4 and R-2001-3 in a randomized block design with two replications during *Kharif* 2009 at Agricultural Research Station, University of Agricultural Sciences, Raichur. Each entry was sown in a row of three meter length spaced 30 cm apart with a plant to plant distance of 10 cm. Recommended cultural practices were adopted to raise a good crop. Observations on five random plants were recorded for 13 quantitative traits such as plant height, number of branches, days to 50 per cent flowering, days to maturity, number of mature

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pods, number of immature pods, total number of pods, pod yield per plant, kernel yield per plant, shelling per cent, sound mature kernels, 100 kernel weight and oil content. The heterosis was estimated over better parent, mid parent and standard parent (GPBD-4) using standard procedures.

RESULTS AND DISCUSSION

The analysis of variance (Table 1) indicated that the parents exhibited significant variances for all the characters studied, indicating that the parents chosen were highly variable for all the characters. The heterosis over mid parent, better parent and standard checks for 13 characters have been presented in Table 3-5. The range of heterosis exhibited by crosses over the respective mid parent, better parent and standard parent for pod yield per plant was -46.78 to 40.19%, -54.65 to 27.47% and -42.31 to 28.11%, respectively (Table 2) and nine crosses exhibited significant positive heterosis over mid parent and three crosses exhibited significant positive heterosis over better parent for pod yield per plant. For pod yield per plant the highest positive heterosis to an extent of 40.19 per cent was noticed in the cross R-2001-2 x GPBD-5 over mid parent followed by ICGV-91114 x SEL-1 (34.41%) and ICGV-91114 x KRG-1 (21.3%). Similarly, the cross that recorded maximum better parent heterosis was ICGV-91114 x SEL-1 (27.47 %) and closely followed by R-2001-2 x GPBD-5 (20 %) and ICGV-91114 x KRG-1 (17.14 %). The crosses R-2001-2 x GPBD-5 and ICGV-91114 x SEL-1 were also superior on per se performance. The prevailence of heterosis over both mid parent and better parent indicate involvement of both additive and non additive components of variance for this trait, suggesting simple pedigree alone is not sufficient to exploit both type of gene actions. The results of many workers are in accordance with the present findings (Mathur *et al.*, 2003; Sathish Yadav *et al.*, 2006; Venkateswarlu *et al.*, 2007).

For plant height, out of 21 crosses five crosses exhibited significant positive heterosis over mid parent and two crosses for better parent. The presence of positive heterosis for plant height has been reported by Chaudhari *et al.* (1992) and John and Vasanthi (2006). While the remaining majority

TABLE 1. ANOVA for parents and crosses for 13 different characters in groundnut.

Source of variance	df	Plant height (cm)	No. of branches per plant	Days to 50 % flowering	Days to maturity	No. of mature pods/ plant	No. of Immature Pods/ plant	Total no. of pods/ plant	Pod yield/ plant	Kernel yield/ plant	Shelling per cent	Sound mature kernel (%)	100 kernel weight	Oil content (%)
Replication	1	0.38	0.0064	0.10	5.82	0.26	0.03	0.001	0.022	0.02	1.88	0.58	0.10	0.27
Parent	9	125.73**	3.56**	15.89**	161.2**	21.75**	1.06**	28.16**	19.13**	7.84**	70.36**	10.22**	137.6**	7.40**
Crosses	20	28.99**	1.45**	27.17**	76.17**	15.64**	1.40**	19.78**	6.33**	3.62**	135.95**	25.06**	48.53**	8.38**
Parent V/s Crosses	1	288.62**	2.22**	4.35	541.8**	1.23	7.24**	14.43**	0.12	5.17**	710.40**	58.13**	257.9**	126.5**
Error	30	0.77	0.02	0.70	1.69	0.32	0.05	0.43	0.28	0.10	1.97	0.85	1.57	0.44

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

of crosses have shown significant negative heterosis in the present study which is supported by Manivel *et al.* (2003). The presence of negative heterosis for plant height can also be exploited in developing dwarf varieties. For number of branches, majority of the crosses exhibited negative heterosis over mid parent, better parent and standard checks. However, the cross R-2001-2 x TAG-24 was recorded the highest standard heterosis (30 %) over check GPBD-4. Chaudhari *et al.* (1992) also reported the significantly high useful heterosis for number of branches in crosses JL 24 x TAG 24 where TAG-24 also used as tester. Considering negative heterosis as desirable for the days to 50 per cent flowering, the cross ICGV-00350 x GPBD-5 showed highest significant negative heterosis of -11.5 % and -20.6 % over mid parent and better parent, respectively. The expression of desirable negative heterosis in the most of crosses indicating the presence of variability among lines and testers. The negative heterosis for this trait was also reported by Chaudhari *et al.* (1992). Majority of crosses were showed significant negative heterosis for days to maturity which is in accordance with the findings of Chaudhari *et al.* (1992). As groundnut is mainly grown in rainfed condition, it necessitates to develop early genotypes to overcome the moisture stress particularly during pod filling stage. In this regard various reports also suggest to use parents of different habit group to develop early genotype.

For number of mature pods which are main components of yield, five crosses manifested significant positive heterosis over mid parent and three for better parent and only two crosses *viz.*, R-2001-2 x GPBD-5 and R-2001-2 x TPT-25 recorded significant positive heterosis over check GPBD-4. The presence of positive heterosis for this trait was also reported by many workers in the past (Vindhiya Varman and Raveendran 1997; John and Vasanthi 2006 and Venkateswarlu *et al.*, 2007). Since number of mature pods indicated the simultaneous pegging to bear more uniform pods, it was essential to select based on this trait to achieve higher pod yield. The cross ICGV-91114 x SEL-1 exhibited highest heterosis over mid parent (27.93 %) and better parent (15.14%), respectively for total number of pods per plant. Similarly, Apparao (2000) also noticed the highest heterosis to an extent of 116.6 per cent and 114.5 per cent for number of mature pods and total number of pods per plant in the crosses TAG-24 x ICGV-86699 and Dh-40 x Dh-73 respectively.

For kernel yield per plant, three crosses exhibited significant positive heterosis over mid parent and two crosses exhibited significant positive heterosis over better parent, whereas for shelling per cent three crosses showed significant positive heterosis over mid parent. Venkateswarlu *et al.* (2007) noticed maximum standard heterosis of 73.06 per cent for kernel yield per plant. The crosses *viz.*, ICGV-00350 x ICGV-00451and ICGV-00350 x SEL-1 showed highest heterosis over mid parent, better parent and standard parent for sound mature kernels and 100 kernel weight, respectively. These results were similar to Vindhiya Varman and

TABLE 2. The range of heterosis over mid parent, better parent and standard parent.

Characters	Mid parent	Better parent	Standard parent
Plant height (cm)	-59.47 – 37.58	-63.64 – 27.28	-6.29 – -9.93
No. of branches per plant	-25.15 – 13.04	-37.97 – 4.08	-23.33 – 30.00
Days to 50% flowering	-11.50 – 16.95	-20.63 – 11.29	-22.95 – 13.11
Days to maturity	-10.43 – 1.83	-20.61 – 1.26	-15.81 – 1.28
No. of mature pods/plant	-43.16 – 26.72	-52.73 – 17.86	-46.15 – 22.78
No. of immature pods/plant	-62.89 – 36.17	-66.67 – 6.67	-60.00 – 28.00
Total no. of pods/plant	-39.42 – 27.93	-46.09 – 15.14	-39.95 – 19.61
Pod yield /plant (g)	-46.78 – 40.19	-54.65 – 27.47	-42.31 – 28.21
Kernel yield/plant (g)	-47.05 – 35.87	-53.43 – 21.20	-40.10 – 29.57
Shelling %	-31.42 – 11.99	-30.93 – 0.66	-28.83 – 8.32
Sound mature kernel (%)	-6.63 – 10.48	-7.65 – 10.17	-5.06 – 9.55
100 kernel weight (g)	-34.71 – 31.41	-48.57 – 24.49	-32.86 – 20.14
Oil content (%)	-10.72 – 8.80	-15.46 – 11.76	-10.61 – 6.15

TABLE 3. Mid parent heterosis for 13 characters in groundnut.

Crosses	Plant height (cm)	No. of branches per plant	Days to 50 % flowering	Days to maturity	No. of mature pods/ plant	No. of Immature Pods/ plant	Total no. of pods/ plant	Pod yield/ plant (g)	Kernel yield/ plant (g)	Shelling per cent	Sound mature kernel (%)	100 kernel weight (g)	Oil content (%)
ICGV-91114 x TPT-25	37.58**	3.03	-5.00	-4.60**	4.17	-15.97*	0.17	13.27*	-20.74**	-29.39**	-1.35	-27.90**	-4.07**
ICGV-91114 x TAG-24	8.11	-1.92	-2.08	-4.83**	3.30	-21.37**	-1.75	-3.38	-14.86**	4.19*	3.87**	-5.74	-7.00**
ICGV-91114 x TMV-2	-24.82**	-8.91**	0.00	-8.39**	-10.83*	-23.66**	-13.62**	13.64*	7.59	3.18	1.67	-8.15**	-9.75**
ICGV-91114 x KRG-1	-21.69**	4.95	-9.62**	-8.39**	16.00**	25.98**	18.02**	21.30**	-0.80	-8.20**	4.35**	-1.60	1.85
ICGV-91114 x SEL-1	-6.68	-6.96**	-2.04	-7.94**	25.71**	36.17**	27.93**	34.49**	33.00**	-0.49	3.64**	4.39	-10.56**
ICGV-91114 x ICGV-00451	-11.23**	-6.98**	-6.42*	-10.34**	-10.08**	5.13	-7.12*	-20.85**	-19.65**	-5.23**	5.52**	-26.26**	4.35**
ICGV-91114 x GPBD-5	20.16**	-16.67**	1.03	-6.58**	-18.45**	-13.11*	-17.35**	8.50	-20.87**	-31.42**	-1.92*	-34.71**	-7.47**
ICGV-00350 x TPT-25	37.57**	4.08	-8.62**	1.83	-3.57	-39.87**	-10.82**	-7.81	-26.27**	-25.75**	-3.87**	-27.27**	-7.77**
ICGV-00350 x TAG-24	13.57*	-4.85	1.79	1.60	-0.93	-12.85*	-3.37	18.92**	-10.99*	-28.12**	3.68**	-10.51**	-10.00**
ICGV-00350 x TMV-2	-25.72**	4.00	16.95**	-3.45**	3.45	-22.21**	-2.09	20.11**	3.49	-10.59**	2.56**	-6.46	-7.99**
ICGV-00350 x KRG-1	-22.80**	0.00	-1.67	-4.31**	1.03	-18.75**	-2.98	-3.39	-22.79**	-24.70**	-3.62**	-13.68**	-0.39
ICGV-00350 x SEL-1	-1.38	-9.65**	12.28**	-1.72	-9.42**	-62.89**	-20.70**	0.00	13.89**	11.99**	9.77**	31.41**	-8.24**
ICGV-00350 x ICGV-00451	-34.30**	-23.44**	10.40**	-7.60**	-20.00**	-3.79	-16.82**	-21.35**	-21.67**	-5.28**	10.48**	-23.42**	8.88**
ICGV-00350 x GPBD-5	-23.34**	-11.51**	-11.50**	-4.31**	-22.69**	1.17	-17.78**	4.15	-23.37**	-29.71**	0.56	-6.78*	-5.34**
R-2001-2 x TPT-25	-16.62**	12.03**	-4.42	-1.11	18.19**	-19.58**	11.11**	15.02**	-0.13	-4.91**	2.47**	-4.13	-10.72**
R-2001-2 x TAG-24	7.84	13.04**	4.59	0.89	-16.54**	-0.71	-13.51**	2.91	-4.03	-7.10**	0.56	-13.99**	-9.93**
R-2001-2 x TMV-2	-52.29**	-12.59**	-2.61	-5.24**	-7.36*	-45.81**	-15.14**	-10.89*	-21.82**	-13.23**	-1.69	4.30	-8.84**
R-2001-2 x KRG-1	-59.47**	-11.11**	4.27	-6.50**	-43.13**	-12.58*	-37.29**	-36.47**	-37.21**	-24.48**	-6.63**	-31.41**	-7.25**
R-2001-2 x SEL-1	-46.17**	-20.81**	9.91**	-5.24**	8.27**	-28.48**	0.96	8.80*	4.81	4.21*	3.70**	16.87**	-9.04**
R-2001-2 x ICGV-00451	-53.00**	-25.15**	13.11**	-5.20**	-38.34**	-44.11**	-39.42**	-46.78**	-47.05**	-3.76*	5.62**	-34.39**	-6.81**
R-2001-2 x GPBD-5	11.42**	-11.69**	-3.64	-1.05	26.72**	0.32	21.60**	40.19**	35.87**	0.15	6.41**	12.49**	-5.66**

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

TABLE 4. Better parent heterosis for 13 characters in groundnut.

Crosses	Plant height (cm)	No. of branches per plant	Days to 50 % flowering	Days to maturity	No. of mature pods/ plant	No. of Immature Pods/ plant	Total no. of pods/ plant	Pod yield/ plant (g)	Kernel yield/ plant (g)	Shelling per cent	Sound mature kernel (%)	100 kernel weight (g)	Oil content (%)
ICGV-91114 x TPT-25	16.98**	2	-10.38**	-6.64**	2.04	-26.47**	-0.99	9.09	-22.42**	-30.93**	-1.61	-31.65**	-8.76**
ICGV-91114 x TAG-24	-9.09	-5.56	-4.08	-7.08**	-4.08	-30.30**	-5.07	-3.68	-19.47**	-1.66	1.62	-11.95**	-9.51**
ICGV-91114 x TMV-2	-38.86**	-9.80**	-7.27*	-15.48**	-14.29**	-37.50**	-15.03**	7.36	-2.22	0.66	-1.08	-16.75**	-11.96**
ICGV-91114 x KRG-1	-36.20**	3.92	-17.54**	-15.48**	13.73**	5.26	11.78**	17.14**	-3.28	-9.61**	3.78**	-8.87**	-0.22
ICGV-91114 x SEL-1	-18.02**	-17.69**	-5.88	-15.06**	17.86**	6.67	15.14**	27.47**	21.20**	-14.50**	0.00	-8.92**	-12.47**
ICGV-91114 x ICGV-00451	-32.88**	-24.05**	-17.74**	-20.61**	-27.50**	-21.90**	-26.34**	-42.25**	-38.57**	-8.84**	3.24**	-38.08**	5.88**
ICGV-91114 x GPBD-5	16.96**	-28.57**	-2.00	-13.81**	-22.22**	-29.70**	-23.97**	3.93	-22.81**	-32.79**	-3.24**	-37.81**	-11.56**
ICGV-00350 x TPT-25	27.87**	4.08	-15.87**	-1.33	-16.92**	-41.42**	-21.35**	-14.90**	-29.23**	-25.92**	-6.45**	-29.90**	-11.34**
ICGV-00350 x TAG-24	4.26	-9.26**	-9.52**	-1.33	-18.46**	-16.32*	-18.07**	5.77	-20.55**	-30.56**	3.39**	-12.41**	-11.46**
ICGV-00350 x TMV-2	-43.89**	1.96	9.52**	-6.28**	-12.31**	-26.25**	-13.28**	1.92	-11.00*	-10.64**	2.27*	-7.50	-9.24**
ICGV-00350 x KRG-1	-41.58**	-1.96	-6.35*	-7.11**	-9.85**	-21.05**	-11.02**	-11.06*	-25.62**	-25.36**	-5.46**	-14.74**	-1.32
ICGV-00350 x SEL-1	-20.24**	-20.77**	1.59	-4.60**	-15.69**	-66.67**	-23.37**	-6.25	-1.81	-1.75	8.52**	24.59**	-9.19**
ICGV-00350 x ICGV-00451	-53.42**	-37.97**	9.52**	-14.12**	-27.50**	-19.05**	-25.74**	-37.63**	-37.30**	-6.70**	10.17**	-40.08**	11.76**
ICGV-00350 x GPBD-5	-32.08**	-24.79**	-20.63**	-7.11**	-29.23**	-5.45	-22.36**	-3.37	-26.19**	-30.00**	-0.56	-10.59**	-8.54**
R-2001-2 x TPT-25	-35.17**	-11.31**	-10.00**	-6.72**	-4.83	-23.33**	-7.85**	-2.00	-13.70**	-7.36**	0.54	-7.35*	-15.46**
R-2001-2 x TAG-24	-16.95**	-7.14**	-5.00	-4.62**	-35.51**	-6.67	-30.80**	-15.20**	-22.18**	-8.10**	0.00	-15.60**	-12.76**
R-2001-2 x TMV-2	-57.29**	-29.76**	-6.67*	-5.44**	-26.49**	-47.50**	-29.35**	-29.60**	-38.62**	-15.23**	-2.79*	2.87	-11.47**
R-2001-2 x KRG-1	-63.64**	-28.57**	1.67	-6.69**	-52.73**	-13.16*	-46.09**	-46.00**	-45.56**	-26.89**	-7.65**	-32.08**	-9.54**
R-2001-2 x SEL-1	-47.37**	-29.76**	1.67	-5.44**	-6.49*	-34.44**	-8.91**	-6.00	-17.54**	-6.63**	1.68	10.54**	-11.38**
R-2001-2 x ICGV-00451	-61.3**	-27.38**	11.29**	-9.54**	-39.50**	-52.10**	-42.12**	-54.65**	-53.43**	-4.62*	5.03**	-48.57**	-5.88**
R-2001-2 x GPBD-5	2.33	-19.05**	-11.67**	-1.26	7.79*	-4.24	7.39**	20.00**	17.77**	-2.61	6.11**	8.16*	-10.23**

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

TABLE 5. Standard parent heterosis for 13 characters in groundnut.

Crosses	Plant height (cm)	No. of branches per plant	Days to 50 % flowering	Days to maturity	No. of mature pods/ plant	No. of Immature Pods/ plant	Total no. of pods/ plant	Pod yield/ plant (g)	Kernel yield/ plant (g)	Shelling per cent	Sound mature kernel (%)	100 kernel weight (g)	Oil content (%)
ICGV-91114 x TPT-25	-19.58**	-15.00**	-22.13**	-15.81**	-26.04**	-33.33**	-27.36**	-17.95**	-37.83**	-25.67**	2.81*	-20.71**	-1.12
ICGV-91114 x TAG-24	-37.50**	-15.00**	-22.95**	-15.81**	-30.47**	-38.67**	-31.96**	-32.91**	-38.21**	5.83**	5.62**	2.14	-6.48**
ICGV-91114 x TMV-2	-32.90**	-23.33**	-16.39**	-13.68**	-37.87**	-33.33**	-37.05**	-25.21**	-24.97**	8.32**	2.81*	-3.43	-9.50**
ICGV-91114 x KRG-1	-30.33**	-11.67**	-22.95**	-13.68**	-14.20**	6.67	-10.41**	-12.39**	-21.88**	-2.72	7.87**	5.71	1.68
ICGV-91114 x SEL-1	-25.55**	-10.83**	-21.31**	-13.25**	-2.37	28.00**	3.15	-0.85	-7.00	-7.98**	3.93**	5.66	-9.50**
ICGV-91114 x ICGV-00451	-9.93*	0.00	-16.39**	-11.11**	-14.20**	9.33	-9.93**	-12.39**	-10.91**	-1.90	7.30**	5.71	0.56
ICGV-91114 x GPBD-5	-15.07**	-16.67**	-19.67**	-11.97**	-37.87**	-22.67**	-35.11**	-20.94**	-37.70**	-27.67**	0.56	-27.86**	-5.14**
ICGV-00350 x TPT-25	-28.31**	-15.00**	-13.11**	-5.13**	-20.12**	-44.00**	-24.46**	-24.36**	-38.34**	-23.75**	-2.25*	-27.14**	-3.91**
ICGV-00350 x TAG-24	-41.54**	-18.33**	-6.56*	-5.13**	-21.60**	-20.00**	-21.31**	-5.98	-30.77**	-28.83**	2.81*	-11.79**	-8.49**
ICGV-00350 x TMV-2	-38.42**	-13.33**	13.11**	-4.27**	-15.68**	-21.33**	-16.71**	-9.40*	-22.45**	-8.42**	1.12	-10.80**	-6.70**
ICGV-00350 x KRG-1	-36.21**	-16.67**	-3.28	-5.13**	-13.31**	-20.00**	-14.53**	-20.94**	-35.18**	-22.14**	-2.81*	-15.71**	0.56
ICGV-00350 x SEL-1	-27.57**	-14.17**	4.92	-2.56*	-18.93**	-60.00**	-26.39**	-16.67**	-14.44**	0.68	7.30**	20.14**	-7.26**
ICGV-00350 x ICGV-00451	-37.50**	-18.33**	13.11**	-3.85**	-14.20**	13.33	-9.20**	-5.38	-9.08*	-4.38**	9.55**	2.29	6.15**
ICGV-00350 x GPBD-5	-50.68**	-12.25**	-18.03**	-5.13**	-31.95**	4.00	-25.42**	-14.10**	-35.69**	-27.67**	0.56	-6.11	-1.90
R-2001-2 x TPT-25	-43.75**	24.17**	-11.48**	-5.13**	8.40*	-23.33**	2.64	4.70	-5.04	-4.65**	5.06**	-3.71	-8.38**
R-2001-2 x TAG-24	-27.94**	30.00**	-6.56*	-2.99*	-26.54**	-6.67	-22.93**	-9.40*	-14.38**	-10.28**	0.56	-15.00**	-9.83**
R-2001-2 x TMV-2	-53.12**	-1.67	-8.20**	-3.42**	-16.27**	-44.00**	-21.31**	-24.79**	-32.47**	-13.23**	-2.25*	-0.29	-8.99**
R-2001-2 x KRG-1	-60.29**	0.00	0.00	-4.70**	-46.15**	-12.00	-39.95**	-42.31**	-40.10**	-23.75**	-5.06**	-32.86**	-7.82**
R-2001-2 x SEL-1	-52.21**	-1.67	0.00	-3.42**	6.51	-21.33**	1.45	0.43	-9.27*	-8.84**	2.25*	7.14	-9.50**
R-2001-2 x ICGV-00451	-48.07**	1.67	13.11**	1.28	-28.40**	-32.93**	-29.23**	-31.2**	-32.47**	-5.18**	5.62**	-12.2**	-10.61**
R-2001-2 x GPBD-5	-11.21*	13.33**	-13.11**	0.85	22.78**	5.33	19.61**	28.21**	29.57**	0.64	7.30**	13.57**	-3.71*

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

Ravichandran (1997) and Venkateswarlu *et al.* (2007).

In general, most of the crosses exhibited negative heterosis over mid parent, better parent and standard checks for oil content which was supported by Makne and Bhale (1987). The cross ICGV-00350 x ICGV-00451 showed highest heterosis of 8.88 % and 11.76 % over mid parent and better parent, respectively which is in agreement with Venkateswarlu *et al.* (2007) as they reported the maximum better parent heterosis (14.51 %) and that of standard parent and mid parent heterosis of 10.8 % and 10.25 %, respectively. However the overall heterosis was negative (-5.79 %) and it was mainly attributed to narrow range oil content among the parents. Therefore it was concluded that heterosis for oil content was quite low, as also concluded by Sathish Yadav *et al.* (2006) and the prime reason for lack of heterosis for oil content is the lack of variability for oil content among groundnut cultivars (Deshmukh *et al.*, 1986, 1987).

The cross R-2001-2 x GPBD-5 exhibited higher and significant heterosis for most of the characters like number of flowers, number of mature pods, total number of pods, pod yield and kernel yield per plant followed by ICGV-00451 x SEL-1 for immature pods, shelling per cent and 100 kernel weight and ICGV-00350 x ICGV-00451 for sound mature kernels and oil content. The high heterotic effects of pod yield in the cross R-2001-2 x GPBD-5 is mainly attributed to the significant heterotic effects of yield attributing traits *viz.*, number of mature pods, total number of pods, and kernel yield per plant. Therefore, association of yield and its attributing characters at both phenotypic and genotypic level was positive and significant (Lakshmidevamma, 2001). Hence, for the above characters, the cross combination showing higher hybrid vigour can be used in isolating high yielding pure lines and to break yield barrier in groundnut as the superior crosses are expected to produce transgressive segregants.

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