Indian J. Genet., **66**(1): 41-42 (2006)

Short Communication

Heterobeltiosis and inbreeding depression in barley (*Hordeum vulgare* L.)

R. K. Kularia and A. K. Sharma

Department of Plant Breeding & Genetics, College of Agriculture, Bikaner 334 006

(Received: May 2005; Revised: March 2006; Accepted: March 2006)

The extent of heterosis of depends generally on the magnitude of non-additive gene action and wide genetic diversity among parents. However, there is report that in self pollinated crops, crosses with high heterosis associated with high magnitude of additive gene effects give better segregants [1].The present investigation was carried out with six generations *viz.*, P_1, P_2, F_1, F_2, BC_1 and BC_2 generated from three crosses of barley (*Hordeum vulgare* L.) i.e., RD 2503 × BL 2, Rajkiran × IBVT 12 and RD 2508 × RD 2052. All the six generations were grown at Agriculture Research Station. Bikaner in randomized block design with three replications during *rabi* 2003. The parents, F_1s and backcross generations were grown in single row whereas each F_2 generation was raised in four rows, each row was two meters long accommodating 20 plants spaced 10cm apart and row to row distance was 25 cm. The data were scored for ten yield and associated traits *viz.*, days to heading, flag leaf area, plant height, number of effective tillers per plant, number of grains per spike, 1000-grain weight, biological yield per plant, harvest index and grain yield per plant, on individual plant basis on five randomly selected plants in P_1, P_2, F_1 and 10 plants in backcrosses and 20 plants in F_2 generations. Heterobeltiosis and inbreeding depression was calculated as per standard procedure [2].

The results on heterobeltiosis and inbreeding depression for yield and its components have been presented in Table 1. The range of heterosis was quite wide except for days to heading and plant height indicating that sufficient amount of genetic variability was present in the parent material. Maximum heterobeltiosis (–2.21) in desirable direction was recorded in the cross RD 2508 × RD 2052 for days to heading with significant inbreeding depression was also reported [3]. The cross Rajkiran × IBVT 12 depicted more heterosis for leaf area (15.43%) with negative significant inbreeding depression (-17.80%) indicating superiority of F_2 in comparison to F_1 for this trait. Heterobeltiosis in desirable direction was recorded in the cross RD 2503 × BL 2 for plant height (–11.58 %) and inbreeding depression ranged from –16.76 to 1.87. Significant positive heterobeltiosis was observed for spike length in cross Rajkiran × IBVT 12 with negative significant inbreeding depression, indicating the chance of getting more spike length through selection from segregation generation. Heterobeltiosis was also reported earlier for this trait by Elenein and Moris [4]. Maximum heterobeltiosis for number of effective tillers per plant was recorded in the cross RD 2508 × RD 2052 (13.38 %). But negative and significant inbreeding depression was showed by all the three crosses indicating that selection in segregating generation for this character may be more beneficial. For number of grains per spike Rajkiran × IBVT 12 showed maximum heterobeltiosis and inbreeding depression. All the three crosses showed positive and significant heterobeltiosis (12.57 to 33.54 %) and inbreeding depression (–8.41 to 24.07%) for 1000-grain weight. Two crosses out of three expressed significant positive heterobeltiosis for biological yield per plant. The negative inbreeding depression was depicted by the cross Rajkiran × IBVT 12 indicating more biological yield in segregating generation.

High helterobeltiosis coupled with high inbreeding depression in negative direction for harvest index indicated superiority of F_2 in comparison to F_1. In respect of grain yield helterobeltiosis was recorded only in cross RD 2508 × RD 2052 (15.22%) whereas inbreeding depression was negative and significant for all crosses. This may be due to production of buttering effect in F_2 generation of genes or sometime because of formation of superior gene combination, resulting in transgressive segregant [5, 6].

The present study indicates that the cross RD 2508 × RD 2052 showing heterosis for one or more yield components and was also showing low inbreeding depression. These parents can be exploited for further improvement and getting better hybrids.

Table 1. Heterosis and inbreeding depression in barley

Character	Crosses					
	RD 2503 × BL 2		RD 2508 × RD 2052		Rajkiran × IBVT 12	
	H	I	H	I	H	I
Days to heading	–0.34	2.29**	–2.21*	–1.74*	7.23**	5.90**
Flag leaf area	–25.11**	–12.70**	–6.92**	–1.62	15.43**	–17.80**
Plant height (cm)	–11.58*	–16.76**	5.65	1.87	7.32*	–2.27
Spike length (cm)	–12.05	–4.07**	–1.10*	0.55	14.29**	–3.28**
No. of effective tillers/plant	–18.45**	–33.83**	13.38**	–15.15**	–5.71**	–17.88**
No. of grains/spike	–11.61**	7.07*	7.13**	11.33**	27.14**	–16.13**
1000 grains weight (g)	15.99**	–8.41**	12.57**	2.51*	33.54**	24.07**
Biological yield/plant (g)	–14.29**	4.43	31.65**	–2.96	23.08**	–13.88**
Harvest index (%)	–3.71	–19.15**	–14.68**	–25.78**	–39.59**	–48.20**
Grain yield/plant (g)	–18.13**	–9.35**	15.22**	–19.63**	–26.56**	–64.12**

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

References

1. **Gupta S., Ahmed Z. and Gupta R. B.** 1989.Combining ability in bread wheat. Indian J. Genet,. **49**: 25-28.
2. **Fonseca S. and Patterson F. L.** 1968. Hybrid vigour in seven parent diallel cross in common winter wheat. Crop Sci., **8**: 85-88.
3. **Conti S. and Buonfigiloli** 1975. Evaluation of heterosis in crosses between two rowed and six rowed barley varieties. Somanti Elletto., **21**: 107-117.
4. **Abo-elenein R. A. and Moris L. R.** 1997. Heterosis and combining ability in barley by diallel analysis. Egyptian J. Genet and Cytology, **6**: 84-97.
5. **Done A. C. and Macer R. C. F.** 1979. Some expression of heterosis in F_1 hybrid barley Arm. Appli. Biol., **91**: 375-378.
6. **Andronov I.** 1992. An investigation of some important characters in the F_1 and F_2 of hybrid series B of spring fodder barley. Acta Univ. Buno., **30**: 35-47.