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HETEROSIS IN CHICKPEA

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Heterosis was studied in 4 crosses of F1 and F2 generations for plant height, primary and secondary branches per plant, pods per plant and yield per plant in chickpea (*Cicer arietinum* L.). Crosses, PK 51814 X CM 72 and C 141 X ILC 72 showed very high positive heterosis for primary branches per plant and pods per plant, over mid, female and male parents. Heterotic vigour in F2 was less than in F1. Hybrid vigour in primary branches per plant and pods per plant seems to influence heterosis in yield.

Key words: *Cicer arietinum* L., Hybrids, Heterosis, Mid parent.

INTRODUCTION

The phenomenon of heterosis has been generally associated with the increased yield and vigour obtained by crossing inbred lines. The presence of heterosis in legumes has been reported by several authors [1,2,4,5,6,7,8]. Heterotic responses being dependent upon the degree of genetic diversity among the parents involved, it should be of interest to know the extent of heterosis among diverse types, Desi and Kabuli, in chickpea (*Cicer arietinum* L.).

MATERIALS AND METHODS

Four crosses were made among genetically diverse parents and their F2 seeds were produced in the next year. Sixteen entries including 8 parents, 4 Fls and 4 F2s were grown in non replicated plots at the National Agricultural Research Centre, Islambad, during 1985-86. Each parent and F1 was grown in a single row of 4m length, accommodating 40 plants 10 cm apart. The F2s were grown in 4 rows. Observations were recorded on 10 randomly selected plants from each parent, 20 and 60 randomly selected plants from each F1 and F2 respectively, on plant height (cm), primary and secondary branches per plant, pods per plant and yield per plant (g). The heterosis in the F1s and F2s were expressed as percentage increase or decrease in the mean values over mid, male and female parents.

RESULTS AND DISCUSSIONS

The values of heterosis (%) for plant height and primary and secondary branches are given in Table 1. Of the 4 crosses, in the F1, all the crosses exhibited positive heterosis over the mid, female and male parents for plant height. In the F2 all crosses showed positive heterosis over the mid and male parent and only 2 over the female parent, but was of lower magnitude. For primary branches per plant positive heterosis was observed in all F1 crosses over mid, female and male parents. In F2 only 3 crosses exhibited their superiority over mid and male parents.

Heterotic effect in all the crosses over the mid and female parents and 3 crosses over the male parent was observed for secondary branches per plant in the F1 generation. But in F2 only 2 crosses showed positive heterosis over mid and female parents.

All crosses showed positive heterosis over the mid and male parents in the F1, except ILC 195 X NEC 138-2, which showed negative heterosis over the female parent, for pods per plant (Table 2). In the F2 only 3 crosses exhibited their superiority over the mid, female and male parents.

F1 heterosis was observed for yield per plant in all crosses over the mid, female and male parents. Crosses, C 141 X ILC 72 and PK 51814 X ILC 3279, exhibited high heterotic vigour. However, in the F2 almost all the crosses exhibited inbreeding depression over the mid, female and male parents. Similiar results were reported by Singh *et. al.* [6].

The degree of heterosis varied from character to character, the maximum being 36.61 % in primary branches per plant and the minimum being 12.84 % in secondary branches per plant, when F1s were compared with mid values of both parents.

From this study it can be concluded that heterosis for primary branches per plant and pods per plant, to a

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Table 1. Heterosis (%) for plant height, primary and secondary branches per plant in chickpea

Hybrids and parental forms		Plant height Heterosis (%) over			Primary branches per plant Heterosis (%) over			Secondary branches per plant Heterosis (%) over		
		MD.P'	F.P	M.P	MD.P.	F.P	MP	MD.P.	F.P	M.P
PK 51814		–	–	– –		–	–	–	–	–
PK 51814 X	FI	16.66	22.94	10.99	48.94	37.78	62.07	10.29	8.01	12.67
ILC 3279	F2	7.72	13.52	2.49	11.62	3.26	21.46	9.43	7.16	11.79
ILC 3279		–	–	–	–	–	–	–	–	–
C 141		–	–	–	–	–	–	–	–	–
C 141 X	F1	26.01	34.88	18.24	48.61	57.03	41.05	15.22	1.80	32.71
ILC 72	F2	17.43	25.69	10.19	18.67	25.39	12.63	–7.04	–717.05	7.05
ILC 72		–	–	–	–	–	–	–	–	–
ILC 195		–	–	–	–	–	–	–	–	–
ILC 195 X	F1	10.33	5.71	15.36	15.81	31.25	3.62	19.55	15.10	24.37
NEC 138-2	F2	2.44	–1.85	7.11	–2.94	10.00	–13.16	9.27	5.20	13.67
NEC 138-2		–	–	–	–	–	–	–	–	–
ILC 202		–	–	–	–	–	–	–	–	–
ILC 202 X	F1	20.26	6.62	37.91	33.06	49.85	19.66	4.86	23.95	–9.13
CM 72	F2	1.36	–10.14	16.23	13.36	27.66	1.94	–18.08	–3.17	–29.01
CM 72		–	–	–	–	–	–	–	–	–

MD.P = Mid parent F.P = Female parent, M.P = Male parent.

Table 2. Heterosis (%) for pods per plant and yield per plant in chickpea.

Hybrids and parental forms		Pods per plant Heterosis (%) over			Yield per plant Heterosis (%) over		
		MD.P.	F.P	M.P	MD.P.	F.P	M.P
PK 51814		–	–	–	–	–	–
PK 51814 x	F1	40.49	81.63	14.54	18.20	11.63	25.59
ILC 3279	F2	24.79	61.34	1.74	13.57	7.26	20.67
ILC 3279		–	–	–	–	–	–
C 141		–	–	–	–	–	–
C 141 x	F1	39.29	43.46	35.36	22.62	29.13	16.75
ILC 72	F2	28.89	32.74	25.25	15.19	21.31	9.67
ILC 72		–	–	–	–	–	–
ILC 195		–	–	–	–	–	–
ILC 195 x	F1	3.36	–8.39	18.59	6.89	12.51	1.82
NEC 138-2	F2	–1.53	–12.74	12.97	–2.73	2.38	–7 35
NEC 138-2		–	–	–	–	–	–
ILC 202		–	–	–	–	–	–
ILC 202 x	F1	11.76	21.72	3.31	8.69	14.18	3.70
CM 72	F2	4.51	13.82	–3.39	3.77	9.01	–0.98
CM 72		–	–	–	–	–	–

MD. P = Mid parent., F.P = Female parent. M.P = Male parent.

large extent decides the magnitude of heterosis for grain yield. Gowda and Bahl [3] and Mandal and Bahl [4], working on chickpea crosses, reported a similiar relationship between heterosis for grain yield and pods per plant.

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