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INHERITANCE OF MORPHOLOGICAL CHARACTERS IN CHICKPEA (*CICER ARIETINUM* L.)

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ABSTRACT

The inheritance of prostrate growth habit, simple leaf type and thick stem was studied in the F_1, F_2 and backcross generations of chickpea (*Cicer arietinum* L.). All the traits showed monofactorial recessive inheritance.

Key words: Chickpea, morphological characters, inheritance.

In chickpea, large variation exists for the qualitative as well as quantitative characters. The information on the inheritance of morphological characters would be useful in changing the architecture of the plant. In this paper, the inheritance of growth habit, leaf type, and thick stem characters are reported in chickpea.

MATERIALS AND METHODS

The variety Ponaflair has prostrate and PDG 8416 and BGM 417 have erect growth habit. PRR 1 is a spontaneous simple leaf mutant in which compound leaf is replaced by a simple lamina. A thick-stem mutant, E 100 Y (M) from a line (E 100 Y) introduced from Greece, also has short, thick and dark green leaves. The parents, F_1, F_2, and backcrosses of PDG 8416 x Ponaflair, BGM 417 x Ponaflair, PDG 8416 x PRR 1, and E 100 Y x E 100 Y (M) crosses were grown in rabi season of 1989-90 to study the inheritance of certain morphological characters. The segregation ratios were tested for the goodness of fit using χ^2 test. Yates correction was applied [1].

RESULTS AND DISCUSSION

PDG 8416 and BGM 417 are erect cultivars and Ponaflair is prostrate type. The F_1 plants of PDG 8416 x Ponaflair and BGM 417 x Ponaflair crosses were erect, suggesting that prostrate growth habit was recessive to the erect type. The F_2 segregation in PDG 8416 x

Ponaflair cross gave a good fit to 3 erect: 1 prostrate ratio (Table 1). The cross BGM 417 x Ponaflair did not show a good fit to this F_2 ratio. However, the backcrosses with erect types (PDG 8416 and BGM 417) exhibited only erect type of plants whereas the backcrosses with Ponaflair gave a segregation pattern of 1 erect : 1 prostrate. The results of the F_2 and backcrosses suggested that the prostrate growth habit is governed by a single recessive gene. This corroborates the earlier findings [2].

Table 1. Segregation for growth habit in the F_2 and backcrosses in chickpea

Cross	Generation	Observed segregation		Expected ratio	χ^2	P
		erect	prostrate			
PDG 8416 x Ponaflair	F_2	362	135	3:1	1.128	0.30–0.20
(PDG 8416 x Ponaflair) x Ponaflair	BC	11	16	1:1	0.592	0.50–0.30
(PDG 8416 x Ponaflair) x PDG 8416	BC	5	0	—	—	—
BGM 417 x Ponaflair	F_2	153	33	3:1	4.845	0.05–0.02
(BGM 417 x Ponaflair) x Ponaflair	BC	3	4	1:1	0	0.99–0.98
(BGM 417 x Ponaflair) x BGM 417	BC	9	0	—	—	—

The inheritance of simple leaf character was studied in the cross between PDG 8416 (normal leaf) and PRR 1 (simple leaf). Nineteen F_1 plants showed a normal leaf type, suggesting recessive nature of simple leaf character. In the F_2 generation, the low frequency of simple leaf type resulted in a poor fit to 3 normal : 1 simple ratio (Table 2). The low frequency of simple leaf type could be explained by their poor adaptation in a heterogeneous population. The backcrosses with PDG 8416 and PRR 1 suggested that one recessive gene is responsible for simple leaf type. Similar results were reported by Rao and coworkers [2].

Table 2. Segregation for leaf type and stem thickness in the F_2 and backcross in chickpea

Character	Generation	Observed segregation		Expected genetic ratio	χ^2	P
		normal	mutant			
Leaf type:						
PDG 8416 x PRR 1	F_2	164	28	3:1	10.563	0.01–0.001
(PDG 8416 x PRR 1) x PRR 1	BC	9	6	1:1	0.266	0.70–0.50
(PDG 8416 x PRR 1) x PDG 8416	BC	14	0	—	—	—
Stem thickness:						
E 100 Y x E 100 Y (M)	F_2	167	45	3:1	1.415	0.30–0.20
(E 100 Y x E 100 Y (M) x E 100 Y	BC	3	7	1:1	0.900	0.50–0.30
(E 100 Y x E 100 Y (M) x E 100 Y (M)	BC	12	0	—	—	—

The inheritance of thick stem was studied in the cross E 100 Y x E 100 Y (M). The eight F_1 plants had normal stem and leaf colour. The F_2 plants segregated in the ratio of 3 normal : 1 mutant, and all the plants with thick stem also had thick and dark green leaves, suggesting that one recessive gene with pleiotropic effect governed the mutant characters. The segregation in backcrosses also supported the findings of F_2 generation (Table 2) which also agrees with the earlier results [3].

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