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Inheritance and linkage relationships of a new lobed vexillum mutant in chickpea

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ABSTRACT Inheritance of a new three-lobed vexillum mutant isolated from a chickpea cultivar ICC-7545 is reported. A single recessive gene controlled this trait. Joint segregation studies revealed linkage with two other marker genes controlling broad leaflets, and double-flowered peduncle The symbol Ivx is proposed for lobed vexillum character

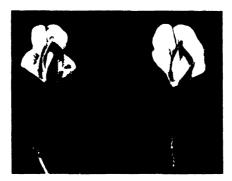
WHILE studying the range of morphological riability of the world collection of chickpea (Cicer arietinum L) germplasm, maintained by the Genetic Resources Unit of ICRISAT, during the post-rainy season of 1977 78, a plant with an unusual vexillum (standard petal of the flower) shape was isolated from a broad-leaved Ethiopian cultivar, ICC-7545, and found to breed true in subsequent years. In contrast to the entire obovate vexillum generally found in chickpeas⁹, the new mutant has a three-lobed vexillum (Figure 1) The inheritance of this character and its linkage relationships with two other marker genes of chickpea were studied and its usefulness as a marker is discussed

Materials and Methods

Crosses were made between the lobed vexillum mutant (which also has broad leaflets) and a double-flowered desi (local Indian) cultivar,

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FIGURF 1 Howers of the lobed vexillum mutant (left) and common chickpea (right)

JG-62, with two flowers borne on each peduncle and normal elliptic leaflets, during the 1978-79 season. Fight F1 plants were raised during 1979 80 The F₂ population was grown during the 1980-81 post-rainy season and the observed segregation ratios for the lobed vexillum, broad leaflets, and double-flowered peduncle were tested for goodness-of fit to the expected ratios by chi square?

Results and Discussion

All F₁ plants had normal vexillae, elliptic leaflets, and single-flowered peduncles, indicating that these traits are dominant. A segregation pattern of 3.1 in the Γ_2 indicated that the lobed vexillum is governed by a single recessive gene Broad leaflets and double-flowered peduncles

Table I Segregation for vexillum, leaflet shape, and number of flowers per peduncle, in a cross between JG-62 and a mutant line of ICC-7545 chickpeas

Trait	No observed		χ^{2} adjusted	
	normal	mutant*	(3.1)	P
Vexillum	365	102	2 569	0201
I eaflets	342	125	0 732	0503
Flowers	365	102	2 569	0201

^{*} Three lobed vexillum broad leaflets two flowers per peduncle

also were found to be monogenic recessives

The monogenic recessive inheritance of the double-flowered peduncle obtained here confirms earlier findings246 Our studies indicate that broad leaves also are controlled by a single recessive gene similar to several other leaf shapes- narrow, obovate, bipinnate and simple-studied earlier by various workers 1-358

Joint segregation studies revealed close linkage between lobed vexillum and broad leaflets. The double-flowered peduncle, however, appears to be loosely linked to lobed vexillum (Table 11)

The occurrence of a lobed vexillum in Cicer arietinum is reported here for the first time. The new recessive mutation has no pleiotropic effects and all other characters of the plant essentially remained unaltered. The gene symbol hx is proposed for lobed vexillum

The new mutant is of value to plant breeders as a genetic marker in isolating accidental selfs during hybridization, and in identifying and evaluating marker-linked genes aftecting specific quantitative traits. As a marker it also may be of value in surveying genetic variation in populations and interpopulation variability

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Table 11 Joint segregation of characters in a cross between JG-62 and a lobed vexillum mutant of ICC-7545 chickpeas

Trait		F ₂ phenotypic classes			χ^2 adjusted	
Lobed vexillum (3.1) vs Broad leaflets (3.1)	normal vexillum normal leaflets 318	normal vexillum broad leaflets 47	lobed vexillum normal leaflets 24	lobed vexillum broad leaflets 78	154 756	<0.001
Lobed vexillum (3.1) vs Double-flowered (3.1) peduncle	normal vexillum single flower 295	normal vexillum double flower 70	lobed vexillum single flower 70	lobed vexillum double flower 32	6 282	0 02 0 01