

## 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 *lvx* is proposed for lobed vexillum character.

WHILE studying the range of morphological variability of the world collection of chickpea (*Cicer arietinum* L.) germplasm, maintained by the Genetic Resources Unit of ICARISAT, 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 chickpeas<sup>9</sup>, 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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FIGURE 1 Flowers 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. Eight  $F_1$  plants were raised during 1979-80. The  $F_2$  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<sup>7</sup>.

### Results and Discussion

All  $F_1$  plants had normal vexillae, elliptic leaflets, and single-flowered peduncles, indicating that these traits are dominant. A segregation pattern of 3:1 in the  $F_2$  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		$\chi^2$ adjusted (3:1)	P
	normal	mutant*		
Vexillum	365	102	2.569	0.201
Leaflets	342	125	0.732	0.503
Flowers	365	102	2.569	0.201

\* Three lobed vexillum, broad leaflets, two flowers per peduncle.

also were found to be monogenic recessives (Table I).

The monogenic recessive inheritance of the double-flowered peduncle obtained here confirms earlier findings<sup>2,4,6</sup>. 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<sup>1,3,5,8</sup>.

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 II).

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 *lvx* 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 affecting 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 II Joint segregation of characters in a cross between JG-62 and a lobed vexillum mutant of ICC-7545 chickpeas

Trait		$F_2$ phenotypic classes				$\chi^2$ adjusted
Lobed vexillum (3:1) vs	normal vexillum normal leaflets	normal vexillum broad leaflets	lobed vexillum normal leaflets	lobed vexillum broad leaflets	154.756	<0.001
Broad leaflets (3:1)	318	47	24	78		
Lobed vexillum (3:1) vs	normal vexillum single flower	normal vexillum double flower	lobed vexillum single flower	lobed vexillum double flower	6.282	0.02-0.01
Double-flowered (3:1) peduncle	295	70	70	32		