

INHERITANCE OF A PUCKERED LEAF MUTANT IN GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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A plant with abnormal leaf characteristics was observed in groundnut variety OG 66-6-1. The plant, which was dwarf and compact, had puckered leaves (partially crinkled) with yellow stripes along the margin, with the exception of a few older leaves which had normal leaf phenotype. It had sequential flowering like the other plants in OG 66-6-1. The plant was harvested and progeny-rowed following the selection of puckered leaf plants in each generation till the phenotype was established. It was

designated puckered leaf mutant (PLM). While such leaf characters may not be of any practical significance to groundnut breeders, morphological variants like this might be useful as marker traits in genetic studies.

The radiation-induced and/or naturally occurring mutants reported for leaf characters in groundnut are crinkle, curly, imperipinnate, lupins, brachytic, cup, willow, rusty, mosaic, multiple leaflets, corduray, flop, and Gujarat narrow leaf. There are also several chlorophyll-deficient mutants (xantha, chlorina, vir-escens, aureus, lutescens, etc.)¹⁻⁵. However, PLM, with the above-mentioned characteristics, was not reported earlier in groundnut.

Parents and F_1 , F_2 and backcross generations of the two reciprocal crosses involving normal leaf parents J 11 and MK 374 with PLM were grown in the 1984 rainy season at ICRISAT Center. Observations of leaf character were recorded for individual plants. The data were subjected to χ^2 analyses for testing the genetic ratio, after correcting for continuity following Yates⁶.

The F_1 plants from both straight and reciprocal crosses of J 11 and MK 374 with PLM showed normal leaves.

The data for F_2 from these crosses were individually analysed for various F_2 ratios (table 1). A good fit to a 13:3 ratio of normal vs puckered leaves was observed in all crosses. The total and pooled χ^2 values were also nonsignificant ($P=0.01$) for a 13:3 ratio.

The BC_1 (F_1 backcrossed with PLM) showed a good fit for a 1:1 ratio of normal vs puckered leaves at 0.01 probability in all the crosses except (MK 374 \times PLM) \times PLM, for which the χ^2 value was significant at 0.05 probability (table 2). Similarly BC_2 (F_1 backcrossed to parent with normal leaf) produced only plants with normal leaves, except in

Table 1 Chi-square test of various F_2 ratios of plants segregating for normal vs puckered leaves in two reciprocal crosses of groundnut

Crosses	Leaf phenotype		χ^2			
	Normal	Puckered	3:1	13:3	15:1	9:7
J 11 \times PLM	43	8	2.36	0.31	7.76**	16.33**
PLM \times J 11	68	16	1.58	0.01	23.66**	20.82**
MK 374 \times PLM	26	2	4.76*	1.77	0.34	15.24**
PLM \times MK 374	35	5	3.30	1.03	2.66	15.86**
Total (4 d.f.)	—	—	12.00*	3.82	34.42**	68.25**
Pooled (1 d.f.)	172	31	10.24**	1.61	28.20**	66.91**
Heterogeneity (3 d.f.)	—	—	1.76	2.20	6.22	1.34

Significant at * $P=0.05$, ** $P=0.01$.

Table 2 Chi-square test for 1:1 and 1:0 ratios of normal vs puckered leaves in the BC_1 and BC_2 generations of two reciprocal crosses of groundnut

Crosses	Leaf phenotype		χ^2
	Normal	Puckered	
<i>Backcross 1 (1:1 ratio)</i>			
(J 11 × PLM) × PLM	21	13	1.88
(PLM × J 11) × PLM	14	7	2.32
(MK 374 × PLM) × PLM	12	3	4.27*
(PLM × MK 374) × PLM	11	9	0.2
<i>Backcross 2 (1:0 ratio)</i>			
(J 11 × PLM) × J 11	16	1	1.06 ^a
(PLM × J 11) × J 11	22	0	—
(MK 374 × PLM) × MK 374	10	0	—
(PLM × MK 374) × MK 374	25	1	1.04 ^a

*Significant at $P=0.05$.

^aThe χ^2 for testing 1:0 ratio was computed following $\chi^2 = m/n$, where n is the observed frequency in a normal class and m is the total.

(J 11 × PLM) × J 11 and (PLM × MK 374) × MK 374, in each of which one plant with puckered leaves was also observed. However, the χ^2 value in both of these BC_2 crosses was nonsignificant at 0.01 probability. The occurrence of a single plant with puckered leaves in BC_2 might be due to a chance mixing of seeds while processing the material.

The segregation pattern in F_2 of the two reciprocal crosses suggests that the normal leaf phenotype in groundnut is controlled by two pairs of genes, designated Nl_1 and Nl_2 . For the development of puckered leaf character, the presence of the Nl_1 gene in recessive homozygous condition and the Nl_2 gene in dominant homozygous or heterozygous condition is essential. All other combinations will have normal leaves.

The backcross segregation pattern did not give strong support to F_2 observations when pooled analyses were done for a 1:1 ratio of normal vs puckered leaves. Frequency of puckered leaf plants was lower than expected in the backcross generation.

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