LINKAGE OF A GENE CONFERRING TOOTHED LEAVES

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Three genes for toothed leaves are known in pea: Inci, Ser and Td. Lamprecht (1) and Blixt (1) described the following differences in phenotype (Fig. 1):
Inci - incisus; leaflets deeply incised.
Ser - serratus; dentation saw-toothed.
Td - scalaris forma dentation.

According to the information kept in the pea gene-bank data base (Blixt, unpublished) and in the supplement to PNL 9 (1) the authors of the characters and gene symbols are as follows:-

Gene	Character		Symbol		Inheritance	Chromosome
Inci	Post	1932	Lamprecht	1962	Dominant	Unknown
Ser	Lamprecht	1962	Lamprecht	1962	Dominant	Unknown
Td	Sutton	1914	Wellensiek	1925	Dominant	4

In 1989 at Wiatrowo, linkage tests were carried out analyzing dihybrid segregation in a number of F_2 generations according to the rule: type line for the investigated gene x tester lines starting with markers for strategic loci in several chromosomes, then lines with morphological as well as isozymic markers on particular chromosomes.

In the linkage tests for And (anthocyanin dots; see 3) it was observed that line Wt702 (And) is characterized additionally by strongly toothed leaves similar to those caused by Inci (Fig. 1). In this paper the symbol "Inci" is used in quotations since the identity of the gene is uncertain until the allelism tests have been done. Observations of this character were made in the F_2 generation. In 5 crosses undisturbed monohybrid (dominant) segregation occurred for toothed leaves (Cross 714, chi-square = 0.12, Cross 716, chi-square = 0.27, Cross 718, chi-square = 0.33 and Crosses 713 and 715 in Table 1. In these crosses the following markers were segregating: A D I k wb s st b M cp te gp n fa v wlo Pl r tl. No significant deviations from the normal dihybrid segregation were observed for "Inci" with most gene markers. The exception was the "Inci" - B combination where substantial deviations were found in two crosses (Table 1). The recombination values (10-20%) indicate localization in chromosome 3.

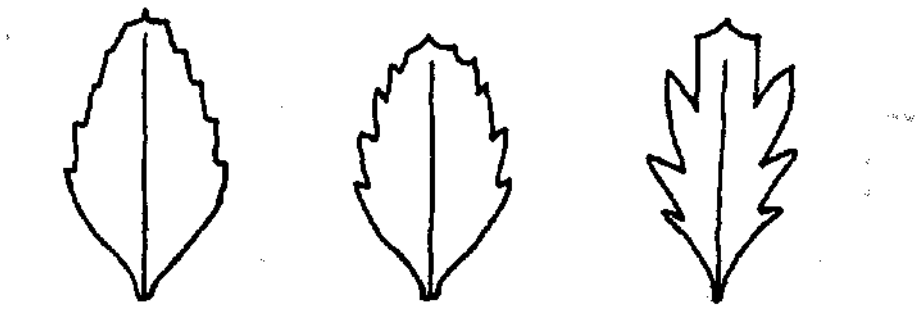

Fig. 1. Toothed leaves: Td (left), Ser (middle) and Inci (right).

Table 1. Phenotypic distribution in F_2 populations segregating for toothed leaves from crosses 713 (Wt702 x Wt11288) and 715 {Wt702 x Wt11238)

Monohybrid segregation				
Cross	B	b	Total	Chi-sq. (3:1)
713	72	17	89	1.65
715	90	16	106	5.55
Total	162	33	195	6.78
	"Inci"	"inci"		
713	76	21	97	0.58
715	107	37	144	0.04
Total	183	58	241	0.11

Dihybrid segregation of B - "Inci" (coupling)

Cross	B Inci	B inci	b Inci	b inci	Total	Joint chi-sq.	Recomb. fraction	SE
713	66	6	4	13	89	38.0	12.9	3.8
715	80	10	6	10	106	23.4	19.8	4.4
Total	146	16	10	23	195	61.3	16.3	2.9

The "Inci" locus will be investigated in three-point crosses and loci B and Lap-1 seem to be the most appropriate markers. In addition, allelism tests will be made against Inci, Ser and Td to identify which gene is present in line Wt702.

The above results show that in a broad project on gene mapping, very precise observations of differences between parents and in segregating offspring are worthwhile since they frequently reveal novel information.

1. Blixt, S. 1977. PNL 9 Suppl.
2. Lamprecht, H. 1971. Monographie der Gattung Pisum, Graz.
3. Swiecicki, W.K. 1990. PNL 22: 59-61.