

NECROSIS (nec); A NEW GENE ON CHROMOSOME 5

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A large number of new pea mutants have been induced using fast neutrons (Nf), N-nitroso-N-aethylurea (NEU) and combined doses of these mutagens (1, 2, 4). Among them is a group of mutants that cause degeneration of leaf tissue (3). Three mutations, each with similar expression, were individually isolated after seed treatment of line Wt 3527 (cv. 'Paloma') by:

- Wt 16124 - 200r Nf + 0.014% NEU - found in M₁ population
- Wt 16128 - 200r Nf + 0.014% NEU - found in M₁ population
- Wt 16130 - 0.014% NEU - found in M₁ population.

The mutations were of the "necrosis" type. The leaf surface of such plants are green with necrotic, brownish yellow areas at the leaflet and stipule margins, covering the interveinal area as well as the veins. Towards the center of the leaflets and stipules the green color remains mainly adjacent to the veins (Fig. 1, 2). The character is easy to observe even in st and af genotypes.

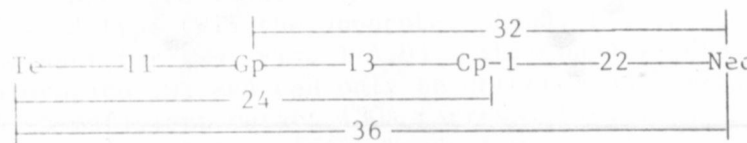
Crosses between mutant x initial line bore normal F₁ plants. The F₂ produced an undisturbed segregation pattern of 3 normal : 1 necrosis (680:210 X²_{3,1} = 1.06). The suggested symbol for this monogenic, recessively inherited character is nec (necrosis).

Because the world pea collection contains some similar mutation types (e.g. degenerating leaves) it was necessary to perform locus identity tests. A diallel test included the following lines: Wt 16124, Wt 16128, Wt 16130 - necrosis; Wt 16129 - gold necrosis, and Wt 16117 - degenerating leaves (type line for Gottschalk's dgl). The F₁'s of crosses among Wt 16124, Wt 16128, and Wt 16130 plants were of the necrosis type, indicating that all three independently isolated necrosis mutants are controlled by the same gene nec.

Wt 16124 x Wt 16129 and Wt 16124 x Wt 16117 gave normal F₁'s indicating that the degenerating leaf and gold necrosis mutants are controlled by genes at loci other than nec.

For the linkage test two lines were crossed: Wt 16124 (necrosis) x WL 1238 (testerline from the Weibullsholm Pea Collection of the Nordic Gene Bank). The F₁ plants were normal and fully fertile. The F₂ generation (247 plants) was grown in the field in 1983. No evidence of linkage was detected between gene Nec and markers on chromosomes 1, 2, 3, 7. Evidence of linkage was, however, found between Nec and genes in chromosome 5 (Table 1).

The four point analysis suggests the following gene order:



Gene U has not been included in this analysis due to irregular segregation, but the data suggested a very significant linkage with Nec, placing U somewhere between Gp and Nec.

1. Swiecicki, W. K. 1981. Mut. Breed. Newsl. 17:10.
2. Swiecicki, W. K. 1983. Hod. Rosl. Ak. i Nas. 27:4.
3. Swiecicki, W. K. 1984. PNL 16:70-72.
4. Swiecicki, W. K. 1985. PNL 17:72-74.

Table 1. Joint segregation between genes in chromosome 5 and gene Nec.

Pair	Phase	Phenotype, no. of plants				Total	Joint χ^2	Recomb. fract.	S.E.
		XY	Xy	xY	xy				
- Te	C	114	27	27	52	220	49.6	24.2 ±	3.4
- Gp	C	133	7	29	50	219	86.0	13.4 ±	2.5
- Nec	R	95	44	75	4	218	19.7	22.5 ±	6.4
- Gp	C	136	5	27	53	221	103.6	10.8 ±	2.2
- Nec	R	100	39	71	10	220	7.2	35.9 ±	5.8
- Nec	R	124	49	55	6	234	8.0	32.4 ±	5.8



Fig. 1. Mutant 16124 - necrosis.

Fig. 2. Expression of gene nec on leaves.