GENETIC STUDIES OF SEMID0M1NANT MUTATIONS IN PEA

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Mutants with dominant or semidominant inheritance occur very rarely among the diverse mutants induced in pea; most mutations are recessive. For this reason, each dominant or semidominant mutation is of theoretical interest. Two mutants with semidominant inheritance were induced in a line derived from the variety 'Torsdag'. Mutant N 5 with compact stem was induced by irradiation with gamma-rays; mutant N 66, which is short and branchy, was induced using ethylene imine (Table 1).

Distinct differences in morphology were evident between the mutants and heterozygotes for the mutations and the original line (Table 2).

Seed productivity was lower in the mutants than in the original line. Specifically, in Torsdag the number of pods per plant was 15.6, seed number was 54.6 and seed mass was 11.4g; the respective values for Mutant N 5 were 11.3, 41.0, and 6.0g; and for mutant N 66 they were 10.9, 37.1, and 5.3g.

The frequency and spectra of natural and gamma-ray induced changes and their inheritance were analyzed in the original and semidominant mutant M_{12} lines (Table 3).

The frequency of natural mutations in the semi-dominant mutant lines was found to be an order of magnitude higher than in the original line. The same was observed in the experiment with the recessive mutations. Of interest is the compact mutant N 5 with induced variability surpassing that of the original line. The range of induced variability, as in the recessive mutants, was smaller in the short, branching mutant N 66 than in the original line.

Analysis of natural and induced variability in the mutant M_{10-15} lines has a bearing on evolutionary aspects of the origin of new plant forms.

Table 1. Observed and expected numbers of segregants in each of three phenotypic classes in F2 from crosses of mutant x normal (cv. 'Torsdag').

	Segregation in F2			
Cross	Observed	Expected at a 1:2:1 ratio	x^2	P
Mutant 5 x Torsdag	34:71:40	36.2:72.5:36.2	0.56	0.9 - 0.8
Torsdag x Mutant 5	32:56:36	31:62:31	1.42	0.5 - 0.2
Mutant 66 x Torsdag	29:81:36	36.5:73.0:36.5	2.42	0.5 - 0.2
Torsdag x Mutant 66	21:41:21	20.8:41.5:20.8	0.01	1.0 - 0.9

Table 2. A morphological characterization of the original line, mutants, and heterozygotes in pea.

Variety, mutant, hybrid	Height (cm)	Node number J/	Average internode 1 ength (cm)	Stem number per piant	Length/ width of leafl ets (cm)	Length/ width of stipules (cm)
Torsdag	77.3	18.1	4.3	1	5.4/2.8	5.8/4.0
Mutant 5	31.9*	17.3*	1.8*	1	3.9/1.8*	3.7/2.6*
Mut.5xTorsdag	51.3*	17.6	2.9*	1	4.7/2.2*	4.6/3.2*
Mutant 66	15.7*	12.5*	1.2*	3.3*	3.8/1.9*	3.8/2.4*
Mut.66xTorsdag	31 .8*	16.4*	1.9*	2.0*	4.5/2.5*	4.6/3.4*

1/Measurements were made at the full flowering stage.

Table 3. Frequencies of natural and induced nutations in the original and semidominant mutant lines of pea.

	Original line		Mutant 5		Mutant 66	
	Control	Gamma-ray treated	Control	Gamma-ray treated	Cont rol	Gamma-ray treated
Total number of families	241	221	221	199	195	161
Families with mutants (%)	0.4	7.2	4.1**	14.1*	3.6*	5.6**
Total number of plants	7993	4927	6141	3575	4457	2504
Mutants (%}	0.04	1.48	0.31***	2.40**	0.25***	0.48***
Number of mutation types	1	15	8	18	8	10

* - P=0.05; ** - P=0.01; *** - P=0.001 as compared with the original line

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