GENETICS AND CYTOLOGY OF MALE STERILITY IN PEAS

Myers, J. R. and E. T. Gritton Department of Agronomy
University of Wisconsin, Madison, WI USA

Fourteen male sterile pea mutants have been studied during the past four years. These mutants were maintained through segregating families because of their low degree of self-fertility. Tests of allelism demonstrated that several mutants from different sources are allelic. The data indicate that G.71A (ms-2) and G.98 (ms-4) are conditioned by the same gene. Since these gene symbols have been previously assigned, ms-2 should be considered the valid symbol with ms-4 as a synonym. We were unable to test for allelism with ms-1 because this gene is extinct. In all, ten unique genes have been distinguished and are shown in Table 1. All are conditioned by homozygous recessive alleles at a single locus and linkage relations have been determined for most genes.

Cytology of ms-2 and ms-3 has been studied by Gottschalk and colleagues (1-5). Among the other male steriles, ms-6 and ms-10 exhibited meiotic abnormalities. The remaining male steriles degenerated after meiosis (Table 2). Both ms-3 and ms-10 showed a high degree of female sterility. All other male steriles possessed normal female fertility.

It Gottschalk, W. and S. R. Baquar. 1972. Cytoblolgie 5:42-50.
2. Gottschalk, W. and A. Jahn. 1964. Z. Vererbungsl. 95:150-167.
3. Gottschalk, W. and M. L. H. Kaul. 1974. Nucleus 17:133-166.
4. Gottschalk, W. and H. D. Klein. 1976. Theor. Appl. Genet. 48:23-34.
5. Klein, H. D. 1969. Nucleus 12:167-172.
6. Wellensiek, S. J. and M. Kauls. 1971. PNL 3:44-45.
7. Wellensiek, S. J. 1971. PNL 3:46-47.
8. Wellensiek, S. J. 1971. PNL 3:47.

Table 1. Source, proposed gene symbol, and linkage relations of pea male steriles.

Source	Line designation	Proposed gene symbol and linkage relations[1]	Chromosome
D. Auld U. of Idaho	M392	**Np**-16-**le**-12-**ms-9**-11-**v**	4
W. Gottschalk[2] U. of Bonn	G.71A/G.98A	**wlo**-12-**ms-2**[3]-26-**pl**	6
	G.33C	?-**ms-3**[3]-?	?
F. J. Muehlbauer Wash. State U.	M.1	**red**-0-**ms-11**-1-**i**	1
	M.2/M.3	**r**-5-**tl**-26-**ms-5**	7
	M.5/M.6	-**ms-10**-	6?[4]
	M.7	**r**-1-**tl**-29-**ms-8**-25-**cr**-14-**gp**	5/7[4]
E. T. Gritton U. of WI	CSC 8221	**af**-0-**ms-7**-23-**i**	1
	CSC 8617A	(identical to M.2/M.3)	
	WI 7104/CSC 8617B	**b**-12-**ms-6**-12-**st**	3

[1] Gene symbols are in boldface, the numbers between gene symbols are cross-over values (%).
[2] Mutants obtained from S. Blixt, Weibullsholm Plant Breeding Institute, Sweden.
[3] Gene symbols previously assigned [see PNL 9 (suppl.)].
[4] Wellensiek Tester Line used as male parent which has a 5/7 translocation (6-8).

Table 2. Timing of breakdown in male sterile peas.

Gene	Timing and description of breakdown
ms-2	meiosis (abnormal chromosome distribution in 2nd division. (See references 1-5.)
ms-3	meiosis (no spindles in either division, degeneration prior to mitosis. See reference 4.)
ms-5	microspores to young pollen (tapetal abnormalities)
ms-6	meiosis (univalents, spindle abnormalities, asynchronous 2nd division)
ms-7	maturing pollen (gradual degeneration)
ms-8	mature pollen (gradual degeneration)
ms-9	microspores (rapid degeneration after release from callose)
ms-10	meiosis (bipolar or tripolar spindles, no 2nd division, sticky chromosomes, bridges and fragments)
ms-11	mature pollen (lacks sculpturing, pollen is clumpy)