A GRAY-GREEN FOLIAGE MUTANT, POSSIBLY WELLENSIEK'S "lead"

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Among four mutants reported by Prof. Wellensiek in 1971, one was designated as "lead" (PNL 3:46). The term "lead" was not used as a symbol but as a short description of the phenotye, viz. gray-green foliage. An attempt to procure the mutant from Prof. Wellensiek was unsuccessful because somehow the seed got lost after Prof. Wellensiek retired but before he had sent it to other workers. We therefore became resigned to putting this potentially useful mutant in the extinct category.

However, in the summer of 1977 I noted that plants of PI 244109, grown by the Northeast Regional Plant Introduction Station (Geneva, NY) that year, had a distinctive gray-green foliage color, thus raising the possibility that the accession carries the "lead" mutant. This PI accession originated in The Netherlands and represents a cultivar named 'Ceres'. Seed of PI 244109 was sent to Prof. Wellensiek for an opinion on whether or not the plants appeared to be identical with plants of his original mutant "lead". He concluded (personal communication) that the PI line indeed appeared to be phenotypleally identical with "lead", with "a probability approaching certainty". Hereafter in this discussion "lead" is also used to designate the phenotype of the mutant in PI 244109.

PI 244109 was crossed with a number of stock lines in my collection. The F1's from these crosses had the normal phenotype and the F_2 populations gave good monogenic segregation ratios (Table 1). Moreover, 13 of 19 progenies from single, normal F_2 plants segregated for "lead" whereas 6 progenies remained constant for the normal, non-mutant phenotype. The 13 segregating progenies showed good agreement with the expected 3 normal : 1 "lead" ratio (Table 2). Since Wellensiek had found linkage between "lead" and fa on chromosome 4 (CrO=25%), we looked for a linkage of the mutant in our material with chromosome 4 markers. We found no clearcut evidence of linkage between "lead" and Le, fa, or was. The population sizes were not, however, sufficiently large to conclude that the mutant in PI 244109 either does or does not show the same linkage relations as Wellensiek found for his "lead" mutant. New experiments will have to be initiated to settle the matter. The determination of linkage relationships for "lead" would be desirable because if it is linked with fa it would be a welcome and much needed marker for that region of chromosome 4. But, regardless of where it is located, it will serve as a very good seedling marker.

The basis for the phenotype is not known. The gray-green or bluish-green foliage color somewhat resembles the phenotype of Arg but is easily distinguished from it because Arg plants have a silvery cast; besides, Arg is a dominant mutant whereas "lead" is recessive. There is also some similarity between "lead" and wex, but plants of the former show no evidence of weakness whereas the latter typically are weak and unproductive.

Since we can never really be certain if the gene found in the variety Ceres is the same as Wellensiek's "lead", we don't know if we have a new mutant or the resurrection of an old mutant. This poses a problem of assigning a symbol. Provisionally, I shall suggest the symbol led for the mutant present in the variety Ceres.

Table 1. Segregation for a gray-green foliage mutant, designated "lead", in F_2 populations grown in 1978 and 1979.

	1978				1979		
Population	Normal	"lead"	Total	Population	Normal	"lead"	Total
B278-299-312	76	32	108	B279-386-392	66	25	91
314-323	85	23	108	393-399	79	26	105
324-328	35	20	55	400-406	55	14	69
331-340	66	29	95	407-415	73	26	99
347-356	68	22	90		273	91	364
357-363	80	29	109				
	410	155	565				

$$\chi^2_{(3:1)} = 1.78^{ns}$$

$$\chi^2_{(3:1)} = 0.0$$

Table 2. Segregation for normal and gray-green ("lead") plants in F3 progenies derived from 13 single $F2$ plants with normal phenotype

Population	Normal	"lead"	Total
C378-169	23	7	30
172	32	8	40
176	30	10	40
177	26	19	45
178	35	15	50
181	39	11	50
182	33	17	50
183	37	13	50
184	36	14	50
185	20	6	26
187	32	8	40
189	26	4	30
190	23	7	30
	392	139	531

$$X^2(3:1) = 0.39^{ns}$$