

ALLELISM TESTS FOR SOME EARLY FLOWERING MUTANTS

Murfet, I. C. and K. Groom Botany Department, University of Tasmania
Hobart, Tasmania 7001, Australia

We report here on the nature of two early flowering mutants and their parental lines which were sent for Identification by Dr. W. K. Swiecicki, Plant Experiment Station, Wiatrowo, Poland.

Six major flowering genes have now been established - Lf, E, Sn, and Hr (4,6) and two recent additions Veg and Dne. The recessive mutant veg completely prevents flower initiation regardless of the environmental conditions or the remaining genotype (1,7). Dne was tentatively identified (5) from a cross between two early day neutral lines, M218 from Novosibirsk (8,9) and Hobart line 73 (sn). The F1 hybrid behaved as a late flowering quantitative long day type indicating that Sn and a second gene (Dne) acted in a complementary manner to confer a photoperiod response. This conclusion has now been confirmed and the dne locus traced to chromosome 3 (King and Murfet, unpub.).

The major genes interact to determine four broad classes of flowering behavior - a day neutral group (class DN) and three photoperiodic types - an early initiating group (class EI) in which the node of flower initiation (NFI) is unaffected by photoperiod but the time of first open flower (FT) is markedly delayed in short days and two late types in which short days delay both NFI and FT in either a limited quantitative manner (class K=L) or a very substantial manner (class G=LHR) (2,3,6).

The lines from Wiatrowo and their phenotypes and genotypes as determined by the use of controlled environment facilities and crossing with reference lines are shown in Table 1.

Table 1.

Line number		Name	Phenotype	Genotype
Wiatrow	Hobart			
Wt 3527	L119	Paloma	L	Lf E Sn Dne hr Veg
WT 11795	L123	Mutant from Paloma	EI	lf* E Sn Dne hr Veg
Wt 4042	L121	Kaliski	L	LF E Sn Dne hr Veg
Wt 11796	L124	Mutant from Kaliski	EI	lf ^a E Sn Dne hr Veg

* lf^a < lf* < lf

Cultivars 'Kaliski' and 'Paloma' are both typical L class lines. Their NFI (counting from the first scale leaf as node 1) increased from around 16 to 17 in a 14 hr photoperiod to around 23 to 30 in an 8 hr photoperiod (temperature 17° night and 23°C day). The mutant lines are both typical of class EI; their NFI was not influenced by photoperiod but FT was delayed in an 8 h photoperiod by around 17 to 22 days as a result of abortion and slow development of the first flower initials. The mutant from Kaliski flowered at node 7 or 8 which is typical of a line with genotype lf. The mutant from Paloma flowered at node 8 or 9 which is on the early limit for genotype lf. However, it also occasionally opened two flowers on the one day which is a property characteristic of

lf⁺ not lf (6). The above phenotypic information suggests that the initial lines Kaliski and Paloma have flowering genotype Lf E Sn Dne hr Veg and that the mutations have been of the type Lf to lf⁺ equivalent and Lf to an allele intermediate in position between lf and lf⁺, respectively. This conclusion was confirmed by the results in Table 2.

Eighteen induced flowering mutants have now been identified by allelism tests at Hobart (4,5,7) and Novosibirsk (9) - 16 have proved to be at the lf locus with one each at veg and dne.

The mutant lf allele in Wt 11795 may prove useful in plant breeding programs for fine tuning the flowering behavior of a cultivar to meet particular requirements.

Table 2.

Cross	Phenotype			Linkage data for A-Lf [†]	
	Parents	F ₁	F ₂	χ^2 Joint seg.	CrO value
119 x 60 [†]	L x EI	L			
123 x 73 [†]	EI x DN	L	9L:3EI:4DN	52.8 ^{***}	4.3%
121 x 60	L x EI	L			
124 x 73	EI x DN	L	9L:3EI:4DN	13.4 ^{***}	8.1%

[†] Genotypes: L60 lf E Sn Dne hr Veg; L73 Lf E sn Dne hr Veg.

[‡] Lines 123 and 124 are devoid of anthocyanin (a); L73 carries A.

^{***} Significant at the 0.001 level.

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