LOW-TEMPERATURE SEED GERMINATION TESTS

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Improvement of the germination ability of peas in cold soil would permit earlier planting of the crop in the spring, and would allow more uniform stand establishment under adverse soil conditions. Other researchers have found genetic differences in emergence speed of pea seedlings from cold soil (Torfason and Nonnecke, Can. J. Pl. Sci. 39:119-124, 1959). Our objectives were to find a rapid test to use in screening lines for low-temperature germination ability, and to determine if selected lines differed genetically for this trait.

Four cultivars were used: 'Alaska' and 'Alsweet', both early-season cultivars, and 'New Season' and 'New Line Early Perfection' (NLEP), both mid-season cultivars. In the first tests, only these four cultivars were used. In a later test, two families (consisting of two parents, their Fi, reciprocal F1, and F_2) were tested. The two families tested were Alaska x New Season and NLEP x Alsweet. All seeds used for the cold tests were produced in the field along one wire trellis in the same growing season. Petri plates (100 x 15 mm) were filled halfway with sterile silica sand, moisture was added, and 15 seeds were placed in the sand. The plates were checked every 12 hours for sprouted seeds. The average number of days for germination of each plate of 15 seeds was calculated and the data were analyzed as a completely randomized experimental design. Two replications were employed in the first tests and six in the tests involving parents, F1's, and F_2.

Three conclusions can be drawn from the data in Table 1. First, there are differences among cultivars for low-temperature germination ability. Second, the differences among cultivars become greater as the temperature is dropped from 20 to 8°C. This is indicated by the greater ranges (number of days between fastest and slowest germinating cultivars) at the lower temperatures. Third, there is no correlation between low-temperature germination ability and maturity, as the fastest and slowest germinators at 8°C are both mid-season cultivars.

Table 1. Germination of pea seeds at three constant temperatures

Cultivar	8°C	10°C	20°C
	days		
New Season	5.13a[1]	5.04a	3.70 b
Alaska	6.51 bc	5.14a	3.30a
Alsweet	6.03 b	5.72 b	3.96 b
NLEP	6.97 c	6.76 c	3.74 b
LSD .05	0.74	0.40	0.40
Range	1.84	1.72	0.66
CV	7.96	3.71	3.71
Reps	2	2	2

[1]Values within a column followed by the same letter are not significantly different using LSD .05.

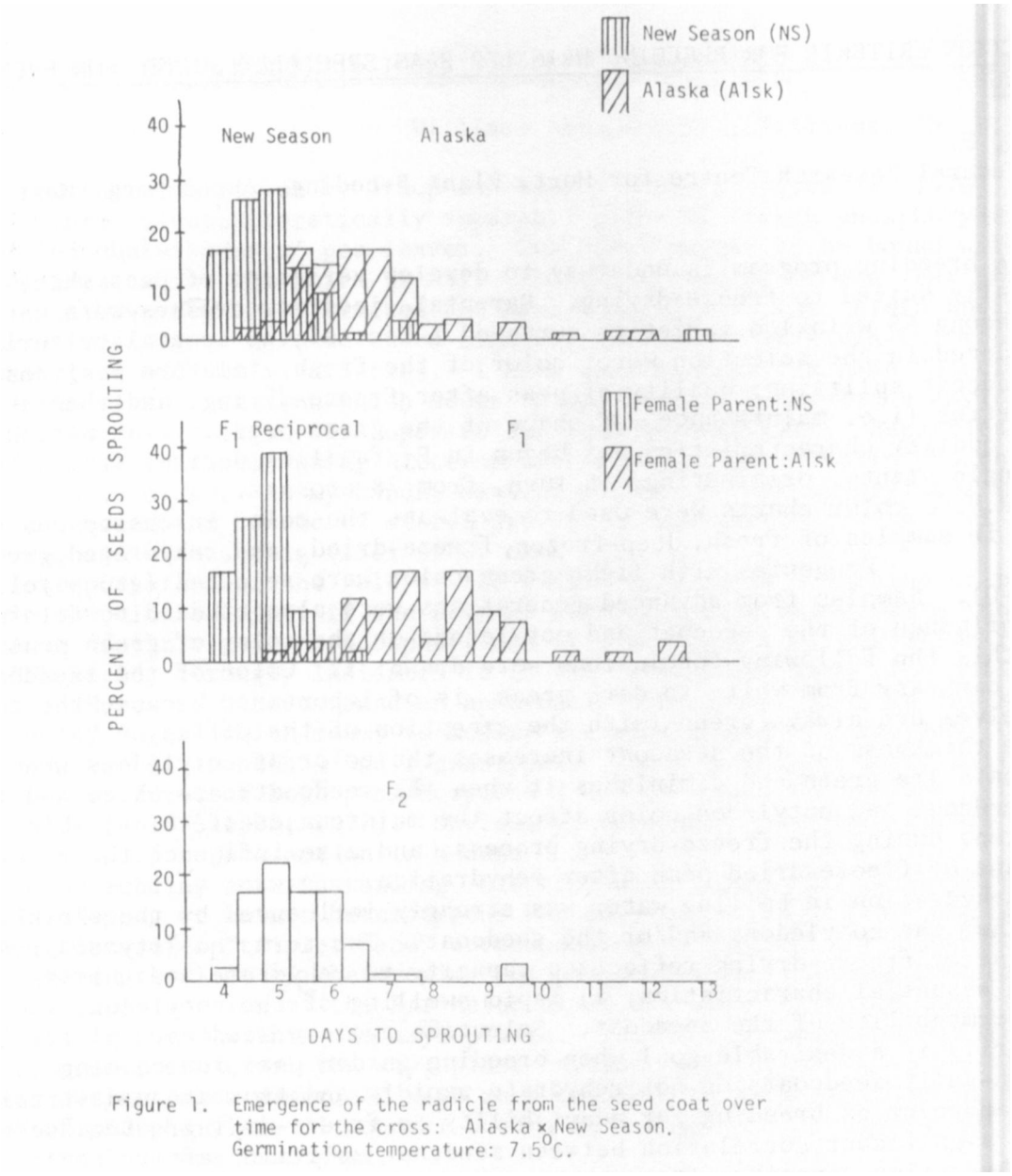

Figure 1. Emergence of the radicle from the seed coat over time for the cross: Alaska x New Season. Germination temperature: 7.5°C.

Distribution of seeds for low-temperature seed germination ability was similar in the two families tested, so only the Alaska x New Season cross is presented (Fig. 1). There is a strong maternal effect for this trait since the Fi tends to be similar to the female parent in mean and range of the distri bution. The distribution of the *Fj* ˡˢ skewed toward the fast-germinating parent indicating dominance for low-temperature seed germination ability.

Low-temperature germination tests run at 8°C or below should be useful in screening lines of peas for use in a breeding program to improve cold tolerance. Maternal effects may complicate the procedure, but the test Is rapid and genetic variability for the trait exists.