

Creating Winter-Hardy Spring Wheat Germplasm

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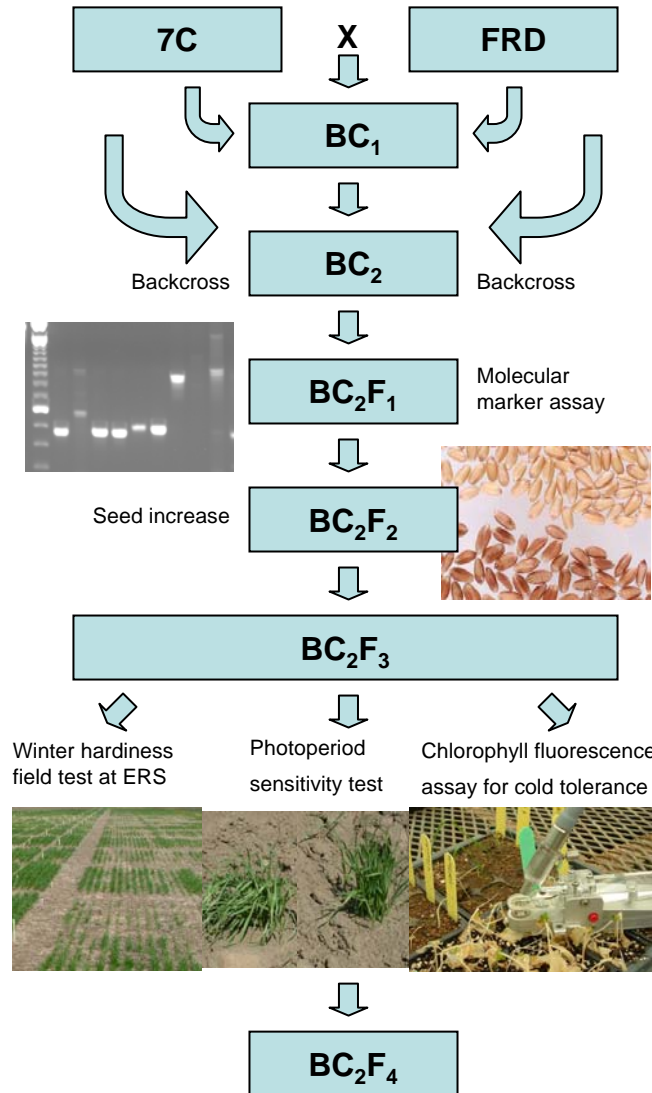
Introduction:

The majority of soft white, soft red and hard red winter wheat from Canada is produced in southern Ontario. Therefore, a focus has been placed on winter wheat breeding in the province. A limiting factor in the efficiency of a winter wheat breeding program is that vernalization is required for every generation. To increase the efficiency of winter wheat breeding programs, doubled haploid methods are being used. However, doubled haploids are expensive to produce, require a high level of expertise and the handling of colchicine for chromosome doubling. A better system would be similar to that used in spring wheat where no vernalization is necessary. Effective use of growth rooms and winter nurseries would maximize efficiencies from a time and genetic improvement perspective.

Background:

In the fall of 2005, 330 wheat lines derived from various winter x spring crosses were planted in the field at the Elora Research Station (ERS). A majority of the lines exhibited acceptable winter hardiness for Ontario. To verify that the lines were true spring wheat, hill plots of the 330 lines were spring planted at the ERS. Over 1/3 of the lines flowered meaning that many of the lines were winter hardy spring wheat.

Limin and Fowler (2006) illustrated in a winter x spring cross that most cold tolerance is lost when the plant switches from vegetative to reproductive growth. They also found that photoperiod was a sufficient repressor of development and therefore, eliminated the need



Correlation of traits and selection of cold tolerant, photoperiod sensitive winter hardy, non-vernalization requiring spring germplasm

for vernalization as the control of the transition from vegetative to reproductive growth.

Hypothesis:

A photoperiod sensitive spring wheat can be developed with sufficient winter hardiness to survive the Ontario winter

Methodology:

Plant Material- Froid (FRD) hard red winter wheat-photoperiod sensitive, excellent winter hardiness. Siete Cerros 66 (7C) hard white spring wheat-photoperiod insensitive, poor winter hardiness.

Methodology- The initial cross between FRD and 7C will have two generations of reciprocal backcrossing. At BC₂ and BC₂F₁, molecular markers will be used to assay VRN, RHT and glutenin and gliadin profiles.

A chlorophyll fluorescence protocol similar to Rizza et al. (2001) will be used to examine and select cold tolerant BC₂F₃ lines. Concurrent to the chlorophyll fluorescence assay, the reciprocal backcrossed winter x spring population will be planted at the ERS to determine the level of winter hardiness identified under field conditions. Chlorophyll fluorescence and field winter hardiness data will be correlated to evaluate the selection system.

Photoperiod sensitivity of the population will be examined by comparing final leaf number, similar to Wang et al. (1995) and compared to heading date and winter hardiness field data.

References:

- Limin and Fowler 2006. *Planta*. 224(2):360-366.
- Rizza et al. 2001. *Plant Breeding*. 120:389-396.
- Wang et al 1995. *Field Crop Res*. 41:91-100.