

## **Wheat Cultivar Development: Selection for Adaptation to Organic Production Systems.**

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### **Background:**

Organic wheat breeding is a relatively new endeavour for western Canada geared to identifying wheat genotypes with adaptation to organic growing conditions. Studies have provided evidence that conventional and organic production systems differ enough to warrant identification of cultivars with adaptation to the rigors of organic crop production. Canada Western Spring Wheat (CWRS) is the most widely grown type of wheat in the Prairies, about 74% of all wheat grown during 2010 and 2011. As a result, the restricted resources available for organic wheat breeding have been targeted to CWRS because of its market importance and breadth of use in prairie grain farming.

### **Project Overview:**

Since 2004, a collaborative effort in Manitoba has been ongoing to create CWRS cultivars adapted for organic production. Approximately 20 F<sub>2</sub> populations are introduced into the organic breeding program each year from crosses made by the conventional CWRS breeding program located at the Cereal Research Centre (CRC) in Winnipeg. Material from F<sub>2</sub> to F<sub>6</sub> generations is selected for agronomic type and disease resistance in organic nurseries where natural infection from multiple diseases occurs followed by a first evaluation of yield at F<sub>5:7</sub>. Six station-years of more extensive evaluation occur to detect candidates suitable for registration testing. Cooperation with peers in Saskatchewan and Alberta has allowed creation of a network of organic test sites that sample differing environments and provide sufficient information for candidate cultivar evaluation. Capacity to evaluate yield potential remains the greatest restriction to this work. Spring wheat organic programs cannot utilize contra-season nurseries because of phytosanitary rules for seed crossing international borders. But, linkages between the CRC conventional and organic programs offer opportunities for genetic gains in the conventional program to be transferred to the organic program. Cooperation with organic producers has been encouraged through the initiation of a participatory plant breeding program where selection within segregating F<sub>3</sub> and F<sub>4</sub> populations by producers at various locations provide opportunities for sampling environmental variation at early generations that conventional programs typically do not do.

### **Conclusions:**

Experience from this work indicates all field experiments should be grown on green-manured land to manage weed, nutrient and moisture levels. Tolerance to weeds can be assessed in yield plots. Grain protein concentration is measured from F<sub>3</sub> generation onwards resulting in higher selection pressure for this important trait compared to conventional wheat programs. Similar agronomic, disease and end-use quality characteristics are selected for both conventional and organic breeding programs as the criteria for registration are the same. However, there are plant physiological features for response to nutrient stress, plant competition and interactions with soil microflora that are not understood and thus not currently available for use as selection tools. Yield performance remains the primary method to assess overall adaptation and performance in organic environments.

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