

Activity 9

Cultivar Enhancement Through the Application of Biotechnology



Lead Researcher

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In this research activity, Firdissa Bokore applies to develop new molecular tools to improve the productivity, precision, and output for wheat breeding programs and to increase the general inventory of knowledge surrounding genetic resistance to disease and insect challenges faced by wheat farmers in Western Canada.

Bokore's research is focused on developing methods to advance Canada Western Red Spring (CWRS) and Canada Western Amber Durum (CWAD) variety breeding programs by enhancing the varietal screening processes with better genetic tools that will allow wheat breeders to discard unsuitable varieties earlier in their breeding program timeline.

By focusing on the genetic background of the next generation of wheat varieties and by investigating the genes controlling important traits and their response to different environments across Western Canada, this research will help maintain and increase yield as farmers face weather, climate change, and pest challenges every year. It is a continuation of a previous wheat cluster initiative.

This research is primarily being done at the Agriculture Agri-Food Canada (AAFC) Research and Development Centre in Swift Current, SK. This AAFC centre has the required resources, infrastructure, and expertise, including the residency of world-renowned wheat breeders and scientists, technicians and training programs, and innovative facilities such as a double haploid production facility and a molecular biology laboratory.

The investigators will also be using AAFC Swift Current's greenhouse and controlled environment facilities to complement the field research activities. This research and wheat breeding is also

KEY TAKEAWAYS

- **Application of molecular breeding technologies pave the way for accelerated variety development**
 - Farmers will be able to get better, more resilient and more profitable varieties faster
- **New molecular tools showing researchers ways to breed genetic disease and insect resilience into wheat varieties**
 - This cluster activity will be a resource for agricultural researchers and wheat breeders
- **Wheat varieties developed and approved for registration during the 2023–24 fiscal year:**
 - **DT2033 (CWAD)**
 - Ergot resistance – the first combined wheat variety with intermediate resistance to FHB.
 - **DT2035 (CWAD)**
 - FHB resistance with high protein, strong straw strength, and low cadmium content.
 - **BW5104 (CWRS)**
 - Enhanced performance against wheat stem sawfly.

being done with scientists at other AAFC stations in Manitoba (Brandon and Morden) and Alberta (Lethbridge).

So far, Bokore's team has implemented genetic tools to create more efficient breeding initiatives which helped in the development of new varieties that have traits associated with better pest

management and desirable seed quality for grain processors.

Information has been generated for the identification of genes associated with these traits of interest, including stripe rust resistance in durum wheat as well as common bunt, loose smut and wheat stem sawfly resistance in bread wheat. Bokore's work, which is ongoing, also focused on traits associated with resistance to Fusarium head blight (FHB), Orange Blossom wheat midge and sawfly, and improved gluten strength and ergot resistance in durum wheat.

This specific research activity, in consort with the AAFC Swift Current wheat breeding program, have developed a bread wheat line (BW5104) and durum lines (DT2033 and DT2035), which were approved for registration during the 2023–24 fiscal year.

The variety BW5104 is a CWRS wheat line with enhanced performance against wheat stem sawfly, DT2033 is a CWAD line with resistance to ergot and is the first CWAD variety that combines intermedi-

ate resistance to fusarium head blight with ergot resistance. The new DT2035 variety is a CWAD with FHB resistance that has high wheat protein, strong straw strength, and low grain cadmium content.

By focusing on the genetic background of the next generation of wheat varieties and by investigating the genes controlling important traits and their response to different environments across Western Canada, this research will help maintain and increase yield, increasingly important factors as farmers face weather, climate change and pest challenges on an annual basis.

The next phase of this research will focus on post-harvest measurements, like grain quality parameters, an in-depth analysis of yield data and the environmental conditions for each testing location and planning for the next field season. Further to this, controlled environment experiments are continuously being done to generate more breeding material and will continue throughout the winter. Laboratory activities and crossing of breeding material is also ongoing.