Activity 8

Economic Growth in Canada Through the Development of Durum Cultivars that Address Climate Change, Environmental Sustainability, and Agri-food Resilience

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This research activity, led by Yuefeng Ruan of Agriculture and Agri-Food Canada (AAFC) in Swift Current, SK., aims to develop new durum wheat varieties that are adapted to a changed climate. This research builds on previous Canadian National Wheat Cluster projects under the Growing Forward 1 (2008–2013), Growing Forward 2 (2013–2018), and Canadian Agricultural Partnership (2018–2023) initiatives.

The purpose of this research activity is to develop new durum wheat varieties that are adapted to climate change thereby improving the environmental sustainability and economic resilience of durum wheat production in Western Canada. This research focuses on several key areas including promoting climate resiliency, sustainably managing insect and disease pests, and reducing the greenhouse gas (GHG) nitrous oxide emission intensity by improving the nutrient use efficiency of new durum varieties. Better nutrient use efficiency will lead to decreased on-farm fertilizer applications and lower fuel consumption, ultimately lowering GHG emissions. This research also aims to improve the end-use quality and market acceptance of Canadian durum wheat through genetic control of strong gluten strength, high yellow pigment, increased grain protein concentration, lower mycotoxins and pre-harvest sprouting.

Canadian durum wheat is marketed as the Canada Western Amber Durum (CWAD) wheat market class. CWAD is grown on approximately five to six million acres annually and is one of the top seeded

KEY TAKEAWAYS

- **The purpose of this research is to develop new durum wheat varieties that are adapted to climate change**
- **The first ever ergot resistant durum variety, AAC Frontier (DT2033), which also has intermediate resistance to FHB, was registered in the CWAD wheat market class in 2024**
  - It has high yield and grain protein concentration similar to AAC Schrader, shorter plant height and good straw strength, low grain cadmium concentration and a high falling number
- **AAC Brigham (DT2010) was registered in the CWAD wheat market class in 2024**
  - It is a midge tolerance durum variety with a combination of resistance to orange wheat blossom midge with high yield, strong straw, short height, greater resistance to FHB, high yellow pigment and low cadmium concentration
- **DT2035 is a durum germplasm supported to register in the CWAD market class in 2024**
  - It has FHB resistance similar to AAC Schrader which is rated as intermediate resistance
  - This variety has a combination of high yield, grain protein concentration similar to AAC Schrader, shorter plant height with strong straw strength and low grain cadmium concentration

crops in Canada. Maintaining growth and strengthening competitiveness in the global and domestic durum wheat market and increasing the return on investment for farmers requires the continuous development of varieties that have greater yield and genetic protection to yield limiting pests while maintaining superior end-use quality.

This research activity targets key industry research priorities, including varietal resilience stress caused by climate change, greater tolerance to insect and disease pressure, and improved water and nutrient use efficiency. This research will develop new durum wheat breeding germplasm and high yielding varieties that have enhanced resistance to diseases and insects such as Fusarium head blight (FHB), wheat stem sawfly, better drought and heat tolerance, improved nutrient use and water use efficiency while maintaining/improving grain quality traits, all achieved by incorporation of desirable genetic traits. The research also aims at developing durum varieties with shorter, stronger straw to improve lodging resistance, making them suitable for production in Western Canada.

The primary location of this research is at the Swift Current Research and Development Centre operated by AAFC and is being done in collaboration with the Brandon, MB.; Morden, MB.; Lethbridge, AB.; Ottawa, ON.; Saskatoon, SK.; and Charlottetown, P.E.I. Research and Development Centres as well as at the University of Saskatchewan and the University of Manitoba.

Through support in part by the Sustainable Canadian Agricultural Partnership Wheat Cluster, new durum varieties have been registered and breeding materials have been developed. The first ever ergot resistant durum variety, AAC Frontier (DT2033), which also has intermediate resistance to FHB, was registered as a new durum variety in the Canada Western Amber Durum (CWAD) wheat market class for Western Canada in 2024. This variety has high yield and grain protein concentration similar to AAC Schrader, shorter plant height and good straw strength, low grain cadmium concentration, and high falling number. Another new variety developed from this research was AAC Brigham (DT2010) registered in the CWAD wheat market class for Western Canada in 2024. AAC Brigham is a midge tolerance durum variety with a unique combination of resistance to orange wheat blossom midge with high yield, strong straw, short height, greater resistance to FHB, high yellow pigment and low cadmium concentration. Lastly, DT2035 is a durum germplasm supported to register in the CWAD market class in 2024. DT2035 has FHB resistance similar to AAC Schrader which is rated as intermediate resistance. This variety has a combination of high yield, grain protein concentration similar to AAC Schrader, shorter plant height with strong straw strength and low grain cadmium concentration.

Over the winter, the research team will continue to collect the data and increase materials in contra-season nurseries, and make selection for next growing season.

This research focuses on developing new durum varieties that meet the needs of Western Canadian farmers and the specific challenges they face every year. These breeding activities will use the best available resources and innovative tools both in the laboratory and in the field, accelerating the release of improved varieties. This means that farmers will have quicker access to higher-performing varieties that will have greater yield, lower input requirements and ultimately a higher return on investment. This research will help farmers in Western Canada remain competitive in an ever-evolving Canadian agricultural environment.