

Biotechnology leads to rapid development of new cultivars

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DEVELOPING NEW WHEAT varieties takes many years of breeding, but modern tools like molecular markers and doubled haploid production help to shorten the time needed to release new wheat varieties. The *Cultivar Enhancement Through the Application of Biotechnology project*, which is funded through the Canadian National Wheat Cluster, is increasing the speed of new cultivar development by orders of magnitude.

Lead Researcher Dr. Firdissa Bokore, Isabelle Piché and wheat breeders from AAFC Swift Current are combining biotechnological tools with traditional wheat methods to develop new bread and durum wheat varieties with desirable trait combinations.

“The application of biotechnology to breeding will allow the development of cultivars that contribute to resilient and sustainable crop production,” said Dr. Bokore.

The team is identifying DNA markers for economically important wheat traits, including disease and pest resistance, as well as for agronomic and grain quality traits. They are validating and implementing DNA markers discovered in other labs and translating them at scale for use in their research.

Their research on new marker discovery also involves gene discovery, having identified genes for rust, Fusarium head blight, common bunt, ergot and wheat stem saw fly resistance, among others. Once markers are identified, they can be deployed into the breeding program to aid in identifying lines carrying traits of interest, also known as marker-assisted selection.



Dr. Firdissa Bokore is working with researchers at AAFC Swift Current to develop new bread and durum wheat varieties. | AAFC PHOTO

Traditional breeding methods are time-consuming as they rely on visual trait assessment in the field and/or post-harvest evaluation. Marker-assisted selection saves time and money in the breeding program by enabling early identification of desirable traits.

Another biotechnological tool employed is doubled haploid production which creates plants with identical pairs of chromosomes.

“Doubled haploid production increases the rate at which new trait combinations can be delivered to farmers. We use DNA markers to screen both doubled haploid lines, and those developed through conventional breeding methods, for various traits of interest,” said Dr. Bokore.

About the CNWC

The Canadian National Wheat Cluster is made possible by the Sustainable Canadian Agricultural Partnership with funding from Agriculture and Agri-Food Canada and industry.

Combined with off-season production, new varieties are ready in record time.

The following new varieties, registered in the past two years, were partially developed using biotechnological tools provided by Dr. Bokore's team:

- **AAC Frontier**, the first durum wheat variety with combined resistance to both ergot and Fusarium head blight;
- **DT2046**, a durum variety with intermediate Fusarium head blight resistance, high protein, strong straw strength and low cadmium content;
- **AAC Oakman**, a CWRS variety with improved wheat stem sawfly and orange blossom wheat midge resistance.

“These forms of biotechnology help breeding respond more quickly to instabilities in food sustainability by increasing efficiencies and shortening the cycle time for breeding resistance to biotic and abiotic stresses, consumer preferences, and societal needs,” said Dr. Bokore. 🌱