

Activity 13

Winter Wheat with Enhanced Economic, Environmental, And Ecological Sustainability for Western Canada



Lead Researcher

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This research activity, led by Harwinder Singh Sidhu of Agriculture and Agri-Food Canada (AAFC) in Lethbridge, AB, aims to develop new Canada Western Red Winter (CWRW) varieties for farmers in Western Canada. This research builds on previous research and new varieties that were developed through funding by the Canadian Agricultural Partnership. Further to this, this breeding program has built upon its highly successful plant breeding and research activities that started in the Growing Forward clusters.

Superior winter wheat varieties, primarily developed by the winter wheat breeding program at the AAFC Lethbridge Research and Development Centre (RDC) have high competitiveness among other CWRW varieties and reduced risk for the Canadian wheat production. This program was led for many years by the highly praised and well-known plant breeder Robert Graf, who recently passed the torch to Sidhu. Sidhu intends to build on this program's many accomplishments by delivering new varieties that farmers can confidently grow on their farm.

Sidhu is targeting several important plant traits that are desirable in CWRW wheat including high yield, improved winter survival, greater tolerance to heat and drought stress, and greater disease tolerance to Fusarium head blight, stem rust, leaf rust, stripe rust and common bunt. Enhanced nitrogen use efficiency and improved end use quality are also on this researcher's radar and Sidhu will be using every genetic and plant phenotyping tool available to increase the effectiveness in finding and selecting for new varieties that have these traits. The overarching goal of this research is to

KEY TAKEAWAYS

- The overarching goal of this research is to develop high yielding and stress tolerant Canada Western Red Winter (CWRW) varieties for commercialization that will be grown across Western Canada
- It builds off previous winter wheat research including that done by retired plant breeder Robert Graf
- Work is being done at dryland sites across Western Canada where new wheat lines are being evaluated against established wheat varieties used as checks
- Growing conditions were favourable for winter wheat development during the 2024–25 growing season with adequate soil moisture available from the 2023 field season facilitating good germination in the fall and survival over winter
- Selections of desirable candidate varieties were made with planting completed on time for the 2025 growing season

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Seyoum Legesse managing the harvested samples from the 2024 harvest and finding the selected lines to continue in next years' trials.

PHOTO: HARWINDER SIDHU

primary trait of selection is high yield.

Advanced lines performing better than the checks overall, and specifically under dryland conditions, are selected to address heat stress tolerance improvement. Further to this, the program is planning to make winter wheat crosses with biological nitrification inhibitor wheat lines to improve the nitrogen use efficiency. They will be assessing the root architecture of the resulting lines from such crosses to understand their underlying genetics and how they perform in the soil. The lines developed through this work will be evaluated primarily in the greenhouse.

The favourable environmental conditions during Sidhu's 2024 field season were optimal for winter wheat production. Adequate soil moisture was available from the 2023 field season which facilitated good germination in the fall and survival over winter. Early summer precipitation helped plant growth during the vegetative growth stage and high temperatures during reproductive development did not reduce yield, an important indication of acceptable heat stress tolerance. Sidhu made selections of desirable candidate varieties and planting was completed on time for the 2025 growing season.

Sidhu has begun to incorporate advanced genetic analyses to characterize their advanced candidate varieties which will ultimately increase their selection efficiency. This research program is well on track to make new parent crosses that



Julie Scholten setting up single row trays for the irrigated trial location in Lethbridge, AB.

PHOTO: HARWINDER SIDHU



Jordan De Leeuw counting seeds for each plot to be planted for the western winter wheat co-op trial at 15 sites across the Prairies.

PHOTO: HARWINDER SIDHU

will contribute to identifying and incorporating the sought-after plant traits into their breeding program and will lead to the development of new, better varieties that will be commercially available within the next ten years. Over winter 2025, Sidhu's team has shifted their focus from the field season to genotyping initiatives in the laboratory to increase disease tolerance and other genetic activities production to push important variety crosses faster through their breeding pipeline. They will also be measuring and evaluating seed quality constituents and the end use quality of varieties that show promise for commercialization.