Bridging the Gap: Wheat Breeding Innovations into Superior Field Cultivars

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Abstract

Canada ranks fifth globally in wheat production, achieving a record 40 million tonnes in 2025, driven by improved yields across the Prairie provinces. Canada Western Red Spring (CWRS) wheat remains predominant, representing 73% of total production, followed by durum (18%) and winter wheat (9%). Approximately 96% of wheat is grown in Alberta, Saskatchewan, and Manitoba, with Manitoba recording the highest yields but facing significant disease pressure from Fusarium Head Blight (FHB) and rusts. Wheat exports totaled 27.4 million tonnes, contributing $8.2 billion CAD to the Canadian economy. To address yield gaps under variable Prairie conditions, breeding programs have integrated genomic selection, doubled haploid technology, and high-throughput phenotyping to accelerate genetic gain. Marker-assisted selection for FHB resistance, incorporation of rust resistance genes, and predictive breeding models have enabled the development of cultivars combining high yield potential, disease resistance, and superior end-use quality. Close collaboration with agronomists ensures that breeding objectives align with field management practices, optimizing cultivar performance under diverse soil and climatic conditions. The presentation highlights breeding methodologies, major disease challenges, sources of resistances, and a schematic of key steps in wheat improvement for the Canadian Prairies.