



Wheat Feat

by Stephanie Fehr

Fred Townley-Smith's enthusiasm for improved wheat varieties has benefited Canadian farmers with a range of varieties, including everything from pest resistance to an entirely new class of Canadian wheat.

DR. FRED TOWNLEY-SMITH has agriculture in his blood. Growing up on a mixed-farm near Lashburn, Saskatchewan – one part pedigreed seed production, one part cereal crop production, and one part beef and dairy cattle – Townley-Smith was involved in the variety trials that took place on the farm and was in charge of running the family farm from May to September when he was 16.

This strong background in agriculture set the stage for a career in plant breeding that saw Townley-Smith, now retired, release more than 25 cereal varieties, including wheat varieties that have benefited farmers through drought, sprouting, rust, and midge resistance, along with early maturity and a new class of wheat in Canada – hard white wheat. His contribution to Canadian wheat has landed him the 2005 Plant Breeder's Award, co-sponsored by the Canadian Seed Trade Association (CSTA) and *Germination*.



Durum Delivers

Townley-Smith began his breeding career in Swift Current, Saskatchewan in 1968, focusing on durum wheat breeding. The quality standard for durum had recently changed and a durum wheat with stronger gluten was required. The Winnipeg breeding program had come up with Hercules, a stronger variety well-suited to the eastern Prairies, but a high-yielding durum variety with appropriate quality characteristics was needed for the brown soils of Saskatchewan and Alberta. Along with Dr. Ted Hurd, Townley-Smith released Wascana and Wakooma, both suited to the western Prairies.

Townley-Smith's biggest breakthrough in durum wheat was Kyle, which has dominated Canadian durum production since 1988. "Kyle was an improvement in yield," says Townley-Smith. "It was a good combination of quality, the yellow colour that is desirable, and better gluten, which gives al dente pasta its pleasant bite."

Kyle is a good yielder, and survives harvest weather quite well. It holds up against sprouting, meaning farmers get better grades on their wheat in adverse harvest conditions. Kyle has been so successful it occupied more than 90% of the durum acreage on the Prairies for many years and held its own in 2003 by maintaining 50% of this area, resulting in about \$4.5 billion worth of Kyle being produced in the last 15 years.

Tackling the Difficult Problems

In 1988, Townley-Smith moved to Agriculture and Agri-Food Canada's Cereal Research Centre in Winnipeg where the focus on wheat breeding was on disease resistance, with emphasis on

straw strength, yield, early maturity, and sprouting resistance. Townley-Smith's work on rust resistance led to a number of varieties being released and a wealth of material that can be used as germplasm for future work on the disease. "Leaf rust changes rapidly, so it's a real challenge to breeders," says Jim Bole, the retired Director of the Cereal Research Centre in Winnipeg who co-nominated Townley-Smith. "In Canada, all varieties have to be genetically resistant to rust. The rust races keep changing all the time, and that means you have to stay a gene or two ahead of them. Fred has developed several varieties with new rust resistance genes."

In addition to his work with rust resistance, Townley-Smith developed wheat varieties with resistance to sprouting, including AC Domain, AC Majestic, and Harvest. The demand for varieties is somewhat cyclical, based on the weather of the previous year. If sprouting at harvest is a problem, farmers tend to choose sprouting resistant varieties for the following year. "AC Domain was released in 1993; it has good sprouting resistance and its acreage increased because of the difficult harvest," says Townley-Smith. "One of our newer varieties is Superb, which is another line with improved sprouting resistance over its high yielding parent."

"Fred tackled the difficult breeding problems," says Bole. "You can see rust resistance in the new lines you've developed: either they have resistance or they don't. You simply subject them to a rust epidemic and if they show rust you throw them away, but sprouting is much more difficult. You need either the right conditions to measure sprouting or go through relatively difficult tests once the plant is fully-grown. It's challenges like that Fred managed to be successful at."



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Hard White Wheat

While these are just some of his contributions, perhaps Townley-Smith's greatest achievement was the creation of a new class of wheat in Canada – hard white wheat. “I think that his absolutely stellar career was capped with him fast-tracking hard white wheat,” says Trenton Baisley, CEO of FarmPure (formerly Quality Assured Seeds), who also nominated Townley-Smith for the award.

Townley-Smith released two hard white wheat varieties with bread and noodle making qualities similar to red spring wheat, and excellent sprouting resistance – something not considered possible in white wheat. In milling, hard white wheat lends itself to better extraction of flour than red, and gives whole-wheat products a pleasing golden colour instead of brown. It also lacks an enzyme that causes noodles to darken after processing.

Australia already owned the market for hard white wheat and in the mid '90s the U.S. was interested in developing hard white wheat as well. “We weren't going to be able to compete if the U.S. and Australia both had hard white wheat; we'd be at a disadvantage,” says Townley-Smith. To that end, Townley-Smith worked diligently to develop a white version of Canada's hard red spring wheat. New techniques like double haploidy and marker-assisted selection allowed him to cut the breeding time down significantly, and in 2000 the first hard white wheat variety, Snowbird, was released, followed by Kanata a year later.

“The development of hard white wheat for Canadian agriculture was just an outstanding accomplishment,” says Baisley. “Not only did he do this in a very short period of time, but the varieties we've got out are outstanding, both from an agronomic and quality perspective. It truly reflects his incredible skill and ability.”



Quality Assured Seeds won the rights to market hard white wheat under an identity-preserved program. Just this spring they broke one million acres planted. “Hard white wheat is really important for Canada in terms of diversifying our crop types and adding value to producers' returns per acre,” says Baisley.

Townley-Smith is gracious about being recognized by the CSTA, and acknowledges the support he has received, from his early mentors, to the pathologists, biotechnologists, cereal chemists, and other breeders who collaborated on varieties. “I think it's a fantastic honour,” says Townley-Smith, “but the production of varieties is never the work of an individual – it is the work of a team. I've been very fortunate to have had a very skilled group of people around me to make it all happen. It's really a tribute to the whole group.”

A CAREER SNAPSHOT

Fred Townley-Smith has had a long and illustrious career. Here are some highlights:

- Wheat Breeder – Agriculture Canada Research Centre, Swift Current (1968-86)
- Advisor/Senior Wheat Breeder – Kenya-Canada Wheat Development Project (1972-74)
- Acting Director – Agriculture Canada Research Centre, Regina (1986-88)
- Wheat Breeder – Agriculture and Agri-Food Canada, Cereal Research Centre, Winnipeg (1988-2001)
- Research Scientist Emeritus – AAFC, Cereal Research Centre, Winnipeg
- Released about 30 cereal varieties, including bread, durum, Canadian Prairie Spring, extra strong, hard white wheats; rye; and triticale. Several lines with special traits were registered as germplasm
- Published more than 40 scientific papers, with new information in the genetics of cereal drought resistance, biostatistics, sprouting resistance, rust resistance, cereal chemistry, and the identification and application of molecular markers
- Adjunct Professor, Plant Science Department, University of Manitoba
- Honorary Life Membership: Saskatchewan Seed Growers' Association, Manitoba Seed Growers' Association, and Canadian Seed Growers' Association
- Robertson Award – Canadian Seed Growers' Association

