



### **MOMENTUM BUILDS FOR TRITICALE**

by KIERAN BRETT

This manmade cross of wheat and rye is the subject of intense research and development, as new biorefining applications create major implications for livestock feeding.

For many years, triticale has quietly been a part of the crop mix in Western Canada, grown by a select group of farmers who believe deeply in its value as grain and silage.

Triticale's low profile appears set to change. With a wide range of biorefining applications now on the horizon, research organizations are intently focused on doubling or tripling triticale acres within the next several years.

The Alberta Crop Industry Development Fund Ltd (ACIDF) is one of these organizations. ACIDF has invested more than \$1.5 million in triticale-related projects and is providing project management and financial support services for the Canadian Triticale Biorefinery Initiative (CTBI).

In this edition of ACIDF *Feed Grain Research Update*, we speak with those who grow, research and promote triticale, for their views on what's happening with this iconic Canadian crop.

Welcome to ACIDF's *Feed Grain Research Update*.

### **GENETICS KEY TO NEW-GENERATION TRITICALE**

A leading plant breeder, now in his fourth decade with the crop, sees promise ahead and pitfalls to overcome.

Don Salmon is the first to admit that triticale varieties registered in Canada in the '70s and '80s were far from perfect. He should know: he bred some of them.

“There was a fair amount of ergot present in some of those varieties, which can be problematic for forages,” says Salmon, long-time plant breeder with Alberta Agriculture and Rural Development.

Salmon is building on his decades of experience with triticale, using classical and novel approaches to breed varieties suitable for biorefining and livestock feeding today. This work is taking place on several levels, from development of germ plasm from international genetic resources, to breeding triticale for feed crop production, to a variety development project funded by ACIDF. Feed-related issues include silage and swath grazing applications.

## **Lessons to learn, systems to build**

While Salmon is hard at work on his own piece of the triticale story, he's keenly aware that improved varieties can achieve little on their own. He advocates a stepped-up education and extension effort, both for the farmers who'll grow the crop and the livestock producers who'll feed it.

While they're at it, Salmon notes, the industry must ensure that robust systems are in place to connect seller and buyer. Right now, such systems are mostly lacking.

“Where can you buy triticale?” he asks. “One guy says he has 20,000 tonnes of triticale for sale, but he can't find a customer. Down the road, a buyer wants 20,000 tonnes of triticale, but he can't find it.”

Ultimately, perhaps, the future of triticale will require not just new varieties, but new ways of thinking. More than genetics, more than marketing, attitude remains a major stumbling block.

Says Salmon: “In France and Germany, there's lots of winter triticale. Europeans look at it as a feed for livestock, especially poultry and hogs. Triticale is a wonderful crop to have in the rotation, but here in Western Canada, people just don't know how to feed it. We need to work on that.”

## **BIOREFINING TO DRIVE GROWTH IN TRITICALE ACRES**

With triticale grain and straw an ideal feedstock for chemicals, structural materials and biofuels, look for plenty of co-products in the feed bunk of the future.

Two years into its mandate, the Canadian Triticale Biorefinery Initiative (CTBI) is already making a significant impact. According to CTBI's Richard Gibson, as dozens of research projects move closer to commercialization, triticale will begin to move closer to meeting its ultimate potential.

“Currently, there are 200,000 acres of triticale grown in Western Canada, including 85,000 acres in Alberta,” says Gibson. “We believe that the biorefinery opportunity can expand acreage to 500,000 in Western Canada within five to six years.”

This significant acreage increase would largely be the product of the growth of biorefining applications for triticale grain and straw. CTBI is funding nearly 30 long-term research projects on everything from ethanol production to bioplastics to platform chemicals. This family of projects includes research on how to enhance triticale's role in livestock feeding, mainly with the Dried Distillers' Grain with Solubles (DDGS) that will be a co-product of biorefining.

## **A triple-win for biorefining, farmers and feeders**

As Gibson explains, CTBI's research is not about abstract concepts and faraway goals. The idea is to efficiently fill the information gap around triticale, biorefining, agronomics and livestock, and bring new ideas to commercialization as quickly as good science allows.

“For farmers, the opportunity for triticale rests on the fact that it grows well on dry and marginal land,” says Gibson. “Farmers can diversify their crop production and optimize the use of their land. At the same time, triticale is a superb candidate for bioenergy, platform chemicals and other applications, because of its unique carbohydrate-based polymers, simple sugars and proteins.”

At a mid-June meeting held in Summerland, B.C., CTBI project leads outlined their progress solving fundamental and practical questions of triticale use. To Gibson, two messages came through loud and clear. First, scientists are making steady progress. Second, the further their research goes, the more likely it seems that triticale can gain traction as a biorefining feedstock. For many projects, in fact, tangible commercial outcomes are within sight.

Mind you, none of this can happen without the support of growers. Assuming demand for triticale increases as projected, processors will look to farmers for a dependable supply.

Says Gibson: “At this point, we are asking producers to learn more about triticale and consider how they may be able to grow it on their farm. The progress we've made on the research side bodes really well for this crop and its future.”

## **CROP OF THE FUTURE? THAT'S UP TO US**

This grower believes triticale has what it takes to be a significant crop. The rest, he says, depends on science, marketing and mindset.

In the three decades Leo Meyer has grown triticale, the crop has shown occasional flashes of the promise he's seen in it from the start. Still, the Woking, Alta. producer thinks the research funding, policy focus and media attention the crop is getting today is something new.

With demand from biorefining applications, and the prospect of feeding co-products to livestock, Meyer sees plenty of reason for optimism.

“This is an absolutely phenomenal opportunity, maybe the greatest I've seen in the last 30 years,” he says. “I've always seen lots of potential from a breeding perspective in triticale.

Apart from the biorefining, triticale could replace wheat in major feed and food staples.”

Just as important, Meyer sees triticale as the best candidate among prairie-grown grains to challenge corn as a feedstuff. With average corn yields seeming to add five bushels per acre every year, triticale researchers will need funding, focus and the support of industry. Thanks to organizations like CTBI and ACIDF, Meyers believes this critical mass is indeed coming together.

### **What farmers want to know**

In recent years, Meyer has been one of the leading lights behind the formation of the Alberta Oat, Rye and Triticale Association. Still, before he makes a bigger commitment to triticale on his own farm, he'll be looking for signs the industry as a whole is preparing to seize the opportunity.

“The biggest question mark is the availability of seed,” he says. “We have distanced ourselves a bit from the crop because of this. At this point, we are preferring winter wheat and fall rye a bit more than triticale.”

Many think of triticale as a uniquely Canadian crop, making Canada the natural place to develop it to its full potential. While the crop's roots are here, Meyer notes that other countries have done more with triticale than we have.

“We still go around the world thinking we're the epicenter of triticale, but how much do we actually grow?” he asks. “In Europe, triticale has completely replaced feed wheat. It is hands down the most productive cereal on the farm.”

Meyer is excited by the progress being made to establish triticale as a biorefining crop, and to feed livestock with the leftovers. If anyone worries whether prairie farmers will pick up the torch, they needn't be. All it takes, in Leo Meyer's view, is for the marketplace to give farmers a worthwhile signal that it's time to plant more triticale.

“If the market wants 2 million tonnes of triticale and the signal is there, you'd better believe farmers will grow it,” he says. “I cannot stress enough the tremendous potential for a positive outcome from the research that's now happening with triticale.”

## **MORE VALUE FROM ETHANOL CO-PRODUCTS**

Biorefining applications would create large volumes of triticale DDGS. This researcher is studying the feed qualities of this material.

The Canadian Triticale Biorefinery Initiative is researching and advocating triticale as a feedstock for ethanol, chemicals, building materials and more. The economics of these applications will depend, in part, on the value of co-products such as triticale DDGS.

Feeding trials conducted by Eduardo Beltranena, Feed Research Scientist with Alberta Agriculture and Rural Development, suggest triticale DDGS is a good fit as livestock feed. In fact, triticale DDGS performs as well as wheat DDGS or corn DDGS.

Triticale also yields 5% to 20% more per acre than wheat, so its use would not only produce more ethanol, but also more pork or poultry per unit of land, compared to wheat.

Beltranena notes there's considerably more work to be done. Still, he's beginning to assemble a compelling case that triticale grain, not just wheat, merits a place as an ethanol feedstock.

“Once we master cellulosic ethanol production, triticale will win hand over fist,” he says. “No other prairie agricultural crop matches the biomass of triticale, to break down with cellulase enzymes prior to fermentation. We may even get more than one biomass crop per year to produce ethanol and the resulting co-product would be quite suitable to feed cattle. For these reasons, we see triticale definitely playing a greater role in the future.”

## **DESIGNER TRITICALE FOR BIOREFINING AND MORE**

Research is finding ways to tame the lignin in triticale, making the crop more attractive to biorefining.

Lignin is a chemical compound found in plants. For companies that process crops into chemicals and energy, it can also be a major headache. During fractionation and conversion, the presence of lignin complicates the process of fractionation of cellulose and hemicellulose.

No problem, says François Eudes, Research Scientist for Cereal Platform Biotechnology with Agriculture and Agri-Food Canada in Lethbridge. He's on a four-year mission to make triticale a better fit with fractionation and chemical conversion processes.

As one innovation, he's working to add an enzyme to triticale that makes it easier to deconstruct the lignocellulosic compound of crop biomass, otherwise known as straw. In another, he's engineering a method to reduce lignin in the leaves and stems that are harvested, all the while improving yield. Progress made so far in encouraging.

“In the spring of 2012, we could have a plant that could be submitted to CFIA for registration,” says Eudes. “We could have a triticale with 20% higher yields but with 50% less lignin in its aerial parts.”



For researchers like Eudes, there's a substantial learning curve involved. While cereals like wheat and barley have been extensively studied, there's still a lot science doesn't know about triticale. A deeper understanding of the plant is a first step toward improving it.

“We're looking at manipulating the composition of the plants to get more of the materials of interest,” he says. “Our target is to facilitate the breakdown of the straw into fermentable sugars.”

## **TRITICALE COULD SHAKE UP CATTLE FEEDING**

The grain matches up well compared to wheat and its DDGS is close to corn. So why aren't more feedlots using it?

Need some triticale? If you put the question to 10 Alberta feedlot operators, chances are eight or nine would say: no thanks. Many have tried to feed triticale grain or silage from time to time, and most have backed away.

According to Tim McAllister, Principal Research Scientist with Agriculture and Agri-Food Canada in Lethbridge, the perception is not entirely fair.

“It's true that triticale has had a somewhat spotty reputation among feedlot operators in the past,” says McAllister. “Partly it's a function of how the crop has been handled in the field. Often producers have tried to use management practices for ensiling barley on triticale.

“Triticale tends to mature earlier than barley, so if you harvest a bit too late, you're going to get lower quality feed due to the lower digestibility of fiber in the forage. So there needs to be more extension to provide producers with the tools required to properly manage triticale production.”

In McAllister's view, several factors point to feedlot operators making a renewed acquaintance with triticale over the coming years.

The crop sits well in a rotation, often being insensitive to the diseases that can plague barley if it is grown on the same field year after year. Triticale also handles drier conditions with ease and typically has a higher forage yield than barley. Once marketing opportunities match agronomic performance, farmers could grow more. McAllister's chemical analysis has also found that triticale grain should perform as well in cattle rations as wheat does.

## **PROJECT STUDIES DDGS**

With triticale biorefining projected to grow, triticale DDGS could become an available, well-priced option. In an ongoing research project, McAllister is studying the feeding characteristics of this material.

“At this point, it ranks fairly close to DDGS from wheat,” he says. “Corn might still be slightly superior because of its oil content. If ethanol plants in the U.S. start to extract the oil from corn DDGS, then triticale DDGS could be comparable to corn DDGS. The quality of DDGS partly depends on how it is processed and dried during manufacture.”

Even if a head-to-head comparison confirms the value of triticale grain and DDGS, McAllister doesn't predict a stampede of feedlot operators. Long-held perceptions change slowly, supply is modest and challenging cattle markets aren't necessarily the time to get creative with rations.

Still, the more credible evidence the triticale industry can marshal, the stronger the argument to feedlot operators will be.

“In the academic world, for every research paper on triticale,” says McAllister, “there are 100 about barley and 1,000 about corn.”

## PARTNERS IN UNLOCKING THE POTENTIAL OF TRITICALE

By bringing together the right organizations, the right people and the right resources, we can capture the value of expanded triticale production. ACIDF recognizes and thanks the following organizations for their expertise and dedication to improving triticale in Western Canada.

- Agriculture and Agri-Food Canada
- Alberta Agriculture and Rural Development
- Alberta Agricultural Research Institute
- Alberta Beef Producers
- Alberta Distillers Ltd
- Alberta Livestock and Meat Agency
- Alberta Pork
- Canadian Triticale Biorefinery Initiative (13 companies and research organizations)
- Corns Brothers Seed Farm
- University of Alberta

*This is the final issue in the series of articles that look in depth at specific solutions to feed competitiveness and will outline investments being made by private industry, farmers, research organizations, government and funding agencies in present and future feed grains research and development. Printed copies are available upon request or visit our website [www.acidf.ca](http://www.acidf.ca) for others issues.*

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