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FALL 2018
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WARD OATWAY

GREETINGS. For most of you, this has been yet another challenging harvest as the snow came earlier than expected for a lot of the province. While this has been a tough time, I am always encouraged by the resilience of Alberta's farmers and I look forward to seeing and commiserating with many of you as we head into the meetings and AGM season this winter.

I always find that this is a crucial part of the year where I can reflect on the past growing season and what lessons I can take forward. If you are like me, then you know what a valuable tool the *Alberta Seed Guide* is in helping you plan ahead for 2019 and beyond.

Are you thinking about going with a new variety for next year? The growers documented in this guide have already experienced what you're looking for and can provide some first-hand advice on varietal performance. The *Alberta Seed Guide* is here as a resource for you and we hope that you find it helpful in your planning and purchasing decisions.

As a quick update, I would like to let you all know that our national body, the Canadian Seed Growers Association (CSGA), along with our Seed Synergy partners, are working to develop a value creation system that helps develop the best of the best new varieties. Our timing coincides with the launch of consultations by Agriculture and Agri-Food Canada regarding the future of Plant Breeders' Rights regulations. These consultations will include discussions on a value creation model in cereals with two options being proposed: an end-point royalty and a trailing royalty system.

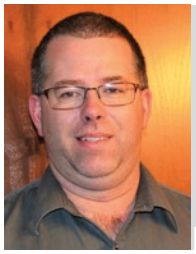
The Alberta Seed Growers (ASG) via the CSGA, along with our seed industry partners, are focused on developing a model that will foster innovation and encourage investment in the use of pedigreed seed. The value system must create a competitive advantage to those varieties that perform well, those varieties that provide more robust production to the farm. If you have thoughts on this, please reach out to me or our executive director Kelly Chambers.

Another important issue on the top of our minds has been Fusarium graminearum (Fg) as it continues to spread throughout the province. We have been in talks with Alberta Agriculture and Forestry Minister Oneil Carlier to explore a legislative solution to better deal with this problem. While discussions continue, our consistent standpoint remains that Fusarium is here, and we need to focus on access to all of the control options available. This includes emphasizing to cereal producers how important it is that we all employ the full suite of best management practices. We need to work together on this issue, and our organization will continue to update our members on the tools they need to succeed in mitigating Fusarium's spread.

On a final note, I always encourage readers of this guide to attend a local crop commission meeting this winter to network and learn about the changes that are facing our industry. Please also consider attending the FarmTech Conference which takes place January 29-31 in Edmonton. As one of the host organizations of the event, ASG will be there to provide crucial updates and ensure you take home some valuable new information.

Thanks everyone,

Ward Oatway
President
Alberta Seed Growers



HECTOR OUELLETTE

ALBERTA SEED PROCESSORS

GREETINGS on behalf of the 67 farmer-owned cooperative seed and grain processing plants in Alberta/B.C. that comprise Alberta Seed Processors.

It seems like it has been a long time since the weather has not dominated conversations in the Alberta crop sector, and 2018 continues to be no exception. However, whatever the climate throws your way, I do hope everyone is able to get through the crop year safely and with some degree of prosperity.

This issue of the *Alberta Seed Guide* focuses on the value of innovation, which when we stop to actually think about it, touches most every corner of our farming operations. Several millenniums ago (427-347 BC), Greek philosopher Plato coined the phrase, "Necessity is the mother of all invention"; and I guess that holds true today. Innovation is all around us, from the seed we plant to the analysis of the end product of our crops; innovative solutions have resulted in higher productivity and prosperity for our farms.

At times, we may wish that innovation would slow down, as innovation typically goes hand in hand with learning. Learning, in turn, requires change in how we do things or even the attitudes we hold. Let's face it: change can be hard… as Red Green (not a Greek philosopher, but a Canadian comedian) says "… I can change, if I have to, I guess." I think the consequences of not embracing innovation are far greater than embracing the growing pains of innovation. The world outside the cropping industry is rapidly developing innovative solutions to real or forecasted issues, and keeping up is a tactic to ensure we not only survive, but thrive.

Part of the innovation equation is identifying a need or gap that innovation can fill. To that end, farmers need to stay connected not only to our own industry, but also to the ever-changing world around us. Accolades to you regardless if you opt to communicate through social media, or in more personal methods such as stepping up to serve on a board of a crop commissions or agriculture related organizations like the Alberta Seed Processors. Communication is a key link in the chain of innovation.

Another opportunity to connect is by attending meetings that will be conducted this fall: most crop commissions have report meetings that are typically held on a regional basis, so all farmers have access to attend. Connecting outside of the agriculture industry is an often-overlooked communication channel. Being involved in some capacity in a sport, educational or recreational pursuit is an excellent way to connect with non-ag focused people. Often issues or opportunities in other industries dovetail into something in agriculture; but we will never know if we only stay in our traditional circles of influence.

The *Alberta Seed Guide* has articles on how gene editing technology is creating opportunities in plant breeding to speed up the breeding process and building varieties that have genetic resistance to costly diseases like fusarium and blackleg, and interviews with a seed grower, seed plant manager, and plant breeder that also tell the stories of how innovation has enhanced the value of what each of these important links in the crop industry value chain bring to the farm gate.

Thank you for staying connected to the seed industry by reading *Alberta Seed Guide*; and please do not hesitate to be part of the innovation equation by reaching out to us. The Alberta Seed Processors can be reached through the "contact us" button on www.seed.ab.ca: be sure to address your message to 'Alberta Seed Processors'.

Best wishes for a safe and successful wrap up of the harvest season.

Hector Ouellette
President
Alberta Seed Processors

ALBERTA SEED PROCESSORS

MINISTER CARLIER

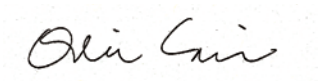
ON behalf of the Government of Alberta, it is my pleasure as Minister of Agriculture and Forestry to extend greetings to the readers of the *Alberta Seed Guide*. This edition focuses on the theme the *Innovation Equation* — demonstrating the value and importance of plant breeding and delivering improved crop varieties.

The long-term success of our agriculture industry relies on a strong commitment to innovation, research and development, environmental stewardship and sustainability. Through valuable tools like the *Alberta Seed Guide*, producers can stay connected and up-to-date about the latest developments in crop science and agricultural practices that result in enhanced quality and efficiency of production.

Agriculture continues to be an enormous contributor to our communities and our provincial economy, generating exports of over $11 billion last year and employing over 75,000 Albertans. It is important to note that Alberta's crop market receipts were a record $6.9 billion last year — and it all starts with top quality seed.

Thank you to the Alberta Seed Growers and the Alberta Seed Processors for their dedication to Alberta's agricultural producers and the production of this important resource.

I extend my sincere wishes for your continued success.



Oneil Carlier
Minister
Agriculture and Forestry

Alberta Seed Guide

Fall 2018

ALBERTA SEED GROWERS

kelly.chambers, executive director,
5030-50 St.
Lacombe, AB T4L 1W8
Ph: (403) 325-0081
Email: kelly@seedalberta.ca

ALBERTA SEED PROCESSORS

monica.klaas, general manager,
5030-50th St.
Lacombe, AB T4L 1W8
Office: (403) 489-9999
Fax: (888) 446-5853
monica.klaas@cleanseed.net

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PUBLISHER
shawn.brook

MANAGING EDITORS
michelle.clarke, **lindsay.**hoffman

EDITORIAL
julie.deering, **marc.**zienkiewicz

CONTRIBUTORS
marc.airhart, **kari.**belanger, **treena.**hein, **julienne.**isaacs, **janet.**kanters, **carolyn.**king, **alex.**martin, **dana.**yates

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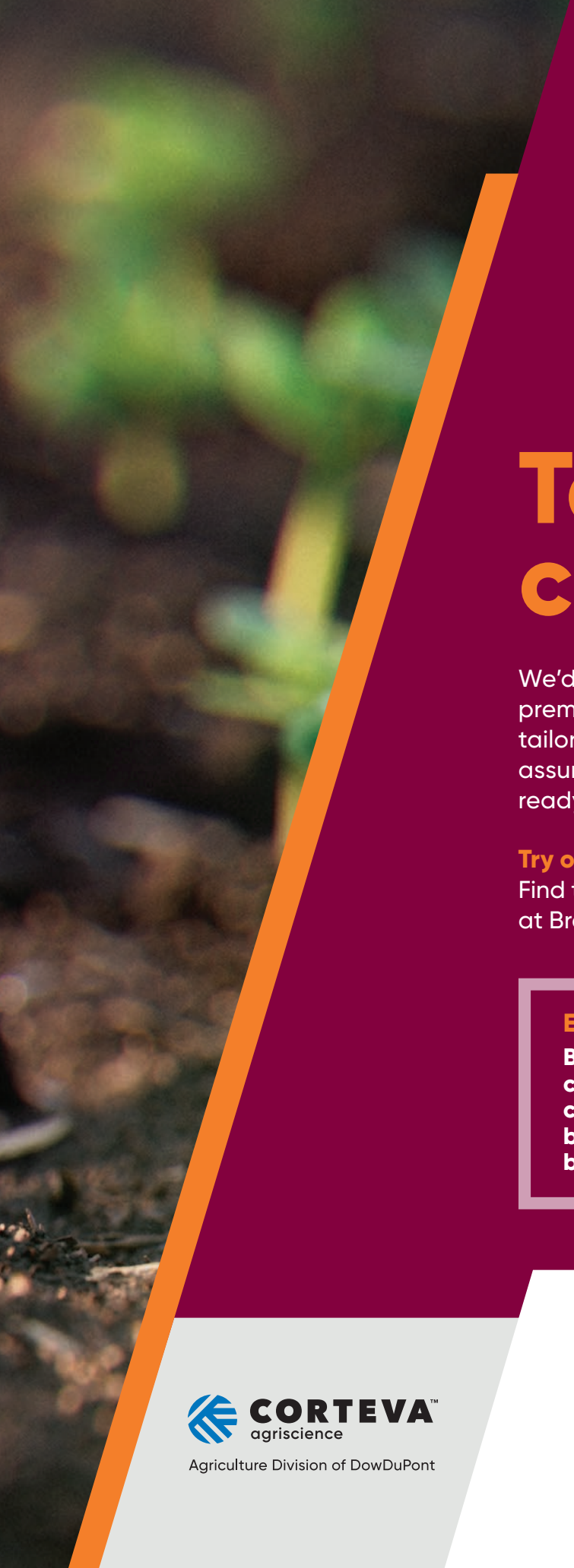

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On the Way to Nitrogen-Fixing Cereals

Alberta researchers are making exciting progress in this challenging task.

CEREAL CROPS that fix their own nitrogen? Achieving this dream could result in major benefits for agriculture and the environment.

Scientists around the world are pursuing this goal, including a group in Alberta. The Lethbridge-based researchers have already made impressive advances towards developing nitrogen-fixing triticale plants as a first step to creating other nitrogen-fixing cereals.

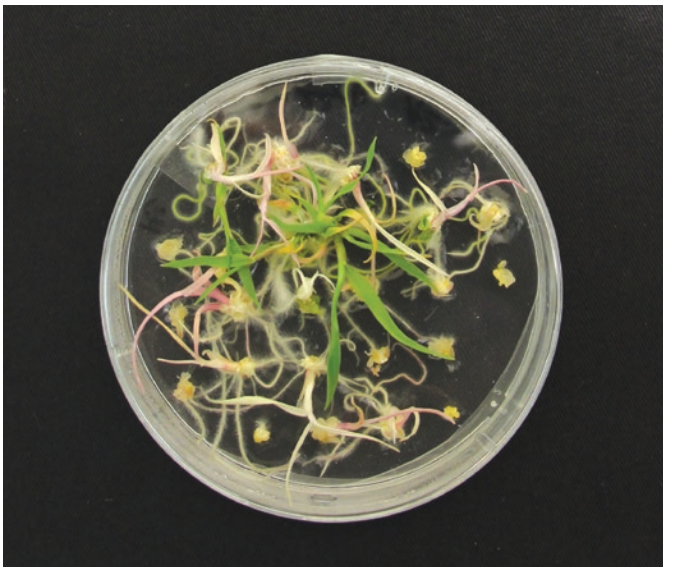
"The idea of nitrogen-fixing cereals is not new. The discovery in the late 1880s of symbiosis between nitrogen-fixing bacteria and legumes spurred the eventual question of whether it is possible in non-legume plants, including cereals. However, the path from the idea to its successful realization is in this case quite bumpy," says Dr. Alicja Ziemienowicz, a research biologist with Agriculture and Agri-Food Canada (AAFC) and an adjunct professor at the University of Lethbridge. She is co-leading this nitrogen fixation research with her AAFC colleague Dr. François Eudes.

"There are three biotechnological approaches for biological nitrogen fixation in cereals, and all require genetic engineering of bacteria or plants or both," she explains. "The first one is to create rhizobium-legume-like symbiosis in cereals; in other words, to convince rhizobia and cereals to form an interaction similar to the interaction of rhizobia with legumes. The second approach aims at improving bacteria that live inside cereal plants or in the soil right next to cereal roots so these bacteria can perform nitrogen fixation more efficiently."

However, these two strategies would rely on the use of bio-fertilizer inoculants, which are not always as effective as crop growers would like and are not as convenient as having the trait in the seed.

"When I joined the team of Dr. François Eudes at AAFC's Lethbridge Research and Development Centre about five years ago, we decided to take the third approach to the biotechnological solutions for the nitrogen fixation problem," adds Ziemienowicz. "This approach is perhaps the most challenging one but also the most promising. It involves the direct transfer of bacterial nitrogen fixation (nif) genes into the plant."

Ziemienowicz is an expert in this type of research and has been working on development of better technologies for plant improvement for over 20 years. She is excited to be applying her knowledge and skills to nitrogen fixation in cereals "to achieve practical and applicable outcomes in a research area that is so important for Canadian and global agriculture."



These triticale plantlets were developed from microspores carrying a selectable marker gene used in the AAFC nif cluster.
Photos: Alicja Ziemienowicz, AAFC

"Many have labelled nitrogen-fixing cereal crops as the 'holy grail,'" notes Lauren Comin, research manager with the Alberta Wheat Commission (AWC). "Nitrogen-fixing cereals could bring a lot of significant benefits. First of all is the benefit to the farmer's profit. Obviously producers would save money by reducing input costs, and there could be time savings as well. Those benefits alone are enough for us to get excited."

Ziemienowicz states, "Nitrogen fertilizers contribute about 20 per cent of cereal crop production costs, not including costs of fertilizer application: fuel, machinery, labour. Cereal crops capable of fixing nitrogen for their own needs will reduce crop dependence on nitrogen fertilizers, and will increase their performance and productivity in nitrogen-deficient soils."

Both Comin and Ziemienowicz point out that nitrogen-fixing cereals would also contribute to sustainability. "There is an ever-growing interest in sustainability from those on the farm and off the farm. Plants that could fix all or some of their nitrogen would mean fewer synthetic applications, less nitrogen loss to the atmosphere and less leaching into the waterways," says Comin.

Ziemienowicz explains that not all of the applied fertilizer is actually used by the crop, and the unused portion can cause

problems including pollution of water sources for humans, livestock and aquatic species, and emission of nitrous oxide, a very potent greenhouse gas. In addition, production of synthetic nitrogen fertilizers is very energy-intensive and generates carbon dioxide.

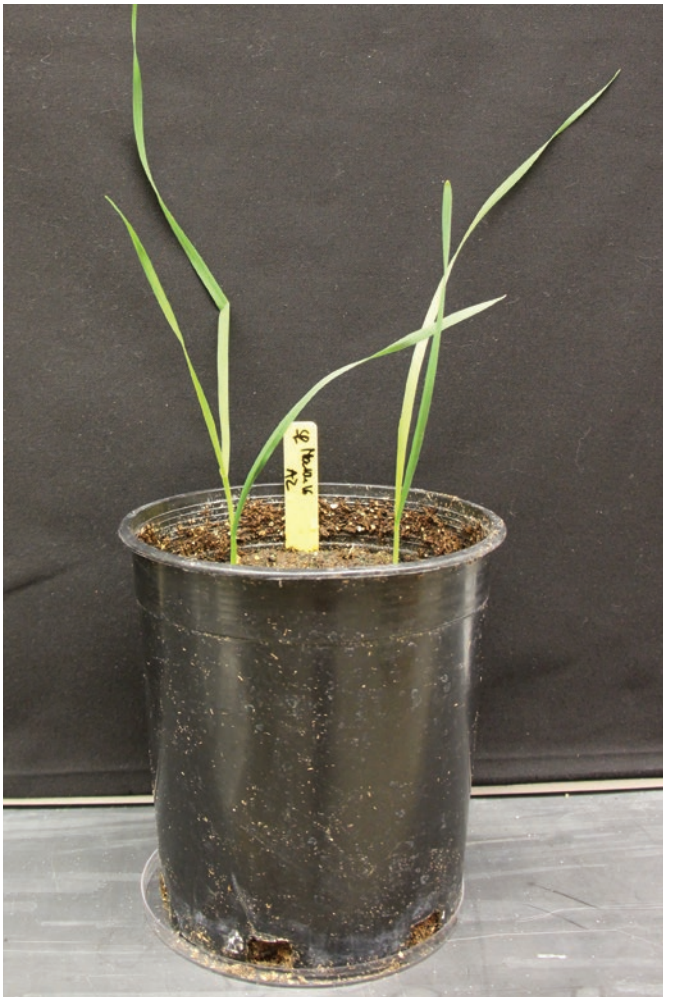
"So, although nitrogen fertilizers provide farmers with great tools to increase cereal crop productivity, they come with costs that are a burden both for farmers and the environment," says Ziemienowicz. "It is generally recognized that the introduction of biological nitrogen fixation into cereals and other major non-legume crops would be one of the most significant contributions that biotechnology could make to agriculture."

Substantial Progress

Eudes and Ziemienowicz began this research in 2014 with a two-year proof-of-concept study, funded by AWC and Alberta Innovates. Last year's research was funded by AWC and the Saskatchewan Wheat Development Commission. Recently, the research was approved for three-year co-funding by all three of these agencies. In this upcoming work, Ziemienowicz and Eudes will be collaborating with AAFC wheat breeders Drs. Robert Graf and Harpinder Randhawa.

"We are open to investing in the full spectrum of available technologies," notes Comin. "Technology changes really quickly in farming just as in any other industry. So we need to make sure that Alberta producers have every possible tool in their toolbox and that they keep up with technology changes."

Ziemienowicz and Eudes' research so far has involved triticale. "Most procedures that we employ in this project work more efficiently in triticale than in wheat," says Ziemienowicz. "Once we obtain nitrogen-fixing triticale, we will transfer this trait into wheat using interspecies breeding techniques. Moreover, lessons learned from development of this trait in triticale will help us to apply it to other crop species."



These seedlings, which are from non-engineered triticale seeds, will grow into microspore donor plants for the AAFC nif cluster work.

In the initial stage of their research, the research team developed tools needed for this work including an AAFC nif cluster, peptide nanocarriers, DNA delivery technology, microspore culture and regeneration, selectable markers and selection procedures, and a nitrogen-fixation assay for plant cells.

Their creation of the AAFC nif cluster is a good example of the important advances they are making. Ziemienowicz explains the ability to fix atmospheric nitrogen is limited to a small number of organisms including certain bacteria. These nitrogen-fixing organisms have about three or four genes responsible for producing the nitrogenase enzyme, which converts atmospheric nitrogen gas into ammonia, and about 10 to 12 genes that produce co-factors needed for nitrogenase activity.

"Prior to our work, biotechnologists were able to deliver only two out of 16 essential nif genes into plants. Recently, an Australian group reported delivery of 16 nif genes, but each gene individually. In addition, both research efforts were done in tobacco as a model plant, and not in cereals," she says.

"The AAFC nif cluster that we developed contains all 16 essential nif genes and two selectable marker genes (needed to maintain the nif genes in the plant genome). The cluster was designed to allow expression of the bacterial genes in triticale and wheat plant cells."

In the next stage of the work, the researchers used their tools to move the AAFC nif cluster into triticale cells. "We deliver the AAFC nif cluster into triticale cells using a unique nanocarrier developed by Dr. Eudes' team, in particular by Dr. Trevor MacMillan. The nanocarrier is a group of cell-penetrating peptides that carry DNA cargo into a specific location in a plant cell," explains Ziemienowicz.

"We chose plant mitochondria as the best delivery place because these plant organelles offer the most optimal environment for nitrogenase production and activity. We use microspore cells (precursors of pollen) because they can be relatively easily regenerated into entire plants.

"Many have labelled nitrogen-fixing cereal crops as the 'holy grail'. Nitrogen-fixing cereals could bring a lot of significant benefits."

—Lauren Comin

"Once the cargo-carrier nanocomplexes reach their destination, the DNA is released and integrated into the mitochondrial genomes, and the nif genes are expressed, which leads to nitrogenase production."

Recently, the researchers have shown that all the delivered nif genes are indeed expressed in the triticale microspore

mitochondria and that the nitrogenase enzyme is produced. Plus, they have demonstrated that the nif-enriched microspores definitely fix atmospheric nitrogen. The research team is now working on regenerating nif-enriched triticale plantlets.

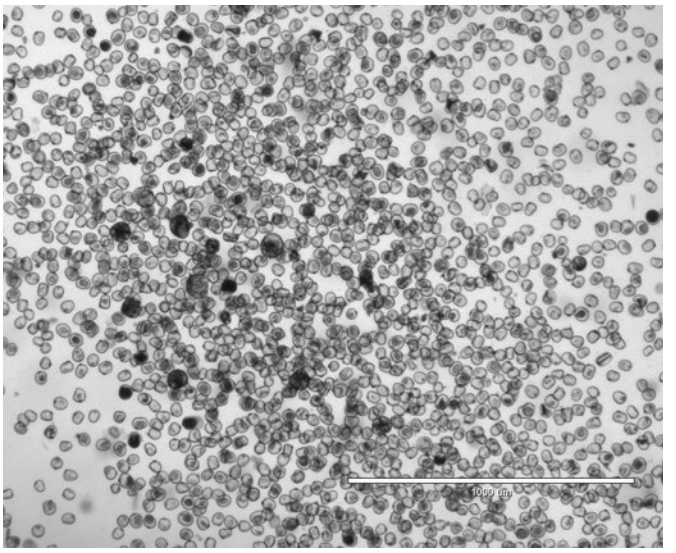
If all goes as expected, they will produce triticale plants that have all the characteristics of the triticale parent plus the ability to fix nitrogen.

Ziemienowicz thinks it will take at least 10 more years to develop nitrogen-fixing wheat. "We need about three years to produce and test the nitrogen-fixing triticale plants. Then, we need a few years to transfer the trait to wheat. Also, it takes years for commercialization of a plant with a novel trait."

Looking Down the Road

Even though it is many years away, the path to commercialization could be as challenging as the scientific path to develop nitrogen-fixing cereals.

One factor will be regulatory requirements for genetically engineered (GE) products. In Canada, the Canadian Food Inspection Agency (CFIA) evaluates all plants with novel traits for safety to the environment before they can be grown or fed to livestock. The CFIA website states: "The CFIA defines a plant with a novel trait (PNT) as a new variety of a species that has one or more traits that are novel to that species in Canada. A trait is considered to be novel when it has both of these characteristics: it is new to stable, cultivated populations of the plant species in Canada; and it has the potential to have an environmental effect…. Novel traits can be developed through various techniques, including, but not limited to, genetic engineering. Examples (other than genetic engineering) are mutagenesis, gene editing, cell fusion, and traditional breeding…. This product-focused approach means that not all PNTs are developed through genetic engineering, and that not all products of genetic engineering are PNTs."



The Alberta researchers placed the AAFC nif cluster of 16 nitrogen-fixation genes into these triticale microspores (spores that develop into pollen grains).

"The Canadian 'plants with novel traits' approach is different from much of the rest of the world. [In Canada] it doesn't really

matter what process you used [to introduce a trait]; it's whether it is a new trait that has never appeared before," explains Cam Dahl, president of Cereals Canada Inc., a not-for-profit organization that brings together partners from all sectors of the cereals value chain.

"However, there would be some significant regulatory hurdles [for GE nitrogen-fixing wheat] in other markets like the EU or Japan because of the unfounded public perception around recombinant DNA technology."

From Dahl's point of view, recombinant DNA technology has provided great benefits, both economic and environmental, in crops like corn, soybeans and canola. But he is uncertain about what the cereals industry could do to change negative public perceptions of the technology. "That's a question I have been asking for 20 years. I'm not quite sure of the answer, whether it's an issue around technology in plant breeding or technology in pesticides, herbicides and fungicides. Very often public perception does not match up with the science and what science is telling us. The gap between scientific understanding and public perception sometimes can be very large, and that is difficult to cross."

Dahl notes another consideration in commercialization. "We would have to ensure that, if a new product is commercialized, it would be done in a way that doesn't jeopardize our current exports." That would require such steps as obtaining regulatory approvals in importing countries and using identity-preserved systems to keep the GE grain separate from other grain. Another factor would be development of a policy on the low-level presence of GE crop material in grain shipments.

At present, many importing countries have a zero-tolerance policy if GE grain that has not been approved by the importing country is present at low levels in grain shipped to that country. This approach can seriously disrupt trade. Canada has been working with its international partners on alternatives to deal with this issue and has released a policy model to encourage international and domestic discussions on the way forward.

"Canada is a leader on the low-level presence issue," notes Dahl. "Through the Canada Grains Council, we are very active on pushing forward with some solutions to that issue internationally."

Despite the challenges, AWC hasn't shied away from funding Eudes and Ziemienowicz's work. "Investing in genetic engineering technology today does not mean that we'll be harvesting a GE crop in August. Developing new varieties is really a long-term game. And depending on which novel traits we're seeking, the benefits could far outweigh the perceived negatives," says Comin.

"We are very excited about the prospect of nitrogen-fixing wheat. A made-in-Alberta solution would make it all the more exciting, especially a solution that we are part of," she adds. "When we first invested in the project we did consider it high risk, but the potential benefits are significant. And we also had to consider the potential discoveries that could be made throughout the research that may also have applications that solve other problems that producers encounter. So even if the benefits wouldn't apply to wheat but maybe another crop, these serendipitous discoveries could have a high value as well."

Carolyn King

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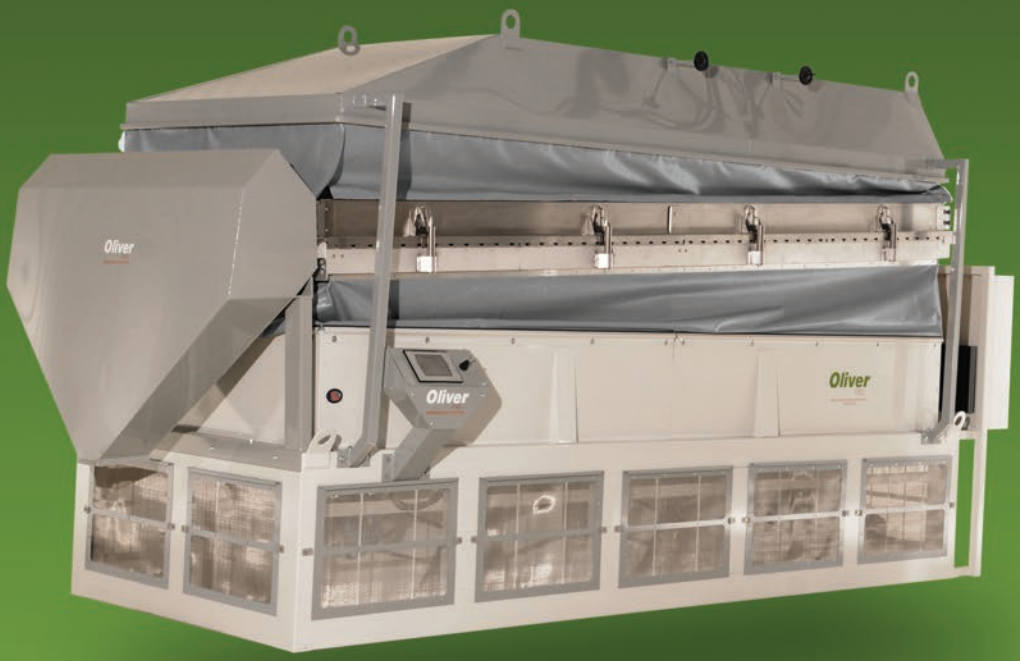

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NRC research officers Polowick (left) and Rajagopalan (right) are investigating the effects of growing wheat plants under accelerated growth conditions.
Photo courtesy National Research Council of Canada

RAMPING UP VARIETY DEVELOPMENT

One of the most time-consuming parts of the crop breeding process is the time needed to grow successive generations of plants. What if we could really speed that up?

THAT'S THE GOAL of a project at the National Research Council of Canada (NRC). The accelerated growth methods used in this project could potentially trim several years off the breeding process, providing a big boost to the development of improved crop varieties.

"The project's overall aim is to speed up plant growth so breeders can achieve multiple generations of the crop in a very short time," explains Dr. Kishore Rajagopalan with the NRC in Saskatoon, who is leading the project. "That will help greatly with plant breeding efforts because plants take quite some time to grow and you need to go through several generations as part of a breeding program."

For instance, imagine the challenge for a breeder who is trying to address an urgent threat, like a very virulent new strain of a major pathogen. "Sometimes it can take 10 to 13 years to get new varieties out into the marketplace. Pathogens can evolve quickly and spread around the world. They don't sit around and wait for the breeders to catch up with them. So the faster that the breeders can introduce new forms of disease resistance into a crop, the better," notes Dr. Patricia Polowick, another NRC researcher involved in accelerated growth studies.

"Accelerated breeding is faster than traditional crop breeding. So if farmers are faced with new threats whether from disease or other means, improved varieties will get to the farmers much faster and they won't have as much crop loss."

Acceleration Options

In his project, Rajagopalan's team is applying multiple methods to speed up wheat growth and looking for the best combination of these methods that will take the plants from seed to flowering and maturity in the shortest time.

One intriguing method involves growing plants under constant light. "The use of continuous light for accelerating crop growth

was adopted initially by a group of Australian researchers in collaboration with others around the world. They were inspired by experiments conducted by NASA [National Aeronautics and Space Administration] in the 1980s and 1990s looking at growing plants in controlled environmental conditions including constant light," Rajagopalan says.

The NASA scientists were experimenting with the use of plants to help maintain human life in space. "In these experiments, they observed a linear effect of light on photosynthetic rate and production of plant biomass. In simple terms, photosynthesis is the process by which a plant converts atmospheric carbon dioxide into storable sugars using energy that comes from sunlight, and in the process it emits oxygen back into the atmosphere. [The scientists observed that] if you increase the supply of light to the plant, then it continues to perform photosynthesis and continues to grow more and faster and produce more biomass," he notes.

"In addition, in certain plants, especially in cereal crops like wheat and barley, applying continuous light also seems to increase the plant's development rate. So the plant goes from seed to flowering faster, and you get to the next generation of plants faster. This is simply because constant light could act as a stress factor. When you apply stress to a plant, the plant responds by producing flowers and seeds, and completing its lifecycle as early as possible before it dies or desiccates."

Rajagopalan notes other environmental stress factors can also accelerate plant development in a similar way. So, along with constant light, the project is testing factors like moisture stress, nutrient availability stress and stress from smaller pot sizes.

The research team is also using a propagation method called embryo rescue to go more quickly from one generation to the next. "We harvest seeds before they are fully mature and dried,

"The project's overall aim is to speed up plant growth so breeders can achieve multiple generations of the crop in a very short time."

—Dr. Kishore Rajagopalan

and harvest the embryos from these grains, put the embryos on nutrient media plates and get seedlings from them. That can save us a few weeks, instead of waiting for the grains to mature and dry," Rajagopalan explains.

Speed Breeding, Canadian Style

The project's four objectives mainly relate to determining optimal procedures for accelerating growth of Canadian wheats, seeing how many generations they can get per year, and increasing understanding of the effects of these accelerated growth conditions on plants.

"The first objective is to evaluate the rust and Fusarium head blight resistance of different Canadian wheat varieties when grown under normal conditions compared with the accelerated growth conditions," says Rajagopalan. "We want to understand how important traits like disease resistance are affected by these accelerated growth conditions so that we can use these conditions for breeding for those traits."

They are focusing on Fusarium head blight and rust because of the relevance of these diseases to Canadian wheat production. "We looked at Fusarium head blight because it's an increasing problem in the wheat-growing regions in Western Canada. The statistics from the last 10 years show the incidence of Fusarium head blight in wheat in Canada has increased almost every year; 2016 was a particularly bad year. Not only does this disease reduce yields but it can also produce toxins, like deoxynivalenol (DON), which can downgrade grain quality and affect the marketability of the grain. So it's a pretty devastating disease economically," he says.

"That's why many researchers here at the NRC and in other organizations are working to find new sources of resistance against Fusarium head blight in wheat. And we want to be able to quickly deploy those novel traits into varieties that are being created, so those varieties can respond to this increasing threat in Canadian farming. By using accelerated breeding, we believe we can bring these traits to the market earlier than is currently possible."

Like Fusarium head blight, rust is a major disease concern in Prairie wheat crops, and many Canadian researchers are working on rust resistance. Rajagopalan's project is targeting leaf rust, a common disease in wheat. Under conditions that favour this disease, susceptible wheat varieties can suffer very serious yield losses. Over the years, several leaf rust resistance genes have been introduced into Canadian wheat cultivars and then the pathogen has evolved to defeat that resistance.

"Rapid deployment of new rust resistance genes is essential for fighting this pathogen. And again, speed breeding would be the way to address that."

The project's second objective is to see if responses to the accelerated growth methods vary among different wheat varieties. This extensive work involves testing multiple Canadian

varieties of bread wheat and durum wheat and determining which combination of acceleration methods is best for each cultivar. "We want to see if we can do any tailoring of conditions for particular varieties," notes Rajagopalan.

The third objective is to rapidly generate a recombinant inbred line population under accelerated growth conditions. Such lines are very useful for mapping traits in a plant's genome. The lines generated in Rajagopalan's project will be used in other projects to characterize resistance genes for rust diseases in wheat.

"And the fourth objective is to evaluate long-term changes induced when plants are grown for multiple generations under accelerated growth conditions," says Rajagopalan. "We want to see if any long-lasting effects are happening in the plants compared to plants grown under normal conditions."

Polowick adds, "One of the reasons we want to look at the long-term effects is because we are putting the plants under a lot of stress." Breeders will want to be sure plants grown under induced stresses to accelerate their growth will respond to things like diseases and insect pests in the same way when they are grown under normal conditions.

Boosting a Breeding Revolution

This two-year project started in April 2017, and Rajagopalan's team has already completed two of the objectives. "We have completed the testing of the effects of Fusarium and rust resistance in different varieties under normal and accelerated growth conditions. And we have completed the very large-scale study to understand the effects of accelerated growth conditions on various wheat varieties. So we have a really good understanding of what conditions work best for the multiple varieties of durum and bread wheat that we have tested." The researchers are currently working on the other two objectives.

The effects of the accelerated growth conditions are very impressive so far.

"Right now, we are getting about five to six generations of wheat within a year using these conditions. For plants grown under normal conditions [in a greenhouse], you will get around two to three generations per year. So you can reduce the generation time of the plant by half by adopting these conditions," says Rajagopalan.

There is already interest in applying speed breeding beyond Rajagopalan's project. "I'm running a parallel study with a private breeding company using the same accelerated breeding ideas with some of their wheat lines," Polowick explains. "This concept has been heavily adopted by the plant breeding industry in places like Australia, and we're hoping that some of our work here will make it more available to the Canadian breeders so Canadian farmers can benefit from our progress."

Along with the benefit of bringing new varieties to the market sooner, Polowick points to a further advantage. "Some of the other projects within the NRC [and other agencies] use the modern 'omics' such as genomics and proteomics, and these technologies have enabled great progress in the identification of novel plant traits whether it is to fight diseases or to mitigate the effects of environmental stresses. So it's not accelerated growth conditions in isolation; it's accelerated growth in combination with a lot of the progress being made in other projects that will provide the most benefit to the farmers."

"Right now, we are getting about five to six generations of wheat within a year using these conditions. For plants grown under normal conditions [in a greenhouse], you will get around two to three generations per year."

—Dr. Kishore Rajagopalan

Alberta Wheat Commission research manager Lauren Comin sees value in this type of research. "Decreasing the time it takes for a variety to be developed is very important for producers. Producers need to be able to be nimble when it comes to choosing a variety. For example, resistance to abiotic and biotic stress plays an important role in selection. We are seeing pests adapt over time and currently employed resistance genes are being defeated. At the same time, we are seeing remarkable advancements in pre-breeding and discoveries of new sources of resistance. Shorter variety development times mean that new genes can be deployed and be in a farmer's field without too much of a lag. Our scientists can respond to changes more quickly, which allows farmers to adapt faster as well."

Along with the potential for large, rapid steps forward in Canadian wheat varietal improvement, other crops could also benefit from the powerful combination of accelerated breeding and valuable new traits. Australian research shows speed breeding can also work in such crops as barley, chickpea, pea and canola, with the number of possible generations per year depending on the crop type.

"We would love to see wider adoption of these accelerated breeding methods that we are working on in Canadian wheat breeding programs and to also make progress in other crops where this approach is applicable," Rajagopalan says.

His project is funded by the Saskatchewan Ministry of Agriculture, the Canada-Saskatchewan Growing Forward 2 program, and the National Research Council of Canada.

Carolyn King

Capturing Value, Funding Innovation

Accessing superior genetics and seed is one way to ensure that Canada remains competitive in global agriculture. We talk with industry experts about the mechanics of funding innovation in cereals research through the concept of value creation/capture.

MANY YEARS OF discussion about how to ensure more innovation in cereal seeds is finally coming to fruition.

Historically, cereal seed breeding has been dominated by public institutions, supported by taxes and producer contributions. Because of this, and because Agriculture and Agri-Food Canada (AAFC) has indicated it will not be increasing its level of investment in cereal breeding, many industry players have been calling for a way to make sure private breeding firms are enticed to do more cereal breeding — by securing their return on larger investments.

Some time ago, a task force called the Value Creation Working Group was created to look at the issues, and two leading funding models eventually emerged. One is a producer-facilitated royalty collection system of varieties registered after Feb. 27, 2015 (known as an end-point royalty). Royalties generated would be distributed to breeders based on a variety's market share, possibly using existing collection systems. However, if a royalty is collected on seed, no royalty would be collected on harvested material.

The other contender — the preferred option of the Canadian Seed Trade Association's Intellectual Property Committee — is a royalty collection system enabled by contracts, where breeders or their representatives use contracts when selling certified seed of varieties registered after Feb. 27, 2015. This system involves the collection of royalties on any farm-saved seed, known as a trailing royalty.

The latter is clearly the winner, reports Lorne Hadley, task force member and executive director at the Canadian Plant Technology Agency. "The seed industry has had long discussions about this over the last eight years and both the CSTA and the Canadian Seed Growers' Association have endorsed the model of trailing royalties," he says. "Certain companies want to proceed with this and market this value to producers."

Hadley notes that producers already decide what seed to buy based on expected value, and those varieties that have value and are priced appropriately will have the market share. "We are trying to put in place a system to start by using pedigreed seeds, and the best varieties among them get the most return."

For his part, Darcy Pawlik believes the trailing contract model is the right one as it's based on well-understood principles of existing contract law. The head of the Syngenta Cereals Portfolio for North America and vice-chair of the CSTA's IP Committee notes the trailing royalty option is ideal for all acres grown of the varieties in question to be tracked, and also provides flexibility for the breeder in terms of the parameters that can be set.

Lorne Hadley is executive director of the Canadian Plant Technology Agency.

Rod Merryweather, CEO of FP Genetics, points out that this model could involve existing collection mechanisms already established by licensees of grain varieties, such as single-use contracts. He adds that the existing system for confidentially tracking every grower who uses midge tolerant wheat could be easily adapted to collect trailing royalties.

"This system would also enable us to also track the use of certified seed, and make sure that a grower is not paying twice for the use of the variety."

Another benefit of the trailing royalty model, says Merryweather, is that trailing royalties also enable differential royalties on different varieties and crops. He says differential trailing royalties would be competitive in that breeders would be fairly compensated for every use of the variety, with growers deciding to use new varieties where the royalty appears worth the investment.

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How it Might Work

While there is much to still be decided on, Hadley notes that an efficient electronic contracting system is envisioned. Similar to how canola is marketed, distributors will decide if payments will be applied per acre or pound of seed. There will be no interference with provincial check-offs.

Pawlik believes the end result will draw on similar situations elsewhere. In his view, an effective system must include the ability to simply and transparently track seed sold and acres planted, and a flexible pricing mechanism associated with the value of individual varieties.

In Merryweather's view, rollout of a trailing royalty system will be quite simple.

"A database would be developed or modified to fit the collection of purchase information on certified seed for every grower which would then identify every purchase of certified seed," he says. "This information would be available to the licensee to administer the royalties. Growers would declare each year what crops have been planted and which variety was used to seed. After harvest, they would then declare production on each field."

Growers would therefore 'pay on production' and companies would then invoice them for the trailing royalty after verifying certified seed purchases and deducting such purchases (a pre-determined amount) so there is no possibility of paying twice. "The licensee would have the right to audit a grower if there was any dispute," he says. "All such audit costs would be charged to the licensee."

Darcy Pawlik is vice-chair of the CSTA's Intellectual Property Committee.

Hurdles

In Pawlik's view, one of the largest hurdles would be a transfer of a significant portion of the costs associated with breeding activities to growers. But he believes that "so long as our objective remains truly aligned among the various stakeholders and parties in that we want to encourage greater investment by the private sector into cereal and pulse breeding, as well as the desire to have the strongest and most globally competitive ag sector, these hurdles can be overcome."

Along with that, Pawlik believes there will be a continued requirement for engagement, transparency, cooperation and foresight. "This will be critical if we are to achieve the vision and reverse the tide of investment that is flowing to other jurisdictions at the expense of Canadian agriculture, farmers and competitiveness."

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As with any significant change, Pawlik notes that this new system will demand the acceptance of "a certain level of ambiguity," as well as the "patience to ensure the system evolves to best serve the needs of the participating stakeholders."

Tom Steve, general manager for the Alberta Wheat and Barley commissions, notes the idea of value creation hasn't come without controversy.

"I hear from farmers that wheat is a lower margin commodity on their farm, but they don't want to change anything. There's a fundamental contradiction there. Of course, no one wants to pay more for seed if they don't get an immediate return — they have a legitimate concern there," he says. "But here's the thing — we need to look longer term at where our competition is coming from, and where the yields and quality of our product need to go to be competitive long term. And the only way to do that is through value creation."

One of the only hurdles Merryweather can think of is getting agreement on the development of one system to track all aspects of the trailing royalty from seed purchase to future use of the variety.

"However, we have done this with midge tolerant wheat stewardship and on single-use agreements, so it is not that difficult," he reports. "However, we will need to be very transparent about how the system works so that there is trust in the system by all who use it. [We will also need to get] agreement from all interested parties to ensure that trailing royalties are fair and equitable."

At this point, Hadley notes the task force is now reaching out to farming organizations such as Grain Famers of Ontario and Alberta Wheat Commission, and meetings and presentations are being scheduled. "Producers need clarity about how it will work," he says. "The producer groups want to be sure that if they are paying more, they are getting more value…They just want the assurance that this program will actually increase the number of breeders and breeding programs going forward."

Tom Steve is general manager of the Alberta Wheat and Barley commissions.

Pawlik is among those who believe that will indeed occur.

"We can expect, over time, an expanded diversity of materials to make their way through the research stages and into new product development," he says. "We will also see greater utilization of tools like marker assisted selection, double hapolids and, hopefully, new plant breeding innovations such as genome editing, for example." **Treena Hein**

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Value Creation: What do Farmers Think?

The chairmen of Alberta Wheat and Alberta Barley say growers are largely uninformed and unsure about the conversation surrounding value creation in cereals.

On whether growers are very informed on the topic of value creation:

"I don't think farmers are very informed about any of these discussions about value capture, or furthermore, about the Seed Synergy initiative. Certainly, anyone involved within industry organizations are somewhat aware of it, but I don't think the general farming public is aware at all."

On why planned consultations regarding value creation are so important:

"As a commission we're most concerned about the reasons behind value creation, and further, the details of the preferred collection model of the Canadian Seed Trade Association's Intellectual Property Committee, that being the trailing royalty model. Right now, there's not much detail. We suspect there will have to be a lot of administration built into it. What's the plan for any sort of compliance or enforcement? We don't have those answers to convey to our stakeholders."

On what it will take for many growers to accept the idea of value creation in cereals:

"As chairman and a farmer myself, I understand the need to attract more private investment into wheat and barley breeding, but farmers need to see benefit from that. Whether it's done through checkoffs or a royalty system, wheat and barley farmers need to see increased value come out of it and back into our operations. We need to see either significant yield improvement or improved disease resistance in wheat and barley varieties. I suspect that this will need to be viewed as a long-term investment by farmers."

Jason Lenz
Chairman, Alberta Barley

On why the topic of end-point/trailing royalties is controversial among growers:

"There's a reluctance among farmers to have to pay yet another fee, and that is a historical phenomenon. Some growers are often critical about the high cost of canola seed, but yet most often the highest priced seed is the first to sell out. This is because our potential return on investment is better than it is with lower priced or older varieties. I think the same could be true for wheat. If there is value, growers will invest. By nature, we don't want to pay more or see another deduction on our grain check unless it's clear or proven that it will generate more profit.

On why many growers are not informed on the topic of value creation:

"No matter how hard we try to get the message out to stakeholders, it doesn't always get there, or it doesn't always get taken up. It's a hard one."

Kevin Bender
Chairman, Alberta Wheat

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Based on the study's preliminary results, some rye lines, like the one shown here, are susceptible to *Fusarium* head blight, but most are in the resistant to intermediate range. Photo courtesy Duoduo Wang, University of Manitoba

PIONEERING WORK ON FUSARIUM HEAD BLIGHT IN RYE

Breeding, fungicide timing and pathogen research will help provide tools that growers need.

UNLIKE OTHER CEREAL crops affected by Fusarium head blight (FHB), very little is known about FHB in fall rye from a Canadian perspective. We don't know how serious a concern FHB might be in our rye crops. We don't know which Fusarium species are infecting rye. We don't have FHB ratings for our current rye varieties. And we have limited information on optimal timing for fungicide applications to manage FHB in rye.

So Jamie Larsen with Agriculture and Agri-Food Canada (AAFC) at Lethbridge and Anita Brûlé-Babel with the University of Manitoba have teamed up on a project to develop FHB-related information and tools that rye growers need.

"This research is new territory from a Canadian and even a North American perspective," says Larsen, who has breeding programs for open-pollinated fall rye and several other cereals.

"Rye has not had a lot of attention from Canadian researchers and growers for a very long time. But the playing field has changed with the new rye hybrids. They are significantly higher yielding, they are shorter, and they are easier to harvest. So now there is renewed interest in rye," notes Brûlé-Babel. "It's important to get a sense of how rye responds to *Fusarium* head blight and whether there is going to be an issue with the disease and what rye growers should do in conditions where *Fusarium* is a concern."

Larsen became interested in the issue due to several factors that have emerged in recent years. "Initially when I started working in rye, I had looked at the literature and I thought the disease wasn't a major problem. Also, the main areas where rye is traditionally grown – north of Swift Current and around the Great Sand Hills area in Saskatchewan – aren't huge *Fusarium* head blight areas. And rye has this natural ability to be tolerant to a lot of diseases. So I wasn't too worried about *Fusarium* head blight," he explains.

"But then I sent some rye varieties to Ontario as checks in a triticale experiment. And as I was walking along in those plots, I saw a rye variety with its head completely glued shut and pink with *Fusarium*. I'd never seen anything like it." As well, he found out FHB occurs in Prairie rye crops through his work as the coordinator for the fall rye cooperative registration trial. Each year, the trial is grown at 15 locations across Western Canada, and in some years *Fusarium*-damaged kernels (FDK) have been found in the grain samples from the trials.

Another driver for Larsen was the potential, especially with the new hybrids, to sell more rye into the feed and food markets. To help in realizing that potential, he saw the need to know more about FHB's impacts on rye yield and quality – particularly since *Fusarium* species can release toxins that can limit the use of grain in feed and food – and the need to develop FHB-resistant rye varieties and other tools to manage the disease.

A widespread concern in Manitoba, Brûlé-Babel conducts screening for FHB resistance as part of her winter wheat breeding program. So Brûlé-Babel and Larsen brought together their different

areas of expertise to develop their plans for the project. Also joining the project is KWS, the German company that has developed several hybrid ryes for Canadian growers.

Evaluating Rye Lines for Resistance

Brûlé-Babel is screening fall rye lines for FHB resistance at her FHB nurseries at Winnipeg and Carman. To increase the potential for disease development, her research team inoculates the rye lines with *Fusarium graminearum*, the most common of several *Fusarium* species that cause FHB in Manitoba cereals.

The FHB responses of the rye lines are measured in three ways: disease levels in the field; FDK levels in the grain; and concentrations in the grain of deoxynivalenol (DON), the primary toxin produced by *Fusarium graminearum.*

In 2017, they evaluated about 70 rye lines, including materials from Canada, the United States, Germany, Russia and other countries, as well as lines from Larsen's breeding program and from KWS. Current Canadian rye cultivars are included in the screening so growers will be able to get information on FHB ratings to help in choosing rye varieties for their farms. For 2018, the researchers have added more rye lines from KWS, so the total is now about 130 lines.

The 2017 results showed that FHB definitely occurs in rye and that some lines are more resistant than others.

"Overall, we're not seeing very many lines that are as susceptible as our susceptible wheat checks. And most of the rye lines are in the resistant to intermediate range," notes Brûlé-Babel.

The testing for FDK and DON in the 2017 samples will be done in the coming months by KWS. However, based on what Brûlé-Babel's team observed in the field and as the grain samples were harvested, it appears that FHB infection often tends to cause the rye plant not to set seed. As a result, the FDK levels are lower than would be expected in a wheat crop with similar field infection levels.

Brûlé-Babel had heard anecdotally through their KWS collaborators that DON levels in rye tend to be quite low. She suspects this could turn out to be true if there aren't many infected kernels in the harvested grain to contribute to DON in the samples.

"So my guess at this point is that the biggest problem from *Fusarium* head blight for rye producers might turn out to be yield loss as opposed to a crop that you can't market [due to FDK and DON]," she says.

Once they have two years of data from the nurseries, Larsen will start making crosses with some of the FHB-resistant lines so he can develop new open-pollinated varieties with this trait.

Other *Fusarium* Species

Brûlé-Babel is also leading two other FHB/rye studies for the project. One study is looking into other *Fusarium* species that cause FHB in rye. "Not a lot is known about which *Fusarium* species infect rye [on the Prairies], so we've worked with Maria Antonia Henriquez at AAFC's Morden Research and Development Centre. She does a *Fusarium* survey every year, collecting diseased plants from [spring wheat and winter wheat fields in Manitoba]. So we asked if she could also collect samples from rye fields," explains Brûlé-Babel.

Photo courtesy of University of Manitoba

Brûlé-Babel's team produces *Fusarium graminearum* inoculum so they can inoculate the plants being screened in her two Fusarium head blight nurseries.

One of Brûlé-Babel's graduate students, Duoduo Wang, has isolated the *Fusarium* species from the Manitoba rye samples. Wang has identified the species based on the appearance of the fungi when grown in the lab, and she will be doing some DNA marker work to confirm the identifications. The preliminary results indicate that the most common species was *Fusarium graminearum*, but other species were also present.

In 2018, Wang will be doing a greenhouse study to examine the infection process and see how the different *Fusarium* species interact with selected rye cultivars.

Optimizing Fungicide Timing

Wang is also working on the other study, which is investigating fungicide timing for managing FHB in rye. "Very little information is available on fungicide timing for rye for this disease. We need to develop some basis for timing recommendations," says Brûlé-Babel.

According to Larsen, the general recommendation for fungicide timing for FHB in wheat is to spray two days after heading because wheat plants usually flower about two days after heading. But in rye, flowering might not start until seven to 14 days after heading. In that long heading/flowering period, what is the best time to apply a fungicide?

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"Very little information is available on fungicide timing for rye for this disease."

—Anita Brûlé-Babel

Brûlé-Babel also points out that, because rye is an outcrossing species, its florets are open for a longer period than the florets of a self-pollinating species like wheat, and it may be that a fungicide might interfere with pollination and seed set in rye.

From the rye lines being screened in the nursery, Wang has selected an FHB-susceptible cultivar, a cultivar with an intermediate response, and an FHB-resistant cultivar to use in the fungicide trials. The trials will take place at Winnipeg and Carman. The fungicide will be Prosaro, a commonly used fungicide that is registered for FHB suppression in wheat and barley.

The trials will compare four fungicide timings: at 50 per cent heading; at 10 per cent anthesis, which is when 10 per cent of the flowers on the spike have extruded anthers; at 80 per cent anthesis; and at six days after flowering. Brûlé-Babel's team will be inoculating the plants with *Fusarium graminearum.* The trials will also have two types of check plots: inoculated with no fungicide and non-inoculated with no fungicide.

Larsen hopes they'll be able to figure out an easy-to-use general rule for FHB fungicide timing in rye similar to the two-days-after-heading guideline for wheat. He adds, "The hybrids are typically a lot more uniform in flowering timing than the open-pollinated ryes, so fungicide timing for open-pollinated ryes might turn out to be a little trickier."

Practical Results

This pioneering project will lead to practical information, improved varieties and other tools for rye growers in Western Canada and perhaps other regions of the country.

"Providing good information for farmers to make decisions is very important. Part of the reason we're doing this research is to make sure there won't be any surprises in terms of potential *Fusarium* problems for rye growers," Brûlé-Babel says. "I'm quite excited about the revival of interest in rye because it's a very good crop for many uses and definitely contributes to diversification on the landscape."

This FHB research is part of a larger project led by Larsen on rye disease issues that also includes work on ergot and rust. Saskatchewan's Agriculture Development Fund, Western Grains Research Foundation, Western Winter Wheat Initiative, Saskatchewan Winter Cereals Development Commission, FP Genetics, KWS and Bayer CropScience are funding the project.

Carolyn King

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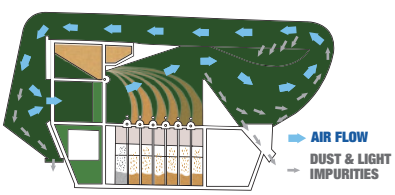

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Sunflowers intercropped with vetch. Courtesy Derek Axten

Mixing it Up

Is intercropping the future? The data is in: yield boosts, lowered disease and insect pressure are just some of many benefits of planting two or more crops together.

LETHBRIDGE-BASED Eric Bremer, head of R&D for Western Ag Innovations, has learned a thing or two about intercropping during his time researching the practice.

"Intercropping can have substantial benefits, but not always. You have to have some good-sized benefits come out of it in order for it to be widely adopted. Growers want to know it's going to work for them before taking it on," Bremer says. He's currently conducting research trials intercropping canola with pulses like pea and lentil.

For producers considering intercropping for the first time, Bremer says it's important to "start small," and get comfortable with the process before growing whole quarters.

Accidents Happen

Derek Axten started intercropping by accident in 2009, when he seeded a field of brown mustard into lentil stubble. When he harvested the field, he expected to see an overall loss. Instead, the lentil yield matched that of his other lentil fields — and he got a great load of mustard to boot.

"I thought, 'What if we do this intentionally?'" says Axten, who together with his wife Tannis was named Saskatchewan's Outstanding Young Farmer in 2017. "It took us until 2011 to get to an organized intercrop. Since then, we've always seen a net benefit."

On their land near Minton and Milestone, Sask., the Axtens grow peas/canola, flax/chickpea, flax/lentil, lentil/mustard, and forage pea, maple pea or winter pea with mustard or canola.

In terms of land equivalency ratios, or the amount of monocropped land needed to achieve yields equal to those of an intercropped system at the same management level, the Axtens average somewhere between 1.25 and 1.3, although they have seen years over 1.5. In 2017, some of their intercropped fields were a wash. "But averaging with the other years we're still ahead of the game," he says.

This is in part owing to the fact that they don't use any nitrogen (N) on their intercrops, because N is supplied by the pulse in each combination. Added to this, disease and insect pressure is so low on their intercropped fields that they almost never have to spray.

It's not known exactly why most intercrops see a reduction in disease and insect pressure, according to Scott Chalmers, diversification specialist for Manitoba Agriculture's Westman Agricultural Diversification Organization (WADO). But the data is there to prove this is often the case.

Chalmers has been studying intercrop mixtures since 2009, mostly focusing on yield and nitrogen and phosphorous interactions in pea/canola (or peanola) intercrops.

Intercropping with canola has major benefits for peas: because peas, which typically fall to the ground, are held up by the canola, they experience less disease pressure and pea quality is higher. They are also much easier to harvest. "You're not having to drag your combine knife through the ground," says Chalmers. "It's easier on the equipment."

Axten says intercropping is an attempt to mimic what happens in a "highly functioning, highly diverse" native ecosystem, where some 120 or more species might coexist. "We've been growing two crops together, which is nothing like it is in a native system. But we've been seeing an improvement with two crops over one, and since then we've added clovers as companion crops."

But intercropping is not about altruism for the Axtens: it's a business decision. "We've never ever had less profit from intercropping," he says. "And with the reduction of inputs you're carrying so much less risk. It's about how much money you keep as well as how much you make."

Assessing the Risk

But any attempt to intercrop can make growers quickly realize just how many stumbling blocks they may run into. The process can be incredibly detailed.

Bremer has collaborated on his intercropping project with Alberta Agriculture agronomy research scientist Doon Pauly. In this particular experiment, Pauly notes that the pulse crop was the primary one that researchers were attempting to grow, with canola being the "bonus" crop. For the purposes of the research, Pauly and Bremer had to carefully manage the canola through low seeding rates and fertilizer placement and timing, to ensure it didn't take over the pulse crop.

For seeding, Pauly and the team ran their pulse seed through the seeding discs and the canola seed through sideband fertilizer discs in a single pass.

"The fertilizer component of the current project is really interesting," says Pauly. "We applied a known fertilizer volume at constant pressure to the entire plot using four drip irrigation lines for the eight rows of pulse and eight rows of canola."

Fertility treatments were applied within days of seeding (theoretically N at this time should limit the pulse crop's ability to fix N and also feed canola, making canola very competitive early) or about a month after seeding in-crop. Because the fertilizer solutions were enriched with low levels of 15N, with isotope analyses of plant material the researchers were

Students counting aphids in peas in a pea-canola crop. Courtesy Scott Chalmers

According to Colin Rosengren, a founding member of Three Farmers, a Saskatchewan-based business that manufactures camelina oil, it's hard to get crop insurance on intercrop mixtures.

able to determine if this surface-applied N was picked up by the pulse crop or the canola crop.

There's a lot yet to be discovered when it comes to intercropping, Pauly says.

"Even with seeding, it's not like you can just throw canola seed into your air cart with a pulse crop. If they separate out, you may not get the uniform stand you may desire," Pauly says.

"Harvest is a challenge, too. If you don't have good synchronization between crop maturities, you can run into problems. You start intercropping and you think, 'Whoa, I didn't anticipate that.' All of a sudden, you start realizing there are certain things you can no longer do that with monocropping wouldn't be an issue."

Intercropping is indeed riskier: according to Colin Rosengren, a founding member of Three Farmers, a Saskatchewan-based business that manufactures camelina oil, it's hard to get crop insurance on intercrop mixtures. In Saskatchewan, producers can get specialty crop insurance on a portion of their intercrops, which guarantees producers the average on their other insured crops. But Rosengren, who

Lethbridge-based Eric Bremer is head of R&D for Western Ag Innovations.

Greg Stamp, director of seed sales for Stamp Seeds.

intercrops perhaps three quarters of his 6,000-acre operation, says it isn't worth it for him.

In fact, he believes most producers who intercrop do not carry crop insurance at all. It's a catch-22 for the industry, as insurers generally won't offer insurance until a minimum number of acres are intercropped in a province.

"Acres are very significant, but many aren't insuring, so the numbers officially aren't there," says Rosengren.

In terms of harvesting and selling intercropped mixtures, Chalmers says producers might need to modify equipment or buy rotary harrows or a cleaner and will need at least two working augers. "Harvesting takes quite a bit of coordination," he says.

Bremer agrees.

"It requires more equipment, and for growers to make that investment, there has to be clear benefit."

Another risk is if buyers are not okay with

a small amount of contamination if seed from another crop is found in a producer's sample, Chalmers points out. "There's no way you can clean out every canola seed in pea," he says. "There's always going to be half a per cent kicking around."

Planning for Success

Alberta's Greg Stamp, director of seed sales for Stamp Seeds based in Enchant, agrees that getting into intercropping could present a number of challenges for growers. Although Stamp Seeds helps clients with cover crop projects, they have yet to experiment with intercropping but have seen some of the work that Bremer and his team have done.

"There is definitely potential for this production practice in the future on the Prairies. When you look at the benefits to producers, with reduced pesticide and fertilizer usage, you can see how it could be an attractive way to diversify your operations," Stamp says.

"As seed growers we are multiplying and growing seed crops on our farm or in the local area. We really get to know the characteristics and quirks – good and bad – of the varieties we sell and that can be valuable information for producers trying intercropping for the first time. When you know how a variety will perform in your local area sometimes that can make all the difference."

An example of pea roots with nodules growing close to canola roots. Courtesy Scott Chalmers

Stamp notes also that using certified seed, which comes with a guarantee of health and vigour, will further manage agronomic risk in producers' intercropping efforts as you are starting with a high-quality seed product.

When Rosengren and his Three Farmers partners first started intercropping, they ran strip trials to compare intercropped and monocropped systems, but they soon abandoned the practice because the benefits were so obvious.

"There are a million products that offer two extra bushels of yield per acre, but that's pretty hard to measure," he says. "When you're talking 25 to 30 per cent extra yield, it's significant enough to measure. It was dramatic enough that we quit doing the strips."

Axten also believes intercropping is the way of the future for Western Canadian farming.

"I think of all the problems that have happened in agriculture, things that have come to light in the last 15 years. We keep trying to do this monocrop thing, but I don't think we're showing that it works very well."

Julienne Isaacs & Marc Zienkiewicz

WHERE ON THE WEB

Alberta Agriculture offers their recommendations for those who wish to give intercropping a try.
https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/faq8444

BLAZING A TRAIL

Russel Hurst discusses the next phase of the Accredited Seed Treatment Operation Standards implementation and how it will benefit farmers and the seed industry as a whole.

THE SCOPE OF the Accredited Seed Treatment Operation Standards is about to expand. All commercial seed treatment operations, including those treating cereal and pulses, must successfully complete an audit of the standards by Dec. 31, 2020. Non-compliance will be enforced by an industry no-ship policy effective Jan. 1, 2021. *Alberta Seed Guide* spoke with Russel Hurst, CropLife Canada's vice-president of sustainability and stewardship, about the journey ahead on the road to standards compliance and the effect implementation will have on industry stakeholders.

ASG: What has the journey been like so far toward implementing the Accredited Seed Treatment Operation Standards?

RH: The whole process has been a unique journey. One of the program's early drivers was to address environmental, health and safety protocols within the seed treatment sector. We viewed seed treatment, which was a rapidly expanding component within the pesticide sector, as a gap in our suite of lifecycle stewardship programs.

This is a vibrant seed industry. If we have robust environmental, health and safety standards, we can stay away from onerous provincial and federal government regulations: in an ideal world, we can communicate that national standard to provincial ministries of agriculture and the environment and the Pest Management Regulatory Agency at the federal level.

The process may be led by CropLife, but we do a lot of briefings and consultations with seed growers, seed cleaning co-ops and seed companies and their respective associations to make sure their wants, needs and desires are met. At the end of the day, maybe not everyone is happy 100 per cent of the time, but we're looking to this process to answer how we continue to culture a vibrant seed sector.

Generally speaking, we're fairly happy with how 2018 turned out. By July, 382 facilities across the which is the majority of operations that fit the scope of the current standards' requirements such as corn, canola ans soybean seed treatment operation had successfully passed the audit. About three dozen facilities are in the process of finalizing their audits, however, they didn't get certified for the 2018 seed treatment year. Typically, those were facilities that weren't treating corn, canola or soybeans, but have aspirations of doing so.

The largest number of certified facilities is in Manitoba, primarily because that's where a high number of seed growers

are located and it's where the soybean business has expanded significantly over the last couple of years. It is expected the will trend upwards in Saskatchewan and Alberta over time.

Any new facility coming online that wants to treat seed commercially — soybeans, canola, and to a lesser extent corn — in Western Canada, will have to complete an audit.

ASG: What are your observations from the first year of program implementation?

RH: In terms of the lessons we've learned from the audit process to date, we've had a very low level of compliance and enforcement issues. Individuals who did try to purchase

designated seed treatment products from an ag-retailer usually weren't fully aware of the requirements — it was more misinformation or misunderstanding rather than deliberate non-compliance.

We also learned the audit protocols must be meaningful to mobile seed treaters. When we first started auditing facilities we had a handful of mobile treaters complete the audit — they were the exception. That segment of the seed treatment business has expanded significantly over the last few years. Within the audit protocols, roughly two-thirds are applicable to mobile treaters.

This fall, the working group will be going through those audit protocols to ensure they're meaningful to mobile treaters because of the unique way their businesses operate.

We also see continuous improvement to a facility's ability to do paperwork, training, education and documentation. That's been the biggest gap throughout the entire process. All operators, and these are incredibly smart people, know their businesses very well. The biggest gap has been showing us that from an audit standpoint, through documentation. This is a work in progress. It's something we'll look to improve upon through templates, or by helping people help themselves by providing examples of what we are looking for, so that they can tailor their documentation accordingly.

Moving forward, we'll likely see associations and registrants in the seed treatment business get more involved because they see it as an opportunity to help their members or customers.

One observation that took us by surprise is this process helps governments increase their levels of compliance with regulations, such as provincial licences for example. Within the standards we have a requirement ensuring a site is compliant with all provincial/federal licenses. Our auditors can let an operator know they need a license for X, Y or Z, if they happen to have either a lapsed license or no license at all.

It wasn't the intent of the standards to monitor license compliance, but has been a nice additional benefit of having an industry standard to ultimately aid our government colleagues and to ensure adherence to various regulatory requirements.

ASG: What is the path forward from now until the end of 2020?

RH: We'll continue to use the designated seed treatment products list, which will get updated and reissued annually at a minimum. Typically, the list will be updated toward the end of October, as this is the time of year most new registrations coming online for the next crop year are completed. We'll do this for the seed treatment years 2019 and 2020.

ASG: What happens beyond 2020?

RH: The program is going to change for 2021. The direction from our May CropLife board meeting was to implement phase II of the Accredited Seed Treatment Operation Standards program. We're going to do away with the designated seed treatment products list. All commercial seed treatment operators — if you're treating seed for sale or gain we deem you a commercial treater — will be required to go through and pass an audit by Dec. 31, 2020, to access seed treatment products. A no-ship policy will be implemented Jan. 1, 2021.

If you're a farmer treating seed on-farm, continue to do what you've been doing. If you're a commercial treater and you're treating corn, canola and soybeans, continue doing your audits, you've already gone through that checkpoint. If you're treating cereals or pulses commercially, by 2021 you must complete an audit.

For those seed treatment facilities in the cereals and pulse space, it's going to be the same journey the corn, canola and soybean operators went through from 2014 to 2018. They're just going to do it a couple years later.

In terms of preparing the industry for that, some of these sites have already completed a pre-audit as part of phase I. We will go through that same process for phase II of the program.

ASG: How does implementation of phase II affect industry stakeholders?

RH: It gives farmers purchasing commercially treated seed an assurance that as of 2021 all facilities across the country, and currently the ones treating the noted commodities, adhere to an industry level of best practice. Farmers benefit from consistent, high-performing products, which in turn protects their investments.

Regulators benefit because their needs are being heard. Specifically, uniform adherence to environmental, health and safety compliance within seed treatment operations. And if when we act on those needs we're doing it in a manner that is implementable and reasonable, they're happy.

From the standpoint of commercial seed treatment operators, after they've gone through the process, I believe everyone will feel their operations were improved. Registrants will have an assurance their products are being used correctly from an environmental, health and safety aspect. Also, that their products are going to perform in the field — and for them that's the holy grail. **Kari Belanger**

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ALBERTA SEED PROCESSORS

Over the past 15 years, Dr. Habibur Rahman has continued his mission to improve canola for Alberta and Canadian crop producers.

CANOLA BREEDER DEDICATED TO HIS CRAFT

Dr. Habibur Rahman has made significant contributions to the industry.

PLANT BREEDING WASN'T Dr. Habibur Rahman's first interest. Indeed, Rahman initially thought he would get into the field of human or plant genetics.

But a chance conversation with a family friend convinced Rahman to enter an agricultural university after graduating from high school, and the rest, as they say, is history.

The eminent canola breeder first became interested in genetics when his high school biology teacher taught the class about the genetics behind human eye colour.

"I became very interested, learning about genes and chromosomes and cells. But when I finished high school, I thought I would study botany at university where I can get specialization in plant genetics," he says. "But my brother's friend suggested I attend an agriculture university that has a genetics department."

Rahman attended Bangladesh Agricultural University, receiving his Bachelor of Science in Agriculture with Honours in 1980 and his Master of Science in Agriculture in Genetics and Plant Breeding in 1982. He completed his Ph.D. in Plant Breeding and Genetics at Royal Veterinary and Agricultural University (now known as Copenhagen University) in 1988.

From January 1989 to September 2003, Rahman worked as a canola breeder/senior breeder with a Danish seed company, Danisco Seed. During this period, he developed (solely or jointly) 47 spring and winter *Brassica napus* canola, high-oleic and low-linolenic acid canola, and high erucic rapeseed cultivars for

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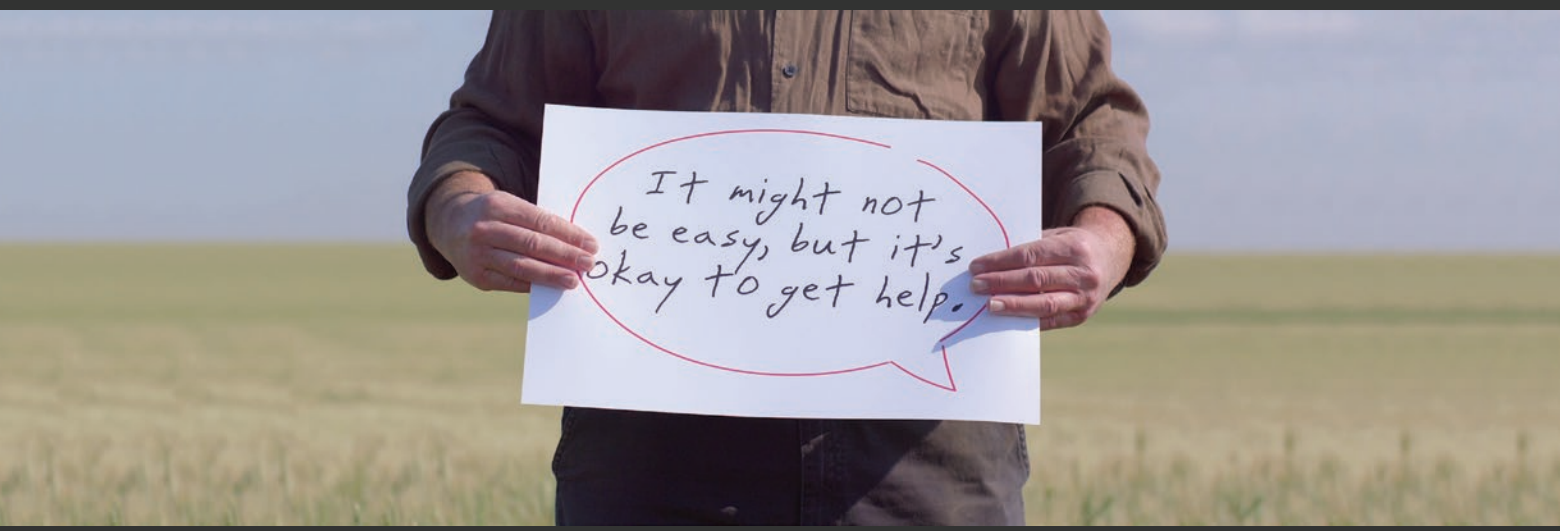

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European and North American markets. At one time, one of his winter canola cultivars, Aviso, captured about one-third of the French market. This cultivar has been used as check for blackleg disease resistance by the French official authority.

In 2003, Rahman accepted a position to teach and lead the canola program at the University of Alberta (U of A). At the time he joined the university, clubroot emerged as a threat to canola production in Canada. He immediately began work on finding solutions, identifying clubroot-resistant *Brassica* germplasm, introgressing resistance into Canadian *B. napus* canola, mapping some of the resistance genes and, in collaboration with an industry partner, developing the first clubroot resistant canola cultivar carrying multiple clubroot resistance genes.

Over the past 15 years, Rahman has continued his mission to improve canola for Alberta and Canadian crop producers. He introgressed exotic genes/alleles from different exotic gene pools, such as European winter canola, Chinese semi-winter type and rutabaga, and allied species, such as *B. oleracea* and *B. rapa*, into Canadian canola, and developed a canola cultivar by the use of genetically diverse materials. And he contributed to the knowledge of the value of different gene pools for increased seed yield in hybrid canola cultivars.

In addition, Rahman has:

- Introgressed earliness of flowering from the C genome of the late-flowering species *B. oleracea* (Chinese kale) into *B. napus* canola and mapped the flowering time genes and established their association with seed yield for use in breeding.
- Identified the B genome chromosomes of *B. carinata* that carry resistance to blackleg disease for the introgression into *B. napus* canola.
- Developed different fatty acid mutant lines of *B. oleracea*, including low-linolenic acid (C18:3), and characterized the C18:3 mutations at sequence level for use in the breeding of *B. napus* canola.
- Mapped several agronomic and seed quality traits and identified molecular markers for use in marker-assisted breeding.
- Developed more than 120,000 SSR markers from the *Brassica* A genome for use in breeding.
- Developed (solely) four additional canola cultivars for commercialization in Canada.

Since joining the U of A, Rahman has published 45 papers in refereed journals and eight papers in conference proceedings.

Rahman says the continued evolution of plant breeding has been a boon to the industry. When he entered the plant breeding field, he said only the most traditional plant breeding techniques were in place.

"But then in the early 1980s, doubled haploid breeding came about, and it was very fascinating and interesting," he notes. "Then in the late 1980s/early 1990s a new tool came – the use of molecular markers in plant breeding. This was a big change, and we're increasingly using molecular markers today in plant breeding."

Other changes Rahman has seen during his career are the development and use of transgenics traits, and the development of hybrid canola cultivars.

As science continues to grow by leaps and bounds, Rahman says we should see more integration of molecular markers and genomics tools in breeding of crop cultivars.

"We've had molecular markers for many years now, but it has not been integrated into most breeding programs that much," he says. "I expect the use of marker technology to increase as costs decrease."

When he's not in the lab at the U of A, Rahman teaches an undergraduate plant breeding course, Genetic Improvement of Crop Plants, and the graduate course Plant Breeding. He has also been teaching the graduate course Seminar in Plant Science. Over the past five years, he's graduated nine M.Sc. students and over the course of his 15 years at U of A, 13 M.Sc. and two

Ph.D. students. He currently supervises four M.Sc. students and supervises or co-supervises four Ph.D. students. He also supervises two postdoctoral fellows, two research associates and three technicians.

Since joining the U of A, Rahman has published 45 papers in refereed journals and eight papers in conference proceedings (over his lifetime 65 papers in refereed journals, 14 in conference proceedings and one book chapter). He has received several research grants as principal investigator or co-principal investigator for conducting breeding research on canola in the areas of clubroot and blackleg disease resistance, genetic diversity and heterosis, earliness of flowering and maturity without yield penalty, clubroot and blackleg disease resistance, yellow seed colour and seed meal quality, fatty acid profile of oil and increasing seed oil content.

There's no doubt Rahman possesses strong academic and commercial plant breeding expertise, and the combination of these two makes him a very unique plant breeder. He has made huge contributions to plant breeding research, to training of the next generation of plant breeders, and has made important contributions to the practical application of research for the development of commercial cultivars.

Despite a highly-successful plant breeding career, Rahman isn't slowing down. He's got plans and dreams.

"I hope to have more money and more time to do more research to integrate molecular tools in breeding," he says. "And I'd like to see all students include a molecular component in their research and integrate this with breeding.

"I would also like to see more integration of molecular tools and research, including the finding of beneficial genes and alleles in *Brassica* vegetables and allied species, in the breeding of canola cultivars; lots of important genes and alleles can be found in *Brassica* – beyond the boundary of *B. napus* canola. If I had a few million dollars, I'd put up a centre for this." **Janet Kanters**

"I hope to have more money and more time to do more research to integrate molecular tools in breeding. And I'd like to see all students include a molecular component in their research and integrate this with breeding."

—Dr. Habibur Rahman

CLUBBING CLUBROOT

An update on breeding clubroot-resistant canola.

ON THE PRAIRIES, clubroot appeared in Alberta in 2003, in Saskatchewan in 2008 and Manitoba in 2013. As any grower can tell you, it's a nasty canola disease that usually worsens in a field every year, partly because the spores are very easy to spread and so hardy they can survive for up to two decades in the soil. Combine this fact with the strong prices that canola fetches these days – widely encouraging back-to-back or two-year rotations – and you have a big problem.

Companies are certainly moving as quickly as possible to produce seed with effective resistance to clubroot, but breeding to defend against this particular pathogen involves navigating a wide range of complex challenges.

"Clubroot has a very short lifecycle resulting in several generations per season," explains Dr. Marcus Weidler, vice president of seed operations at Bayer CropScience, "enabling the pathogen to react to changes in its environment very quickly, including new crop resistance genes."

Dr. Jed Christianson, pathology lead at Monsanto Canada, explains that clubroot's large and quickly-adapting population sizes means that it takes relatively long canola rotations of three or four years to see significant drops in the number of viable spores in the soil, and very long rotations of over 10 years for spores to effectively disappear.

"Each gall produced on a canola root can contain billions of spores," he says. "So, given the numbers of spores generated, even very rare events like the emergence of individual spores that have gained the ability to infect resistant canola will happen over a fairly short number of cropping cycles. A one in a billion event doesn't seem that unlikely to happen when you're given 20 billion chances."

While Bayer CropScience undertakes much canola breeding research, such as in the greenhouse pictured, clubroot resistance research is conducted in a highly-secure lab to prevent the spread of the pathogen.
Photo: Bayer CropScience

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Photo: DowDuPont

A bundle of plants from a susceptible product versus clubroot-resistant hybrid 45H29 under disease pressure (Leduc, Alberta). Notice clubbed roots and premature ripening.

Photo: DowDuPont

Resistant product 45H29 (left) under severe clubroot pressure versus susceptible product (right) with premature ripening and stunted growth.

Combine this with the fact not all clubroot pathotypes (races) have been identified, and it's therefore difficult, explains Weidler, to develop a canola variety that is resistant to all potential pathotypes to which a plant may be exposed.

Dr. Igor Falak reminds us that it was in 2013 that a new clubroot pathotype was identified, one to which all canola varieties on the market carrying resistance to the original 2003 pathotype were susceptible. Although hybrids with the initial type of resistance continue to hold their own on most infested acres, the number of fields with the new pathotype is increasing annually. Falak, senior research scientist with Corteva Agriscience, blames this situation on "years of canola-on-canola."

In addition, he notes that although clubroot "is similar to another disease of canola (blackleg), where canola products may carry race specific resistance," clubroot-resistant canola varieties "do not have 'fallback' resistance mechanisms, unlike blackleg-resistant products that also have a different type of stable resistance."

More breeding challenges are found in the fact that because canola plants carry no clubroot resistance genes, all the major seed companies are actively testing resistance genes found in rutabaga, cabbage and turnip. However, Weidler notes that because these species are only remotely related to canola, it's far from easy to transfer genes between them without also transferring additional unwanted genetic "baggage" that negatively impacts yield, canola quality or agronomics.

If all this wasn't enough, clubroot is a challenging organism to deal with, having unique characteristics – described by Weidler as a form of life "somewhere between a bacterium and a fungus."

Christianson concludes that the biggest challenge in creating clubroot-resistant canola seed is to introduce resistance "while continuing to improve hybrid performance for yield, maturity, standability, resistance to other diseases, harvestability, seed quality and all of the other attributes that are important to growers' success."

Breeding Steps to Develop Clubroot-Resistant Canola Seed

Christianson says the steps involved in breeding clubroot-resistant varieties are relatively simple, and that any breakthroughs relating to resistance genes "are really just the discovery and characterization of more of them through concerted screening efforts."

The entire process is a matter of crossbreeding canola with resistant relatives through normal pollination procedures and recovering offspring that are clubroot-resistant. "Those offspring then have to be crossed with canola again and again through many generations, selecting the resistant offspring at each generation for use in the next cycle to obtain plants that maintain resistance, but have recovered the characteristics of high-performing canola," Christianson explains.

Weidler adds that unwanted genetic material from the resistance donor that negatively impacts the agronomic performance of the offspring is removed through several crossings of the offspring with elite parent stock. "Using molecular breeding tools, we can check the progress towards the end goal," he notes. "Ideally, only the genetic sequence conferring clubroot resistance has been transferred and no other parts of the donor genome remain in the offspring."

Breeding Progress

DowDupont was the first company in Canada to market clubroot resistant hybrids in 2009 (45H29).

"Our hybrids have multi-source and multi-race resistance to clubroot, and have a high level of resistance to the most prevalent clubroot race – race 3 – along with resistance to races 2, 5, 6 and 8," Falak notes. Pioneer has new canola hybrids that contains a new source of clubroot resistance that confers resistance to both the initial type and new pathotypes, and can be rotated with the original resistant hybrids."

For its part, Bayer CropScience has "identified several new potential resistance sources," says Weidler, "and we have been able to demonstrate that these are different from what is currently on the market."

Christianson says that as Monsanto nears "actual commercial entry into the marketplace, we will have more to share about how second-generation resistance fits in with existing resistance traits to provide a sound disease management strategy."

No matter what resistant canola varieties are marketed, no company can predict how long a new variety will last before it's compromised. This depends on too many factors, explains Weidler, including the resistance gene, environmental conditions and management practices.

Dr. Marcus Weidler

All the companies strongly agree that the existence of varieties with resistance is only part of the clubroot solution.

Weidler emphasizes the importance of an integrated disease management approach for clubroot, and fully supports the recommendations of the Canola Council of Canada.

Falak and Christianson echo the sentiment. "All resistance traits will be effective for longer periods of time if they are used judiciously," says Christianson. "Choosing resistant seed is only one part of a successful disease management strategy. Growers need to include crop rotation, field scouting and early detection of clubroot, and minimizing soil movement between fields on equipment."

Falak agrees. He says following a proper canola rotation as well as rotation of resistance genes, combined with preventing soil movement and other agronomic measures "would enable sustainable clubroot management that would prolong efficacy of any new resistance sources that are introduced." **Treena Hein**

ADDING VALUE to ALBERTA CROPS

Food Processing Development Centre grows province's food and beverage industries.

THE PRODUCTION OF primary commodities and value-added products is vital to Alberta. Ensuring Alberta producers are getting best value for their products is part of the mandate of the province's Food Processing Development Centre in Leduc.

The Food Processing Development Centre (FPDC) is a modern, fully equipped pilot plant and product development laboratory facility. Staffed with experienced food scientists, engineers and technologists, it is operated by the Food and Bio Processing Branch of Alberta Agriculture and Forestry (AF). Alberta Agriculture and Forestry provides unique facilities to provide development and research services for agri-food processing companies, as well as those interested in non-food uses for agricultural products.

"Entering the food industry is a capital-intensive venture, and the market has tight margins," says Wanda Aubee, director of the Food Science and Development Section with the Food Processing Development Centre. "The intent of the centre is to reduce the risks that businesses take on as they enter the sector and start to grow."

Wanda Aubee, director of the Food Science and Development Section with the Food Processing Development Centre.

The food and beverage industry is Alberta's largest secondary manufacturing industry, generating in excess of $13 billion in value of shipments. Through the Alberta Heritage Savings Trust Fund, AF opened the centre in 1984. A $5.5 million expansion to the facility was completed in 2002.

Over the past 34 years, a wide range of products have been developed at the centre, from processed meats and cheeses, to baked goods, juices, soups, sauces and baby food. According to Aubee, Alberta's commodities are often processed outside of Canada, and in turn, the province then imports these value-added products.

"Alberta and Canada are net exporters of agricultural commodities, but Alberta benefits economically by doing value-added processing here rather than importing processed goods," says Aubee. "Growing the value-added agricultural industry is complex, and the FPDC is one significant asset the province offers to support this transition from commodity-based exports to value added."

The FPDC does work on projects from outside Alberta, but the majority of projects are Alberta-based. For instance, Siwin Foods Ltd. is one of the centre's success stories. Siwin Foods is a Chinese company that was looking to establish a processed meat plant in either North America or Australia. According to Aubee, the services the FPDC offered made the decision for Siwin.

"They were able to work with the centre's food scientists to develop products for the North American palate and to scale up their production in the pilot plant before moving into an incubator suite," she says. "From there, they built their own facility in Edmonton in 2014 and continue to grow."

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Adjacent to the FPDC is the Agrivalue Processing Business Incubator (APBI), a multi-tenant facility providing infrastructure and services to support and enhance the establishment and growth of new companies and new business ventures in Alberta. The APBI assists with the start-up of new food businesses, providing facilities and programs to help manage the transition from new product development through commercialization, market launch and growth in sales, resulting in graduation and the establishment of their own facilities.

Alberta-based Aliya's Foods Inc. was a small company producing and manufacturing samosas east of Edmonton. The company recognized the potential growth in Indian cuisine and wanted to expand their operation to include prepared ethnic meals. After accessing the product development and evaluation services of the FPDC, they leased a suite in the APBI.

"Now with sufficient production capacity, Aliya's focused on the U.S. market and successfully increased their sales to the point where they committed to the investment in a new processing facility," says Aubee. "In June 2012, Aliya's Foods graduated to a new $20 million, 40,000 square foot processing facility in the City of Edmonton. Today, they continue to use the services of the FPDC for product improvements and line extensions."

The FPDC and APBI have a staff complement of 45 people consisting of food safety professionals, food scientists, food technologists, maintenance and administration. The facility is home to PhD and Masters degree food scientists with specializations in crop and plant protein processing, meat processing, dairy processing, sensory science and bakery science.

"The future is very exciting for the food and beverage value-added industry," says Aubee. "There is an incredible interest in food and flavour, and experimenting with new and innovative processes and products. People are experiencing food as a key part of their vacation destinations, as an influencer in their health and wellness, and as a teaching tool to bring their children closer to nature in urban environments. These are opportunities for entrepreneurs to meet the needs of the consumer and provide unique products made right here in Alberta."

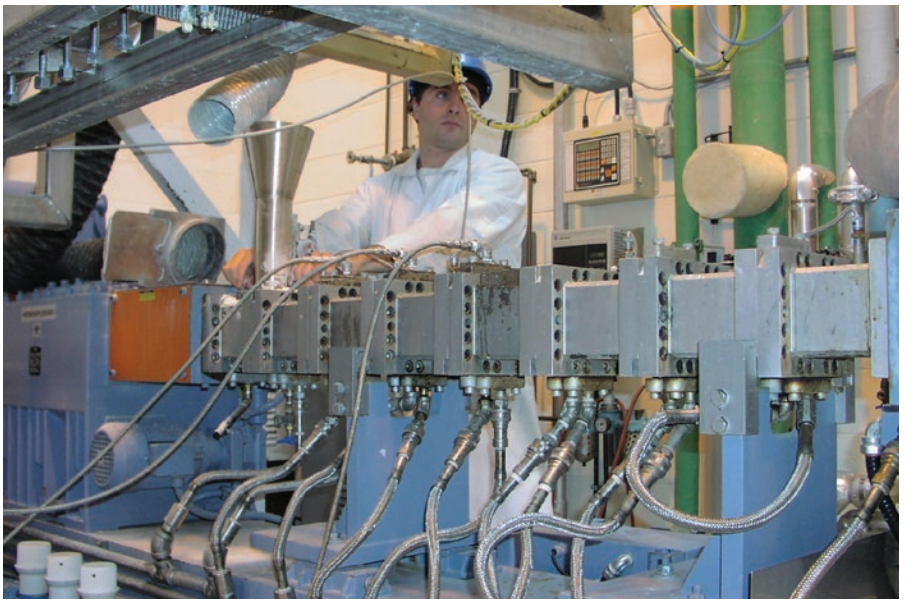

Photo: FDPC.

An employee works at an extruder at the Food Processing Development Centre.

The Food Processing Development Centre, located in Leduc, Alberta.

Going forward, the FPDC offers Alberta growers the opportunity to increase their acres and/or the possibility of growing new and novel crops in the province. Indeed, Aubee says the centre is seeking new and different sources of food protein to experiment with.

"As the world population grows, there's an increased need for agriculture and agri-food products, and specifically, people are looking for alternatives to traditional protein sources," she notes. "This is an opportunity for Alberta producers to increase their growing of pulses – it's not only a great rotational crop, it has an incredible nutritional profile, it's high in fibre and it's really good for the soil. The FPDC has the equipment and expertise to explore what could be possible with plant protein, including extracting protein from grains and oilseeds."

The FPDC is one of the largest food processing development centres in North America, and one of the most complete with the APBI. An expansion to the APBI was announced in 2016 as part of the Alberta Jobs Plan. Planning is currently underway for this expansion, offering Alberta growers – and companies – myriad opportunity to create added value to the province's high-quality crop offerings. **Janet Kanters**

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becoming SEED SMART

The most important thing you can do for your crop is check your seed's health.

WHAT'S THE BEST thing you can do for your crops? Is it making sure they get enough water, sunlight and love? What about having the best herbicides and pesticides to protect them from pests? The best seed treatment? Precision seeding equipment?

Well, there's something more important than that: testing your seed.

About three years ago, Alberta Seed Processors (ASP) began a program called Seed Smart to promote and educate about the importance of seed health and testing your seed. Since then, the goal has remained the same: to get the word out that seed testing is "smart."

"Seed Smart has only had about three seasons," says Monica Klaas, general manager of ASP. "The program hasn't changed much and the co-op seed and grain processing network throughout Alberta/ BC Peace region have been the catalysts of the program to date. As our program gains momentum, we're making plans to involve other parts of the crop sector value chain."

But why should growers care so much about their seed health? Why should they get their seed tested?

"Everything a farmer does on the farm is to unlock the potential of the seed," Klaas says. "The message of the Seed Smart program is for farmers to know the quality parameters of the seed they plant. If a farmer is using pedigreed seed, asking for the seed analysis from the seed retailer will assist that grower in planning for success. If a grower is using farm saved seed, getting a full seed test from an accredited laboratory will determine seed health parameters."

Seed Smart recommends testing for germination and Fusarium graminearum, as a bare minimum. Other tests such as fungal scans, vigour testing, and 1000 Kernel weight are other parameters that are critical indicators of seed health

Klaas says that particularly in this season, growers will want to make seed testing their first priority, as challenging harvest conditions will play a role in seed health.

Submitting a representative sample to the seed lab is of ultimate importance. With a later than normal harvest, farmers

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"Everything a farmer does on the farm is to unlock the potential of the seed."

—Monica Klaas

are reminded to take a sample from each truck load. Seed Smart has developed a sampling document to help guide farmers to use proper sampling techniques. The idea is to get a snapshot of seed quality of the whole seed lot, (not just what a farmer can access from a bin door).

Seed Smart's next focus is marketing towards trade shows. Klaas says that they've been working on materials that will be available at more trade shows, and that they're amping up more materials to be put in seed processing facilities.

In addition to Seed Smart marketing materials, there are now Seed Smart scholarships. Currently, Seed Smart awards two scholarships to encourage the next generation of growers to know the quality of the seed they're planting.

The scholarship targets second to fourth year students enrolled in an agriculture-related field at universities across Canada, with given preference to students at an institution in Alberta. This year, Seed Smart awarded scholarships to Cole Huppertz, a 20-year-old from Westlock, Alberta, studying at Lakeland college, and Kyle Wheeler, a 20-year-old from Strathmore, Alberta, and a student at the University of Alberta.

"One of the things we recognize is that if a grower has been farming for 60 years or so and has never tested their seed, chances are that's not the demographic that wants to send in seed samples," Klaas says. "We know that we need to start working and encouraging the next generation to be cognizant about seed health and make it their first step."

Currently, Seed Smart is staying focused on Alberta, but Klaas hopes that some of their marketing materials can be amended to other locations.

"The message is the same no matter where you farm," Klaas says.

"We talk a lot in agriculture about sustainability and integrated pest management," Klaas says. "Arguably, having a seed analysis fits into both platforms — you're trying to predict an outcome. It's difficult to try and predict something if you don't know where you're starting. Seed analysis often gets lost around the other parameters of crop production, but the Seed Smart program believes it should be the starting point." **Alex Martin**

WHERE ON THE WEB

Visit the Alberta Seed Processors website **www.seedprocessors.ca/seed-smart** for resources and tools to help you be Seed Smart.

Gijs van Rooijen is the chief scientific officer of Genome Alberta.

Revolutionizing with CRISPR

CRISPR-Cas9 is revolutionizing the way we create novel crops, but why should growers care?

THERE ARE PLENTY of buzzwords surrounding the seed industry in 2018 — GMOs, gene-editing, organic and, of course, CRISPR. While we know a lot surrounding the debate of GMOs versus organic and whether or not GMOs and gene-editing overlap, one gene-editing technology still seems a mystery.

So, what exactly is CRISPR-Cas9, and why does it matter to the seed industry?

CRISPR is a genome editing system that could benefit the seed industry by allowing breeders to make minor changes into the genomes of existing high performance cultivars that will result in enhanced yield, ability to withstand stresses such as drought, heat and diseases and give crops the nutritional qualities that consumers are looking for.

"From an academic perspective, I like to think of plants as machines," says Nat Graham, a postdoctoral associate from the Voytas lab at the University of Minnesota. "Everything runs on a code — DNA. What we're focused on from a genome engineering perspective is how can we manipulate DNA for our gain?"

"With traditional transgenics, you would take a genetic sequence and randomly insert it into the DNA, which can disrupt the sequence," Graham explains. "If it disrupts, you just keep trying again until it doesn't cause a problem. If you want to turn a sequence off, you'd need to use mutagenesis. CRISPR-Cas9 is a new tool for genome engineering, and it allows breeders to go through the genome, find a sequence and precisely alter it."

Graham continues by explaining that currently, CRISPR is used to "turn off," sequences through mutation. His current research focuses on how to insert new sequences by using CRISPR-Cas9, but he emphasizes that most products that come from CRISPR currently turn off mutations.

CRISPR-Cas9 is a protein found in bacteria that were under attack from bacteriophages. It can recognize sequences of invaders and cut the DNA sequences apart. Researchers discovered that the proteins could be programmed to recognize a new sequence and introduce mutations site-specifically into the DNA sequence.

There are a few different ways that CRISPR works to "turn-off," sequences.

Graham explains that one way is to alter the sequence, thus the gene no longer makes sense. If the gene sequence doesn't make sense, it wouldn't make the product anymore.

Another way to "turn-off," the sequence is by completely removing it, which would make the sequence no longer functional. It would stop making the product, because it would no longer be there.

Finally, you could alter current genes. In this idea, instead of traditional mutagenesis, where a researcher would create a desirable sequence, find the sequence to be changed and replace it with the new, more desirable sequence, a researcher could find a specific base pair in a sequence and alter it completely. Graham likes to use sentences as examples for this idea: if you had the sentence "the cat was fat," and you wanted to change it to "the rat was fat," CRISPR would allow a researcher to find the sentence and change the "c" to an "r" to create the desired sentence.

Another example he uses is that CRISPR directly edits gene "text," while genetic modification is more like inserting a new chapter into a book.

"Traditional breeding takes advantage of natural mutations to find new traits," Graham says. "The difference is we're causing mutations to happen in the way we choose. We're accelerating the natural process."

"CRISPR is new from an academic perspective — it hit the science journals in 2012," Graham says. "We're still learning about it and how to make it better. There's a lot we still need to learn."

CRISPR is also beneficial to the seed industry because it won't be regulated like GMOs. Gijs van Rooijen, chief scientific officer of Genome Alberta, says that CRISPR regulations are similar to traditional genetics across Canada.

"If you're making minor changes such as deletions or insertions, it isn't different than anything from traditional breeding," says van Rooijen.

In Canada, crops are regulated through plants with novel traits (PNT). Regardless of how the plant was created, be it through traditional breeding or gene-editing, the government must ask questions about whether or not the trait is novel and if it would make the plant more 'weedy' or difficult to control.

"Whether crops are generated through traditional breeding, GMOs, or gene-editing, they will be looking at the risks associated in relation to human health, animal health and environmental health," van Rooijen says.

"The government also takes into account trade risks when dealing with a new cultivar," van Rooijen says. "Right now, if you're growing a GMO variety, chances are it's going to cause more issues with your trading partners, particularly in Europe. However, if you're growing traditional varieties, it's usually okay trade-wise."

Currently, one of the only gene-edited varieties starting to be marketed in Canada is from Cibus's Rapid Trait Development System. Developed in 2015, Cibus has begun trialing a sulfonylura (SU) canola trait, which will be marketed with their Draft herbicide. Together, they can control key weeds such as common buckwheat, common ragweed and redroot pigweed.

"With the advances in CRIPSR and gene-editing technology, the technology and regulations are actually straightforward, so smaller companies are encouraged to

"CRISPR will provide similar benefits that GMOs already bring, however they'll be regulated differently."

—Gijs van Rooijen

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InVigor L140P	• First hybrid to feature Pod Shatter Reduction trait • Medium height • Available in limited quantities for 2019	**100%** of checks (InVigor 5440 and Pioneer® 45H29) in 2011-2012 WCC/RRC trials	All growing zones	Strong	Pod Shatter Reduction Blackleg Resistance LibertyLink system
NEW InVigor L234PC	• Pod Shatter Reduction • NEW 2nd generation multi-genetic clubroot resistant** traits • Excellent yield performance • Early maturity • Medium height	**104%** of checks (InVigor 5440 and Pioneer® 45H29) in 2017 WCC/RRC trials	All growing zones	Strong	Pod Shatter Reduction 2nd Generation Multi-Genetic Clubroot Resistance Blackleg Resistance LibertyLink system
InVigor L255PC	• Pod Shatter Reduction & Clubroot Resistance** • Top yield performer • Harvest flexibility • Medium height	**109%** of checks (InVigor 5440 and Pioneer® 45H29) in 2016 WCC/RRC trials	Mid- to long-growing zones	Very Strong	Pod Shatter Reduction Clubroot Resistance Blackleg Resistance LibertyLink system
InVigor L241C	• Clubroot Resistance** • Winner of the 2016 Canola 100 at **81.43 bu./ac.** • Strong yield performance • Mid maturity • Medium height	**102%** of checks (InVigor 5440 and Pioneer® 45H29) in 2012-2013 WCC/RRC trials	All growing zones	Very Strong	Clubroot Resistance Blackleg Resistance LibertyLink system
InVigor L135C	• Clubroot Resistance** • Solid performance • Early maturity • Medium height • Available in Alberta only	**138%** of checks (Pioneer® 46A65 and Q2) in 2010 WCC/RRC trials	All growing zones	Strong	Clubroot Resistance Blackleg Resistance LibertyLink system
InVigor L252	• #1 hybrid canola grown in Canada in 2016 & 2017*** • Winner of the 2017 Canola Performance Trials (CPTs) for the 5th straight year (average of all growing zones) • Top yield performance • Medium height	**110%** of checks (InVigor 5440 and Pioneer® 45H29) in 2011-2012 WCC/RRC trials	All growing zones	Strong to Very Strong	Blackleg Resistance LibertyLink system
InVigor L230	• Strong yield performance • Early maturing • Medium height	**103.9%** of checks (InVigor 5440 and Pioneer® 45H29) in 2014-2015 WCC/RRC trials	All growing zones	Strong to Very Strong	Blackleg Resistance LibertyLink system

*2018 BPI (Business Planning Information) Data

**To predominant clubroot pathotypes identified in Canada at the time of product registration. NEW InVigor L234PC has the same resistance profile as InVigor L255PC, InVigor L135C and InVigor L241C, plus it contains 2nd generation multi-genetic clubroot resistance to additional clubroot pathotypes to help combat evolving clubroot pathotypes

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begin developing their own products," van Rooijen says. "CRISPR is actually giving smaller companies the ability to compete with larger companies."

Van Rooijen says that currently, CRISPR research in crops is focused around developing varieties similar to GMOs. However, in using CRISPR in North America, these crops can be regulated as non-GMO. In particular, research has been focused on herbicide tolerance.

"You can imagine that a lot of companies are beginning to look at traits that focus on higher nutritional quality, such as high-oleic soybeans or high-fibre wheat," van Rooijen says. "These varieties are likely to be seen in the next couple of years. Since companies can make edits to the existing genome, varieties can be developed much faster, but current research focuses on traits that have already been approved."

Currently, through traditional breeding, it takes around seven years to create a new desirable variety. With genetic modification, it still takes around 10 to 12 years due to regulatory barriers and high costs. Currently, researchers believe genome editing will only take around three to five years, since gene-editing is more precise than other breeding methods.

However, the best part about CRISPR would be it wouldn't change the way growers have been farming already.

"Growing gene-edited crops won't be much different from growing GMO varieties," van Rooijen says. "By providing the available traits, it means growers can use herbicides only when needed, which is better for the crops and the environment. CRISPR will provide similar benefits that GMOs already bring, however they'll be regulated differently."

CRISPR could provide growers with improved disease resistance, drought tolerance and higher yields, while providing consumers with better food quality, nutrition and a longer shelf life.

Van Rooijen also believes CRISPR has the potential to expand grower's export markets. "Growers have the potential to expand into markets where people are weary of GMOs," he says.

In addition, since CRISPR crops are easier to create than GMOs, van Rooijen says there's a possibility that the seeds might be sold at a reduced rate in comparison to other GMO traits.

However, van Rooijen says the biggest benefit CRISPR will have is an environmental impact.

"There's no question that consumers are concerned about the environmental impact of how we grow our food," van Rooijen says. "We need to grow more efficient crops. With CRISPR, we can grow the amount of food we need to feed the population, but we also increase our efficiency while reducing stress on the environment."

"CRISPR and gene-editing technologies are revolutionizing the way novel traits can be created," says van Rooijen. "The positive effects outweigh the negatives, and we must continue to find the consumer's support so that we can provide the world with better opportunities for growers, consumers and the environment. It's almost irresponsible to not take this opportunity."

We've come a long way in agriculture. From crop domestication to cross breeding to plant breeding based on genetic information to GMOs, it seems the natural way to go from here is target breeding. Whatever may happen with these technologies, it seems one thing is for certain: CRISPR and gene-editing are paving the future of agriculture.

Alex Martin

Nat Graham is a postdoctoral associate from the Voytas lab at the University of Minnesota.

"CRISPR-Cas9 is a new tool for genome engineering, and it allows breeders to go through the genome, fin a sequence and precisely alter it."

—Nat Graham


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Flipping the Switch

For global researchers studying epigenetics, looking at the surface of the genome could be the key to discovering the next big thing in plant and seed engineering.

CLASSICAL GENETICS has been with us for a long time, ever since Gregor Mendel put forward his laws on the basic mechanisms of heredity in the 19th century.

Classical genetics has led to wondrous developments in the area of agriculture, including GM and gene editing technologies. And now, another area of study is on the cusp of changing our ideas about plant function even more.

Epigenetics, although has existed as a concept for nearly eight decades, is becoming a new buzzword that's causing lots of chatter in plant breeding and seed circles, and for good reason.

"Epigenetic technologies are on the cusp of being industry-ready. Unlike techniques such as CRISPR, it's not quite there yet — but very close," says Michiel Van Lookeren Campagne, head of seeds research at Syngenta.

A field like epigenetics holds great promise for companies like Syngenta, he says, which invests a lot of time and money in dealing with the regulatory hurdles that invariably come with breeding plants that have had their genetic codes altered in some way.

Michiel Van Lookeren Campagne is head of seeds research at Syngenta.

Flipping Switches

Epigenetics comes from the Greek root word epi, meaning "on" or "on top of."

"Epigenetics essentially sits on top of the layer of classical genetics, which has been the basis of all breeding programs," says Van Lookeren Campagne.

Epigenetics is the study of heritable changes in gene function that do not involve changes in the DNA sequence. Epigenetic changes in plants do not occur as a result of any changes to the plant's DNA, but as a result of other factors like changes to chromosomes that affect gene activity and expression.

Basically, Van Lookeren Campagne explains, epigenetic changes occur when various "switches" in DNA are flipped on and off, triggering different reactions within the plant. He notes that epigenetics as a field really took off in the 1990s when Dutch and American molecular biologists breeding purple petunias obtained a number of unexpected results that were difficult to explain.

They were trying to increase the colour intensity of the petals in petunias by introducing a gene which causes the formation of red pigment in the flowers. But instead of intensifying the colour, this treatment led to a complete loss of colour and the petals turned white. The mechanism causing these effects remained elusive until Andrew Z. Fire and Craig C. Mello discovered the cause, earning them the Nobel Prize in Physiology for Medicine for 2006.

Fire and Mello deduced that double-stranded RNA can silence genes, that this RNA interference is specific for the gene whose code matches that of the injected RNA molecule, and that RNA interference can spread between cells and even be inherited.

In other words, genes can be turned on and off like light switches, producing different reactions within a plant without altering the plant's genetic code in any way.

New Frontier

Those epigenetic changes are ushering in a new frontier for the seed industry as a result. In March, Epicrop Technologies Inc., a company co-founded by University of Nebraska-Lincoln professor and epigenetics pioneer Sally Mackenzie, announced it had secured US$3.2 million in funding. This funding will be used to further develop epigenetic technology with a focus on large increases in yield and stress tolerance in crops.

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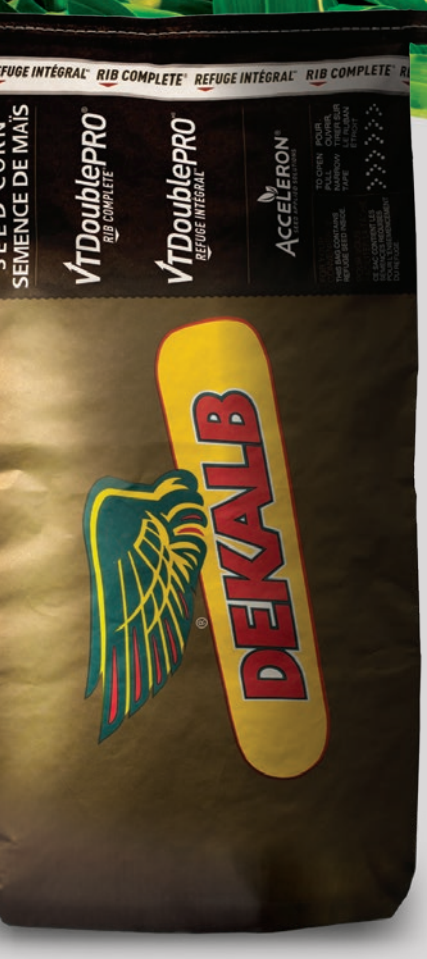

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ALWAYS FOLLOW GRAIN MARKETING AND ALL OTHER STEWARDSHIP PRACTICES AND PESTICIDE LABEL DIRECTIONS. Details of these requirements can be found in the Trait Stewardship Responsibilities Notice to Farmers printed in this publication.

appreciate the game changing potential of this technology," said Michael Fromm, chief executive of Epicrop Technologies.

In the company's field and greenhouse trials, epigenetically improved plants — soybeans, tomatoes, sorghum and Arabidopsis — show increased yields and stress tolerance.

"Increasing yield and stress tolerance are key goals of most seed companies. Epicrop's method has the potential to provide these traits by adding epigenetic information directly to the seeds of commercial varieties without adding any genetic material. The unique features of this method readily fit into traditional commercial breeding and seed production methods to facilitate company adoption of this system."

Poppies on the Prairies

In Alberta, University of Lethbridge Department of Biological Sciences researcher Igor Kovalchuk has gained the reputation as a world leader in epigenetics.

His goal: to produce hardier crops that are increasingly resistant to stress and even able to detect pollution. This capability, in turn, will help to improve the efficiency, profitability and overall success of farms.

Thanks to Kovalchuk, in fact, the Canadian Prairies could one day be dotted with fields of medicinal poppies. He is currently working with a Canadian biotech company that plans to develop a market for the high thebaine poppy industry in Canada. A significant cash crop opportunity, high thebaine poppies are used to create valuable medicines, but unlike their traditional counterparts, cannot easily be converted into heroin.

Alberta's Igor Kovalchuk has gained the reputation as a world leader in epigenetics. Photo courtesy University of Lethbridge

University of Nebraska-Lincoln professor Sally Mackenzie co-founded Epicrop Technologies, which develops technologies that make use of epigenetics. Photo courtesy University of Nebraska-Lincoln

Kovalchuk is also a driving force behind the establishment of the Alberta Epigenetics Network, the first epigenetic network in Canada.

"Plants have an amazing capacity to respond immediately to stress and to propagate this response so future generations can be better prepared," he says.

One of the ways plants do this, of course, is via epigenetic changes.

For Van Lookeren Campagne, the doors yet to be unlocked by epigenetics are many, and he's excited as new research initiatives are undertaken to bring epigenetic technologies to market.

"We now understand the machinery that epigenetic changes are related to, and we're able to tune that machinery. Now we have to find the applications we can deploy this toward. It holds a lot of potential and promise."

Marc Zienkiewicz, Marc Airhart and Dana Yates

Editor's Note: This article was produced with files from Marc Airhart (University of Texas at Austin), Justin Raikes (Epicrop Technologies), Dana Yates (University of Lethbridge)

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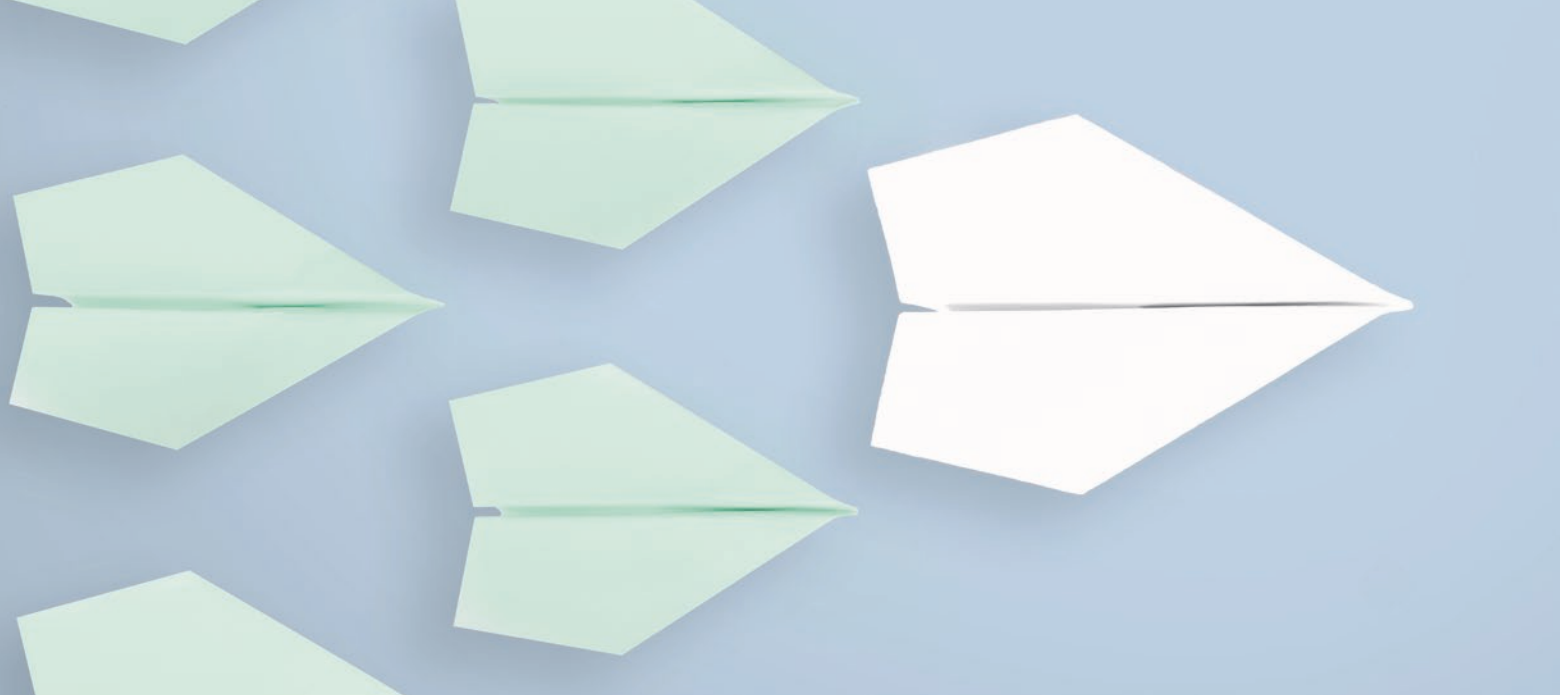


The Scoop on Seed Synergy

An attempt to forge a next-generation seed system for Canada is gaining speed. Here's what you need to know about what's happening.

CANADA'S SEED INDUSTRY has come together under the Seed Synergy Collaboration Project banner to collectively envision what a next-generation seed system in Canada could look like.

The project's goal: develop recommendations and implementation plans that will enable a next-generation seed system. This system is meant to be a reformed, industry-led, government-enabled seed system that effectively attracts investment from businesses both large and small, fosters innovation, and delivers new and tailored seed traits to customers efficiently.

In Montreal, Quebec, in July, a Seed Synergy information session was hosted jointly by the Canadian Seed Growers' Association (CSGA) and the Canadian Seed Trade Association (CSTA) to update members and get feedback on where the project is heading.

A huge theme of Seed Synergy is the idea of a Single Window through which anyone and everyone involved in Canadian seed can access information.

At the same time, the goal of Seed Synergy is to propose a next-generation seed system to the federal government — in the form of a white paper anticipated this fall — in time for the government's planned opening of the Seeds Act scheduled for 2020. It is this "window of opportunity" that the Seed Synergy partners seek to take advantage of.

4 Main Areas

The Seed Synergy partners have been focused on the whole system but in particular the potential impacts of:

1. Streamlining member services into a "Single Window" — A customer service oriented means of providing information and conducting business with seed industry stakeholders.

2. Enabling plant breeding innovation — Proposed is the idea of an industry-wide coalition that, in effect, would remove any unnecessary complexities resulting from the existence of three separate review offices which assess the food, feed and environmental safety of crops in Canada.

3. Stimulating innovation and value creation — Following an extensive process through workshops, working groups and a task force of the Agriculture and Agri-Food Canada Grains Roundtable two proposed models for value creation in cereals were tabled last fall: Producer-Facilitated Royalty Collection, also known as an End Point Royalty; and Royalty Collection Enabled via Contract, known as a Trailing Royalty. The CSTA Intellectual Property Committee voted at its annual meeting in Montreal in July to support the Trailing Royalty option. The federal government has announced public consultations will be held in November to discuss Plant Breeders' Right changes that would be needed to support a value creation funding model.

4. Next-generation traceability and seed certification framework — Seed Synergy proposes a public-private partnership with CFIA having overall responsibility for a modernized and streamlined version of the regulations, for enforcement, for monitoring and for international trade.

Is a Merger Possible?

The boards of our five dedicated seed associations — CSTA, CSGA, Canadian Seed Institute (CSI), Commercial Seed Analysts' Association of Canada (CSAAC) and the Canadian Plant Technology Agency — have given preliminary direction to explore a possible merger of those organizations, in addition to a formal alignment with CropLife Canada modelled on the existing CropLife Canada-CSTA Memorandum of Understanding.

The intent is to create a streamlined model for information management, advocacy, service provision and provide greater value for the industry's collective members, and — most importantly — to amplify the impact of the various complementary functions within the Synergy organizations.

The temporary "placeholder" name Seeds Canada is being used to reference this hypothetical single organization.

As a precursor to a possible merger of these five groups, CSI and CSAAC have indicated they're looking at exploring a "pre-emptive" merger themselves.

Opinions from Wild Rose Country

Ron Markert
CSGA Board Member and President, Markert Seeds

On Reaching the Goal of a merger by 2020: "We knew things would be slow, but when you try and bring six organizations together, things take time. You have to remember this is solely exploration. We're simply looking at the possibility of merging. We're not saying this is what we're going to do. With CropLife Canada being a part of it — but at the same time not being a part of it — we'll see how it plays out. We're on the tip of the iceberg now to see if we're all on the same page and want to work together. Everyone wants to do it fast. I agree with doing it as fast as we can, but it takes time to talk to everyone and get their opinions."

On the inner workings of the Oversight Committee: "We've only had five one-hour conference calls. Each one is only an hour long. We've only met face-to-face twice. It's proving to be a challenge to get everyone on the same page. One of the big issues is trust. We have to learn to do that, and it won't happen overnight. One of the challenges we have at CSGA is the fact we have 3,500 members. We have a lot of people to communicate with before we can make a decision. For us that's a year-long process. 2019 is the earliest anything can even be decided."

Morgan Webb
President, Commercial Seed Analysts Association of Canada and Owner, SeedCheck Technologies Inc.

On CropLife Canada Staying Independent in the Event of a Merger: "It's not that CropLife is staying on the outside, they're very much still a partner on the inside. They simply have more interests than just seed."

On What he Expects from the White Paper Slated for this Fall: "The green paper did a lot to explore various possibilities but didn't have a lot of detail and wasn't vetted by each organization's members like the white paper will be. Once we get further into detail, you'll see everyone around the table really having a great discussion." **Marc Zienkiewicz**

WHERE ON THE WEB

Haven't read the Seed Synergy Green Paper? Visit **seedsynergy.net/get-informed/.**

Major Milestone Met

Frontier Seed Cleaning Co-op surpasses the one million bushels mark, doubling its volume in five years.

FOR THE FIRST time in its near 40-year history, Frontier Seed Cleaning Co-op Ltd. has processed more than one million bushels of seed and grain, surpassing all expectations of Ken Wiebe, the plant's manager.

"We did almost 1.1 million bushels. It's unbelievable. Every year you figure you can't do any more, but it keeps increasing," says Wiebe. "It's a good feeling, but sometimes it's very hectic considering the capacity — if you divide 300 to 350 bushels per hour by 1.1 million bushels that's a lot of hours."

Over the past five years, the plant has doubled its volume. In 2013, the plant processed roughly 500,000 bushels, and each year thereafter, increased bushel numbers by at least 100,000. One reason the plant topped one million bushels is its storage capacity.

Last summer, Wiebe installed two additional storage bins, increasing storage volume by about 7,000 bushels, bringing the plant's total storage capacity up to 30,000 bushels. He also upped the plant's operating times: during peak seasons, it runs around the clock. Wiebe figures about 3,400 hours went into processing 1.1 million bushels of oats, wheat, canola, peas, barley and lentils.

However, it's the region's increasing production acres driving the plant's boom. "Our acres have increased. They've probably tripled over the last two to three years. A lot of new land is being put into production," he says.

Also central to the plant's processing growth is the organic industry. According to Wiebe, about 30 to 40 per cent of all organic producers in Alberta are growing crops in his region. The organic industry has significantly boosted production in the area for the last five years. As a certified organic facility since 2013, approximately 50 per cent of the plant's processing can be attributed to this sector.

"The organic industry is big here," says Wiebe. "This is what makes us money. We got our plant certified in 2013, and it's been picking up every year."

The plant currently cleans about 300,000 to 400,000 bushels of organic products per year, in addition to 20,000 to 30,000 bushels of conventional oat seed for distribution to organic producers.

From left to right: Hunter Orlesky, Ken Wiebe, Simon Peters, and Edith Peters.

Big Plans

Established in 1980, and sitting on two acres near the northern Alberta hamlet of La Crete, the plant has reached its processing capacity, says Wiebe, and he has no plans to increase the volume it can handle. "I've done everything I can do with this plant," he says. However, Wiebe has got big plans for the future.

The ink has only just dried on the legal paperwork for the purchase of seven acres to house a new seed cleaning facility on the outskirts of La Crete. The plant manager hopes to break ground in three to four years for a state-of-the-art seed cleaning facility.

"When we do it, we want to go all out. We want to build a big, modern facility. That's the goal we've set for now," says Wiebe. He figures it'll take a year from the start of construction to cleaning the first bushels of seed and grain.

Besides a brand-new building, Wiebe also looks forward to new, high-tech equipment, such as a colour sorter, and computerized operations.

"This is world-renowned oat country. We do lots of oats here, but then wild oats become a problem. We need a colour sorter. I can only take out a limited amount of wild oats — you need a colour sorter for the rest. That'll be super exciting," he says.

Presently, everything is as it should be at the plant: Wiebe has it running like a well-oiled machine. "Right now, we're operating pretty smoothly. I don't foresee any challenges unless the capacity gets way out of hand. Every year you think you can't do more, and then you throw in another 100,000 bushels on top. It's the struggle we'll have for the next three to four years," he says.

The only other potential pitfall is a downturn in organic markets, something Wiebe doesn't dwell on. Instead, he remains focused on the tasks at hand, such as separating crop combinations.

"When we do it, we want to go all out. We want to build a big, modern facility. That's the goal we've set for now."

—Ken Wiebe

The season begins to heat up for the plant manager in August, when farmers start combining. And, because intercropping is so popular in the area, separating oats and peas or barley and peas are fall projects on Wiebe's to-do list.

Processing peas begins in August and lasts until the end of October. Then the Frontier crew starts on the rest of the seed cleaning. During the busy seasons, up to seven other staff members are on the payroll.

However, no matter the time of year or how many staff members are employed, an important focus of the business is customer care. According to Wiebe, establishing and maintaining good relationships with the producer community is important, especially because of the plant's size.

"Our capacity is so small that we all have to cooperate. I have very good relationships with my farmers. I bend over backwards for them, and they for me. That's very important because of the plant's size and processing volume." **Kari Belanger**

"PARDON ME – DO YOU HAVE ANY GREY POUPON?"

The first hybrid brown mustard and a whopping 61 other cultivars were put forward for registration at this year's meeting of the Prairie Grain Development Committee.

IN SOME WAYS, this year's meeting of the Prairie Grain Development Committee (PGDC) belonged to the mustard plant.

Held at the end of February 2018 in Banff, Alta., the PGDC's Prairie Recommending Committee for Oilseeds (PRCO) put forward only one line for registration, but it's a major one — the first hybrid brown mustard ever released.

B3318 has significantly higher (24 per cent) yield than the check variety, Centennial Brown. Developed in the breeding program of Bifang Cheng, the condiment mustard breeder with Agriculture and Agri-Food Canada in Saskatoon, it's aimed at the European market, where brown mustard is used to produce Dijon mustard.

But according to Kevin Hursh, executive director for the Saskatchewan Mustard Development Commission, it opens up a wealth of possibilities for the Canadian mustard industry.

"A 20 per cent yield boost over the check variety is hugely significant for growers. The question will be if can we produce hybrids that present a good value proposition for growers," he says. "Preliminary information seems to indicate that yes, we should be able to do that. Companies specialize in hybrid production both in Alberta and B.C., and with winter nurseries in Chile, the industry should be able to help this take off."

PGDC acts as a forum for the exchange of information relevant to the development of improved cultivars of grain crops for the western Canadian Prairies and advises regulatory agencies about legislation and regulations governing grain breeding, cultivar production and sector development.

This year, a whopping 62 cultivars in four different crop categories were recommended for registration, delivering even more options for stakeholders throughout the agriculture sector and beyond.

Among those cultivars were 23 pulse lines put forward by the Pulses and Special Crops Committee (PRCPSC). As demand for pulses goes up, breeding for new pulses to satisfy consumers is booming along with it, notes Peter Frohlich, pulses and special crops project manager for the Canadian International Grains Institute (Cigi).

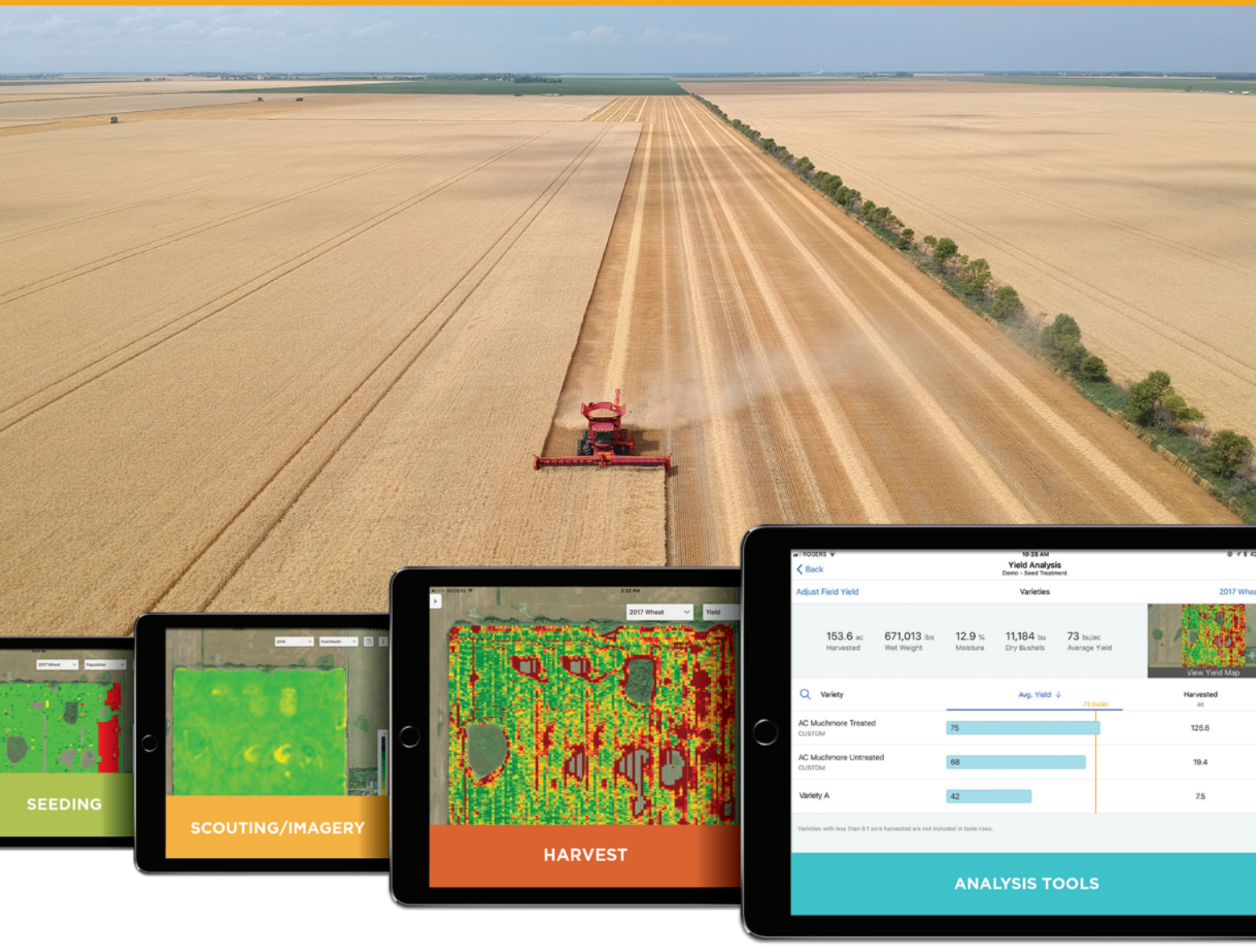
He addressed the PRCPSC this year to unveil some recent work done by Cigi in the area of pulse flour. Under the Advancing Pulse Flour Processing and Applications project, Cigi is continuing the development and optimization of pulse flours as high-quality food ingredients to further their commercial use in pulse-based products.

"One of the biggest obstacles for the pulse market is flavour. Pulses are extremely nutritious, however consumers often don't like the flavour of them when used in certain products," Frolich says.

According to Frohlich, as demand for ingredients like pulse flour goes up, processors will be looking for ingredients that add good flavour — or none at all — to their products. That's where breeders involved with PGDC come in, Frohlich adds. "Addressing flavour issues around pulse ingredients starts at the breeding level."

As processors look for ingredients with qualities like improved flavour profiles, breeders continue to deal with new challenges and opportunities presented by new technology. The theme for this year's PGDC plenary session was

SEE THE BIGGER PICTURE



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"Addressing flavour issues around pulse ingredients starts at the breeding level."

— Peter Frohlich

disruptive change and transformational technology. Speakers included Tim Sharbel, professor in the plant sciences department at the University of Saskatchewan, and Erin Armstrong, industry and regulatory affairs director for Canterra Seeds.

Sharbel spoke about launching an apomixis research program at the Global Institute for Food Security, located at the University of Saskatchewan. Apomixis is a naturally occurring phenomenon in certain types of plants like St. John's wort and Kentucky bluegrass, which reproduce seed asexually, whereby all offspring are genetically identical to the mother plant.

It isn't found in any food crops, but if apomixis could be successfully introduced into agriculture, Sharbel says it could be a disruptive technology. Essentially, it would enable the immediate fixation of any desired genotype and lead to faster, simpler breeding schemes.

"People have been studying the biology of these asexual plants and animals for 100 years or so, but it's only 20 or 30 years ago that people started thinking about it in terms of agriculture," he says. "There are a number of laboratories around the world studying apomixis. It's worth billions of dollars if we can get it working."

Armstrong's presentation focused on two value creation models for cereals she has been working on with Tom Steve, general manager of the Alberta Wheat Commission. Together they co-chair the Value Creation Working Group (VCWG), a sub-committee within the federal government's Grains Roundtable (GRT). It was formed in 2016 to inform the federal government as to the potential for a new royalty system for cereals. (See page 22 to read more about value creation in cereals)

"The idea that value creation and capture could be a part of Canadian agriculture in the future is something that could really change how things work. We could see an influx of new investment in breeding and new opportunities for other companies and organizations to be involved," says Mitchell Japp, PGDC chairperson.

"It's at the idea stage right now and we don't know how it will play out, but it will ultimately affect both the breeding side and the seed development side." **Marc Zienkiewicz**

BY THE NUMBERS

The breakdown of cultivars recommended for registration at the 2018 PGDC meeting is:

Prairie Recommending Committee for Wheat, Rye and Triticale:
- 14 Canada Western Red Spring
- 1 Canada Northern Hard Red
- 1 Canada Western General Purpose
- 1 in Canada Western Special Purpose
- 2 Canada Western Special Purpose winter wheat
- 3 Canada Western Durum Wheat
- 2 spring triticale
- 1 winter triticale
- 1 fall rye

Prairie Recommending Committee for Oats and Barley:
- 3 oat
- 7 barley

Prairie Recommending Committee for Oilseeds:
- 1 mustard

Prairie Recommending Committee for Pulse and Special Crops:
- 5 dry bean
- 6 lentil
- 8 faba bean
- 4 field pea
- 1 buckwheat

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Len Solick with his sons Kelsey and Corwin.

Photo: Paul Sankar

No *I* in *Team*

Family and customers drive Solick Seeds Ltd.

WHEN SPEAKING WITH Len Solick of Solick Seeds, it is clear there are two driving factors behind his business: his family and his customers.

"We wouldn't be able to do what we do without the family base," Len says.

Backing up a few years — 30-plus years to be exact — Len was in the engineering field for quite some time, living in Edmonton as well as working in the Arctic.

"I was all over the place and had a couple of close encounters in the Arctic, and then I decided it was time to move on."

Moving on included buying a farm in Halkirk, Alta. in 1978 after working a bit on his parents' farm in Lacombe, Alta. "We started out as a commercial grain and cattle enterprise. Through transition, in 1986, I grew my first pedigreed seed crop. That was because of the Crow Rate — I saw freight would be an issue going forward. That was one of my main reasons for getting into the seed business — we were able to market off the farm. My grandfather was actually in the seed business quite a few years back. He was a founding director of United Grain Growers. My parents farmed southeast of Lacombe, grain and cattle … I guess I continued on in that direction."

Moving onto the farm with their then one-year old son at the time, no one could predict that the family — and the operation — would grow.

"We take that information — after the sales year has gone by — and we sit down and say, 'Okay, what can we do better to look after these customers?'"

— Len Solick

Len's wife, Lucy, and sons Kelsey and Corwin all work on the farm. Len says Lucy is behind the scenes doing a lot of the paperwork. Other than a full-time hire, and maybe an extra body for occasional help in the busy seasons, Solick Seeds is family owned and operated. Len and Lucy's daughter Kim resides in Lacombe with her husband, Rieley and three children.

But on the farm, it is all about family teamwork.

Spring is the most hectic with seed delivery, seed pick up, and treating and seeding their own crops as well. Corwin and Kelsey do all of the seeding and spraying, and at harvest everyone is out there doing their part. One of the biggest labour demanding jobs is the cleaning of all operations whether it be the bins, equipment

or machinery used; combines and grain dryer being the biggest jobs. Len says many hours are spent all year on this which most people do not realize.

Due to the difficulties to get hired labour, Solick Seeds opted to not set up their own seed cleaning operation. All of the seed is cleaned at the Forestburg Co-op Seed Cleaning Plant Ltd. This involves many hours of trucking, which both sons are involved in.

Len's oldest son, Kelsey, is a heavy-duty mechanic by trade, and Len says Kelsey is an innovator when it comes to equipment. Kelsey looks after all the equipment, making sure that everything is ready and working. He also does most of the marketing.

As far as innovation goes, Len is aware the younger generation of farmers are keeping things moving forward in terms of customer service and ensuring Solick Seeds has everything its customers desire. He says without his sons, Solick Seeds would not be where it is today.

But as innovation advances the industry, Len says there is nothing better than touching base with his customers — personally. He knows how valuable his customers are, and he wants to ensure they are well taken care of.

"I love to talk to the people. I like to touch base afterwards — find out how things have been since the year has gone by. Sometimes I don't get to everyone, but I like to touch base with them to see how a particular product has worked for them."

During the winter months is when you would usually see Len on the phone, every night, catching up with his customers.

"I do a lot of that — people are more relaxed then and have a bit more time. Farmers are really good — if they don't like the product they'll tell you in about 30 seconds. On the other side, if it is our product we can improve on or if there is something else they are looking for, that gives us a couple of months to work toward a variety we can work into our rotation if we don't have it. Len says they gain valuable information and assistance from many sources, but the Field Crop Development Centre and the Lacombe Research Centre has been exceptional.

In the springtime, Len says he is the guy in the yard. "I am there talking to my customer and I enjoy that the most because it gives me an idea as to what's going on. Maybe I am not totally there loading the trucks, but I am at the scale or someplace."

Len says he learns as much from his customers as they do from him. And that propels some of Solick Seeds' business decisions.

"We take that information — after the sales year has gone by — and we sit down and say, 'Okay, what can we do better to look after these customers?'"

Solick Seeds farms some 4,000 acres of pedigreed seed, including but not limited to peas, barley, wheat and spring triticale for its niche market. Commercial canola is also grown every year. Len is well aware of two key factors in the farming industry; you cannot make everyone happy all the time … and you can't control the weather. But you can control your relationship with your customers and who you work with. And for Len, that is his reward after a hard day's work. **Michelle Clarke**

The *Alberta Seed Guide* New Varieties List is your heads up to what will soon be available in a field near you.

Some varieties may only be available in limited supply, so make sure you call your local representative for more information. The companies that were asked to supply information are responsible for any claims contained within the list. Always remember that variety performance may vary from region to region. Visit the seed.ab.ca website for company links.

abbreviations

DISEASE RESISTANCE
S – Susceptible
MS – Moderately Susceptible
MR – Moderate Resistance
R – Resistant
I – Intermediate

OTHER
CB – Corn Borer
CHU – Crop Heat Units
CPT – Canola Performance Trials
FHB – Fusarium Head Blight
HU – Heat Units
IDC – Iron Deficiency Chlorosis
PRR – Phytophthora Root Rot
SCN – Soybean Cyst Nematode
WCC/RCC – Western Canada Canola/ Rapeseed Recommending Committee

TRAITS
CR – Clubroot Resistance
GENVT2P RIB – Genuity VT Double Pro RIB Complete
GENRR2Y – Genuity Roundup Ready 2 Yield
GENRR2X/SCN – Genuity® Roundup Ready 2 Xtend
GT – Glyphosate Tolerant
LL – Liberty Link
RR – Roundup Ready
RR2 – Roundup Ready 2
RR2Y – Roundup Ready 2 Yield
SCL – Sclerotinia Resistance
SS – SmartStax

WHEAT
CNHR – Canada Northern Hard Red
CPSR – Canada Prairie Spring Red
CWAD – Canada Western Amber Durum
CWHRW – Canada Western Hard Red Winter
CWRS – Canada Western Red Spring
CWSWS – Canada Wester Soft White Spring

ALFALFA

ALFALFA

Company		Variety Name/Type	Use (Hay or Grazing)	Winter Hardiness	Merit Tested in Canada (Y/N)	Highlights
BrettYoung	BrettYoung 1-800-665-5015 brettyoung.ca	Surge HG Taproot	Hay	Excellent	Y	Hi-GestAlfalfa Technology Improved fibre digestion and crude protein More pounds of milk per cow
Northstar Seed	Northstar Seed 1-800-430-5955 northstarseed.com	Revolution MD	Hay	1.7	N	High digestibility alfalfa Excellent disease resistance Fast regrowth, 30/30 DRI
		Sidewinder	Dual Purpose	1.6	N	Creeping root High yield Excellent winterhardiness
Nutrien Ag Solutions / Proven Seed	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444 nutrienagsolutions.ca, provenseed.ca	PV Parlour HG Hi-Gest Tap Root	Hay	1.8	N	51% multifoliate High leaf to stem ratio Low lignin
		Halo 2 Tap Root	Dual Purpose	2.0	N	75% multifoliate Excellent salinity tolerance High forage yield potential

BARLEY

BARLEY

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
Canterra Seeds	CANTERRA SEEDS 1-204-988-9750 canterra.com	AAC Connect Malt 2-Row	Equal to AC Metcalfe	103% of AC Metcalfe	MR to FHB MR to Net Blotch	High yield potential with plumper kernels Excellent standability due to its short strong straw Excellent malting quality - similar profile to AC Metcalfe
Nutrien Ag Solutions / Proven Seed	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444 nutrienagsolutions.ca, provenseed.ca	Oreana Feed Grain 2-Row	+2 days to AC Metcalfe	114% of AC Metcalfe	R to Various Smuts MR to Net/Spot Blotch	Well suited for high input operations and manured soils Excellent yield potential and test weight Very short stature/straw length
		Claymore Feed Grain and Sileage 2-Row	+2 days to AC Metcalfe	116% of AC Metcalfe	R to Various Smuts I to Net/Spot Blotch I to FHB	Superior straw strength High test weights Highest yielding feed barley in 2016 Co-op testing
SeCan	SeCan 1-800-665-7333 secan.com	CDC Fraser Malt 2-Row	+1 day of AC Metcalfe	114% of AC Metcalfe	I to FHB MR to Stem Rust	High yield potential Strong straw Under malt market development
Syngenta	Syngenta Canada 1-877-964-3682 syngenta.ca	Sirish 2-Row	+1.5 AC Metcalfe	107% of AC Metcalfe	MR for Scald R for Smuts S to Stem Rust and Loose Smut MS to FHB	High yield potential Short straw, lodging 2.6

CANOLA

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
BASF We create chemistry	BASF 1-877-371-2273 AgSolutions.ca	InVigor L234PC Hybrid *napus* LibertyLink	3 days earlier than the average of the checks	104% of the checks (InVigor 5440 and Pioneer 45H29) in the 2017 WCC/RRC trials.	R to Blackleg R to Clubroot	Pod Shatter Reduction Technology New second generation multi-genetic clubroot resistance* Excellent yield performance and strong standability Suitable for all growing seasons, medium height
		InVigor Health L258HPC Hybrid *napus* LibertyLink	One and a half days later than the average of the checks	104.9% of the checks (InVigor 5440 and Pioneer 45H29) in the 2017 WCC/RRC trials.	R to Blackleg R to Clubroot	High yielding hybrid with very strong standability Specialty oil, Pod Shatter Reduction Technology Clubroot Resistance* Suitable for all mid- to long-growing seasons * To predominant clubroot pathotypes found in Canada at the time of registration. All InVigor clubroot-resistant hybrids share the same clubroot resistance profile. The NEW InVigor L234PC has this resistance profile plus it contains 2nd generation multi-genetic clubroot resistance to additional clubroot pathotypes to help combat evolving clubroot pathotypes.
VICTORY HYBRID CANOLA	VICTORY VictoryCanola.com	V24-1 Hybrid RR	Mid	101% of 5440 and 45H29	R to Clubroot R to Blackleg R to Fusarium Wilt	High yielding, clubroot resistant variety with excellent standability Medium height Polygenic blackleg resistance providing control at every growth stage
		V33-1CL Hybrid Clearfield	Mid to Late	104% of 46H75	R to Blackleg R to Fusarium Wilt	High yielding variety with excellent standability. Medium height Polygenic blackleg resistance providing control at every growth stage

CANOLA

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
CORTEVA agriscience Agriculture Division of DowDuPont™ / BREVANT seeds	Corteva Agriscience, Agriculture Division of DowDuPont 1-800-667-3852 brevant.ca	1028 RR Genuity RR	Mid-Late	110% of 1020 RR	R to Clubroot R to Blackleg R to Fusarium Wilt	High yield potential Medium height Multi-genic blackleg resistance
		2028 CL CL	Mid-Late	102% of 2020 CL	R to Clubroot R to Blackleg R to Fusarium Wilt	High yield potential Medium height Multi-genic blackleg resistance
CORTEVA agriscience Agriculture Division of DowDuPont™ / PIONEER	Corteva Agriscience, Agriculture Division of DowDuPont 1-800-667-3852 ca.pioneer.com/west/en	45CM39 Genuity RR	Mid	103% of 45H33	R to Clubroot R to Blackleg R to Fusarium Wilt	High yielding hybrid with excellent standability Suitable for straight cut New source of clubroot resistance - Resistant to current pathotypes 2,3 5,6 and 8 and emerging pathotypes 2B, 3A and 5X.
Nutrien Ag Solutions / Proven SEED	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444 nutrienagsolutions.ca, provenseed.ca	PV 585 GC	Mid	106% of PV 580 GC	R to Blackleg R to Fusarium Wilt R to Clubroot	Multigenic clubroot resistance Very strong blackleg resistance Excellent standability
		PV 591 GCS	Mid-Early	102% of PV 590 GCS	R to Blackleg R to Fusarium Wilt MR to Sclerotinia R to Clubroot	High yielding hybrid with complete disease protection Very good standability Protection against Blackleg, Clubroot and Sclerotinia

CHICKPEAS

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
SeedNet	SeedNet Inc 403-715-9771 seednet.ca	CDC Palmer Kabuli	Medium	Higher than Check	M to Ascochyta	Improved yield over Amit Earlier maturity to Amit or CDC Orion Seed size predominantly 9-10 mm

CORN

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
BrettYoung ELITE	BrettYoung/Elite 1-800-665-5015 brettyoung.ca	Dalton R	2150 CHU Silage RR2 Silage and Grazing	Excellent	Excellent plant health	Early maturing, high yield silage hybrid Excellent early season vigour and extended harvest window Good staygreen and very good feed quality
		Archibald R	2450 CHU Silage RR2 Silage and Grazing	Excellent	Excellent plant health	Tall plant suited for silage or grazing Excellent stalk strength Suited to long heat unit areas
		E49K32 R	2300 CHU Grain VTDoublePRO RIB Complete Grain and Silage	Excellent	Very Good for Goss's Wilt Tolerant to Smut	Early flowering Excellent stalks and roots for great standability Excellent yield for maturity and very good tolerance to Goss's Wilt
		E61C37 R	2725 CHU Grain RR2 Silage and Grazing	Excellent	Very good tolerance to drought	Tall plant ideal for high silage yield Very good early vigour with excellent drought tolerance A great full season silage choice
		E61C35	2725 CHU Grain Conventional	Excellent	Very good tolerance to drought	Tall plant suited for high silage yield A great full season conventional silage choice Very good early vigour with excellent drought tolerance
CORTEVA agriscience Agriculture Division of DowDuPont™ / PIONEER	Corteva Agriscience, Agriculture Division of DowDuPont 1-800-667-3852 ca.pioneer.com/west/en	P6909R GM Hybrid Silage/Grazing	1950 HU	Excellent Silage Yield Potential		Ultra early silage corn hybrid with strong agronomics Very good drought tolerance and stalk strength Good root strength and exceptional test weight Higher silage yields than Pioneer hybrid 39F44
		P7455R GM Hybrid Grain Corn	2100 HU	9.5 bu/ac increase vs. a competitor corn hybrid, across 5 large-scale plot locations in Western Canada, 60% WINS	Average for Goss's Wilt Resistance	Excellent grain corn hybrid Very good test weight scores Excellent stalk and root strength Very good drought tolerance scores
DEKALB	DEKALB 1-800-667-4944 DEKALB.ca	DKC29-89RIB VT2P	2275 CHU	Excellent	VT2P	Excellent drydown and harvest appearance Excellent root and stalk strength Late flowering timing for maturity, but dries down very quickly

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*Based on 2017 VICTORY Performance Trial results.

Legend Seeds	Legend Seeds Canada 1-888-974-7246 legendseeds.ca	LR 9972 GT Grain Corn	2125 CHU 72 Day RM	Excellent for ultra early grain maturity	Agrisure Trait QuickRoots on Seed	Nice grain quality and good test weight Fast black layer with great dry down for early harvest Semi determinate ear type, very good agronomics Early hybrid with outstanding emergence and strong vigour
		LR 9473 RR Grain RR	2150 CHU 73 Day RM	Excellent for early grain maturity	Roundup Ready	Performs well on all soil types but best under high fertlity Very early flowering Semi-determinate eat type with fast dry down
		LR 9573 VT2PRIB Grain VT Double Pro RIB Complete	2200 CHU 73 Day RM	Excellent for early grain maturity	VT Double Pro RIB Complete QuickRoots on Seed	Superior ear retention and strong plant health package High-yielding early maturity with semi-determinate ear type Recommended for light to medium soil types
		LR 9474 VT2PRIB Grain/Silage VT Double Pro RIB Complete	2225 CHU 74 Day RM	Excellent for grain/ silage	VT Double Pro RIB Complete QuickRoots on Seed Excellent for Goss's Wilt	Determinate eat type with rapid grain setup Recommended for all soil types Strong plant health package with excellent yield potential
		LR 99S77 RR Silage RR	2310 CHU 77 Day RM	Excellent for silage	Roundup Ready	A great choice for a silage-specific product Medium-tall to tall hybrid with excellent agronmics Excellent choice for the drought regions of the high plains area Adapted to a wide range of soil types
		LR 9579 RR Silage RR	2350 CHU 79 Day RM	Excellent for silage	Roundup Ready	Rapid early growth Great standability due to lateral branching root style Good plant health package
		LR 9980 VT2PRIB Silage VT Double Pro RIB Complete	2400 CHU 80 Day RM	Excellent for silage	VT Double Pro RIB Complete QuickRoots on Seed	Silage choice with very good roots and stalks Semi-determinate ear with good girth allowing for bottom end stability Great fit on tough and variable soils
		LR 9583 VT2PRIB Silage VT Double Pro RIB Complete	2450 CHU 83 Day RM	Excellent for silage	VT Double Pro RIB Complete QuickRoots on Seed	Silage choice with flex ear type Early flowering with rapid grain setup Excellent yield in low production environments Exceptional standability
		LR 9983 VT2PRIB Grain/Silage VT Double Pro RIB Complete	2490 CHU 83 Day RM	Excellent for grain	VT Double Pro RIB Complete QuickRoots on Seed	Strong emergence and seedling vigour Semi-determinate ear with good ear type and dry down Medium statured plant with excellent stalks and root strength Impressive disease tolerance including NCLB and Goss's Wilt
		LR 9885 GTCBLL Silage Agrisure GT/CB/LL	2625 CHU 85 Day RM	Excellent for silage	Agrisure GT/ CB/LL QuickRoots on Seed	Silage choice with semi-determinate ear Excellent disease package Robust plant type with exceptional standability Recommended for all soil types
PRIDE SEEDS	PRIDE Seeds 1-800-265-5280 prideseed.com	A3993G2 RIB GM Hybrid Silage/Grazing	2025 CHU	Excellent Grain Yield	VT2P for Above Ground Insect Protection and Glyphosate Tolerance	New introduction for ultra early season maturity zones. Strong emergence and excellent seedling vigour allow for a fast early season start. Superb grain quality and an early flower with rapid drydown make this hybrid an excellent choice for this maturity zone
		AS1017RR EDF GM Hybrid Silage/Grazing	2050-2250 CHU	Excellent Silage, Grazing and High Moisture Yield	Roundup Ready 2	New introductory early silage, high moisture corn offering opportunity in shorter season growing areas. Slow grain drying rate preserves reliable and consistent feed quality at ideal moisture content. Strong emergence and aggressive spring vigour. Tall, uniform plant height. Consistent ear size producing flint kernels on white cob. Very good health, standability and disease resistance, including Goss's Wilt
		A4514RR GM Hybrid Silage/Grazing	2275 CHU	Excellent Silage and Grain Yield	Roundup Ready 2 for Glyphosate Tolerance	New Roundup Ready 2 introduction for dual purpose use as grain and silage useage. Strong yield performance potential with rapid drydown. Very good seedling vigour make it a good choice for early planting. Attractive grain on girthy ears

PRIDE SEEDS	PRIDE Seeds 1-800-265-5280 prideseed.com	A4646G2 RIB GM Hybrid Silage/Grazing	2300 CHU	Excellent Silage and Grain Yield	VT2P for Above Ground Insect Protection and Glyphosate Tolerance	New introduction for dual purpose use as grain and silage useage. Strong yield performance potential with rapid drydown. Very good seedling vigour makes it a good choice for early planting. Outstanding fall appearance and late season plant integrity
		AS1037RR EDF GM Hybrid Silage/Grazing	2275-2450 CHU	Excellent Silage, Grazing and High Moisture Yield	Roundup Ready 2	New introductory choice for silage feed and high moisture corn. Tall plant with consistent ears that produces flint kernels on white cob. Excellent silage characteristics, yield and energy content. Slow grain and plant drying rate preserves reliable and consistent feed quality at ideal moisture content. Additional staygreen nature for a wider harvest window. Outstanding health and standability
Nutrien Ag Solutions ProVen SEED	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444 nutrienagsolutions.ca, provenseed.ca	PV 61180 RIB	2275 CHU	Excellent	VT Double Pro RIB Complete	Excellent stalk strength, drydown and yield Superb yield potential Elite grain
		PV 62282 RIB	2350 CHU	Outstanding	VT Double Pro RIB Complete	Excellent silage characteristics Excellent stalk strength, yield and quality Excellent stay green
		PV 61079 RIB	2250 CHU	Excellent	VT Double Pro RIB Complete	Excellent stalk strength, drydown and yield Early flowering Dual purpose
THUNDER SEED FIRST in the FIELD	Thunder Seed Canada 1-888-6Thunder thunderseed.com	TH6977 VT2P	2200 CHU	Excellent	GENVT2P RIB	Good Gosss's Wilt and NCLB tolerance Medium height with great agronomics Good yield stability across variable soils

FALL RYE

FALL RYE

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
FPGenetics	FP Genetics Inc. 1-877-791-1045 fpgenetics.ca	KWS Gatano Hybrid Fall Rye	+2 day of Hazlet	124% of Hazlet	I to Ergot	Excellent hybrid fall rye yielder Improved ergot resistance Very good winter hardiness
		KWS Progas Hybrid Fall Rye		Silage product		Top silage yielder Very good standability Very good winter hardiness
SeedNet	SeedNet Inc 403-715-9771 seednet.ca	Guttino Hybrid Fall Rye	Excellent Winter Survival	Very High Yielding		Highest falling number for milling markets
		KWS Daniello Hybrid Fall Rye	Very Good Winter Survival	Very High Yielding	Low Ergot Risk	Lowest ergot risk
		KWS Propower Hybrid Fall Rye	Very Good Winter Survival	Very High yielding	Low Disease Incidence	Silage/forage variety Good lodging resistance

FLAX

FLAX

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
SeCan Canada's Seed Partner	SeCan 1-800-665-7333 secan.com	AAC Bright	+2 days CDC Bethune	94% of CDC Bethune		Bright yellow seed coat Good fit in food and baking products Good lodging resistance
		AAC Prairie Sunshine	+3 days CDC Bethune	105% of CDC Bethune		Good lodging resistance Best fit in high production areas
		CDC Buryu	+1 days CDC Bethune	105% of CDC Bethune		108% of CDC Bethune in long season areas Seed slightly larger than CDC Bethune
SeedNet	SeedNet Inc 403-715-9771 seednet.ca	CDC Dorado Yellow Flax	-1 day Flanders	Similar to AC Nugget Higher than AC Nugget in black and grey soil zones	Immune to Flax Rust MR to Wilt and Powdery Mildew	Higher oil content, linolenic acid, meal protein than Flanders Shorter season Larger seed than Flanders

LENTILS

LENTILS

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
SeCan Canada's Seed Partner	SeCan 1-800-665-7333 secan.com	CDC Impulse Small Red Lentil Clearfield	Early to Medium	103% of Maxim	MR to Anthra-nose (race 1) MR to Ascochyta	Small seed, 44 grams/1000 seeds High yielding small red lentil with the Clearfield trait
		CDC Redmoon Small Red Lentil	Early to Medium	110% of Maxim	MR to Anthra-nose (race 1) MR to Ascochyta	Small seed, 41 grams/1000 seeds High yielding conventional small red lentil
		CDC Roxy Extra Small Red lentil	Early to Medium	100% of Maxim	MR to Anthra-nose (race 1) MR to Ascochyta	Small seed, 34 grams/1000 seeds High yielding extra small red lentil Plump seed for ease of processing
		CDC Kermit Small Green Lentil	Early to Medium	102% of Kermit	MR to Anthra-nose (race 1) MR to Ascochyta	Small seed, 34 grams/1000 seeds High yeilding small green lentil
SeedNet	SeedNet Inc 403-715-9771 seednet.ca	CDC Proclaim Small Red Lentil CL	Early to Mid	Higher than Check	MR to Anthra-nose MR to Ascochyta	Higher yield to CDC Maxim Taller than CDC Maxim Seed thickness greater than CDC Maxim

OATS

OATS

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
SeCan Canada's Seed Partner	SeCan 1-800-665-7333 secan.com	ORe3541M White Hulled Milling Oat	-2 days of AC Morgan	98% of AC Morgan	R to Crown Rust	Short strong straw High percentage plump
		ORe3542M White Hulled Milling Oat	-1 day of AC Morgan	100% of AC Morgan	R to Crown Rust	Short strong straw Extremely high percentage plump

ORCHARDGRASS

Company		Variety Name/Type	Use (Hay or Grazing)	Winter Hardiness	Merit Tested in Canada (Y/N)	Highlights
BrettYoung	BrettYoung 1-800-665-5015 brettyoung.ca	Trailburst Leafy Bunchgrass	Hay and Pasture	Very Good	Yes	Selected for vigour and plant health High forage quality and palatibility High yield

PEAS

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
CANTERRA SEEDS	CANTERRA SEEDS 1-204-988-9750 canterra.com	AAC Comfort Green Pea	Medium	100% of CDC Limerick	Fair to Fusarium Wilt	Rounder seed shape Good colour intensity and bleaching tolerance
DL seeds	DL Seeds (204) 331-3611 dlseeds.ca	DL Goldeye Yellow Pea Forage	-2 days 40-10	Slightly higher than 40-10		High biomass, leafy type Small seeded, black hilum Better standability than 40-10 Distributed by Riddell Seed Co.
SeCan Canada's Seed Partner	SeCan 1-800-665-7333 secan.com	CDC Athabasca Yellow pea	Medium	96% of CDC Amarillo		Large seed, 300 g/1000 seeds Fair resistance to seed coat breakage Good protein
		CDC Blazer Maple pea	Medium	98% of CDC Amarillo		Small seed, 190 g/1000 seeds Good resistance to seed coat breakage Maple pea with a light coloured seed coat
		CDC Canary Yellow pea	Early	97% of CDC Amarillo		Medium seed, 230 g/1000 seeds Good resistance to seed coat breakage Good protein
		CDC Forest Green pea	Medium	101% of CDC Amarillo		Medium seed, 230 g/1000 seeds Good resistance to seed coat breakage
		CDC Jasper Forage pea	Medium	79% of Grain Yield of CDC Amarillo		Small seed, 180 g/1000 seeds High forage biomass High RFV
SeCan Canada's Seed Partner	SeCan 1-800-665-7333 secan.com	CDC Spectrum Yellow pea	Medium	103% of CDC Amarillo		Medium seed, 240 g/1000 seeds Good resistance to seed coat breakage Good protein
		CDC Spruce Green pea	Medium	97% of CDC Amarillo		Medium seed, 240 g/1000 seeds Fair resistance to seed coat breakage Good protein content
SeedNet	SeedNet Inc 403-715-9771 seednet.ca	CDC Inca Yellow	Medium	Higher than Check	R to Powdery Mildew I to Fusarium	Medium seed weight Low seed coat breakage Good lodging resistance

SOYBEANS

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
BrettYoung ELITE	BrettYoung/Elite 1-800-665-5015 brettyoung.ca	Lassa R2X RR2 Xtend	000.9 2275 CHU	Excellent	Very Good Field Resistance (Rps1c gene) to PRR Very Good to White Mould R to SCN ST to IDC	Very early season RR2Xtend soybean with SCN protection Prefers light fertile soils and narrow rows Medium height plant that stand very well
		Karpo R2 RR2	00.2 2350 CHU	Excellent	Very Good Field Resistance (Rps1c gene) to PRR White Mould: Very good ST to IDC	A tall variety with a great look Very good yield for and early soybean Solid roots and good IDC scores
		Sunna R2X RR2 Xtend	00.3 2375 CHU	Excellent	Very Good Field Resistance (Rps1c gene) to PRR Very Good to White Mould R to SCN ST to IDC	Tall bushy variety suited to heavier soils and wider rows Excellent early season vigour and top yields Very good for IDC
CORTEVA agriscience Agriculture Division of DowDuPont™ BREVANT seeds	Corteva Agriscience, Agriculture Division of DowDuPont 1-800-667-3852 brevant.ca	B0040L1* GENNRR2Y *pending registration	2350 HU	4.2 bu/ac increase over an early competitor soybean variety across 11 locations	Very Good IDC Tolerance Very Good PRR Tolerance	Excellent yield potential in all growing environments and planting systems Excellent field appearance with tawny pubescence Narrow leaf-type soybean and medium to bushy canopy
		B0064S1 GENNRR2Y	2450 HU	Excellent Yield Potential	Cyst Nematode Resistance Phytophthora Rps 1k Resistance Gene Very Good IDC Rating	Good yield potential and plant standability Phytophthora resistance gene allows for good growth on heavier soils Excellent field emergence with medium-tall plant height
		B0067Z1 GENNRR2Y	2450 HU	Excellent Yield Potential	Very Good PRR Tolerance Excellent IDC Tolerance	Excellent yield potential for maturity Strong emergence, medium to short plant height
		P0007A65R Glyphosate Tolerant	2200 HU	Excellent Yield Potential for an Early Maturity Product		New Ultra early soybean with outstanding yield potential Outstanding harvest standability scores Very good shatter score and field emergence
		P006A37X GENNRR2X (Xtend)	2425 HU	2.1 bu/ac increase over Pioneer variety P006T46R in 13 large-scale trials, 70% WINS	Very Good IDC Tolerance	Outstanding yield potential and harvest standability Average plant height for maturity Provides an additional option for weed control
		P00A49X GENNRR2X (Xtend)	2525 HU	1.4 bu/ac increase over Pioneer variety P006T46R in 10 large-scale trials, 70% WINS	Cyst Nematode Resistance Very Good IDC Tolerance	Outstanding yield potential for later maturity soybean Good harvest standability Provides an additional option for weed control
DEKALB	DEKALB 1-800-667-4944 DEKALB.ca	DKB0005-44 RR2X	2175 CHU	Excellent	Excellent White Mould Tolerance Very Good Field Resistance to Phytophthora Root Rot and Brown Stem Rot	Branchy, medium height variety with excellent standability Similar to 22-60RY with more height Ultra-early maturity

DEKALB	DEKALB 1-800-667-4944 DEKALB.ca	DKB0009-89 RR2X	2275 CHU	Excellent	Resistance to SCN Very good field resistance to PRR Excellent White Mould Tolerance	Bushy and branches well Medium height variety with excellent standability Ultra-early maturity
		DKB006-99 RR2X	2450 CHU	Excellent	Resistance to SCN Very Good Field Resistance to PRR	Shorter, bushy plant that branches well Best suited to wide rows and lower populations Well suited to tougher growing conditions
		DKB007-67 RR2X	2475 CHU	Excellent	Resistance to SCN Good Field Resistance to PRR and IDC Very Good White Mould Tolerance	Excellent standability and very good early season vigour Performs well on all soil types
Legend Seeds Canada	Legend Seeds Canada 1-204-331-3696 legendseeds.ca	LS TRI7XT	0.007 RM 2225 CHU	Excellent for ultra early maturity		Upright to semi bush, medium plant heigh Well suited for narrow row spacing (15" or less) Xtend option
		LS TRI8XT	0.008 RM 2250 CHU	Excellent for ultra early maturity	RPS 1C Gene R to SCN	Semi bush, medium plant height Iron Chlorosis field tolerance is outstanding Excellent white mold tolerance Xtend option
		LS TRI9R2Y	0.009 RM 2275 CHU	Excellent for ultra early maturity		Upright to semi bush Medium plant height Well suited for narrow row spacing (15" or less)
		LS 001XT	0.01 RM 2325 CHU	Excellent for early maturity	RPS 1K Gene R to SCN	Semi bush, medium to tall plant height Iron Chlorosis field tolerance is outstanding Works well with all row widths Xtend option
		LS Solaire	0.02 RM 2375 CHU	Excellent for early maturity	RPS 1K and 1C Gene R to SCN	Semi bush, medium to tall plant height Works well with all row widths Great standability and lodging score

Legend Seeds Canada	Legend Seeds Canada 1-204-331-3696 legendseeds.ca	LS 003R24N	0.03RM 2400 CHU	Excellent	RPS 1C Gene R to SCN	Bushy plant type, tall plant height Great on IDC tolerance Great for tough soils
PRIDE SEEDS	PRIDE Seeds 1-800-265-5280 prideseed.com	PS 00078 XRN RR2Xtend	MG 000.7 (2225 CHU)	Outstanding	Tolerant to SCN, Phytophthora, IDC and White Mould	New introductory Roundup Ready 2 Xtend variety that presents an opportunity for growers in ultra early season zones. Shorter plant that's ideally suited for the mid to late MG000 season zones. Excellent disease package and strong yield potential for it's maturity. Value added SCN and Phytophthora Rps 1c root rot protection. Provides tolerance to dicamba and glyphosate herbicides
Nutrien Ag Solutions / Proven Seed	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444 nutrienagsolutions.ca, provenseed.ca	PV 17s0007 R2X GENNRR2Xtend	0007 Relative Maturity 2225 Heat Units	Excellent Yield for Maturity	Very Strong IDC Tolerance Excellent for White Mould Rps1k Phytoph-thora Gene SCN Resistance	Excellent yield for ultra-early maturity Extremely early maturity Medium height with excellent standibility Well suited to narrow row production
		PV 15s0009 R2X GENNRR2Xtend	0009 Relative Maturity 2300 Heat Units	Excellent Yield for Maturity	Excellent IDC Tolerance Rps1c Phytoph-thora Gene SCN Resistance	Tall upright growth habit with excellent stand-ability Prefers light fertile soils Excellent yield potential Well suited to narrow row production
Quarry Seed	Quarry Seed 1-888-274-9243 quarryseed.com	Dayo R2X RR2Y Xtend	2225 CHU	Excellent	Excellent Sclerotinia Tolerance Excellent IDC Tolerance	Very good yield potential for maturity One of the earliest varieteis on the market Best suited in conventional soil management
		Alaska IP	2350 CHU	Excellent	Excellent Sclerotinia Tolerance	Excellent standabitlity Excellent yield potential Well adapted to all soil types
		Devo R2X RR2Y Xtend	2350 CHU	Very Good	Excellent Sclerotinia Tolerance Excellent IDC Tolerance	Extremely vigorous with early flowering and pod set Very good yield potential for maturity Among the earliest maturing varieties on the market
		Dinero R2X RR2Y Xtend	2400 CHU	Very Good	Excellent Sclerotinia tolerance Excellent IDC Tolerance	Very healthy robust plant that will impress from day one Very good yield potential for maturity Great bushing capacity and excellent vigour
		Maxus IP	2400 CHU	Excellent	Excellent Sclerotinia Tolerance Excellent IDC Tolerance	Very aggressive vigour out of the ground with excellent standability Excellent yield potential Well adapted to all soil types

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SOYBEAN

SeCan Canada's Seed Partner	SeCan 1-800-665-7333 secan.com	Bourke R2X RR 2Xtend	2400 CHU	Excellent Yield index 110%	S to IDC MR to Phy-tophthora Field Tolerance	Good disease resistance Very high yield potential
		Fisher R2X RR 2Xtend	2275 CHU	Very Good for Early Maturity Yield index 90%	IDC Rating Semi-Tolerant MR to Phy-tophthora Field Tolerance	Very early matruity Good disease resistance
		Prince R2X RR 2Xtend	2325 CHU	Excellent Yield index 110%	IDC Rating Semi-Tolerant MR to Phy-tophthora Field Tolerance	High yield and early maturity Good disease resistance
Thunder Seed First in the Field	Thunder Seed Canada 1-888-6Thunder thunderseed.com	TH890005 R2XN	2175 CHU	Excellent	Double Stack PRR Genes SCN Tolerance	Ultra-early variety Slender plant that stands well and prefers narrow rows Target lighter, fertile soils

SPELT

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
SeedNet	SeedNet Inc 403-715-9771 seednet.ca	CDC Evolve	Earlier	High yielding		Shorter straw Better lodging resistance

TIMOTHY

Company		Variety Name/Type	Use (Hay or Grazing)	Winter Hardiness	Merit Tested in Canada (Y/N)	Highlights
BrettYoung	BrettYoung 1-800-665-5015 brettyoung.ca	Catapult Leafy Bunchgrass	Hay and Pasture	Excellent	Yes	Excellent spring vigour and summer regrowth Excellent quality forage Excellent stand persistance

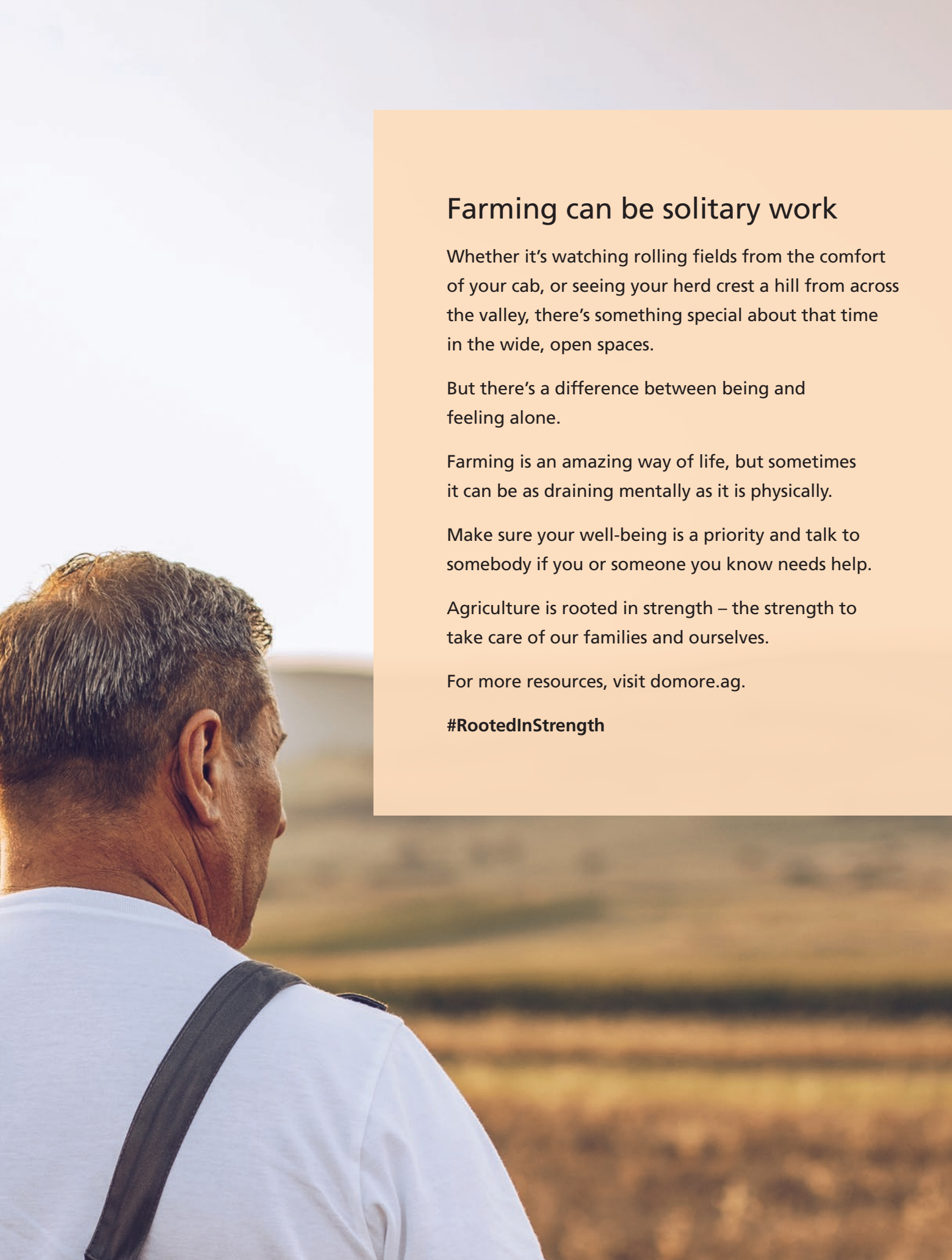
WHEAT

Company		Variety Name/Type	Maturity	Yield	Disease/Pest Resistance	Highlights
ALLIANCE SEED	Alliance Seed 1-877-270-2890 allianceseed.com	CDC Precision CWAD	Similar to Strongfield	114% of Strongfield Highest yielding line in all SK Production zones	MR or R on all Rusts	Significant step forward in yield Strong Standing Grade Protection
		AAC Redberry CWRS	3 days earlier than Carberry	115% of checks through registration trials 108% of Carberry	FHB similar to Carberry Low FHB and DON levels in MCVET FHB trials	Semidwarf Excellent grading Results Efficient harvest
CANTERRA SEEDS	CANTERRA SEEDS 1-204-988-9750 canterra.com	AAC Crossfield CPSR	Medium	122% AC Barrie	I to FHB R to Stripe, Leaf and Stem Rust	Very high yielding Very good standability, suitable for intense management and irrigation Excellent quality for its class
FPGenetics	FP Genetics Inc. 1-877-791-1045 fpgenetics.ca	AAC Viewfield CWRS	-1 day of Carberry	117% of AC Barrie	R to Stem Rust R to Stripe Rust I to FHB	Top CWRS yielder Excellent standability High protein
		CDC Adamant CWRS	-2 days of Carberry	111% of AC Barrie	Sawfly & Midge Tolerant R to Stem Rust I to FHB	Sawfly and midge tolerant High yielder Early maturing
		CDC Alloy CWAD	+1 day of Strongfield	102% of Strongfield	R to Leaf Rust R to Stripe Rust MS to FHB	High yielder Good standability Strong rust package
		CDC Landmark VB CWRS	-1 day of Carberry	113% of AC Barrie	Midge Tolerant R to Stem Rust I to FHB	Very high CWRS yielder Excellent standability Midge tolerant

Nutrien Ag Solutions / Proven Seed	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444 nutrienagsolutions.ca, provenseed.ca	AAC Entice CPSR	-1 day to 5700PR	102% of 5700PR	R to All Rusts I to FHB	Excellent protein potential Strong disease package High yields in high moisture regions
		CDC Dynamic CWAD	+1 day to Strongfield	102% of Strongfield	R to Bunt MR to Stripe Rust	Excellent test weight Very good protein and yield Strong straw
		CDC Hughes VB CWRS	-1 day to AC Carberry	103% of AC Carberry	MR to Loose Smut I to Stripe Rust and Leaf Spot I to FHB	Midge resistant High yielding with short straw Easy to thresh
SeCan	SeCan 1-800-665-7333 secan.com	AAC Awesome VB CWSP	Maturity equal Carberry	135% Carberry	I to FHB R to Stripe Rust and Stem Rust MR to Leaf Rust	Special purpose with soft white kernel Midge tolerant
		AAC Goodwin CPSR	-1 day Carberry	116% Carberry	I to FHB R to Leaf Rust and Stripe Rust I to Stem Rust	Short strong straw High protein CPSR
		AAC Paramount VB CWSWS	+ 1 day Carberry	131% Carberry	MS to FHB R to Stripe Rust I to Stem and Leaf Rust	Improved soft white milling Midge tolerant

WHEAT

SeCan Canada's Seed Partner	SeCan 1-800-665-7333 secan.com	AAC Stronghold CWAD	+2 days Strongfield	104% AC Strongfield	MS to FHB R to Leaf and Stem Rust	Short strong straw Solid stem for saw fly protection
		AAC Tisdale CWRS	-1 day Carberry	105% Carberry	MR to FHB R to Leaf and Stem Rust S to Stripe Rust	High Protein Strong straw MR to FHB
RICHARDSON PIONEER syngenta	Richardson Pioneer Bred by Syngenta Canada 1-877-964-3682 syngenta.ca	SY Obsidian CWRS	-1.4 Carberry	100% Carberry 105% in Black Zones	R to Leaf Rust MR to Stripe Rust I to Leaf Spot and Stem Rust R to Loose Smut	Excellent lodging Quality and protein similar to Glenn



Farming can be solitary work

Whether it's watching rolling fields from the comfort of your cab, or seeing your herd crest a hill from across the valley, there's something special about that time in the wide, open spaces.

But there's a difference between being and feeling alone.

Farming is an amazing way of life, but sometimes it can be as draining mentally as it is physically.

Make sure your well-being is a priority and talk to somebody if you or someone you know needs help.

Agriculture is rooted in strength – the strength to take care of our families and ourselves.

For more resources, visit domore.ag.

#RootedInStrength

Alberta and British Columbia Pedigreed Seed Growers
Directory of Varieties Produced in 2018

Grower listings were prepared by the Canadian Seed Growers' Association for varieties eligible for sale in Canada and crops issued certificates at the time of publication. Breeding institution and distributor listings were prepared by the publisher. CSGA assumes no responsibility for errors or omissions in any listings. Pedigreed class code is listed after the grower's phone number.

S=Select; F=Foundation; R=Registered; C=Certified; BI=Breeding Institution; Dist=Canadian Distributor(s)

(PBR) = PBR 78 (91) = PBR 91 ▲ = PBR 91 pending

NOTE: Varieties denoted with a * are carryover pedigreed seed.

BARLEY - FEED SIX ROW

	S	F	R	C
AB CATTLELAC				
BI: FCDC (Lacombe), DIST: Alliance Seed				
Friedel, Brock / Fairview / (780) 201-7425			R	
Holmstrom, Darrell / Killam / (780) 385-3574	S	F	R	
Sim, Darwin & Derek / Ponoka / (780) 372-2111			R	
Stamp Seeds / Enchant / (403) 739-2233	S		R	
AC ALBRIGHT				
BI: N/A, Dist: SeCan Members				
Wuthrich, David / Cecil Lake / (250) 781-3527	S			
AC RANGER				
BI: AAFC (Brandon), DIST: FP Genetics				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
AC ROSSER				
BI: AAFC, DIst: SeCan Members				
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*		
AMISK (91)				
BI: FCDC (Lacombe), DIST: SeCan Members				
Beamish, Dale / Jarvie / (780) 954-2166				C
Benci, Dennis / Carmangay / (403) 643-2294				C*
Dallas, Bradley C. / Bowden / (403) 224-2162			R	C
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377				C
Feenstra, Lloyd / Barons / (403) 757-3737			R	
Jones, Greg Thomas & Tristan / Ponoka / (403) 783-6495				C
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535			R	
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*	R*	C*
Webber, Curtis / Parkland County / (780) 963-6897			R	C
Wiebe, Paul & Julie / Acme / (403) 510-9260				C
Wildeman, Russell / Clive / (403) 470-8528				C
CHIGWELL ▲				
BI: CDC, DIST: SeCan Members				
Anderson, Ken & Evelyn / Barrhead / (780) 674-5670		F		
Feenstra, Lloyd / Barons / (403) 757-3737				C
SUNDRE ▲				
BI: FCDC (Lacombe) , DIST: Mastin Seeds				
Feenstra, Lloyd / Barons / (403) 757-3737				C
Hallett's Hay And Seed / Carstairs / (403) 337-3072				C
Jones, Danny / Beaverlodge / (780) 354-8089			R	
Lyster, Norman / Stettler / (403) 742-4456				C
Mastin, Robert B. / Sundre / (403) 556-2609			R	
TROCHU ▲				
BI: FCDC (Lacombe) , DIST: SeCan Members				
Kittle, James William & Andrew / Viking / (780) 336-2583				C
Webber, Curtis / Parkland County / (780) 963-6897				C
VIVAR ▲				
BI: FCDC (Lacombe) , DIST: SeCan Members				
McDonald, Grant / Didsbury / (403) 335-8188		R		

BARLEY - FEED TWO ROW

	S	F	R	C
BRAHMA ▲				
BI: Westbred LLC., DIST: Nutrien Ag Solutions/Proven Seed				
Massey, Derwin & Kirby / Stettler / (403) 883-2503			R	
Moore, Dean W. / Red Deer County / (403) 227-2865				C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	C
BUSBY ▲				
BI: FCDC (Lacombe) , DIST: Mastin Seeds				
Mastin, Robert B. / Sundre / (403) 556-2609				C
CANMORE (91)				
BI: FCDC (Lacombe) , DIST: Canterra Seed				
Benci, Dennis / Carmangay / (403) 643-2294				C
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Lindholm Seed Farm / New Norway / (780) 352-3240				C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333			R*	C*
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R	
Rasmussen, Brian Dale & Joel Trevor / Standard / (403) 644-3800				C
Rix, Graham / Wetaskiwin / (780) 360-9234				C
Sendziak Seed Farm / Edmonton / (780) 434-1322			R	
Shultz, Shawn / Didsbury / (403) 335-3694			R	
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228			R	
Solick Seeds Ltd. / Halkirk / (403) 884-2358	S*	F	R	
CDC AUSTENSON ▲				
BI: CDC, DIST: SeCan Members				
Alect Seeds / Three Hills / (403) 443-9599				C
Anderson, Ken & Evelyn / Barrhead / (780) 674-5670				C
Benci, Dennis / Carmangay / (403) 643-2294				C
Bright, David / New Norway / (780) 855-2240				C
Brummelhuis, Mitchell & Mack / Vauxhall / (403) 654-7515				C
Card, Gordon B. & Rhett / Magrath / (403) 758-3444				C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900		F		C
Clark, Todd / Edmonton / (780) 499-5060				C
Davidson, E. Daryl & Dean / Kitscoty / (780) 846-2456			R	
Dyck, Heinz W., Colin, Alan & Kelton / Rosemary / (403) 378-3321	S			C
Fabian, Patrick V. / Tilley / (403) 377-2000				C
Feenstra, Lloyd / Barons / (403) 757-3737				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
Hadland, Edward / Baldonnel / (250) 793-9746			R	C
Hallett's Hay And Seed / Carstairs / (403) 337-3072				C
Hoff, Peter Edward / Gleichen / (403) 734-2140	S	F	R	C
Huvenaars, Carl / Hays / (403) 725-2213				C
Jones, Greg Thomas & Tristan / Ponoka / (403) 783-6495	S			C
Kemp, Richard L. / Red Deer County / (403) 227-4836				C
Klapstein, Dallas / Calmar / (780) 819-4993				C
Limoges, Richard / McLennan / (780) 324-2335				C
Markert Seeds Ltd. / Vulcan / (403) 485-6708		F		C
Massey, Derwin & Kirby / Stettler / (403) 883-2503				C
McDonald, Gerald / Co. of Grande Prairie #1 / (780) 538-3868				C
McNelly, Bevin / Clyde / (780) 348-5749				C
Meinczinger, Matthew Jr. / Busby / (780) 349-2456				C
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C
Metzger, Don / Carbon / (403) 572-3284				C
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713	S	F	R	
Nemetz, Charlie, Jerritt & Lewis / Stettler / (403) 742-0436				C
Niemela, Terrance & Tracy / Sylvan Lake / (403) 746-2645				C
Oatway's Seed Farm Ltd. / Clive / (403) 784-3001				C
Pare, Raymond A. / Wainwright / (780) 842-2073	S	F	R	
Penwest Seeds / Three Hills / (403) 443-2577				C
Schmermund, Donnie / Sturgeon County / (780) 967-2850				C
Selte, Donald / Vermilion / (780) 853-2484				C
Sim, Darwin & Derek / Ponoka / (780) 372-2111				C
Stamp Seeds / Enchant / (403) 739-2233			R	
St. Paul Municipal Seed Cleaning Assoc. Ltd. / St. Paul / (780) 645-3939				C
Templeton, Doran & Brant / Lethbridge / (403) 345-4144				C
Webber, Curtis / Parkland County / (780) 963-6897				C
Witdouck, Dale / Iron Springs / (403) 738-4395			R	C
CDC COALITION ▲				
BI: CDC, DIST: Canterra Seeds				
Cross, Douglas / Westlock / (780) 349-2587			R	C
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Lindholm Seed Farm / New Norway / (780) 352-3240	S			C
Meinczinger, Matthew Jr. / Busby / (780) 349-2456				C
Plante, Jacques / St. Paul / (780) 645-4604				C
CDC COWBOY ▲				
BI: CDC, DIST: SeCan Members				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383			R	
Jonk, Nicholas / Westlock / (780) 349-5458			R	

Selte, Donald / Vermilion / (780) 853-2484			R	
Stewart, E. Wilbur & Eldon / Big Valley / (403) 876-2784			R	
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S	F		
Webber, Curtis / Parkland County / (780) 963-6897				C
CDC MAVERICK				
BI: CDC, DIST: SeCan Members				
Card, Gordon B. & Rhett / Magrath / (403) 758-3444		F		C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383			R	C
Hadland, Edward / Baldonnel / (250) 793-9746			R	
Hallett's Hay And Seed / Carstairs / (403) 337-3072				C
McDonald, Gerald / Co. of Grande Prairie #1 / (780) 538-3868			R	C
Metzger, Don / Carbon / (403) 572-3284				C
Mueller, Darcy / Three Hills / (403) 820-4115				C
Selte, Donald / Vermilion / (780) 853-2484	S			C
St. Paul Municipal Seed Cleaning Assoc. Ltd./ St. Paul/ (780) 645-3939				C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617		F		
Webber, Curtis / Parkland County / (780) 963-6897			R	
CDC THOMPSON				
BI: CDC, DIST: N/A				
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036			R	
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				C*
Trueblood, Brian G. / Dapp / (780) 954-3745			R	
CDC TREY				
BI: CDC, DIST: FP Genetics				
Wood, Robert, Patricia & Marshall / Bowden / (403) 588-3548	S	F	R	C
CLAYMORE (M)				
BI: CDC, DIST: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	C
CONLON				
BI: NDSU, DIST: Seed Depot				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228				C
GADSBY				
BI: FCDC (Lacombe) , DIST: SeCan Members				
Harris, William P., Linda, Thomas & Alexander / Beaverlodge / (780) 354-2823	S	F		
Schmermund, Donnie / Sturgeon County / (780) 967-2850				C
Stewart, E. Wilbur & Eldon / Big Valley / (403) 876-2784				C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*		
Webber, Curtis / Parkland County / (780) 963-6897				C

OREANA (M)				
BI: Westbred LLC., DIST: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011		F	R	C
SEEBE				
BI: FCDC (Lacombe) , DIST: SeCan Members				
Anderson, Ken & Evelyn / Barrhead / (780) 674-5670				C
Webber, Curtis / Parkland County / (780) 963-6897			R	C

BARLEY - HULLESS TWO ROW

	S	F	R	C
CDC ASCENT ▲				
BI: CDC, DIST: SeCan Members				
Sim, Darwin & Derek / Ponoka / (780) 372-2111	S	F		
CDC HILOSE				
BI: CDC, DIST: N/A				
Sendziak Seed Farm / Edmonton / (780) 434-1322			R	

BARLEY - MALTING SIX ROW

	S	F	R	C
LEGACY				
BI: Busch Ag Res. Inc., DIST: Nutrien Ag Solutions/Proven Seed				
Wood, Robert, Patricia & Marshall / Bowden / (403) 588-3548		F	R	C

BARLEY - MALTING TWO ROW

	S	F	R	C
AAC CONNECT ▲				
BI: AAFC (Brandon), DIST: Canterra Seeds				
Cross, Douglas / Westlock / (780) 349-2587				C
Eliason, Bruce W. / Wrentham / (403) 222-2258			R	C
Ellis, Brian / Olds / (403) 556-2890				C
XSeed Ag Products / Lacombe / (403) 896-2992				C
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Penwest Seeds / Three Hills / (403) 443-2577				C
Rasmussen, Brian Dale & Joel Trevor / Standard / (403) 644-3800				C
Richards, Dan / Sexsmith / (780) 766-2266				C
Rix, Graham / Wetaskiwin / (780) 360-9234				C

Sendziak Seed Farm / Edmonton / (780) 434-1322			R	C
Solick Seeds Ltd. / Halkirk / (403) 884-2358		F	R*	C
Wuthrich, David / Cecil Lake / (250) 781-3527				C
AAC SYNERGY				
BI: AAFC (Brandon), DIST: Syngenta Seeds				
Eliason, Bruce W. / Wrentham / (403) 222-2258				C
Gatez, Blaine Gerald / Crossfield / (403) 946-3994				C
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268			R	C
Lindholm Seed Farm / New Norway / (780) 352-3240				C
Markert Seeds Ltd. / Vulcan / (403) 485-6708				C
Strathmore Seed Cleaning Plant / Strathmore / (403) 934-3421				C
AC METCALFE				
BI: AAFC (Brandon), DIST: SeCan Members				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Cornish, Bob / Airdrie / (403) 948-3070				C
Dueck, Ralph E. & Brent / Olds / (403) 556-2602		F	R	
Eliason, Bruce W. / Wrentham / (403) 222-2258				C
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500		F	R	C
Limoges, Richard / McLennan / (780) 324-2335				C
McNelly, Bevin / Clyde / (780) 348-5749				C
Murray, Bruce & Wesley / Lethbridge County / (403) 327-9389				C
Svean, Alan Carl & Scott / Rivercourse / (780) 745-2578			R	C
Stamp Seeds / Enchant / (403) 739-2233				C*
Webber, Curtis / Parkland County / (780) 963-6897			R	C
Wheatcrest Farms / Lomond / (403) 792-3696				C
Bentley				
BI: FCDC (Lacombe), Dist: Canterra Seeds				
Solick Seeds Ltd. / Halkirk / (403) 884-2358			R*	C*
CDC BOW				
BI: CDC, DIST: SeCan Members				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900			R	
Eliason, Bruce W. / Wrentham / (403) 222-2258				C
Goldstrom, David / Red Deer County / (403) 227-2133			R	
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929			R	C
Huvenaars, Carl / Hays / (403) 725-2213				C
Knight, William, Craig & Brian / Tees / (403) 784-3633				C
Kopjar, Gerald M. / Rowley / (403) 368-2409	S	F	R	C
Metzger, Don / Carbon / (403) 572-3284			R	C
Nisbet, Andrew E. & Diane E. / Mountain View County / (403) 224-3788	S	F		C
Shultz, Shawn / Didsbury / (403) 335-3694			R	
Sim, Darwin & Derek / Ponoka / (780) 372-2111			R	
Solick Seeds Ltd. / Halkirk / (403) 884-2358			R*	C*
Stamp Seeds / Enchant / (403) 739-2233				C*
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				C
True Seeds Ltd. / Redwater / (780) 777-5885			R	
Wagner, Terry & Loree / Lacombe / (403) 782-2107				C
Wheatcrest Farms / Lomond / (403) 792-3696		F		
Witdouck, Dale / Iron Springs / (403) 738-4395			R	
CDC CLEAR (HULLESS)				
BI: CDC, DIST: SeCan Members				
Sendziak Seed Farm / Edmonton / (780) 434-1322			R	
CDC COPELAND				
BI: CDC, DIST: SeCan Members				
Alect Seeds / Three Hills / (403) 443-9599				C
Archer, Nathan / Didsbury / (403) 556-0693				C
Benci, Dennis / Carmangay / (403) 643-2294				C
Bright, David / New Norway / (780) 855-2240				C
Carlson, David / Gwynne / (780) 352-6871				C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900		F		C
Dallas, Bradley C. / Bowden / (403) 224-2162				C
Dueck, Ralph E. & Brent / Olds / (403) 556-2602	S	F	R	
Dyck, Ernie / La Crete / (780) 821-9445				C
Eliason, Bruce W. / Wrentham / (403) 222-2258			R	
Forward Seed Farm / County of Barrhead / (780) 674-3822			R	C
Goldstrom, David / Red Deer County / (403) 227-2133			R	
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929				C
Harris, William P., Linda, Thomas & Alexander / Beaverlodge / (780) 354-2823	S	F		C
Hartzler, Leonard / Carstairs / (403) 337-2416			R	C
Herzog, Greg / Delia / (403) 364-2114				C
Kemp, Richard L. / Red Deer County / (403) 227-4836				C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333			R*	C
Kittle, James William & Andrew / Viking / (780) 336-2583				C
Knight, William, Craig & Brian / Tees / (403) 784-3633				C
Kopjar, Gerald M. / Rowley / (403) 368-2409				C
Lindholm Seed Farm / New Norway / (780) 352-3240				C
MacFarquhar, Bill / Cremona / (403) 337-2910				C
Macyk, Tim / Radway / (780) 699-4073				C
Massey, Derwin & Kirby / Stettler / (403) 883-2503				C
McNelly, Bevin / Clyde / (780) 348-5749				C
Moffitt, Kenneth & Raymond / Radway / (780) 818-6550			R	
Mueller, Darcy / Three Hills / (403) 820-4115	S	F		C

	S	F	R	C
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713				C
Niemela, Terrance & Tracy / Sylvan Lake / (403) 746-2645	S		R	
Nisbet, Andrew E. & Diane E. / Mountain View County / (403) 224-3788		F	R	
Penwest Seeds / Three Hills / (403) 443-2577			R	
Richards, Dan / Sexsmith / (780) 766-2266				C
Schmermund, Donnie / Sturgeon County / (780) 967-2850				C
Sim, Darwin & Derek / Ponoka / (780) 372-2111				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358			R*	C
Svean, Alan Carl & Scott / Rivercourse / (780) 745-2578				C
Victoor, Rene & Jamie / Sturgeon County / (780) 459-3253		F		C
Wagner, Terry & Loree / Lacombe / (403) 782-2107				C
Wiebe, Paul & Julie / Acme / (403) 510-9260				C
Wildeman, Russell / Clive / (403) 470-8528				C*
Zwack, Thomas / Daysland / (780) 374-2450			R	
CDC COPPER				
BI: CDC, DIST: FP Genetics				
King, Harold & Webb, David G. / Three Hills / (403) 443-3333	S			
CDC FRASER ▲				
BI: CDC, DIST: SeCan Members				
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929	S	F	R	
Jones, Greg Thomas & Tristan / Ponoka / (403) 783-6495		F		
Niemela, Terrance & Tracy / Sylvan Lake / (403) 746-2645		F	R	
Sayer, Roger / Carstairs / (403) 337-5847				C
Stamp Seeds / Enchant / (403) 739-2233		F*		C*
CDC GOLDSTAR				
BI: CDC, DIST: Canterra Seeds				
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268	S	F		
CDC KINDERSLEY				
BI: CDC, DIST: SeCan Members				
Niemela, Terrance & Tracy / Sylvan Lake / (403) 746-2645				C
CDC MEREDITH				
BI: CDC, DIST: SeCan Members				
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Harris, William P., Linda, Thomas & Alexander / Beaverlodge / (780) 354-2823			R	
Wheatcrest Farms / Lomond / (403) 792-3696		F		
LOWE ▲				
BI: FCDC (Lacombe) , DIST: SeCan Members				
Mueller, Darcy / Three Hills / (403) 820-4115				C
MAJOR				
BI: AAFC (Brandon), DIST: Alliance Seed				
Wood, James / Elnora / (496) 596-4189			R	
SIRISH ▲				
BI: Syngena Ag, DIST: Syngenta Canada				
Ellis, Brian / Olds / (403) 556-2890	S		R	

OATS - FEED

	S	F	R	C
AC MUSTANG				
BI: AAFC (Lacombe), DIST: Mastin Seeds				
King, Harold & Webb, David G. / Three Hills / (403) 443-3333				C*
Mastin, Robert B. / Sundre / (403) 556-2609	S	F		
Richard, Gerald / Spirit River / (780) 864-2339				C
Shultz, Shawn / Didsbury / (403) 335-3694			R	
Tolway, Wilfred / Clairmont / (780) 567-2422	S	F		C
CDC NASSER				
BI: CDC, DIST: T & L Seeds				
King, Harold & Webb, David G. / Three Hills / (403) 443-3333			R	
WALDERN				
BI: AAFC (Lacombe), DIST: SeCan Members				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Richard, Gerald / Spirit River / (780) 864-2339				C

OATS - FORAGE

	S	F	R	C
CDC BALER				
BI: CDC, DIST: FP Genetics				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
Sim, Darwin & Derek / Ponoka / (780) 372-2111			R	
Wood, Robert, Patricia & Marshall / Bowden / (403) 588-3548			R	
CDC HAYMAKER				
BI: CDC, DIST: SeCan Members				
Archer, Nathan / Didsbury / (403) 556-0693				C
Hadland, Edward / Baldonnel / (250) 793-9746		F		C
Hadway, Walter Thomas / Didsbury / (403) 335-4929				C
Herzog, Greg / Delia / (403) 364-2114				C*
Jonk, Nicholas / Westlock / (780) 349-5458			R	C
McDonald, Gerald / Co. of Grande Prairie #1 / (780) 538-3868				C
Selte, Donald / Vermilion / (780) 853-2484	S			C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*		
MURPHY				
BI: AAFC (Lacombe), DIST: SeCan Members				
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*		
Webber, Curtis / Parkland County / (780) 963-6897			R	C

OATS - MILLING

	S	F	R	C
AC MORGAN				
BI: AAFC (Lacombe), DIST: SeCan Members				
Benci, Dennis / Carmangay / (403) 643-2294			R	C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Corns, Bryan / Taber / (403) 223-1614				C
Felstad, Colin / Dapp / (780) 349-9505				C
Hill, Gordon P. & Blair / Taylor / (250) 789-3469				C
Jonk, Nicholas / Westlock / (780) 349-5458				C
Kemp, Richard L. / Red Deer County / (403) 227-4836				C
Klapstein, Dallas / Calmar / (780) 819-4993				C
Kopjar, Gerald M. / Rowley / (403) 368-2409				C
McDonald, Gerald / Co. of Grande Prairie #1 / (780) 538-3868			R	
Meinczinger, Matthew Jr. / Busby / (780) 349-2456				C
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713				C
Ohrn, Norman / Thorsby / (780) 985-2263			R	
Schmermund, Donnie / Sturgeon County / (780) 967-2850				C
Selte, Donald / Vermilion / (780) 853-2484	S		R	C
St. Paul Municipal Seed Cleaning Assoc. Ltd./ St. Paul/ (780) 645-3939				C
Stamp Seeds / Enchant / (403) 739-2233				C*
Victoor, Rene & Jamie / Sturgeon County / (780) 459-3253				C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*	R	C*
Webber, Curtis / Parkland County / (780) 963-6897				C
Wildeman, Russell / Clive / (403) 470-8528			R	C*
CDC ARBORG ▲				
BI: CDC, DIST: FP Gentetics				
Stamp Seeds / Enchant / (403) 739-2233	S			C*
CDC NASSER				
BI: CDC, DIST: T & L Seeds				
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251				C
CDC RUFFIAN				
BI: CDC, DIST: FP Genetics				
Laliberté, Adam / Fairview / (780) 835-4632				C
Stamp Seeds / Enchant / (403) 739-2233	S			
True Seeds Ltd. / Redwater / (780) 777-5885				C
CS CAMDEN				
BI: Lantmannen SW Seed, DIST: Canterra Seeds				
Beaulieu, Emery / Fairview / (780) 835-8525			R	
Fairview Seed Cleaning Coop / Fairview / (780) 835-2478				C
Jonk, Nicholas / Westlock / (780) 349-5458				C
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500		F		
Plante, Jacques / St. Paul / (780) 645-4604				C
Sekulic, Nick / Rycroft / (780) 814-2849				C
Sendziak Seed Farm / Edmonton / (780) 434-1322				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358				C
True Seeds Ltd. / Redwater / (780) 777-5885			R*	C
Unrau, George / La Crete / (780) 928-0096				C
Wuthrich, David / Cecil Lake / (250) 781-3527			R	C
CDC Seabiscuit				
BI: CDC, Dist: Canterra Seeds				
Sendziak Seed Farm / Edmonton / (780) 434-1322		F*	R*	C*
ORE3542M				
BI: Oat Advantage, DIST: SeCan Members				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900		F		
Hill, Gordon P. & Blair / Taylor / (250) 789-3469	S	F		
Sekulic, John Jr. / Rycroft / (780) 765-2280			R	
Selte, Donald / Vermilion / (780) 853-2484			R	
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S	F	R	

RYE

	S	F	R	C
GUTTINO				
BI: KWS Lochow GMBH, DIST: SeedNet Inc.				
Stamp Seeds / Enchant / (403) 739-2233				C*
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434				C

HAZLET
BI: AAFC (Swift Current), DIST: SeCan Members
Alect Seeds / Three Hills / (403) 443-9599 — C
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383 — R
KWS DANIELLO
BI: KWS Lochow GMBH, DIST: SeedNet Inc.
Benci, Dennis / Carmangay / (403) 643-2294 — C
Stamp Seeds / Enchant / (403) 739-2233 — C
Specialty Seeds Ltd. / Bow Island / (403) 545-6018 — C
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434 — C
Witdouck, Dale / Iron Springs / (403) 738-4395 — C
MUSKETEER
BI: AAFC (Swift Current), DIST: SeCan Members
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383 — R
PRIMA
BI: AAFC (Swift Current), DIST: SeCan Members
Stamp Seeds / Enchant / (403) 739-2233 — C*

SPELT

	S	F	R	C
CDC EVOLVE				
BI: CDC, DIST: SeedNet Inc.				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900			R	
Stamp Seeds / Enchant / (403) 739-2233	S*	F		

TRITICALE - SPRING

	S	F	R	C
AAC DELIGHT ▲				
BI: AAFC (Lethbridge), DIST: Fabian Seeds Ltd.				
Fabian, Patrick V. / Tilley / (403) 377-2000			R	
Hoffmann, Curtis / Oyen / (403) 664-9617			R	
AC ULTIMA				
BI: AAFC, Dist: N/A				
Solick Seeds Ltd. / Halkirk / (403) 884-2358	S*	F*		
BREVIS				
BI: CIMMYT, DIST: N/A				
Sim, Darwin & Derek / Ponoka / (780) 372-2111	S		R	
Webber, Curtis / Parkland County / (780) 963-6897			R	

BUNKER
BI: FCDC (Lacombe), DIST: FP Genetics
Airth, Jock & Linda / Brooks / (403) 362-4372 — R
Solick Seeds Ltd. / Halkirk / (403) 884-2358 — R C
CIRCUIT
BI: N/A, DIST: Seed-Link Inc.
Kerschbaumer, John A. / Fairview / (780) 835-4508 — R
PRONGHORN
BI: FCDC (Lacombe), DIST: Progressive Seeds
Mans, John / Nobleford / (403) 824-3585 — R C
SUNRAY
BI: AAFC (Lethbridge), DIST: SeedNet Inc.
Benci, Dennis / Carmangay / (403) 643-2294 — C
TAZA
BI: FCDC (Lacombe), DIST: Solick Seeds Ltd.
Solick Seeds Ltd. / Halkirk / (403) 884-2358 — F* R* C
TYNDAL
BI: FCDC (Lacombe), DIST: SeCan Members
Card, Gordon B. & Rhett / Magrath / (403) 758-3444 — C
Corns, Bryan / Taber / (403) 223-1614 — C

TRITICALE - WINTER

	S	F	R	C
LUOMA				
BI: FCDC (Lacombe), DIST: Corns Brothers Farm Ltd.				
Corns, Bryan / Taber / (403) 223-1614		F		
METZGER				
BI: FCDC (Lacombe), DIST: Haney Farms Ltd.				
Wood, Robert, Patricia & Marshall / Bowden / (403) 588-3548				C

WHEAT - CNHR

	S	F	R	C
AC FOREMOST				
BI: AAFC (Swift Current), DIST: SeCan Members				
Cyre, Clifford & Greg / Barrhead / (780) 307-4332				C
Radke, Bryan Victor / Barrhead / (780) 674-5715		R		

FALLER
BI: NDSU, Dist: Seed Depot
Stamp Seeds / Enchant / (403) 739-2233 — C*

PARK
BI: AAFC, DIST: N/A
Lyster, Norman / Stettler / (403) 742-4456 — S, R

WHEAT - CPSR

	S	F	R	C
5700PR				
BI: Syngenta Seeds Canada Inc, Dist: Nutrien Ag Solutions/Proven Seed				
Hartzler, Leonard / Carstairs / (403) 337-2416				C
AAC CROSSFIELD ▲				
BI: AAFC (Winnipeg), Dist: Canterra Seeds				
Cyre, Clifford & Greg / Barrhead / (780) 307-4332			R	C
Ellis, Brian / Olds / (403) 556-2890			R	
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
Rasmussen, Brian Dale & Joel Trevor / Standard / (403) 644-3800			R	
Rix, Graham / Wetaskiwin / (780) 360-9234				C
Sekulic, Nick / Rycroft / (780) 814-2849			R	
Sendziak Seed Farm / Edmonton / (780) 434-1322	S	F	R	
Shultz, Shawn / Didsbury / (403) 335-3694			R	
AAC ENTICE ▲				
BI: AAFC (Winnipeg), Dist: Nutrien Ag Solutions/Proven Seed				
Hartzler, Leonard / Carstairs / (403) 337-2416				C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011	S			C
AAC GOODWIN				
BI: AAFC (Swift Current), DIST: SeCan Members				
Forward Seed Farm / County of Barrhead / (780) 674-3822				C
Ohrn, Norman / Thorsby / (780) 985-2263		F		
AAC PENHOLD				
BI: AAFC (Swift Current), DIST: SeCan Members				
Baier, Bill & Dean / Clyde / (780) 348-5791				C
Beamish, Dale / Jarvie / (780) 954-2166				C
Bright, David / New Norway / (780) 855-2240				C
Clark, Todd / Edmonton / (780) 499-5060			R	C
Cyre, Clifford & Greg / Barrhead / (780) 307-4332				C
Dallas, Bradley C. / Bowden / (403) 224-2162				C
Dargis, Richard / St. Vincent / (780) 635-2333				C
Davidson, E. Daryl & Dean / Kitscoty / (780) 846-2456			R	
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377				C
Felstad, Colin / Dapp / (780) 349-9505				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
Goldstrom, David / Red Deer County / (403) 227-2133			R	
Hadland, Edward / Baldonnel / (250) 793-9746			R	
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929				C
Hoff, Peter Edward / Gleichen / (403) 734-2140			R	
Jones, Greg Thomas & Tristan / Ponoka / (403) 783-6495			R	
Kemp, Richard L. / Red Deer County / (403) 227-4836				C
Lawrence, Cody / Wainwright / (780) 842-0285				C
Limoges, Richard / McLennan / (780) 324-2335			R	C
Lindholm Seed Farm / New Norway / (780) 352-3240				C
Lindholm, Luke & Stevan / Camrose / (780) 781-6077				C
Lopushinsky, Julian / Bruderheim / (780) 796-2048			R	
Macyk, Don / Waskatenau / (780) 358-2411				C
Macyk, Tim / Radway / (780) 699-4073			R	C
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713			R	
Niemela, Terrance & Tracy / Sylvan Lake / (403) 746-2645				C
Nisbet, Andrew E. & Diane E. / Mountain View County / (403) 224-3788		F		C
Oatway's Seed Farm Ltd. / Clive / (403) 784-3001			R	C
Ohrn, Norman / Thorsby / (780) 985-2263			R	
Pare, Raymond A. / Wainwright / (780) 842-2073				C
Radke, Bryan Victor / Barrhead / (780) 674-5715		F	R	
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251				C
Sayer, Roger / Carstairs / (403) 337-5847				C
Schmermund, Donnie / Sturgeon County / (780) 967-2850				C
Sendziak Seed Farm / Edmonton / (780) 434-1322			R	
Shaw, Tom / Country of Grande Prairie No.1 / (780) 882-7766				C
Shultz, Shawn / Didsbury / (403) 335-3694				C
St. Paul Municipal Seed Cleaning Assoc. Ltd./ St. Paul/ (780) 645-3939				C
Stamp Seeds / Enchant / (403) 739-2233				C*
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				C
Wierenga, Brad, Bruce & Clayton / County of Barrhead / (780) 674-4624				C
Wood, Robert, Patricia & Marshall / Bowden / (403) 588-3548			R	
Zwack, Thomas / Daysland / (780) 374-2450			R	

CDC TERRAIN
CI: CDC, Dist: FP Genetics
Stamp Seeds / Enchant / (403) 739-2233 — S*

SY ROWYN
BI: Syngenta Seeds Canada Inc, Dist: Alliance Seed
Ellis, Brian / Olds / (403) 556-2890 — S, R
Forward Seed Farm / County of Barrhead / (780) 674-3822 — C
Holmstrom, Darrell / Killam / (780) 385-3574 — R
Klassen, Ken / Rosemary / (403) 378-4408 — C
Sich, Louis John, Ivan & Martin / Trochu / (403) 442-2112 — C
Stamp Seeds / Enchant / (403) 739-2233 — R* C
Wood, James / Elnora / (496) 596-4189 — C
Zwack, Bryan / Daysland / (780) 608-9426 — C

WHEAT - CWEW

	S	F	R	C
AAC ICEFIELD				
BI: AAFC (Lethbridge), DIST: FP Genetics				
Quatro Ventures Inc. / Bow Island / (403) 545-2222			R	

WHEAT - CWHWS

	S	F	R	C
AAC CIRRUS				
BI: AAFC, Dist: N/A				
Stamp Seeds / Enchant / (403) 739-2233	S	F		
AAC ICEBERG				
BI: AAFC, Dist: Alliance Seed				
Stamp Seeds / Enchant / (403) 739-2233	S*	F*	R*	C*

WHEAT - CWRS

	S	F	R	C
5605HR-CL				
BI: Syngenta Seeds Canada Inc, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	C
AAC BRANDON				
BI: AAFC (Swift Current), DIST: SeCan Members				
Alect Seeds / Three Hills / (403) 443-9599			R	C
Anderson, Ken & Evelyn / Barrhead / (780) 674-5670				C
Archer, Nathan / Didsbury / (403) 556-0693				C
Baier, Bill & Dean / Clyde / (780) 348-5791			R	C
Beamish, Dale / Jarvie / (780) 954-2166			R	
Benci, Dennis / Carmangay / (403) 643-2294				C
Brummelhuis, Mitchell & Mack / Vauxhall / (403) 654-7515			R	C
Cailliau, John, Dana, S., Dave, & Danielle / Enchant / (403) 739-3785			R	
Carlson, David / Gwynne / (780) 352-6871				C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Clark, Todd / Edmonton / (780) 499-5060				C
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333				C
Cyre, Clifford & Greg / Barrhead / (780) 307-4332				C
Davidson, E. Daryl & Dean / Kitscoty / (780) 846-2456			R	C
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377				C
Dovichak, Michael / Brooks / (403) 501-5420			R	
Dyck, Ernie / La Crete / (780) 821-9445				C
Dyck, Heinz W., Colin, Alan & Kelton / Rosemary / (403) 378-3321		F	R	
Ellis, Brian / Olds / (403) 556-2890				C
Fabian, Patrick V. / Tilley / (403) 377-2000			R	
Fairview Seed Cleaning Coop / Fairview / (780) 835-2478				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
Geeraert, Gerald / Rockyford / (403) 533-2421				C
Goode, Tim / Lacombe / (403) 506-9424			R	
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929				C
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Herzog, Greg / Delia / (403) 364-2114				C
Hierath, Michael Wayne & Philip / Milk River / (403) 647-2347				C
Hoff, Peter Edward / Gleichen / (403) 734-2140			R	C
Hoffmann, Curtis / Oyen / (403) 664-9617				C
Hundeby, Arron / Wetaskiwin / (780) 335-5111				C
Huvenaars, Carl / Hays / (403) 725-2213				C
Kalinsky, Dwayne / Iron River / (780) 826-4452				C
Kapitski, Lawrence / Andrew / (780) 365-2134				C
Kemp, Richard L. / Red Deer County / (403) 227-4836			R	C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333				C
Kittle, James William & Andrew / Viking / (780) 336-2583			R	C
Klassen, Ethan / Coaldale / (403) 345-3770				C

Konieczny, Scott / Mannville / (780) 581-5693			R	C
Kopjar, Gerald M. / Rowley / (403) 368-2409	S	F		C
Limoges, Richard / McLennan / (780) 324-2335				C
Lindholm Seed Farm / New Norway / (780) 352-3240				C
Lindholm, Luke & Stevan / Camrose / (780) 781-6077				C
Lopushinsky, Julian / Bruderheim / (780) 796-2048			R	
Massey, Derwin & Kirby / Stettler / (403) 883-2503				C
Meinczinger, Matthew Jr. / Busby / (780) 349-2456				C
Metzger, Don / Carbon / (403) 572-3284				C
Miller, Brian / Barrhead / (780) 674-5001				C
Nemetz, Charlie, Jerritt & Lewis / Stettler / (403) 742-0436			R	C
Pare, Raymond A. / Wainwright / (780) 842-2073		F	R	
Penwest Seeds / Three Hills / (403) 443-2577			R	C
Rasmuson, Dennis G. & Cory Dean / Gwynne / (780) 312-1148	S		R	
Rix, Graham / Wetaskiwin / (780) 360-9234			R	C
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251				C
Sayer, Roger / Carstairs / (403) 337-5847				C
Sekulic, Nick / Rycroft / (780) 814-2849				C*
Sendziak Seed Farm / Edmonton / (780) 434-1322			R	C
Shultz, Shawn / Didsbury / (403) 335-3694			R	C
Solick Seeds Ltd. / Halkirk / (403) 884-2358		F*	R	C
Specialty Seeds Ltd. / Bow Island / (403) 545-6018				C
St. Paul Municipal Seed Cleaning Assoc. Ltd./ St. Paul/ (780) 645-3939				C
Stamp Seeds / Enchant / (403) 739-2233				C*
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				C
Victoor, Rene & Jamie / Sturgeon County / (780) 459-3253			R	C
Wagner, Terry & Loree / Lacombe / (403) 782-2107				C
Wiebe, Paul & Julie / Acme / (403) 510-9260				C
Wildeman, Russell / Clive / (403) 470-8528			R	C*
Witdouck, Dale / Iron Springs / (403) 738-4395			R	C
Wood, Robert, Patricia & Marshall / Bowden / (403) 588-3548		F	R	C
Zwack, Bryan / Daysland / (780) 608-9426			R	C
Zwack, Thomas / Daysland / (780) 374-2450				C
AAC CONCORD (H)				
BI: AAFC, Dist: Canterra Seeds				
Solick Seeds Ltd. / Halkirk / (403) 884-2358	S*	F*	R*	
AAC CONNERY (H)				
BI: AAFC (Swift Current), DIST: Canterra Seeds				
Berge, James Garnet / Dawson Creek / (250) 759-4773				C
Boisvert, Marc / Girouxville / (780) 618-4724				C
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333				C
Cross, Douglas / Westlock / (780) 349-2587			R	
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036		F	R	
XSeed Ag Products / Lacombe / (403) 896-2992				C
Hallett's Hay And Seed / Carstairs / (403) 337-3072			R	
Lindholm Seed Farm / New Norway / (780) 352-3240		F		C
Markert Seeds Ltd. / Vulcan / (403) 485-6708			R	
Richards, Dan / Sexsmith / (780) 766-2266			R	
Rix, Graham / Wetaskiwin / (780) 360-9234				C
Sekulic, Nick / Rycroft / (780) 814-2849			R	C
Sendziak Seed Farm / Edmonton / (780) 434-1322			R	
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358				C
Victoor, Rene & Jamie / Sturgeon County / (780) 459-3253	S	F	R	C
Wuthrich, David / Cecil Lake / (250) 781-3527				C
AAC ELIE (H)				
BI: AAFC (Swift Current), DIST: Alliance Seed				
Ellis, Brian / Olds / (403) 556-2890			R	
Hierath, Michael Wayne & Philip / Milk River / (403) 647-2347				C
Holmstrom, Darrell / Killam / (780) 385-3574				C
Howard, Fred / Wanham / (780) 694-2427				C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333	S	F		C
Konieczny, Scott / Mannville / (780) 581-5693			R	C
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C
Sich, Louis John, Ivan & Martin / Trochu / (403) 442-2112		F	R	C
Specialty Seeds Ltd. / Bow Island / (403) 545-6018				C
Stamp Seeds / Enchant / (403) 739-2233	S	F	R*	C*
True Seeds Ltd. / Redwater / (780) 777-5885				C
Wheatcrest Farms / Lomond / (403) 792-3696				C
Wood, James / Elnora / (496) 596-4189			R	
AAC REDBERRY (H)				
BI: AAFC (Swift Current), DIST: Alliance Seed				
Alect Seeds / Three Hills / (403) 443-9599			R	C
Ellis, Brian / Olds / (403) 556-2890			R	C
Friedel, Brock / Fairview / (780) 201-7425				C
Hadway, Walter Thomas / Didsbury / (403) 335-4929				C
Hierath, Michael Wayne & Philip / Milk River / (403) 647-2347	S	F	R	C
Holmstrom, Darrell / Killam / (780) 385-3574	S	F	R	C
Howard, Fred / Wanham / (780) 694-2427				C
Klassen, Ken / Rosemary / (403) 378-4408				C

Pare, Raymond A. / Wainwright / (780) 842-2073	S	F		C
Sich, Louis John / Trochu / (403) 442-2112			R	
Stamp Seeds / Enchant / (403) 739-2233				C*
True Seeds Ltd. / Redwater / (780) 777-5885				C
Wood, James / Elnora / (496) 596-4189				C
Zwack, Bryan / Daysland / (780) 608-9426				C
AAC REDWATER				
BI: AAFC (Winnipeg), Dist: SeCan Members				
Alect Seeds / Three Hills / (403) 443-9599				C
Bright, David / New Norway / (780) 855-2240				C
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036			R	C
Hallett's Hay And Seed / Carstairs / (403) 337-3072				C
Harris, William P., Linda, Thomas & Alexander / Beaverlodge / (780) 354-2823	S	F		C
Hegland, David Olaf / Wembley / (780) 766-2450				C
Huvenaars, Carl / Hays / (403) 725-2213				C
Lopushinsky, Julian / Bruderheim / (780) 796-2048				C
Maisonneuve, Andre / Guy / (780) 925-3074				C
McDonald, Gerald / Co. of Grande Prairie #1 / (780) 538-3868				C
Oatway's Seed Farm Ltd. / Clive / (403) 784-3001				C
Richard, Gerald / Spirit River / (780) 864-2339				C
Trueblood, Brian G. / Dapp / (780) 954-3745			R	C
Sendziak Seed Farm / Edmonton / (780) 434-1322			R*	C*
Webber, Curtis / Parkland County / (780) 963-6897				C
Witdouck, Dale / Iron Springs / (403) 738-4395				C
AAC TISDALE				
BI: AAFC (Swift Current), DIST: SeCan Members				
Hill, Gordon P. & Blair / Taylor / (250) 789-3469		F	R	
Strain, Arthur George / Foremost / (403) 867-2227				C
AAC VIEWFIELD ▲				
BI: AAFC (Swift Current), DIST: FP Genetics				
Airth, Jock & Linda / Brooks / (403) 362-4372			R	
Benci, Dennis / Carmangay / (403) 643-2294			R	C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Forward Seed Farm / County of Barrhead / (780) 674-3822				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036	S	F	R	
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268			R	C
Hoff, Peter Edward / Gleichen / (403) 734-2140	S	F		C
Kapitski, Lawrence / Andrew / (780) 365-2134			R	
King, Harold & Webb, David G. / Three Hills / (403) 443-3333		F	R	
Laliberté, Adam & Vos, Henry / Fairview / (780) 835-5286				C
Lindholm Seed Farm / New Norway / (780) 352-3240			R	C
Markert Seeds Ltd. / Vulcan / (403) 485-6708				C
Massey, Derwin & Kirby / Stettler / (403) 883-2503				C
Quatro Ventures Inc. / Bow Island / (403) 545-2222	S	F		C
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251			R	C
Sekulic, Nick / Rycroft / (780) 814-2849			R	C
Sim, Darwin & Derek / Ponoka / (780) 372-2111		F		C
Solick Seeds Ltd. / Halkirk / (403) 884-2358		F	R	C
Stamp Seeds / Enchant / (403) 739-2233	S	F	R*	C
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535			R	C
True Seeds Ltd. / Redwater / (780) 777-5885			R*	C
Victoor, Rene & Jamie / Sturgeon County / (780) 459-3253	S	F	R	
Witdouck, Dale / Iron Springs / (403) 738-4395			R	C
AC WASKADA				
BI:AAFC (Winnipeg), Dist: SeCan Members				
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383				C
CARBERRY				
BI: AAFC (Swift Current), DIST: SeCan Members				
Macyk, Tim / Radway / (780) 699-4073			R	
Schmermund, Donnie / Sturgeon County / (780) 967-2850				C
CARDALE				
BI: AAFC (Winnipeg), Dist: Seed Depot				
Schmermund, Donnie / Sturgeon County / (780) 967-2850		F		C
CDC ABOUND				
BI: CDC, Dist: Nutrien Ag Solutions/Proven Seed				
Hartzler, Leonard / Carstairs / (403) 337-2416				C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	C
CDC BRADWELL				
BI: CDC, DIST: SeCan Members				
Herzog, Greg / Delia / (403) 364-2114			R	
McDonald, Gerald / Co. of Grande Prairie #1 / (780) 538-3868				C
Pepneck, David / Vauxhall / (403) 424-0096				C
CDC GO				
BI: CDC, Dist: CDC				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333				C
Huvenaars, Carl / Hays / (403) 725-2213				C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333				C
Limoges, Richard / McLennan / (780) 324-2335				C
Metzger, Don / Carbon / (403) 572-3284				C
Murray, Bruce & Wesley / Lethbridge County / (403) 327-9389			R	C
Pepneck, David / Vauxhall / (403) 424-0096				C
Schmermund, Donnie / Sturgeon County / (780) 967-2850				C
Stamp Seeds / Enchant / (403) 739-2233	S*	F*		C*
Templeton, Doran & Brant / Lethbridge / (403) 345-4144				C
CDC PLENTIFUL				
BI: CDC, Dist: FP Genetics				
King, Harold & Webb, David G. / Three Hills / (403) 443-3333	S*	F*	R*	
CDC STANLEY				
BI: CDC, Dist: Nutrien Ag Solutions/Proven Seed				
Moore, Dean W. / Red Deer County / (403) 227-2865				C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011				C
COLEMAN				
BI: U of Alberta, Dist: Lefsrud Seed				
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500				C
GLENN				
BI: NDSU, Dist: Canterra Seeds				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
MUCHMORE				
BI: AAFC (Swift Current), DIST: FP Genetics				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036			R*	C*
King, Harold & Webb, David G. / Three Hills / (403) 443-3333			R*	C*
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				C
True Seeds Ltd. / Redwater / (780) 777-5885				C*
NEEPAWA				
BI: AAFC, DIST: N/A				
Lyster, Norman / Stettler / (403) 742-4456		F		
PARATA ▲				
BI: U of Alberta, Dist: SeCan Members				
Baier, Bill & Dean / Clyde / (780) 348-5791		F		
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383	S			
Hadland, Edward / Baldonnel / (250) 793-9746	S			
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929		F		
Hallett's Hay And Seed / Carstairs / (403) 337-3072		F		
Macyk, Don / Waskatenau / (780) 358-2411	S			
STETTLER				
BI: AAFC (Swift Current), DIST: SeCan Members				
Baier, Bill & Dean / Clyde / (780) 348-5791			R	
Benci, Dennis / Carmangay / (403) 643-2294				C*
Dyck, Ernie / La Crete / (780) 821-9445			R	
Harris, William P., Linda, Thomas & Alexander / Beaverlodge / (780) 354-2823			R	
Limoges, Richard / McLennan / (780) 324-2335				C
McDonald, Gerald / Co. of Grande Prairie #1 / (780) 538-3868				C
Nemetz, Charlie, Jerritt & Lewis / Stettler / (403) 742-0436			R	C
SY SLATE ▲				
BI: Syngenta Seeds Canada Inc, Dist: Syngenta Canada				
Gatez, Blaine Gerald / Crossfield / (403) 946-3994			R	
Strathmore Seed Cleaning Plant / Strathmore / (403) 934-3421			R	
THORSBY				
BI: U of Alberta, Dist: Canterra Seed				
Boisvert, Marc / Girouxville / (780) 618-4724				C
Richards, Dan / Sexsmith / (780) 766-2266				C
Unrau, George / La Crete / (780) 928-0096				C
ZEALAND				
BI: U of Alberta, Dist: N/A				
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500		F		C

WHEAT - CWRW

	S	F	R	C
AAC ELEVATE				
BI: AAFC (Lethbridge), DIST: SeCan Members				
Kiffiak, Nathan & Anderson, Tim / Foremost / (403) 867-2338				C
Kiffiak, Nathan & Mercer, Ryan / Foremost / (403) 867-2338	S			
Stamp Seeds / Enchant / (403) 739-2233	S*		R*	C*
AAC GATEWAY				
BI: AAFC (Lethbridge), DIST: Seed Depot				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C
Stamp Seeds / Enchant / (403) 739-2233			R*	C*
Witdouck, Dale / Iron Springs / (403) 738-4395			R	
AAC GOLDRUSH ▲				
BI: AAFC (Lethbridge), DIST: FP Genetics				
Quatro Ventures Inc. / Bow Island / (403) 545-2222	S			

	S	F	R	C
AAC WILDFIRE ▲				
BI: AAFC (Lethbridge), DIST: SeCan Members				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S	F		
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333				C
Klassen, Ethan / Coaldale / (403) 345-3770				C
Penwest Seeds / Three Hills / (403) 443-2577			R	
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228				C
Stamp Seeds / Enchant / (403) 739-2233	S	F	R	C*
Templeton, Doran & Brant / Lethbridge / (403) 345-4144			R	
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434			R	
Witdouck, Dale / Iron Springs / (403) 738-4395			R	
CDC CHASE				
BI: CDC, Dist: Canterra Seeds				
Benci, Dennis / Carmangay / (403) 643-2294		F*		
RADIANT				
BI: AAFC (Lethbridge), DIST: Canterra Seeds				
Airth, Jock & Linda / Brooks / (403) 362-4372			R	

WHEAT - CWSP

	S	F	R	C
ALDERON				
BI: KWS-UK, Dist: SeCan Members				
Templeton, Doran & Brant / Lethbridge / (403) 345-4144			R	C
Stamp Seeds / Enchant / (403) 739-2233				C*
Witdouck, Dale / Iron Springs / (403) 738-4395				C
PASTEUR				
BI: Wiersum Plant Breeding, Dist: SeCan Members				
Sim, Darwin & Derek / Ponoka / (780) 372-2111				C
Witdouck, Dale / Iron Springs / (403) 738-4395			R	

WHEAT - CWSPWW

	S	F	R	C
PINTAIL				
BI: FCDC (Lacombe), Dist: Mastin Seeds				
Mastin, Robert B. / Sundre / (403) 556-2609				C

WHEAT - CWSWS

	S	F	R	C
AC ANDREW				
BI: AAFC (Lethbridge), DIST: SeCan Members				
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C*
Kittle, James William & Andrew / Viking / (780) 336-2583				C
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434	S	F	R	

WHEAT - DURUM

	S	F	R	C
AAC CONGRESS (H)				
BI: AAFC (Swift Current), DIST: Canterra Seeds				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333				C
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Huvenaars, Carl / Hays / (403) 725-2213	S		R	C
Kiffiak, Nathan & Anderson, Tim / Foremost / (403) 867-2338				
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228				C
AAC RAYMORE				
BI: AAFC (Swift Current), DIST: SeCan Members				
Huvenaars, Carl / Hays / (403) 725-2213				C
Stamp Seeds / Enchant / (403) 739-2233			R*	
AAC SPITFIRE (H)				
BI: AAFC (Swift Current), DIST: SeCan Members				
Benci, Dennis / Carmangay / (403) 643-2294				C
Brummelhuis, Mitchell & Mack / Vauxhall / (403) 654-7515				C
Catherwood, James / Calgary / (403) 836-9699				C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Eliason, Bruce W. / Wrentham / (403) 222-2258				C
Hierath, Michael Wayne & Philip / Milk River / (403) 647-2347			R	
Kiffiak, Nathan & Anderson, Tim / Foremost / (403) 867-2338				C
Klassen, Ethan / Coaldale / (403) 345-3770				C
Klassen, Ken / Rosemary / (403) 378-4408				C
Penwest Seeds / Three Hills / (403) 443-2577			R	
Stamp Seeds / Enchant / (403) 739-2233				C*
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434			R	
Witdouck, Dale / Iron Springs / (403) 738-4395				C

NOT ONE BUT TWO STAND-UP WHEATS!

NOW YOU'RE GOING PLACES.

Leading standability, ultra high yields and strong disease resistance will give you the highest ROI in the industry. And more profit means more time for other things – like fishing with the family.

TWO NEW CWRS WHEATS THAT HAVE IT ALL

CDC LANDMARK VB

- Top of class standability
- Top in class yield (113%)
- Wheat midge tolerant

AAC VIEWFIELD

- Top of class standability
- Very high yielding (109%)
- High protein, good sprouting resistance

FPGenetics

The Cereal Seed Experts

FPGENETICS.CA

AAC STRONGHOLD ▲				
BI: AAFC (Swift Current), DIST: SeCan Members				
Benci, Dennis / Carmangay / (403) 643-2294		F	R	
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333		F	R	
Eliason, Bruce W. / Wrentham / (403) 222-2258			R	
Huvenaars, Carl / Hays / (403) 725-2213			R	
Penwest Seeds / Three Hills / (403) 443-2577	S			
AC NAVIGATOR				
BI: AAFC (Swift Current), Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011				C
BRIGADE				
BI: AAFC (Swift Current), Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	C
CDC ALLOY ▲				
BI: CDC, DIST: FP Genetics				
Benci, Dennis / Carmangay / (403) 643-2294			R	
Quatro Ventures Inc. / Bow Island / (403) 545-2222			R	C
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228		F	R	
Stamp Seeds / Enchant / (403) 739-2233	S			C
CDC CREDENCE ▲				
BI: CDC, DIST: Canterra Seeds				
Huvenaars, Carl / Hays / (403) 725-2213				C
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	S			
CDC DYNAMIC				
BI: CDC, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	C
CDC PRECISION ▲				
BI: CDC, Dist: Alliance Seed				
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333				C
Hierath, Michael Wayne & Philip / Milk River / (403) 647-2347			R	C
Hoffmann, Curtis / Oyen / (403) 664-9617				C
Kiffiak, Nathan & Anderson, Tim / Foremost / (403) 867-2338			R	
Markert Seeds Ltd. / Vulcan / (403) 485-6708				C
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R	C
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228		F		C
Specialty Seeds Ltd. / Bow Island / (403) 545-6018				C
Stamp Seeds / Enchant / (403) 739-2233			R*	C
Witdouck, Dale / Iron Springs / (403) 738-4395			R	
CDC VIVID ▲				
BI: CDC, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	
TRANSCEND				
BI: AAFC (Swift Current), DIST: FP Genetics				
Benci, Dennis / Carmangay / (403) 643-2294		F*	R*	C*
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900		F		C
Quatro Ventures Inc. / Bow Island / (403) 545-2222				C
Sim, Darwin & Derek / Ponoka / (780) 372-2111				C
Stamp Seeds / Enchant / (403) 739-2233	S			C*
Strain, Arthur George / Foremost / (403) 867-2227				C

WHEAT - MIDGE TOLERANT

	S	F	R	C
AAC ALIDA VB				
BI: N/A, Dist: SeCan Members				
Huvenaars, Carl & Crooyman, John / Hays / (403) 725-2213		F		
Limoges, Richard / McLennan / (780) 324-2335		F		

AAC AWESOME VB				
BI: N/A, Dist: SeCan Members				
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383	S			
Markert Seeds Ltd. / Vulcan / (403) 485-6708				C
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434		F	R	
AAC CAMERON VB ⓦ				
BI: N/A, Dist: Canterra Seeds				
Boisvert, Marc / Girouxville / (780) 618-4724				C
Huvenaars, Carl / Hays / (403) 725-2213				C
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500	S			C
Penwest Seeds / Three Hills / (403) 443-2577				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358		F		
AAC CHIFFON VB				
BI: N/A, Dist: SeedNet Inc.				
Moffitt, Kenneth & Raymond / Radway / (780) 818-6550				C
Stamp Seeds / Enchant / (403) 739-2233			R*	
Witdouck, Dale / Iron Springs / (403) 738-4395			R	
AAC FORAY VB				
BI: N/A, Dist: SeCan Members				
Hoff, Peter Edward / Gleichen / (403) 734-2140				C
Huvenaars, Carl / Hays / (403) 725-2213				C
Lopushinsky, Julian / Bruderheim / (780) 796-2048				C
Markert Seeds Ltd. / Vulcan / (403) 485-6708				C
True Seeds Ltd. / Redwater / (780) 777-5885				C
AAC INDUS VB				
BI: N/A, Dist: SeCan Members				
Kittle, James William & Andrew / Viking / (780) 336-2583				C
AAC LEROY VB				
BI: AAFC (Brandon), Dist: Alliance Seed				
Stamp Seeds / Enchant / (403) 739-2233	S			
AAC PARAMOUNT VB				
BI: N/A, Dist: SeCan Members				
Stamp Seeds / Enchant / (403) 739-2233				C
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434		F		C
AAC WARMAN VB				
BI: N/A, Dist: N/A				
Benci, Dennis / Carmangay / (403) 643-2294	S	F		
Hoffmann, Curtis / Oyen / (403) 664-9617		F		

AC SADASH VB				
BI: N/A, Dist: SeCan Members				
Stamp Seeds / Enchant / (403) 739-2233				C*
Zwack, Thomas / Daysland / (780) 374-2450			R	
AAC SUCCEED VB				
BI: AAFC (Swift Current), Dist: N/A				
Quatro Ventures Inc. / Bow Island / (403) 545-2222	S			
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228	S	F		
Stamp Seeds / Enchant / (403) 739-2233	S			C*
AC SHAW VB				
BI: N/A, Dist: SeCan Members				
Maisonneuve, Andre / Guy / (780) 925-3074				C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F	R*	C*
CDC ADAMANT VB				
BI: N/A, Dist FP Genetics				
Quatro Ventures Inc. / Bow Island / (403) 545-2222	S		R	
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228				C
CDC CARBIDE VB				
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011			R	C
CDC HUGHES VB				
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed				
Hartzler, Leonard / Carstairs / (403) 337-2416				C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011	S		R	C
CDC LANDMARK VB				
BI: N/A, Dist FP Genetics				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
Hoff, Peter Edward / Gleichen / (403) 734-2140				C
Markert Seeds Ltd. / Vulcan / (403) 485-6708	S	F	R	
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251			R	C
Sekulic, Nick / Rycroft / (780) 814-2849			R	C
Stamp Seeds / Enchant / (403) 739-2233	S			C
True Seeds Ltd. / Redwater / (780) 777-5885			R*	C
CDC TITANIUM VB				
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011		F		C
KWS CHARING VB				
BI: N/A, Dist: SeCan Members				
Forward Seed Farm / County of Barrhead / (780) 674-3822			R	

CANOLA SEED DISTRIBUTORS

For additional canola varieties available for purchase and detailed variety information please contact these canola seed distributors.

BASF / 1-877-371-2273 / www.agsolutions.ca
BrettYoung / 1-800-665-5015 /www.brettyoung.ca
Canterra Seeds Ltd. / (204) 988-9750 / www.canterra.com
Victory Hybrid Canola / Cargill / www.victorycanola.com
Cibus Canada / 1-844-372-4287 / www.cibuscanola.ca
Corteva Agriscience, Agriculture Division of DowDuPont / 1-800-667-3852 / www.brevant.ca & ca.pioneer.com/west/en
DEKALB / Bayer Canada / 1-800-667-4944 / www.DEKALB.ca
DL Seeds / (204) 331-2361 / www.dlseeds.ca
Lefsrud Seed Ltd / 6King Genetics / (780) 336-6700 Ed or (780) 336-5700 Kevin
Mastin Seeds / (403) 556-2609 / www.mastinseeds.com
Nutrien Ag Solutions/Proven Seed / 1-855-569-9444 / www.nutrienagsolutions.ca & www.provenseed.ca
Rotam North America / (431) 335-9471 / rotamnorthamerica.com
SeCan / 1-800-665-7333 / www.secan.com
Syngenta Canada Inc. / 1-877-964-3682 / www.syngenta.ca

ADDITIONAL RESOURCES:

Canola Council of Canada / 1-866-834-4378 / www.canolacouncil.org
Alberta Agriculture and Rural Development / 310-FARM (3276) / www.agriculture.alberta.ca
Alberta Canola Producers Commission / 1-800-551-6652 / www.canola.ab.ca

CANOLA - *NAPUS*

	S	F	R	C
1022 RR				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
1024 RR				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
1026 RR				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
1028 RR				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
2026 CL				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
4187 RR				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
McNaughton, Kevin / Lethbridge / (403) 317-4181				C
45CS40				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
45H33				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
45H37				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
45M35				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
45M38				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
46H75				
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont				
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135				C
5535 CL				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
McNaughton, Kevin / Lethbridge / (403) 317-4181				C
6074 RR				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
McNaughton, Brian / Lethbridge / (403) 308-9914				C
6076 CR				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Horner, Scott / Lethbridge / (403) 308-8152				C
6090 RR				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Horner, Scott / Lethbridge / (403) 308-8152				C

74-44 BL, 75-45 RR, 75-42 CR, 75-65 RR
BI: Monsanto Canada ULC, DIST: DEKALB Canada
Monsanto Canada ULC / Lethbridge County / (800) 667-4944 C

D3155C
BI: N/A, Dist: Corteva Agriscience, Agriculture Division of DowDupont
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135 C

EVOLVE
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed
Proven Seed/CPS Genetics / Lethbridge / (403) 336-5854 C

INVIGOR L135C
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

INVIGOR L233P
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

INVIGOR L234PC
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

INVIGOR L241C
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

INVIGOR L252
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

INVIGOR L140P
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

INVIGOR L157H
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

INVIGOR L230
BI: BASF Canada, Dist: BASF Canada Inc.
BASF Canada Inc. / Lethbridge / (403) 320-4567 C

PV 200 CL
BI: Corteva Agriscience, Agriculture Division of DowDupont, Dist: Nutrien Ag Solutions/Proven Seed
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135 C

PV 540 G
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed
Proven Seed/CPS Genetics / Lethbridge / (403) 336-5854 C

PV 560 GM
BI: Corteva Agriscience, Agriculture Division of DowDupont, Dist: Nutrien Ag Solutions/Proven Seed
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135 C

PV 581 GC
BI: Corteva Agriscience, Agriculture Division of DowDupont, Dist: Nutrien Ag Solutions/Proven Seed
Pioneer Hi-Bred Production Company / Lethbridge County / (403) 327-6135 C

UA ALFAGOLD
BI: U of Alberta, Dist: 6 King Genetics
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500 C

UA BOUNTYGOLD
BI: U of Alberta, Dist: 6 King Genetics
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500 C

CANOLA - *RAPA*

	S	F	R	C

EARLY ONE
BI: AAFC, Dist: Mastin Seeds
Mastin, Robert B. / Sundre / (403) 556-2609 C

Trait Stewardship Responsibilities Notice to Farmers

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. These products have been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from these products can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for these products. Excellence Through Stewardship® is a registered trademark of Excellence Through Stewardship.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready 2 Xtend® soybeans contain genes that confer tolerance to glyphosate and dicamba. Agricultural herbicides containing glyphosate will kill crops that are not tolerant to glyphosate, and those containing dicamba will kill crops that are not tolerant to dicamba. Contact your Monsanto dealer or call the Monsanto technical support line at 1-800-667-4944 for recommended Roundup Ready® Xtend Crop System weed control programs. **Roundup Ready® technology** contains genes that confer tolerance to glyphosate, an active ingredient in Roundup® brand agricultural herbicides. Agricultural herbicides containing glyphosate will kill crops that are not tolerant to glyphosate.

Acceleron® seed applied solutions for corn (fungicides only) is a combination of three separate individually-registered products, which together contain the active ingredients metalaxyl, prothioconazole and fluoxystrobin. **Acceleron® seed applied solutions for corn (fungicides and insecticide)** is a combination of four separate individually-registered products, which together contain the active ingredients metalaxyl, prothioconazole, fluoxystrobin, and clothianidin. **Acceleron® seed applied solutions for corn plus Poncho®/VOTiVO™ (fungicides, insecticide and nematicide)** is a combination of five separate individually-registered products, which together contain the active ingredients metalaxyl, prothioconazole, fluoxystrobin, clothianidin and *Bacillus firmus* strain I-1582. **Acceleron® Seed Applied Solutions for corn plus DuPont™ Lumivia® Seed Treatment (fungicides plus an insecticide)** is a combination of four separate individually-registered products, which together contain the active ingredients metalaxyl, prothioconazole, fluoxastrobin and chlorantraniliprole. **Acceleron® seed applied solutions for soybeans (fungicides and insecticide)** is a combination of four separate individually registered products, which together contain the active ingredients fluxapyroxad, pyraclostrobin, metalaxyl and imidacloprid. **Acceleron® seed applied solutions for soybeans (fungicides only)** is a combination of three separate individually registered products, which together contain the active ingredients fluxapyroxad, pyraclostrobin and metalaxyl. Fortenza® contains the active ingredient cyantraniliprole. **Visivio™** contains the active ingredients difenoconazole, metalaxyl (M and S isomers), fludioxonil, thiamethoxam, sedaxane and sulfoxaflor. Acceleron®, Acceleron BioAg™, Acceleron BioAg and Design™, Cell-Tech®, DEKALB and Design®, DEKALB®, Genuity®, JumpStart®, Optimize®, QuickRoots®, Real Farm Rewards™, RIB Complete®, Roundup Ready 2 Xtend®, Roundup Ready 2 Yield®, Roundup Ready®, Roundup Transorb®, Roundup WeatherMAX®, Roundup Xtend®, Roundup®, SmartStax®, TagTeam®, Transorb®, TruFlex™, VaporGrip®, VT Double PRO®, VT Triple PRO® and XtendiMax® are trademarks of Bayer Group, Monsanto Canada ULC licensee. BlackHawk®, Conquer® and GoldWing® are registered trademarks of Nufarm Agriculture Inc. Valtera™ is a trademark of Valent U.S.A. Corporation. Fortenza®, Helix®, Vibrance® and Visivio™ are trademarks of a Syngenta group company. DuPont™ and Lumivia® are trademarks of E.I. du Pont de Nemours and Company. Used under license. LibertyLink® and the Water Droplet Design are trademarks of BASF. Used under license. Herculex® is a registered trademark of Dow AgroSciences LLC. Used under license. Poncho® and VOTiVO™ are trademarks of BASF. Used under license. All other trademarks are the property of their respective owners.

Roundup Ready 2 TECHNOLOGY · LIBERTY LINK®

FLAX

	S	F	R	C
AAC BRAVO				
BI: AAFC (Morden), Dist: FP Genetics				
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333			R*	C*
Wheatcrest Farms / Lomond / (403) 792-3696			R	
AAC BRIGHT ▲				
BI: AAFC (Morden), Dist: SeCan Members				
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434				C
AAC MARVELOUS				
BI: AAFC (Morden), Dist: N/A				
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036	S			
Stamp Seeds / Enchant / (403) 739-2233	S			
AAC PRAIRIE SUNSHINE ▲				
BI: AAFC (Morden), Dist: SeCan Members				
Stamp Seeds / Enchant / (403) 739-2233				C
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434	S	F		C
CDC DORADO				
BI: CDC, Dist: SeedNet Inc.				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900		F		
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	S	F		
Stamp Seeds / Enchant / (403) 739-2233	S	F		
Wheatcrest Farms / Lomond / (403) 792-3696	S	F		
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434	S	F		
CDC NEELA				
BI: CDC, DIST: Canterra Seeds				
Huvenaars, Carl / Hays / (403) 725-2213				C
CDC PLAVA				
BI: CDC, DIST: SeCan Members				
Klassen, Ken / Rosemary / (403) 378-4408				C
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500			R	
Maisonneuve, Andre / Guy / (780) 925-3074			R	
Skaley, Wayne / Rycroft / (780) 765-2175			R	
Stamp Seeds / Enchant / (403) 739-2233		F*	R*	C*
Webber, Curtis / Parkland County / (780) 963-6897			R	
PRAIRIE SAPPHIRE				
BI: AAFC (Morden), Dist: Alliance Seed				
Feenstra, Lloyd / Barons / (403) 757-3737				C
Kiffiak, Nathan & Anderson, Tim / Foremost / (403) 867-2338			R	C
Stamp Seeds / Enchant / (403) 739-2233				C*
TOPAZ				
BI: Nutrien Ag Solutions., Dist: Alliance Seed				
Stamp Seeds / Enchant / (403) 739-2233	S*	F		
VT50				
BI: Nutrien Ag Solutions, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011		F	R	
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434			R	
WESTLIN 71				
BI: Nutrien Ag Solutions, Dist: Nutrien Ag Solutions/Proven Seed				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R	
WESTLIN 72				
BI: Nutrien Ag Solutions, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011				C

FLAX - RECONSTITUTED

	S	F	R	C
CDC GLAS				
BI: CDC, DIST: SeCan Members				
Alect Seeds / Three Hills / (403) 443-9599				C
Dyck, Heinz W., Colin, Alan & Kelton / Rosemary / (403) 378-3321				C
Fabian, Patrick V. / Tilley / (403) 377-2000				C
Hoff, Peter Edward / Gleichen / (403) 734-2140			R	
Holmstrom, Darrell / Killam / (780) 385-3574				C
Huvenaars, Carl / Hays / (403) 725-2213				C
Mueller, Darcy / Three Hills / (403) 820-4115				C
Stamp Seeds / Enchant / (403) 739-2233				C*
CDC SORREL				
BI: CDC, DIST: SeCan Members				
Catherwood, James / Calgary / (403) 836-9699				C
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383			R	
King, Harold & Webb, David G. / Three Hills / (403) 443-3333			R*	C*
Zwack, Thomas / Daysland / (780) 374-2450				C

ALFALFA

	S	F	R	C
4030				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Giesbrecht, Peter W. / Rolling Hills / (403) 622-2297				C
Quatro Ventures Inc. / Bow Island / (403) 545-2222				C
5010				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Ostrop, Alex / Grassy Lake / (403) 655-2485		F		
Vos, Lorne / Burdett / (403) 360-0759		F		
54Q14				
BI: N/A, Dist: DuPont Pioneer				
Vanderstoel, Jeroen / Enchant / (403) 654-2653				C
54Q25				
BI: N/A, Dist: DuPont Pioneer				
Cailliau, John, Dana, S., Dave, & Danielle / Enchant / (403) 739-3785				C
55Q27				
BI: N/A, Dist: DuPont Pioneer				
Cailliau, John, Dana, S., Dave, & Danielle / Enchant / (403) 739-3785				C
Vanderstoel, Jeroen / Enchant / (403) 654-2653				C
AAC NIKON				
BI: AAFC, Dist: N/A				
Calvert, Brad / Brooks / (403) 362-3587				C
AC GRAZELAND BR				
BI: AAFC, Dist: DLF Pickseed				
Vanderstoel, Jeroen / Enchant / (403) 654-2653				C
AC YELLOWHEAD				
BI: AAFC, Dist: SeCan Members				
Kerschbaumer, John A. / Fairview / (780) 835-4508				C
ALGONQUIN				
BI:N/A, Dist: Pask Farms Ltd.				
Cailliau, John, Dana, S., Dave, & Danielle / Enchant / (403) 739-3785				C
Friesen, Danny Jim / Fort Vermilion / (780) 927-4900				C
ALTHEA				
BI: N/A, Dist: La Coop féderée				
Klassen, Josh / Bow Island / (403) 952-1030				C
ASCEND				
BI: N/A, Dist: La Coop féderée				
Skrove, Chad / Rolling Hills / (403) 964-2135				C
ASSALT ST				
BI: N/A, Dist: DLF Pickseed				
Dyck, Heinz W., Colin, Alan & Kelton / Rosemary / (403) 378-3321				C
BARRICADE SLT				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Wheatcrest Farms / Lomond / (403) 792-3696				C
BEAVER				
BI: N/A, Dist: DLF Pickseed				
Kerschbaumer, John A. / Fairview / (780) 835-4508		F		
COMPASS				
BI: N/A, Dist: Gold Medal Seed Ltd.				
Gold Medal Seeds Limited / Brooks / (403) 362-3444				C
CONCEPT				
BI: N/A, Dist: Quality Seeds Ltd				
Petker, Viktor / Rosemary / (403) 501-1322				C
DALTON				
BI: AAFC, Dist: N/A				
Vandenberg, Ed / Enchant / (403) 634-0355				C
DIGEST HD				
BI: N/A, Dist: General Seed Company				
Burton, Derek / Medicine Hat / (403) 633-1858				C
FOOTHOLD				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
BrettYoung Seeds Limited / Rycroft / (780) 765-3069				C
Giesbrecht, Peter W. / Rolling Hills / (403) 622-2297				C
FORTUNE				
BI: N/A, Dist: DLF Pickseed				
Dyck, Daryl / Rosemary / (403) 378-3804				C
Huvenaars, Ron / Hays / (403) 725-2054			F	
Schroeder, A. Brent / Tilley / (403) 377-2020				C
FOUNDATION APR				
BI: N/A, Dist: Gold Medal Seed Ltd.				
Virostek, Derek / Rolling Hills / (403) 633-0520				C
GALAXY				
BI: N/A, Dist: N/A				
Dyck, Daryl / Rosemary / (403) 378-3804				C
Folkerts, Arthur / Tilley / (403) 377-2502				C
GEMSTONE				
BI: N/A, Dist: DLF Pickseed				
Folkerts, Arthur / Tilley / (403) 377-2502				C
Nikkel, Ed & Darren / Lethbridge / (403) 312-4070				C
HALO 2				
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011				C
INSTINCT				
BI: N/A, Dist: DLF Pickseed				
Dyck, Craig / Rosemary / (403) 378-4444				C
Knelsen, Abe / Bow Island / (403) 866-5187				C
Wiebe, Ronald / Rosemary / (403) 378-3018				C
LEGENDAIRY XHD				
BI: N/A, Dist: Gold Medal Seed Ltd.				
Gold Medal Seeds Limited / Brooks / (403) 362-3444				C
MAGNUM 7				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Skrove, Chad / Rolling Hills / (403) 964-2135				C
MASKA				
BI: N/A, Dist: Semican				
Vanderstoel, Jeroen / Enchant / (403) 654-2653				C
OCTANE				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Muller, Sivert / Hays / (403) 725-2230				C
OPTIMUS				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Giesbrecht, Peter W. / Rolling Hills / (403) 622-2297				C
PEGASE				
BI: N/A, Dist: N/A				
Nikkel, Ed & Darren / Lethbridge / (403) 312-4070				C
PICKSEED 2065MF				
BI: N/A, Dist: DLF Pickseed				
Folkerts, Arthur / Tilley / (403) 377-2502				C
Plett, Donald H. / Gem / (403) 641-2494				C
Slenders, Wayne & Brian / Scandia / (403) 362-7885				C
POWER 4.2				
BI: N/A, Dist: Power Seed Inc.				
Burton, Derek / Medicine Hat / (403) 633-1858				C
Nikkel, Ed & Darren / Lethbridge / (403) 312-4070				C

PV ULTIMA
BI: N/A, Dist: Gold Medal Seed Ltd.
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

RAMBLER
BI: N/A, Dist: DLF Pickseed
Kerschbaumer, John A. / Fairview / (780) 835-4508 C

ROBUST
BI: N/A, Dist: Northstar Seed Ltd.
Kerschbaumer, John A. / Fairview / (780) 835-4508 C

SHOCKWAVE-BR
BI: N/A, Dist: BrettYoung Seeds Ltd.
Ostrop, Alex / Grassy Lake / (403) 655-2485 F
Skrove, Chad / Rolling Hills / (403) 964-2135 C

SHOWDOWN
BI: N/A, Dist: Quality Seeds Ltd
Nikkel, Ed & Darren / Lethbridge / (403) 312-4070 C

SPREDOR 5
BI: N/A, Dist: Gold Medal Seed Ltd.
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

SPYDER
BI: N/A, Dist: BrettYoung Seeds Ltd.
Anderson, Stephen F. / Scandia / (403) 362-5886 C

STOCKPILE
BI: N/A, Dist: BrettYoung Seeds Ltd.
Versteegen, Erik / Rolling Hills / (403) 964-2740 C

STRONGHOLD
BI: N/A, Dist: Gold Medal Seed Ltd.
Douglass, Leslie / Gem / (403) 641-2227 C
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

SUPER NOVA
BI: N/A, Dist: DLF Pickseed
Scheibner, Carl / Gem / (403) 641-2435 C

VALID
BI: N/A, Dist: Quality Seeds Ltd
Nikkel, Ed & Darren / Lethbridge / (403) 312-4070 C

VISION
BI: N/A, Dist: DLF Pickseed
Dyck, Heinz W., Colin, Alan & Kelton / Rosemary / (403) 378-3321 C
Reid, Collin / Duchess / (403) 362-0888 C
Reid, Derek C. / Gem / (403) 641-3072 C

VR TOTAL
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed
Stiekema, Lauran / Vauxhall / (403) 635-1497 C
Wiens, Larry / Rosemary / (403) 378-4142 C

WL 319HQ
BI: N/A, Dist: Gold Medal Seed Ltd.
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

WL 358 LH
BI: N/A, Dist: Gold Medal Seed Ltd.
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

WL 366HQ
BI: N/A, Dist: Gold Medal Seed Ltd.
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

WL353LH
BI: N/A, Dist: Gold Medal Seed Ltd.
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

WL354HQ
BI: N/A, Dist: Gold Medal Seed Ltd.
Gold Medal Seeds Limited / Brooks / (403) 362-3444 C

BROMEGRASS

	S	F	R	C

AC KNOWLES
BI: AFFC (Saskatoon), Dist: Nutrien Ag Solutions/Proven Seed
Dechant, Clem / Hotchkiss / (780) 836-5541 C
Rewerts, Ken / Fairview / (780) 834-8326 C

AC SUCCESS
BI: AAFC, Dist: DLF Pickseed
Morseth, Lorne B. / Vulcan / (403) 892-1942 C

ADMIRAL
BI: AAFC, Dist: SeCan Members
Card, Gordon B. & Rhett / Magrath / (403) 758-3444 C

CARLTON
BI: AAFC (Saskatoon), Dist: Phillips' Seeds Ltd
Dynamic Seeds Ltd. / Fairview / (780) 835-5435 C
Enns, Walter / Clayhurst / (250) 781-3357 C
Froese, Cornelius H. / La Crete / (780) 927-4645 C
Hadland, Edward / Baldonnel / (250) 793-9746 C
Hanson, Troy / Valhalla Centre / (587) 343-2286 C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CHEDDAR
BUCKS
DOUGH
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MONEY
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REALFARMREWARDS.CA
REAL FARM REWARDS™
*Registration required. Growers must purchase a minimum of 32 bags of a qualifying brand of Genuity® Roundup Ready® canola plus additional participating products to be eligible to earn rewards. Visit RealFarmRewards.ca for full details.
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	S	F	R	C
Hegland, David Olaf / Wembley / (780) 766-2450				C
Kerschbaumer, John A. / Fairview / (780) 835-4508				C
Milkovich, Nicholas / Rycroft / (780) 765-3968				C
Sallis, Gary / Manning / (780) 836-2381				C
FLEET				
BI: AAFC (Saskatoon), Dist: SeCan Members				
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Froese, Cornelius H. / La Crete / (780) 927-4645				C
Froese, Isaac / La Crete / (780) 926-6945				C
Hadland, Edward / Baldonnel / (250) 793-9746		F		C
Hostettler, Fritz / Bluesky / (780) 835-4761				C
Van Garderen, Kees / Picture Butte / (403) 738-4203				C
Yoder, Calvin / Spirit River / (780) 814-4497				C
MANCHAR				
BI: N/A, Dist: No Rep				
Dynamic Seeds Ltd. / Fairview / (780) 835-5435				C
MBA				
BI: N/A, Dist: DLF Pickseed				
Olfert, Thomas A. / Hays / (403) 725-2265				C

CICER MILKVETCH

	S	F	R	C
AC OXLEY II				
BI: AAFC (Lethbridge), Dist: N/A				
Baerg, Robert J., Stephen & Jason / Rosemary / (403) 378-4382				C
VELDT				
BI: AAFC (Lethbridge), Dist: N/A				
Vanderstoel, Jeroen / Enchant / (403) 654-2653				C

CLOVER

	S	F	R	C
AURORA				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Gach, Ken / Nampa / (780) 618-9687				C

FESCUE

	S	F	R	C
BOREAL				
BI: AAFC (Beaverlodge), Dist: Nutrien Ag Solutions/Proven Seed				
Carlstad, Tyler / Bear Canyon / (780) 835-0505				C
DLF Moore Seed Inc. / Debolt / (780) 957-3964				C
Jones, Danny / Beaverlodge / (780) 354-8089		F		C
Richard, Gerald / Spirit River / (780) 864-2339				C
Richard, Michel / Spirit River / (780) 864-4220				C
ORACLE				
BI: AAFC (Beaverlodge), Dist: N/A				
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Hegland, David Olaf / Wembley / (780) 766-2450				C
Longson, A. Keith / Beaverlodge / (780) 831-7998				C
PRADEL				
BI: N/A, Dist: Speare Seeds				
Dynamic Seeds Ltd. / Fairview / (780) 835-5435				C

ORCHARDGRASS

	S	F	R	C
AC KILLARNEY				
BI: AAFC, DIST: N/A				
Card, Gordon B. & Rhett / Magrath / (403) 758-3444				C
TUNDRA LATE				
BI: N/A, DIST: Northstar Seed Ltd.				
Kerschbaumer, John A. / Fairview / (780) 835-4508				C

REED CANARY GRASS

	S	F	R	C
RIVAL				
BI: N/A, Dist: SeCan Members				
Dirks, Aaron Jonathan / Cecil Lake / (250) 781-3346				C

SAINFOIN

	S	F	R	C
AAC GLENVIEW				
BI: AAFC (Lethbridge), DIST: N/A				
McNaughton, Brian / Lethbridge / (403) 308-9914		F		

TIMOTHY

	S	F	R	C
ALMA				
BI: N/A, Dist: DLF Moore Seed Processors Inc.				
DLF Moore Seed Inc. / Debolt / (780) 957-3964				C
BARPENTA				
BI: N/A, Dist: DLF Moore Seed Processors Inc.				
DLF Moore Seed Inc. / Debolt / (780) 957-3964				C
COMER				
BI: N/A, Dist: DLF Pickseed				
Wirth, Jason / Valleyview / (780) 524-4736				C
PROMESSE				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Dirks, Aaron Jonathan / Cecil Lake / (250) 781-3346				C
SUMMERGRAZE				
BI: N/A, Dist: BrettYoung Seeds Ltd.				
Danyliuk, Jeff / Sunset House / (780) 524-2039				C
TENHO				
BI: N/A, Dist: DLF Moore Seed Processors Inc.				
DLF Moore Seed Inc. / Debolt / (780) 957-3964				C
TITAN				
BI: N/A, Dist: Northstar Seed Ltd.				
Hill, Gordon P. & Blair / Taylor / (250) 789-3469				C
TUUKKA				
BI: N/A, Dist: DLF Moore Seed Processors Inc.				
DLF Moore Seed Inc. / Debolt / (780) 957-3964				C

WHEATGRASS

	S	F	R	C
AC SALTLANDER				
BI: AAFC (Swift Current), DIST: SeCan Members				
Miller, Kenneth F. / Milk River / (403) 647-2127		F		C
ELBEE				
BI: AAFC (Lethbridge), DIST: SeCan Members				
Limoges, Daniel / Girouxville / (780) 833-1287				C
FAIRWAY				
BI: N/A, Dist: N/A				
Hostettler, Fritz / Bluesky / (780) 835-4761				C
GREENLEAF				
BI: N/A, DIST: SeCan Members				
Card, Gordon B. & Rhett / Magrath / (403) 758-3444		F		C
KIRK				
BI: AAFC (Saskatoon), Dist: SeCan Members				
Limoges, Daniel / Girouxville / (780) 833-1287				C
Meiers, Mark / Charlie Lake / (250) 827-3843				C
NEWKIRK				
BI: AAFC, DIST: N/A				
Limoges, Daniel / Girouxville / (780) 833-1287		F		C
WALSH				
BI: AAFC (Lethbridge), DIST: SeCan Members				
Card, Gordon B. & Rhett / Magrath / (403) 758-3444		F		

CANARYGRASS

	S	F	R	C
CDC CIBO ▲				
BI: CDC, DIST: Canterra Seeds				
Jonk, Nicholas / Westlock / (780) 349-5458			R	

CHICKPEAS

	S	F	R	C
CDC LEADER				
BI: CDC, DIST: N/A				
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434			R	C
CDC ORION				
BI: CDC, DIST: N/A				
Kiffiak, Nathan & Mercer, Ryan / Foremost / (403) 867-2338	S		R	
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434	S	F	R	C
CDC PALMER				
BI: CDC, DIST: N/A				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S			
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	S			
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434	S	F		

FABA BEANS

	S	F	R	C
CDC SNOWDROP				
BI: CDC, DIST: N/A				
Kittle, James William & Andrew / Viking / (780) 336-2583				C
Penwest Seeds / Three Hills / (403) 443-2577				C
Sim, Darwin & Derek / Ponoka / (780) 372-2111				C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*	R*	C*
FABELLE				
BI: DL Seeds, Dist: N/A				
Stamp Seeds / Enchant / (403) 739-2233	S*	F*		C*
FB 9-4 (MALIK)				
BI: N/A, Dist: N/A				
Stamp Seeds / Enchant / (403) 739-2233	S*	F*	R*	C*
SNOWBIRD				
BI: Innoseeds, Dist: Limagrain Cereals Research Canada				
Alect Seeds / Three Hills / (403) 443-9599			R	
Cyre, Clifford & Greg / Barrhead / (780) 307-4332	S	F	R	C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268				C
Lindholm Seed Farm / New Norway / (780) 352-3240			R	C
Plante, Jacques / St. Paul / (780) 645-4604				C
Stamp Seeds / Enchant / (403) 739-2233				C
VERTIGO				
BI: DL Seeds, Dist: N/A				
Stamp Seeds / Enchant / (403) 739-2233	S*			

HEMP

	S	F	R	C
FINOLA				
BI: N/A, Dist: Hemp Oil Canada				
Witdouck, Dale / Iron Springs / (403) 738-4395				C
PICOLO				
BI: Hemp Genetics International, Dist: SeedNet Inc.				
Pepneck, David / Vauxhall / (403) 424-0096			R	
Witdouck, Dale / Iron Springs / (403) 738-4395			R	

LENTILS

	S	F	R	C
CDC GREENSTAR				
BI: CDC, DIST: N/A				
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434				C
CDC IMPOWER				
BI: CDC, DIST: N/A				
Quatro Ventures Inc. / Bow Island / (403) 545-2222				C
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434				C
CDC IMPULSE ▲				
BI: CDC, DIST: SeCan Members				
Huvenaars, Carl / Hays / (403) 725-2213				C
Kiffiak, Nathan & Anderson, Tim / Foremost / (403) 867-2338				C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011				C
Quatro Ventures Inc. / Bow Island / (403) 545-2222				C

	S	F	R	C
CDC MAXIM				
BI: CDC, DIST: N/A				
Catherwood, James / Calgary / (403) 836-9699				C
Richard, Gerald / Spirit River / (780) 864-2339				C
CDC PROCLAIM ®				
BI: CDC, DIST: N/A				
Benci, Dennis / Carmangay / (403) 643-2294	S		R	
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	S			
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228			R	
Stamp Seeds / Enchant / (403) 739-2233				C*

MUSTARD

	S	F	R	C
AAC ADAGIO ▲				
BI: AAFC (Saskatoon), Dist: N/A				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736		F		
ANDANTE				
BI: AAFC (Saskatoon), Dist: N/A				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736		F		C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011		F		
CENTENNIAL				
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011				C
FORGE				
BI: N/A, Dist: Nutrien Ag Solutions/Proven Seed				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C

PEAS - FORAGE

	S	F	R	C
CDC HORIZON				
BI: CDC, Dist: Mastin Seeds				
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Hadland, Edward / Baldonnel / (250) 793-9746	S	F	R	C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617		F	R*	C*
CDC LEROY				
BI: CDC, DIST: N/A				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S			C
DL DELICIOUS				
BI: DL Seeds, DIST: FP Genetics				
Quatro Ventures Inc. / Bow Island / (403) 545-2222	S			

PEAS - GREEN

	S	F	R	C
AAC COMFORT ▲				
BI: AAFC, Dist: Canterra Seeds				
Huvenaars, Carl / Hays / (403) 725-2213			R	
Lindholm Seed Farm / New Norway / (780) 352-3240	S	F	R	
BLUEMAN				
BI: DL Seeds, DIST: SeedNet Inc.				
Stamp Seeds / Enchant / (403) 739-2233	S			
Wheatcrest Farms / Lomond / (403) 792-3696	S			
CDC DAKOTA				
BI: CDC, DIST: N/A				
Klempnauer, Joerg / Vauxhall / (403) 330-5480				C
CDC FOREST ▲				
BI: CDC, DIST: SeCan Members				
Hoff, Peter Edward / Gleichen / (403) 734-2140	S			
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535	S			
CDC GREENWATER				
BI: CDC, Dist: Saskatchewan Pulse Growers				
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C*
Solick Seeds Ltd. / Halkirk / (403) 884-2358		F*	R*	C*
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434			R	
CDC LIMERICK				
BI: CDC, Dist: Saskatchewan Pulse Growers				
Archer, Nathan / Didsbury / (403) 556-0693				C
Ellis, Brian / Olds / (403) 556-2890				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C*
Hallett's Hay And Seed / Carstairs / (403) 337-3072				C
Lindholm Seed Farm / New Norway / (780) 352-3240	S	F		C
Sekulic, John Jr. / Rycroft / (780) 765-2280				C
Sendziak Seed Farm / Edmonton / (780) 434-1322				C
Shultz, Shawn / Didsbury / (403) 335-3694			R	
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*	R*	C*

CDC RAEZER				
BI: CDC, DIST: N/A				
Baier, Bill & Dean / Clyde / (780) 348-5791				C
Kapitski, Lawrence / Andrew / (780) 365-2134				C
Krywko, Ronald / Sturgeon County / (780) 939-1719		F	R	
Shultz, Shawn / Didsbury / (403) 335-3694			R	C
CDC SPRUCE				
BI: CDC, DIST: SeCan Members				
Baier, Bill & Dean / Clyde / (780) 348-5791			R	
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377			R	
CDC STRIKER				
BI: CDC, DIST: N/A				
Sim, Darwin & Derek / Ponoka / (780) 372-2111			R	
COOPER				
BI: Innoseeds, Dist: Canterra Seeds				
Cyre, Clifford & Greg / Barrhead / (780) 307-4332				C
GARDE				
BI:N/A, Dist: Bob Park				
Hegland, David Olaf / Wembley / (780) 766-2450			R	
Lohner, Kevin / Daysland / (780) 679-6309			R	

PEAS - MAPLE

	S	F	R	C
AAC LISCARD				
BI: AAFC (Lacombe), DIST: N/A				
Stamp Seeds / Enchant / (403) 739-2233				C
CDC BLAZER				
BI: CDC, DIST: SeCan Members				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S		R	

PEAS - YELLOW

	S	F	R	C
AAC ARDILL				
BI: AAFC (Lacombe), DIST: N/A				
Hartzler, Leonard / Carstairs / (403) 337-2416				C
Penwest Seeds / Three Hills / (403) 443-2577				C
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251				C

AAC BARRHEAD				
BI: AAFC (Lacombe), DIST: N/A				
Hadland, Edward / Baldonnel / (250) 793-9746				C
Konieczny, Scott / Mannville / (780) 581-5693			R	
Meinczinger, Matthew Jr. / Busby / (780) 349-2456				C
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713	S	F	R	
AAC CARVER				
BI: AAFC, Dist: Canterra Seeds				
Berge, James Garnet / Dawson Creek / (250) 759-4773				C
Boisvert, Marc / Girouxville / (780) 618-4724				C
Ellis, Brian / Olds / (403) 556-2890	S			C
Fairview Seed Cleaning Coop / Fairview / (780) 835-2478				C
Goode, Tim / Lacombe / (403) 506-9424				C
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268				C
Jonk, Nicholas / Westlock / (780) 349-5458			R	
Kapitski, Lawrence / Andrew / (780) 365-2134			R	C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333				C
Penwest Seeds / Three Hills / (403) 443-2577	S	F		C
Plante, Jacques / St. Paul / (780) 645-4604				C
Richards, Dan / Sexsmith / (780) 766-2266				C
Rix, Graham / Wetaskiwin / (780) 360-9234				C
Sekulic, Nick / Rycroft / (780) 814-2849			R	C
Solick Seeds Ltd. / Halkirk / (403) 884-2358			R	
True Seeds Ltd. / Redwater / (780) 777-5885				C
Unrau, George / La Crete / (780) 928-0096				C
Wuthrich, David / Cecil Lake / (250) 781-3527				C
AAC CHROME ▲				
BI: AAFC (Lacombe), DIST: FP Genetics				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S	F		
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036		F		
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268	S			
King, Harold & Webb, David G. / Three Hills / (403) 443-3333	S			
Quatro Ventures Inc. / Bow Island / (403) 545-2222	S	F		
Sim, Darwin & Derek / Ponoka / (780) 372-2111	S	F		
Stamp Seeds / Enchant / (403) 739-2233	S	F		
AAC DELHI				
BI: AAFC (Lacombe), DIST: N/A				
Specialty Seeds Ltd. / Bow Island / (403) 545-6018	S			
Stamp Seeds / Enchant / (403) 739-2233	S			
AAC LACOMBE				
BI: AAFC, Dist: SeedNet Inc.				
Alect Seeds / Three Hills / (403) 443-9599				C
Benci, Dennis / Carmangay / (403) 643-2294	S*	F*	R*	
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377			R	
Dyck, Ernie / La Crete / (780) 821-9445				C
Ellis, Brian / Olds / (403) 556-2890	S			C
Forward Seed Farm / County of Barrhead / (780) 674-3822				C
Huvenaars, Carl / Hays / (403) 725-2213				C
Jonk, Nicholas / Westlock / (780) 349-5458				C
Macyk, Tim / Radway / (780) 699-4073				C
Moffitt, Kenneth & Raymond / Radway / (780) 818-6550			R	
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713		F		C
Oatway's Seed Farm Ltd. / Clive / (403) 784-3001			R	C
Specialty Seeds Ltd. / Bow Island / (403) 545-6018				C
Stamp Seeds / Enchant / (403) 739-2233	S*	F		C*
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				C*
True Seeds Ltd. / Redwater / (780) 777-5885			R*	C*

	S	F	R	C
Victoor, Rene & Jamie / Sturgeon County / (780) 459-3253	S	F		C
Wheatcrest Farms / Lomond / (403) 792-3696	S	F		
Wiebe, Paul & Julie / Acme / (403) 510-9260				C
Witdouck, Dale / Iron Springs / (403) 738-4395				C
AAC PEACE RIVER				
BI: AAFC, Dist: FP Genetics				
Hadland, Edward / Baldonnel / (250) 793-9746				C
Mastin, Robert B. / Sundre / (403) 556-2609				C
Richard, Gerald / Spirit River / (780) 864-2339				C
ABARTH ⓦ				
BI: Limagrain, Dist: FP Genetics				
Quatro Ventures Inc. / Bow Island / (403) 545-2222	S	F	R	
CDC AMARILLO				
BI: CDC, Dist: Saskatchewan Pulse Growers				
Alect Seeds / Three Hills / (403) 443-9599				C
Bell, D. Leslie / Drumheller / (403) 823-9462				C
Davidson, E. Daryl & Dean / Kitscoty / (780) 846-2456			R	C
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383				C
Foster's Seed & Feed Limited / Beaverlodge / (780) 354-2107				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C*
Harris, William P., Linda, Thomas & A. / Beaverlodge / (780) 354-2823			R	C
Konieczny, Scott / Mannville / (780) 581-5693			R	C
Limoges, Richard / McLennan / (780) 324-2335		F		C
Lindholm Seed Farm / New Norway / (780) 352-3240				C
Pare, Raymond A. / Wainwright / (780) 842-2073		F	R	
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251				C
Sendziak Seed Farm / Edmonton / (780) 434-1322				C
Shaw, Tom / Country of Grande Prairie No.1 / (780) 882-7766				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358	S*	F*	R*	C
True Seeds Ltd. / Redwater / (780) 777-5885			R	C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617		F*	R*	C*
CDC ATHABASCA ⓦ				
BI: CDC, DIST: SeCan Members				
Harris, William P., Linda, Thomas & A. / Beaverlodge / (780) 354-2823	S			
CDC CANARY ▲				
BI: CDC, DIST: SeCan Members				
Degenhardt, Keith L., Terry L. & Kerry / Hughenden / (780) 856-2383	S			
Kittle, James William & Andrew / Viking / (780) 336-2583	S			
Pare, Raymond A. / Wainwright / (780) 842-2073	S			
CDC INCA ⓦ				
BI: CDC, DIST: N/A				
Benci, Dennis / Carmangay / (403) 643-2294	S		R	C
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900			R	
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333			R	C
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377				C
Eliason, Bruce W. / Wrentham / (403) 222-2258			R	
Hoff, Peter Edward / Gleichen / (403) 734-2140			R	C
Hoffmann, Curtis / Oyen / (403) 664-9617				C
Holmstrom, Darrell / Killam / (780) 385-3574			R	
Howard, Fred / Wanham / (780) 694-2427			R	
Jackson, Thomas / Killam / (780) 385-2332			R	
Jacula, Dean S. & Shawn D. / Vermilion / (780) 581-9011	S	F	R	
Kiffiak, Nathan & Anderson, Tim / Foremost / (403) 867-2338			R	
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500				C
Lindholm, Luke & Stevan / Camrose / (780) 781-6077			R	
Markert Seeds Ltd. / Vulcan / (403) 485-6708	S	F	R	C
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R	C
Moffitt, Kenneth & Raymond / Radway / (780) 818-6550				C
Sayer, Roger / Carstairs / (403) 337-5847				C
Sich, Louis John, Ivan & Martin / Trochu / (403) 442-2112			R	
Sim, Darwin & Derek / Ponoka / (780) 372-2111			R	
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228	S	F	R	
Solick Seeds Ltd. / Halkirk / (403) 884-2358		F*	R	
Specialty Seeds Ltd. / Bow Island / (403) 545-6018				C
Stamp Seeds / Enchant / (403) 739-2233	S		R	C*
True Seeds Ltd. / Redwater / (780) 777-5885			R	C
Wheatcrest Farms / Lomond / (403) 792-3696			R	
Wiebe, Paul & Julie / Acme / (403) 510-9260			R	
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434	S	F	R	
Witdouck, Dale / Iron Springs / (403) 738-4395			R	
Wood, Robert, Patricia & Marshall / Bowden / (403) 588-3548			R	
CDC MEADOW				
BI: CDC, DIST: N/A				
Airth, Jock & Linda / Brooks / (403) 362-4372				C
Benci, Dennis / Carmangay / (403) 643-2294			R	C
Felstad, Colin / Dapp / (780) 349-9505			R	C
Hadland, Edward / Baldonnel / (250) 793-9746			R	C
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929				C
Hartzler, Leonard / Carstairs / (403) 337-2416				C
Kapitski, Lawrence / Andrew / (780) 365-2134				C
King, Harold & Webb, David G. / Three Hills / (403) 443-3333			R*	C
Kittle, James William & Andrew / Viking / (780) 336-2583			R	C
Koester, Gordon & Munro, Daniel / Rockyford / (403) 533-2248				C
Limoges, Richard / McLennan / (780) 324-2335				C
MacFarquhar, Bill / Cremona / (403) 337-2910				C
Massey, Derwin & Kirby / Stettler / (403) 883-2503				C
Nemetz, Charlie, Jerritt & Lewis / Stettler / (403) 742-0436				C
Page, Dan / Didsbury / (403) 335-4563				C
Radke, Bryan Victor / Barrhead / (780) 674-5715		F	R	
Richard, Gerald / Spirit River / (780) 864-2339				C
Richards, Dan / Sexsmith / (780) 766-2266				C
Sich, Louis John, Ivan & Martin / Trochu / (403) 442-2112				C
Stamp Seeds / Enchant / (403) 739-2233				C*
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*	R*	
CDC SAFFRON				
BI: CDC, DIST: N/A				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C*
Klassen, Ethan / Coaldale / (403) 345-3770				C
Kopjar, Gerald M. / Rowley / (403) 368-2409			R	
Lefsrud, Kevin J. & Edmund J. / Viking / (780) 336-2500			R	C
Shultz, Shawn / Didsbury / (403) 335-3694				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358				C
Warkentin, Harold K. & Errol / Beaver County / (780) 662-2617	S*	F*	R*	
Zwack, Thomas / Daysland / (780) 374-2450				C
CDC SPECTRUM ⓦ				
BI: CDC, DIST: SeCan Members				
Dyck, Ernie / La Crete / (780) 821-9445			R	
Hoff, Peter Edward / Gleichen / (403) 734-2140			R	
Huvenaars, Carl / Hays / (403) 725-2213			R	
Kopjar, Gerald M. / Rowley / (403) 368-2409	S		R	
Penwest Seeds / Three Hills / (403) 443-2577	S			
Sand, Ron W. & David R. / McLaughlin / (780) 745-2251				C
Wildeman, Russell / Clive / (403) 470-8528				C
Willms, Henry & Timothy H. / Grassy Lake / (403) 655-2434			R	
LN4228 ⓦ				
BI: Limagrain, Dist: Lindholm Seed Farm				
Lindholm Seed Farm / New Norway / (780) 352-3240				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358			R*	C*

SOYBEANS

	S	F	R	C
FISHER R2X				
BI: N/A, Dist: N/A				
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036		F		
MAXUS				
BI: Semences Prograin, Dist: Quarry Seed				
Klassen, Ethan / Coaldale / (403) 345-3770				C
NSC LEROY				
BI: N/A, Dist: Northstar Genetics Canada				
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
PV 10S005 RR2, PV 11S001 RR2, PV 12S007 R2X, PV 14S008 RR2, PV 15S0009 R2X, PV 16S004 R2X				
BI:N/A, Dist: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions (Canada) / High River / (403) 603-6011 S F R C				
R2C0724				
BI: WinField United Canada, Dist: N/A				
Farion, Ken W. / Vegreville / (780) 632-7140				C
S007-Y4				
BI: N/A, Dist: Syngenta Canada				
Walker, Bradley R. / Vulcan / (403) 485-6573				C

Soybeans on the Prairies

Once considered an eastern crop, soybeans have been migrating west across the Prairies to become an important crop for producers.

WHAT WAS ONCE all but unheard of in Manitoba, is now found all over the province and has moved well beyond it in a seemingly unstoppable westward domination of Canadian fields?

The answer is soybeans, and they are marching west from Manitoba to Alberta, with researchers working hard to create new varieties.

"Canada has a history of soybean expansion West and northward," said Elroy Cober, who has worked at the AAFC Ottawa Research and Development Centre as a soybean breeder since 1996.

"Starting from two counties in southern Ontario, we have seen expansion through Ontario, Quebec and now Manitoba. Who knows how much soybean can expand in Saskatchewan and Alberta? As far as breeding for these regions is concerned, we have to balance between too dry in the Palliser Triangle and too short a season as we move north."

Tom Warkentin, who breeds field pea cultivars with emphasis on agronomic traits, disease resistance, and end-use quality, says there's interest there on the research side and on the part of some growers.

"Right now the acreage is small. It should be a good fit in the irrigation district where you can rule out drought, but it would mean a compromise between picking soybeans over some of the higher value crops that are grown there," Warkentin says.

According to Alberta Agriculture and Forestry, soybeans are sometimes referred to as "short-day plants", as they flower in response to shortened day length. Latitude greatly affects day length, so geography plays a very important role in the production of soybeans. Because of this, each variety has a very narrow north-south range of adaptation, usually no wider than 150-250 kilometers. Varieties grown south of their maturity band will mature earlier than normal, resulting in reduced yield. Varieties grown further north than their maturity band will mature later and be at a greater risk of a killing frost. If a season-ending freeze hits soybeans before they reach physiological maturity, both yield and quality will be affected.

Elroy Cober

Tom Warkentin

"In general soybeans are a long-season crop, so that's obviously a factor here on the Prairies," says Warkentin. "It's somewhat drought susceptible. In some ways the seed is expensive, which can be an issue for some."

Soybeans Heading West

To find out exactly how much acreage has expanded, how the development of locally-adapted varieties is going and where the future of soybeans in the West is headed, Glenda Clezy, an agronomy specialist at the Saskatchewan Pulse Growers (SPG), broke down the numbers.

Clezy says it was around 2012 that the crop really started to increase significantly in acreage in Western Canada. She points to Statistics Canada data shows a strong jump in acreage in Manitoba from last year to this year (2.3 million acres in 2017 up from about 1.6 million in 2016), and a tremendous leap over the same time period in Saskatchewan (850,000 in 2017, more than three-and-a-half times the 240,000 acres grown in 2016).

Alberta is not currently included in the data due to low acreage, nor in Statistics Canada's June 2017 crop report, which states that Ontario, Manitoba, Quebec and Saskatchewan account for 99 per cent of national total soybean production, and that all of these provinces reached record high soybean acreages this year.

"The number of varieties available to growers is on the rise as well," Clezy explains, "and is likely a key factor in the increase in acres as more varieties are available that are shorter-season

and have the potential to reduce risk for producers. Currently there are 48 varieties in the variety trials in Saskatchewan. These varieties range from 006 to 0006 maturity groups."

Something to Consider: Season and Varieties

Cober states soybean production in Canada is one of continuously expanding to shorter-season areas. "Soybean cultivars are regionally adapted. Individual cultivar movement north-south is primarily limited by day length responses and season length, and as a result we see strips of adaptation, or maturity zones, running east-west." He adds this is in contrast to wheat, a long-day plant, where moving north speeds maturity and helps fit it into the shorter season.

Cober says that when making soybean variety selections for your farm, you need to start with a realistic maturity for your location.

"Avoid the temptation to look at those higher yielding varieties further down the chart. Use actual days to maturity from your multiple location regional trials to judge maturity," Cober says. "Seed composition may be an issue for you if there is a way to capture that value in an identity preservation system. Also, do you have the equipment and marketing infrastructure to grow soybeans?"

But once a farmer determines they want to grow soybean, what are some ways they can pick the best variety for them?

"They should determine what maturity they're comfortable with, the season for their farm, tolerance for loss to frost — then look at a pool of varieties that fit into that maturity," notes Cober. "They'll also want to look at yield. Then there are the non-yield issues, possibility of iron deficiency chlorosis, or maybe they need herbicide tolerance traits for their cropping system."

Clezy took a look at the websites for companies that are currently selling soybean varieties in Western Canada, and reports that there now seem to be more than 90 varieties available in total. However, she notes that not all of these varieties will be suitable for all areas, and farmers in some areas will have a much smaller number of varieties to select from that may be suitable for their locations.

Cober agrees that maturity is a requirement for reliable production on the Prairies. "Growers need to select lines that reliably mature," he advises, "while recognizing they may give up a little yield in years when there is a long open fall."

Testing, Testing, Testing

Over the last 15 years or so, Cober has been testing his early-maturing soybean lines with staff at the AAFC station in Morden, Man. He notes that while the growing season in that area is a long

season when considering Western Canada as a whole, he's found "the early half of my breeding material to be adapted to Manitoba."

Cober has developed a very early-maturing variety called 'AAC Edward' marketed by SeCan. "During its testing, it was grown at Saskatoon for a number of years and performed very reliably there," Cober reports. "It is necessary to test lines in their proposed area of adaptation. Iron deficiency chlorosis is not an issue in Eastern Canada, while it can be a problem with some soils in Manitoba. Local testing will sort out lines that are susceptible."

Cober is currently testing early-maturing breeding material in Manitoba at AAFC Morden and Portage, Man. He is also collaborating in a pilot project where he is developing populations and sending them to Morden and Saskatoon for selection and testing with the belief that local selection may allow for even better adaptation.

Looking Forward

In terms of where in the West we may see soybeans being grown next and how the industry is preparing for that, Clezy points to a few factors.

Glenda Clezy

"The future of soybeans will be dependent on the success that growers have over the next few years, as well as the ongoing release of new varieties that offer higher yields and earlier maturity," she says. "The weather and the amount of moisture available will also impact the success of soybeans. As varieties continue to develop that are able to mature in fewer number of days, and yield sufficiently to make them a suitable option for more of Western Canada, we will likely continue to see soybean acres increase as well as expand in geography to the north and to the West."

Cober notes that some growers are trying soybeans in areas such as The Pas and Edmonton, and he feels it might be a possible to grow soybeans that far north, and he continues to look for new early-maturity genes which might allow for further northern expansion. "While heat-loving soybeans might be able to be grown in the northern Prairies, they need to yield enough to be competitive with cool-climate crops," he notes. "I hope that soybeans might find a place in canola rotations to allow for longer rotations and reduce canola disease pressure."

Marc Zienkiewicz, Treena Hein
With Files from Alberta Agriculture and Forestry

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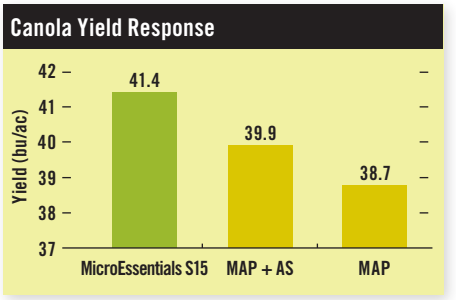

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7 Ways Seed-Applied Technologies are Evolving

From boosting yield to helping you focus on your farming tasks, these products hold a lot of promise for the future.

NEXT-GENERATION SEED treatment technologies, non-chemistry-based seed treatment technologies, and the potential of biologicals and microbes are all driving the industry forward. Farmers need to keep in mind that they must not only keep up with the latest trends, but they also have to make sure they are asking the right questions. In order to do that, you need to know how these products are growing and evolving.

They may help boost yield.

Russell Trischuk, regional technical manager for BASF Functional Crop Care in Saskatoon, Sask., says to get to the next plateau of yield, there's a lot yet to be done with these technologies. "We've made big strides in yield over the past few decades due to effective fungicides, herbicides and insecticides plus a big contribution from genetics technologies. Still, the yield increase year over year isn't what is used to be. Through on-seed technologies we can afford the plant the ability to manage abiotic and even some biotic stresses. We believe these products really will take us to the next level of production in our crops not only in Western Canada, but globally."

They may help you rely less on chemistry.

John Kibbee is the owner of Kibbee ST Consulting in Guelph, Ont. He has a history of product development and technical management experience in seed treatments. He says in terms of the non-chemistry-based seed treatment technologies that are of interest to him, microbes for seed treatment — also called biologicals — can do some incredible things "and we've only scratched the surface." Kibbee believes seed treatments have become a low-impact crop protection method, and microbes are the next evolution. "They're green, have a better acceptance among consumers, but are complicated to formulate and turn into a commercial product that works consistently in the field."

They may help enhance the effectiveness of the chemistry you're using.

Trischuk says the use of biologicals in combination with chemistry allows them to plug holes in their crop protection systems and improve the crops they are putting it on. "A biological seed treatment is a technology where it's easy to demonstrate these benefits," he states, adding a chemical treatment is very effective for protecting the seed and plant as it gets out of the ground.

These products will help protect the plant during its most crucial stage.

"We know that within a two or three-week period after planting, the impact of that chemical treatment starts to wear off. This is where biological treatments come in," says Trischuk. He explains that it takes some time for that microorganism to grow and colonize the root system or soil surrounding it, and due to that they see a delayed response in disease control. "This is right in line for when we see a chemical treatment begin to lose its efficacy," he says. "We can bridge that gap that we see until later in the season when a foliar treatment can be applied."

These technologies are changing how we think about seed treatments.

Kibbee says it took him a long time to adjust his thinking, as he spent his career trying to protect crops from microbes, but now he thinks about nurturing them and allowing them to survive. Looking to the future, what sort of microbes can we harness for use in seed treatments of the future? "Rhizobia is an obvious one for nitrogen fixation on legumes and is something we're already seeing used. Azospirillum is popular in Latin America for nitrogen fixation on cereals," says Kibbee.

"We've made big strides in yield over the past few decades due to effective fungicides, herbicides and insecticides plus a big contribution from genetics technologies."

—Russell Trischuk

6 Seed treatments are changing how manufacturers commercialize products.

"We now have a dedicated seed and soilborne pathogens screening program [at BASF]," Trischuk explains. "All molecules are screened not only for efficacy against foliar diseases, but against all major diseases attacking the seed and seedling in the soil. That's in contrast to what we used to do, where we'd find an active ingredient that was a good fungicide, develop it for foliar use, and then look to see if there's was a fit on seed or in soil." He believes that change in philosophy has allowed them to identify a couple of molecules that they don't think would have passed screening for a foliar fungicide but have been found to be very effective on seed or in soil.

7 They'll help change how you make product selections.

In the end, Trischuk says when comparing biological and chemical solutions — especially with regard to consistency of performance and expectation of results — farmers need to examine their expectations. "Some of these products don't have a requirement to submit efficacy data to receive registration," he says. "Make sure you ask questions about the product. If there's only been one trial, how credible is that data? At BASF we try to give a lot of info about what the grower can expect. If you want to know how something works, ask for data."

Marc Zienkiewicz

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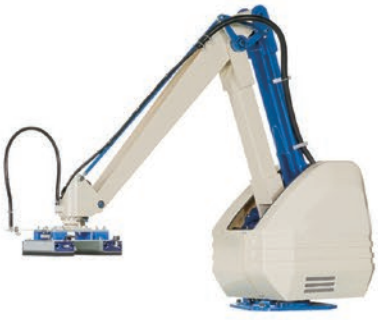

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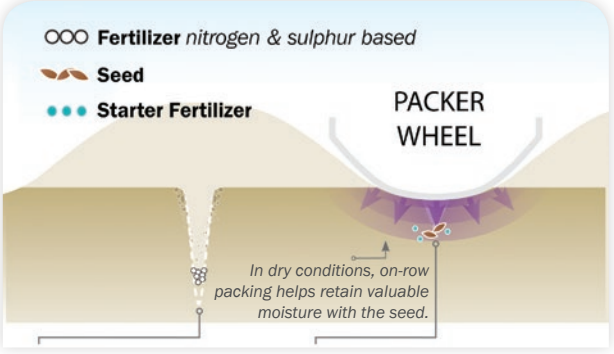

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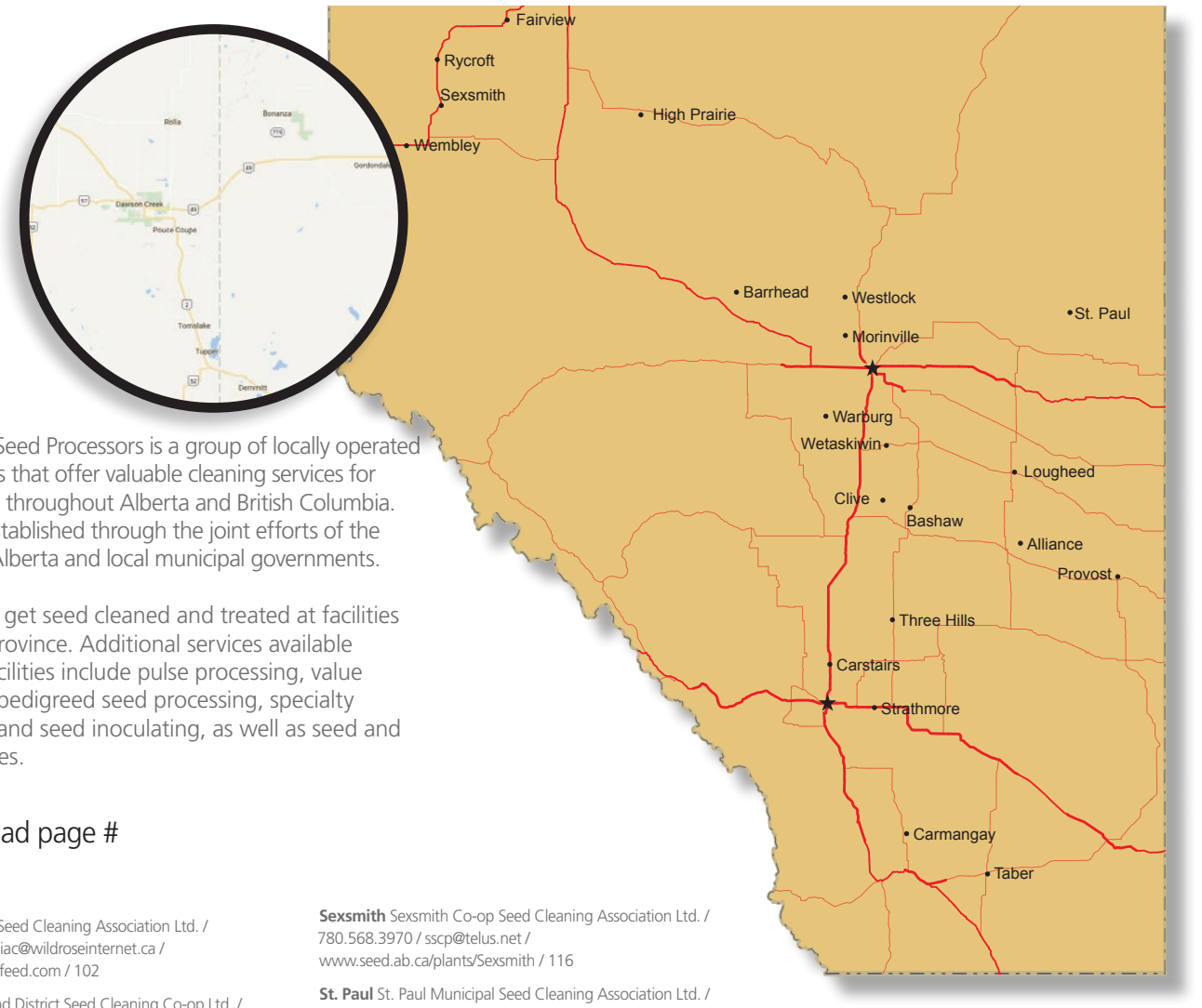

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Most Americans Remain Confused About GMOs

GMO Answers, an initiative committed to responding to consumer questions about how their food is grown, released the findings of a new YouGov survey finding that a majority of Americans aren't confident they definitely know what genetically modified organisms (GMOs) are, and that this lack of knowledge may be driving overall uncertainty and discomfort.

GMO Answers conducted the survey to better understand public perceptions of GMOs and launches the findings on the first day of "Get to Know GMOs Month," an annual event held in October to encourage conversations about GMOs, explain new advancements, and dispel common misconceptions around the health and safety of GMOs.

The survey's key findings include:

- 69% of consumers are not confident they know what GMOs are, and less than a third of Americans (32%) say they are comfortable with the use of GMOs in their food products.
- Roughly 3 in 5 Americans are interested in learning more about GMOs.
- 74% want to learn more about GMOs' impact on their overall health.
- 67% are interested in learning more about the overall safety of GMOs.
- 43% of consumers believe that food (in general) sold in the US is safe for consumption, meaning there is widespread distrust as a whole when it comes to food production, despite the U.S. having the safest food supply in the world.

Creating a New Crop Through Genome Editing

For the first time, researchers from Brazil, the U.S. and Germany have created a new crop from a wild plant within a single generation using CRISPR-Cas9. Starting with a "wild tomato" they have, at the same time, introduced a variety of crop features without losing the valuable genetic properties of the wild plant.

The researchers chose *Solanum pimpinellifolium* as the parent plant species, a wild tomato relative from South America, and the progenitor of the modern cultivated tomato. The wild plant's fruits are only the size of peas and the yield is low – two properties which make it unsuitable as a crop. On the other hand, the fruit is more aromatic than modern tomatoes, which have lost some of their taste due to breeding. Moreover, the wild fruit contains more lycopene.

Specifically, the researchers produced the following modifications in comparison with the wild tomato: the fruit

is three times larger than that of the wild tomato, which corresponds to the size of a cherry tomato. There is ten times the number of fruits, and their shape is more oval than the round wild fruit. This property is popular because, when it rains, round fruits split open faster than oval fruits. The plants also have a more compact growth.

Global Warming Will Have Us Crying in What's Left of Our Beer

In a study published in *Nature Plants*, researchers from the University of California, Irvine and other institutions report that concurrent droughts and heat waves, exacerbated by anthropogenic global warming, will lead to sharp declines in crop yields of barley, beer's main ingredient.

The economic models used in the paper demonstrated strong potential for price surges in some beer-loving countries, and whether or not people get to enjoy a frosty mug of suds will likely depend on their willingness to pay.

Co-author Steven Davis, UCI associate professor of Earth system science said the research team modeled scenarios based on current and expected future levels of fossil fuel burning and carbon dioxide emissions. In the worst case, parts of the world where barley is grown – a including the northern Great Plains, Canadian prairies, Europe, Australia and the Asian steppe – were projected to experience more frequent concurrent droughts and heat waves, causing declines in crop yields of three to 17 per cent.

Only 17 per cent of the globe's barley is used in brewing. The study further outlines how different regions of the world will be affected, determining that prices will go up the most in such wealthy, beer-loving countries as Belgium, Canada, Denmark and Poland.

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INSECTICIDE SEED TREATMENT

DuPont™ Lumiderm™ insecticide seed treatment provides:

- Enhanced protection against striped and crucifer flea beetles
- Early season cutworm control
- Excellent early season seedling stand establishment, vigour and biomass

Ask your seed provider to include Lumiderm™ on your 2019 canola seed order. For more information, call the Solutions Center at 1-800-667-3852 or visit lumiderm.dupont.ca.

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