Alberta Seed Guide

Advancing Seed in Alberta

FALL 2019

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LOT OF WEIGHT
AS A BRAND.

—Dave Carey

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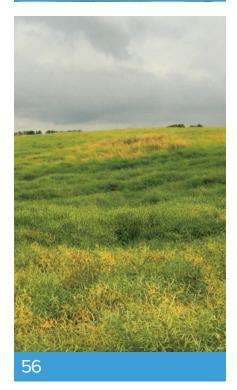
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MESSAGES I Alberta Seed Growers



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GREETINGS TO EVERYONE, We've reached that time of year when yet another busy growing season is behind us. As 2019 winds down, now is the time to look ahead to future opportunities and successes. But big opportunities don't just happen, they are the result of hard work, devotion and change, and they can only truly blossom after a small seed has been planted and nurtured.

I thought about this a lot over the summer. For starters, our family welcomed a new little seed grower this June. As we learned how to care for our new addition and watched him grow, I realized that there are many parallels between our families and the business we are in. That is, the more you nurture that small seed and learn to understand it, the more it can flourish. The same can be said for the work of the Alberta Seed Growers board, who this summer, was planting and nurturing small seeds for our industry as they forged new connections, highlighted industry challenges and continued important discussions.

One way your Alberta Seed Growers board of directors is working toward opportunities was by meeting with our newly elected Agriculture and Forestry Minister, the Honorable Devin Dreeshen. When meeting with Minister Dreeshen the board highlighted several challenges that Albertan seed growers are facing, including the issue of Fusarium graminearum (Fg) and the need for more options to manage it aggressively and effectively. The board shared that finding new, innovative ways to support and enhance seed and agronomy research is essential for the future quality and quantity of Alberta crops. And the board highlighted the need for reliable funding so seed growers and farmers can benefit from successful public and private plant breeding programs.

The board also spent the summer working on other important seed grower concerns. In particular, the challenge of obtaining crop insurance was discussed and the board began conversations with the insurance industry around new products to allow seed growers to insure for such things as plant breeder seed cost and seed crop failure.

At the national level, the Canadian Seed Growers Association (CSGA) has been busy setting the stage for a single-window seed system. Our board of directors and our members are contributing to that conversation, representing ASG at the CSGA/ Canadian Seed Trade Association Joint Annual Meeting this summer and speaking up about the current issues impacting their businesses.

Directly related to this is news that StrategyCorp was commissioned to work on the Seed Synergy Collaboration Project. Earlier this fall, StrategyCorp interviewed members of CSGA and members of the five other Seed Synergy Project organizations, and will develop a plan to combine six unique seed organizations over the coming months. Keep an eye on our website to learn more about the progress toward Seed Synergy.

Tackling the fusarium issue, trying to obtain crop insurance, the creation of a singlewindow seed system and supporting research and innovation are all big, ambitious goals. Right now we're starting small, with conversations, meetings and ideas. After all, big opportunities and changes all stem from a small, nurtured seed.

Thanks everyone for your continued support,

Renee Hoyme President Alberta Seed Growers

MESSAGES | Alberta Seed Processors



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AT THE TIME of writing, many farmers in Alberta are firing up grain dryers, struggling with lodged crops, and some are even waiting for snowdrifts to melt before finishing harvest. Hence, I think it's safe to say that the topic of seeding next year's crop is not at the top of your list right now. However, as harvest progresses, observations about the outcomes of particular fields are being made. These observations will impact cropping and agronomy decisions for next year's crop. Many refer to the complex process of making the multitude of decisions that this business of farming requires as a "Decision Tree." I guess the image of a tree with roots and branches that are all interconnected is pretty good, as most decisions are connected to one another. I believe the root of most cropping decisions is seed. Needless to say, seed is one of the most important ingredients in successful crop production. I trust the content contained in this issue of the *Alberta Seed Guide* assists in making some of the decisions for next year's crop.

There are a few BIG topics regarding seed that have recently hit the radar within the farming community. The topic of funding seed breeding activities continues to garner a lot of attention; and so it should, as previously stated: seed is important! Part of the conversation here is the fact that government investment in agriculture-based research is in a precarious position. Seed companies feel Canada needs to create an environment to attract private investment in ag research, specifically seed breeding, otherwise, Canada will fall behind our global competitors.

Late in 2018, two models to capture the value of farmers using seed were pitched: one being an end-point royalty, the other being a trailing royalty — or a royalty that would be assessed on farm-saved seed. The reaction to the models presented at a meeting in Edmonton was somewhat negative. I believe there is a lot that went into this reaction including, but not limited to, lack of financial analysis of the impact of the models; fear of farmers losing control; more red tape; and an added burden on already compromised margins on the farm. During the summer, the three prairie farmer's organizations — Alberta Federation of Agriculture for one — pitched a third model called "collective research," and launched a survey with the goal of collecting feedback from farmers on the now three models of value capture/creation. I do not have the answer to this complex issue, but what I do know is that (again) seed is important. I encourage all farmers to be engaged in this conversation, as we have a once-in-a-lifetime opportunity to build a sustainable funding system for the future.

On the topic of building a sustainable seed system of the future, the Seed Synergy Collaboration Project is an on-going dialogue between five national organizations that have regulatory and advocacy roles within the current seed system. The goal of building one collective organization that is agile, efficient and transparent to meet the needs of the future seed system is a massive task as there are connections to various departments with the federal government, as well as amalgamating differing culture of the existing organizations. Although the impact of Seed Synergy to farmers may be at an arm's length, farmers need to understand that the Canadian seed industry is at the brink of some very BIG changes.

Alberta Seed Processors has been part of an ad-hoc industry working group led by the Alberta Wheat Commission. The goal of this working group is to amend the Alberta Pest Control Act regarding *Fusarium graminearum* — one of the pathogens that causes fusarium head blight. Please read the article on Fusarium, as well as our open letter to Alberta farmers why legislative reform is now required.

For 20 years, the *Alberta Seed Guide* has brought focus on the importance of seed and the multitude of behind-the-scenes efforts in the seed sector that works to bring farmers high-quality seed. Thank you for your support!

Hector Ouellette PresidentAlberta Seed Processors

GREETINGS I Government of Alberta



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AS MINISTER OF AGRICULTURE and Forestry and on behalf of my colleagues at the Alberta Legislature, it is my pleasure to extend greetings to readers of Alberta Seed Guide. This edition's theme, "Opportunity Starts with Seed," is a worthy reminder that every success starts with a small first step.

Agriculture is an essential element of Alberta's history, communities and economy, contributing billions to the province every year. It is an industry that is always changing, innovating and making new, exciting advances. Publications like Alberta Seed Guide are essential to everyone in agriculture.

As a fifth-generation farmer, I always have an issue of Alberta Seed Guide around. It's a helpful guide to recent developments in crop science and agricultural practices, and ensures that thousands of producers in Alberta, including myself, are up to date and informed.

Thank you to Alberta Seed Growers and Alberta Seed Processors for your hard work and dedication to the province's producers.

Best wishes for many more successful years.

Honourable Devin Dreeshen

Minister, Agriculture and Forestry

Alberta Seed Guide

Fall 2019



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PUBLISHED BY **ISSUFS INK**

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Return undeliverable Canadian addresses to the Winnipeg office: Issues Ink

> 403-313 Pacific Avenue Winnipeg, MB R3A 0M2

PRINTED IN CANADA

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HYBRID	KEY FEATURES	YIELO % OF CHECKS	MATURITY	AGRONOMIC TRAIT
NEW InVigor L345PC	New InVigor® L345PC offers a significant jump in yield potential over InVigor L233P and features our patented Pod Shatter Reduction technology plus first generation clubroot resistance. This hybrid is suitable for all growing zones.	111.9% of the checks (InVigor 5440 and Pioneer® 45H29) in 2017/2018 WCC/RRC¹ trials 111.4% of InVigor L233P (n=28 trials, 2018)	One day earlier than InVigor L252	Patented Pod Shatter Reduction First generation clubroot resistance ² Rated R - for Blackleg
NEW InVigor L352C	InVigor L352C offers yield potential that exceeds InVigor L252. It is suitable for all growing zones and is ideal for growers that prefer to swath.	108.6% of the checks (InVigor 5440 and Pioneer 45H29) in 2017/2018 WCC/RRC trials 104% of InVigor L252 (n=28 trials, 2018)	Half-day later than InVigor L252	First generation clubroot resistance ² Rated R - for Blackleg
NEW choice InVigor LR344PC	InVigor Choice LR344PC, the first InVigor Choice hybrid, has both the LibertyLink® technology system and TruFlex™ canola with Roundup Ready® Technology. You have the option to use Liberty® herbicide or Roundup WeatherMAX® herbicide on your canola.	104.1% of the new checks (InVigor L233P and Pioneer 45H33) in 2018 WCC/RRC trials 103.6% of InVigor L233P (n=12 trials, 2018)	Over one day earlier than InVigor L252	Patented Pod Shatter Reduction First generation clubroot resistance Dual herbicide trait systems: LibertyLink® technology system and TruFlex™ canola with Roundup Ready® Technology Rated R - for Blackleg
InVigor L233P	InVigor L233P was grown on more acres in Western Canada than any other canola hybrid in 2019 ³ . This early-maturing, high-yielding hybrid provides exceptional harvest flexibility for growers looking to straight cut or delay swath. Winner of 2017 and 2018 Canola 100 contest.	108.8% of checks (InVigor 5440 and Pioneer 45H29) in 2014/2015 WCC/RRC registration trials	Over three days earlier than the average of checks	Patented Pod Shatter Reduction Rated R - for Blackleg
InVigor L234PC	With both the patented Pod Shatter Reduction technology and second generation clubroot resistance, InVigor L234PC offers outstanding yield potential and strong standability similar to InVigor L233P. This hybrid is a great fit for growers in known clubroot-affected areas.	104% of the checks (InVigor 5440 and Pioneer 45H29) in 2017 WCC/RRC registration trials	Three days earlier than the average of checks	Patented Pod Shatter Reduction Second generation clubroot resistance ² Rated R - for Blackleg
InVigor L255PC	InVigor L255PC is a medium-height hybrid that has separated itself from others due to its very impressive standability and performance. It is well suited for growers in mid- to long growing zones.	109% of checks (InVigor 5440 and Pioneer 45H29) in 2016 WCC/RRC registration trials	One-and-a-half days later than the average of checks	Patented Pod Shatter Reduction First generation clubroot resistance Rated R - for Blackleg
InVigor L241C	You can expect strong standability and high yields from this mid-maturing hybrid that's well suited to all clubroot-affected regions. InVigor L241C won the 2016 Canola 100 contest with a yield of 81.43 bu/ac.	102% of checks (InVigor 5440 and Pioneer 45H29) in 2012/2013 WCC/RRC registration trials	One day earlier than the average of checks	First generation clubroot resistance Rated R - for Blackleg
InVigor L252	A consistent top performer, InVigor L252 continues to offer incredible yield performance and strong standability with mid-season maturity. InVigor L252 won the 2018 third-party Canola Performance Trials (CPTs) for the sixth straight year (average of all growing zones in small plot swath trials).	110% of checks (InVigor 5440 and Pioneer 45H29) in 2011/2012 WCC/RRC registration trials	One day later than the average of checks	Rated R - for Blackleg
InVigor L230	Early-maturing InVigor L230 displays outstanding yield potential with excellent standability. This hybrid is ideal for growers who prefer an early-maturing hybrid that consistently performs.	103.9% of checks (InVigor 5440 and Pioneer 45H29) in 2014/2015 WCC/RRC registration trials	Over three days earlier than the average of checks	Rated R - for Blackleg

Western Canadian Canola/Rapeseed Recommending Committee (WCC/RRC) trials.
 InVigor L345PC, InVigor L352C, InVigor Choice LR344PC, InVigor L255PC and InVigor L241C all contain the same clubroot resistance profile. InVigor L234PC contains this resistance profile plus second generation clubroot resistance to additional emerging clubroot pathotypes to help combat the evolving clubroot pathotypes.
 2019 BPI (Business Planning Information) Data.



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The **Rise** of Pulses

Pulse breeders are working with industry players in Alberta and beyond to address the rising popularity of plant-based protein.

ACCORDING TO ROBYNE Bowness Davidson, a pulse research scientist at Alberta Agriculture and Forestry (AF) in Lacombe, Alta., there is huge opportunity for the pulse industry due to demand for plant-based protein.

"By 2050, the global demand for food is expected to rise significantly, and with it, the shift to include more protein in diets, especially in Asia. Add to that, the shift in consumer trends toward more plant-based protein and the demand to grow food more sustainably."

Bowness Davidson notes the new Canada Food Guide recommends Canadians eat more plant protein and many major restaurants are now providing vegan options. Over the next five years, she says, human consumption of plant-based protein is expected to double — and there is also a huge increase in demand for protein to make pet food, livestock feed and aquaculture feed.

The agriculture sector in Western Canada is very well-positioned to meet these demands.

"We already know how to grow pulses well, and as more and more fractionation plants are announced, we, as an industry, will be able to add more value to our products by processing them here," says Bowness Davidson. "By separating pulses into the fibre, starch and protein that the companies are requesting, we increase our marketability. This creates jobs, grows our Canadian businesses and strengthens our economy, while still building our large international export markets."

In terms of pulse breeding, various high-protein lines are being developed by AF's breeding partners, which include universities,

Agriculture and Agri-Food Canada (AAFC) and private breeding companies in Canada and in several European countries. Once new lines are genetically stable, Mark Olson (unit head of crops at AF), Christy Hoy (research agrologist, AF) and their colleagues test them under Alberta growing conditions through the project "Enhancing Field Pea, Faba Bean and Lentil Productivity and Resilience through Germplasm Screening" funded by the Alberta Pulse Growers (APG). Promising lines are entered into the Western Co-op trials (also known as registration trials), which are funded by industry and government.

"The success of pulse breeding and projects like the one mentioned above continues to speak for itself as yields have continued to grow at one to two per cent per annum," says Olson. "However, while pulses are recognized for numerous benefits, such as being high in protein, low in fat, and for their ability to fix nitrogen [lowering the carbon footprint of the entire cropping system], they are not one of the top six economically most important crops [rice, wheat, soybean, cotton, corn/maize and vegetables] globally."

Large, international companies are not investing billions of dollars in pulse breeding in the Prairies, says Olson, as is currently happening in the pursuit of hybrid wheat, soybean and grain corn. "Public breeding institutions are heavily relied upon in pulse breeding and this will not be changing in the near future," he explains. "That said, for pulse crops, public-private collaboration is absolutely critical."

Genetics are only one factor in boosting pulse protein content, says Olson. He explains field pea protein content is affected by



environment, soil type and agronomic management practices, and research has shown even genetically-identical dry pea plants grown in the same year and on the same field produced protein concentrations that ranged from 19.3 to 25.2 per cent. Protein content is also affected by inoculation and fertilizer application.

That's why AF is also working with Alberta Pulse Growers (Zone 3) to determine which agronomic practices — for example, adding nitrogen — best boost pulse protein. Olson explains while it may seem counter-intuitive to add nitrogen to pulse crops because they fix their own nitrogen, timing N application at anthesis in other crops, such as cereals, does usually increase grain protein.

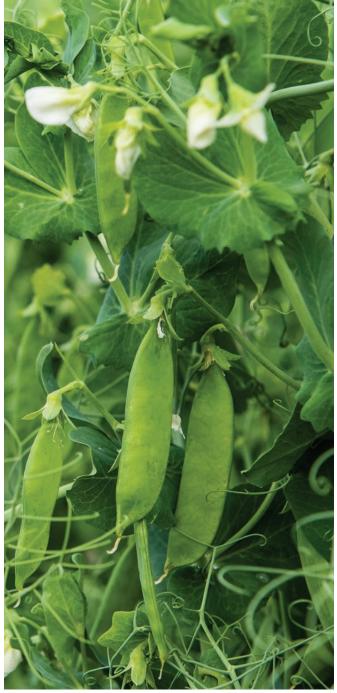
Therefore Olson, Hoy, Bowness Davidson and their colleagues are examining application of the following to Amarillo peas: foliar N (15 pounds per acre and 30 lbs/ac actual N), peat inoculant (1X, 2X, 3X rates), commercial products such as Releaf/42PHI, Foliar Nitrogen/Sulphur applications, ESN, a slow-release coated N (15 lbs/acre actual), urea N (30lbs/acre actual) at seeding, granular inoculant (1X rate), inoculant blend (peat and granular) and commercial products (Magnetar liquid, Magnetar All Out). In addition, a high-protein field pea line developed by D.J. Bing (Agriculture and Agri-Food Canada) was also included as a treatment in the research trial.

Efforts to investigate how growing regions across Western Canada and crop management practices impact protein and starch attributes of pulses are also being undertaken by Pulse Canada, Manitoba Pulse and Soybean Growers and Saskatchewan Pulse Growers.

More Breeding Goals

Pulse Canada has set a goal for 25 per cent of Canada's pulse production to be sold in "new use categories" such as food ingredients by 2025, and as a member of Pulse Canada, APG shares this goal. APG research manager, Jenn Walker, in a new article for APG's *Pulse Crop News*, reports expanding the value and usage of pulse crops by having targeted end uses for the starch, fibre and protein components in addition to the traditional markets for whole seed, could push demand for western Canadian pea, lentil, chickpea, faba bean and dry bean crops to new heights.

"The challenge, however, is to ensure the pulses Canadian farmers grow are bred to provide the precise qualities food companies are looking for, and to ensure they are both functional in the food manufacturing process and that they taste good," says Walker.



Over the next five years, human consumption of plant-based protein is expected to double, says Robyne Bowness Davidson, an Alberta Agriculture and Forestry pulse research scientist. Photo: ROBMCMORRIS PHOTOGRAPHY



 $William Pellinger, a pulse \ breeder \ with \ Limagrain (UK) \ Ltd., visually \ evaluates \ the performance of the company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photo: ROB MCMORRIS PHOTOGRAPHY \ Annual Company's varieties in Canada. \ Photography \ Annual Company's v$

Related to Bing's research — he is testing high protein lines of 28 to 30 per cent protein in a variety of locations in Alberta to ensure varieties will deliver acceptable yields — is that conducted by Jay Han, senior food scientist with AF's Food Processing Development Centre, says Walker. Han is focused on achieving a milder pea flavour and tailoring pea characteristics to address processors' desires, and he is working with various processors on this.

Also, according to Walker, Lingyun Chen, professor and Canada research chair in the Faculty of Agricultural Life and Environmental Sciences at the University of Alberta, is carrying out research funded by APG to examine value-added applications for pulse proteins (pea, lentil and faba beans) in human foods. Chen notes that processors are focused on getting high protein yields from the extraction process, but she is also investigating how processing can change pulse protein structure and how this can be optimized to ensure processors are getting desired structural characteristics.

Another researcher in the pulse protein sphere identified by Walker is U of A professor Thava Vasanthan, who developed cost-effective Air Currents-Assisted Particle Separation (ACAPS) technology several years ago.

"Vasanthan believes that as the fractionation is refined and the manufacturing process improved, pulse crops stand a good chance of growing their footprint in the multi-billion-dollar North American pet food market," says Walker. "Over the past year and a half, he has started characterization of pulse crops for this market. Because high fibre and high starch levels are not desirable in pet food, processing to minimize these components and maximize the bioavailability of the protein through cost-efficient technologies is critical." Vasanthan's research is supported by funding from APG.

Walker concludes that while the protein content of pea crops isn't currently increasing sale prices for farmers, strong demand for pulse ingredients in human and pet food could very well see them increase in future. "Understanding what to grow where for specific end-markets may soon provide farmers with closed loop contract opportunities, and grower organizations want to be sure that we have the agronomic knowledge to support consistent supply of highly-desired product."

APG chair, Don Shepert, believes there is a lot of potential for growers to be rewarded for choosing to grow peas or lentils with specific quality attributes for specific companies, but adds that, "yield and disease resistance will always be key to breeding programs that are focused on the whole seed markets where farmers get paid based on tonnage of product."

He also says that while changes to grading systems are often a point of discussion, until there are clear guidelines on the needs of specialty markets, it will be difficult to put new grading parameters in place.

• Treena Hein



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Opening Doors to International Markets

Canada's highly-regarded certified seed is creating all kinds of international opportunities for seed producers and sellers in this country. Industry experts say the Canadian brand gives buyers a sense of added confidence.

IT'S NO SECRET that Canadian certified seed is highly regarded by many buyers around the globe. In 2017-18, Canada exported just over \$645 million worth of seed to international buyers, with a good chunk of those sales being certified varieties.

Dave Carey, executive director of the Canadian Seed Trade Association (CSTA), says what makes Canadian certified seed appealing to buyers in other parts of the world is that it provides increased predictability and risk mitigation in an increasingly volatile world of international trade.

"I think certified seed and the corresponding blue tag holds a lot of weight as a brand. When it comes to importing seed through Canada's certified seed system ... it gives people a sense of confidence that what they're importing or buying is of the highest quality and has traceability," he says.

"It definitely opens doors for Canadian seed exports when we have a robust certified seed system. We have seed crop inspections, CFIA oversight and auditing of the seed crop inspection services. It's all the pieces of the puzzle ... and lets people know that that seed is of the highest quality and has met all the rigours that go into producing certified seed."

That \$645 million in Canadian seed exports represents a harmonized sales count, which includes both certified seed and common seed. While it's difficult to determine an exact breakdown between the two, Carey says a "significant" portion of those sales is certified seed.

Leading the way in 2017-18 was pea seeds used for sowing, with total exports valued at about \$91.8 million. They



Greg Stamp is the seed sales manager for Stamp Seed.

were followed by yellow dent corn seed (\$78.2 million), lentil seeds (\$76.7 million), bean seeds (\$47.5 million) and soya beans (\$46.9 million). Meanwhile, certified alfalfa seed sales totaled \$44.8 million

Increased Confidence

Not surprisingly, the United States is Canada's biggest trading partner when it comes to international seed sales. Canada exported \$403.2 million worth of seed to the United States in 2017-18, which represents slightly more than 62 per cent of the country's total international seed sales. The United States was followed by China (\$46.7 million), Ireland (\$30.8 million), Japan (\$19.1 million), Turkey (\$12.7 million), the Netherlands (\$12.2 million) and Nepal (\$11.2 million).

Carey says another major factor in the appeal of Canadian certified seed to international buyers is the millions of dollars that go into testing each year.



Dave Carey is the executive director of the Canadian Seed Trade Association.

For example, many seed companies, including those producing forages and grasses, employ their own in-house seed analysts to check for germination and vigour and to ensure there is not genetically enhanced or modified content.

"Certified Canadian seed really provides a high level of confidence for an importer to know that when they import seed from Canada that they're getting the best quality," he adds.

"What people [buyers] want and what seed companies really strive to do—and put their reputations on the line for—is you want to is to achieve a high level of have uniformity. You don't want to have one bag that's great and the next has poor germination and you don't get good stand."

Easy Navigation

The Canadian certification system is also far easier to navigate for international buyers than it is in some other countries, according to Carey. For example, Canada has one set of rules and regulations that apply to each and every province. Compare that to the United States which has a patchwork system with more than three dozen state certification systems.

"I think keeping it at that one level [in Canada] allows for greater uniformity and predictability," Carey adds.

As robust as international seed sales have been of late, the CSTA recently began work on a market development study for its members to help identify emerging markets that may currently be underserved. Those markets include Turkey, Eastern Europe including Ukraine and Kazakhstan, and Japan. Carey says Japan is a particularly important market, not just because of the number of consumers there, but because the country is also a trendsetter in Asia and the decisions it makes can have a profound impact on a number of other countries in the region.

Ukraine is another priority market for Canada because its growing conditions are very similar to those on the Canadian Prairies. Two Canadian seed companies are already specializing in exports to that country.

"As they get their system in place, the Ukrainian government is looking at intellectual property and plant breeders' rights as a way to get new and better varieties into the hands of their farmers as they move towards more modern agriculture," Carey says.

Gaining a Market Edge

Ryan Furtas, a market analyst with the economics and competitiveness branch of Alberta's Agriculture and Forestry Department, says one of the most lucrative opportunities for the Canadian seed sector is working with growers who supply product to end users, such as food processors and the premium foods market, both here and overseas. That can be for anything from the wheat used in higher quality breads to the malts used to brew your favourite craft beer or gluten-free oats for people suffering from celiac disease.

"Several of these end users, such as food processors, are demanding products made from certified seed," Furtas says. "This gives them an edge in their market over their competitors. It also gives them an advantage with a quality assurance system that's creating some confidence in their ingredients. That helps them with marketing quality assurance and perhaps capturing the premium market that's out there."

So, what can seed growers, farmers and sellers do to get a foot in the door of these international markets?

Furtas says it all comes down to relationship building, whether that's with the end user, grain buyers, commodity brokers or whoever has demand.

"Not everybody can participate in these markets, but then again not everybody wants to," he adds. "It if fits your operation and you can manage it, I think there are opportunities out there. But it takes time on the phone and building these types of relationships. You have to make those relationships."

International Relationships

Greg Stamp has first-hand experience with how important it is to build those kinds of international relationships.

Stamp is the seed sales manager for Stamp Seed in Enchant, Alta. The family-owned business recently began producing and marketing Daniello, a new type of hybrid rye, as part of an agreement with KWS, the German-based plant breeding company that developed the variety. The deal was facilitated through the Southern Alberta SeedNet group of independent seed growers.

"We're getting genetics we never had access to before with the certified seed model," Stamp says. "We're able to access more and provide more value to our customers with these hybrid ryes. As far as adding value, these hybrids have 20 to 40 per cent yield advantage over traditional rye varieties, so it's a huge bump in what farmers are seeing on their returns."

Stamp Seed is also one of a handful of companies collaborating with multinational brewing company Molson Coors to develop a new variety of malting barley. Bill Coors 100 is a tworowed, spring variety bred by Molson Coors in Burley, Idaho. A number of farms in southern Alberta have been contracted to grow it as part of a certified

seed program with Stamp Seeds doing the higher pedigree and certified production for this value chain.

Stamp says he sees there being plenty of further opportunities down the road, both for his company and others, as food processors and consumers alike demand to know more about where the ingredients they use come from and how they are produced.

"I definitely think those premium markets like Japan, where people want greater quality and predictability and reliability, they're going to want to know the exact value chain and where it came from," he says.

"I think the more predictable we can be, and certified seed certainly helps to maintain that predictability in products for end users, I think that's going to become more and more important as end users demand specific qualities. They want to be able to trace it back to the start and I think there's going to be more and more of that."

Ron Wirsta is the general manager of St. Paul Seed Processors and Exports in east-central Alberta, a co-op comprised of more than 500 active producer members. It exports products sourced from certified seed, including a number of pulses, as far away as India, Indonesia and the Philippines.

Canadian pulses grown from certified seed sources are eagerly sought out by foreign markets, Wirsta says, because of their high quality and the fact that customers want to know what variety they are buying. His group also has the advantage of being located close to the West Coast and is able to get its producers' product to port in Vancouver in as few as four or five days, which is much faster than provinces located further east.

Foreign Markets

Wirsta says there are a number of foreign markets where there is an opportunity for the Canadian seed sector to grow its footprint with branded specific varieties requested from overseas buyers. Egypt and South Africa, in particular, are both growing markets.

"We've just touched base with them about shipping them some of our high-protein products. Just because of

the population base, they really need the food [in those two markets]," he adds.

Despite the growing global opportunities for the Canadian seed sector, Wirsta cautions it's not without risk. He says companies need to do their homework on who they are dealing with or risk being left high and dry when it comes time to be paid.

"It's just doing the right business checks to make sure you're going to get paid for your product at the end of the day. People sometimes don't look at the processing or shipping side of it and then they get caught with no payment," he says.

As promising as these global opportunities may be, Carey says the Canadian seed sector can't afford to become complacent.

Important Investment

He says seed companies and the federal government must continue to invest in research and development so that the doors to these global markets remain open. While private sector investment in R&D rose by \$171 million between 2012 and 2017, nearly 89 per cent of that amount was invested in research on just three crops — corn, canola and soybeans.

"While that's great, we also know that we represent 50 crop kinds. That leaves 47 other crop kinds that are fighting over that other 11 per cent," he says.

"We have to make sure that Canada has an intellectual property environment that encourages companies to make



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Ron Wirsta is the general manager of St. Paul Seed Processors and Exports.

investments in pulses and peas and other crops. We need to have an environment that allows companies to make those investments."

Of more immediate concern is the protectionist sentiment that is sweeping across many nations and prompting a number of retaliatory measures such as tariffs and other penalties. While seed hasn't been seriously impacted by tariffs, Carey says other non-tariff trade barriers are a concern to the industry.

"Tariffs are certainly a concern, but more on the grain side and the commodity side. But we are subject to a lot of non-tariff trade barriers, whether it's countries looking at crop protection products ... or phytosanitary conditions," he adds.

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Starting from Scratch

In the cannabis sphere, genetics is only the beginning as breeders work to understand the plant and create the next generation of seed.

GREG BAUTE has a problem. It's one that many breeders of other major crop kinds wish they had.

"There's too much genetic diversity in cannabis right now. If you have seeds, because there's no inbred lines, they're going to be very heterogeneous — all over the place — and in production, you'll see a range of plant sizes with varying cannabinoid levels. Nothing at all like we see in row crops," says the director of the under-construction Cannabis Innovation Centre (CIC) based in the Comox Valley of British Columbia.

"For example, the agronomics of corn production all look mostly the same. That's not the case in cannabis at all. That's a good problem to have in breeding, but it's still a problem.

We're just beginning to figure out what diversity we want and take our material in that direction."

Baute, 33, left a job with Monsanto working in vegetable seed to helm the CIC construction project being undertaken by Aurora Cannabis subsidiary Anandia. He comes from an agricultural family, his parents having founded the Ontario-based hybrid corn seed company Maizex Seeds.

For Baute, the legalization of recreational cannabis in October 2018 opened the door to a fascinating new world of breeding discoveries, a world in which breeders are only beginning to unlock the mysteries of a plant they have never before been able to properly research.

"Even in crops that are completely neglected, there's usually a gene bank curated by a professional. You'll know where a sample was collected and when. In cannabis, we have nothing like that. It's a random grab bag of germplasm.



Greg Baute, Cannabis Innovation Centre director.

The Golden Age of cannabis breeding is literally just beginning."

Anandia was founded in 2013 by Jonathan Page and John Coleman who saw the need to support the expanding cannabis industry with better science on testing, genetics, and other technical needs.

The Cannabis Innovation Centre will begin operation in the fall of 2019 and will serve as the new headquarters for Aurora's plant breeding work. The first phase of the Comox project will consist of a 21,000 square-foot greenhouse and a 10,500 square-foot research building that will have offices, lab space, meeting rooms, and also house all the mechanical and electrical systems that support the greenhouse.

Most agricultural crops have had decades (if not centuries) of breeding to develop beneficial traits. Cannabis hasn't received the same attention by plant biologists and plant breeders because of the historical difficulties in obtaining the appropriate licences. Aurora will be using traditional plant breeding techniques to develop new cultivars that have desirable chemistry, disease resistance, and/or traits that improve industrial cultivation practices.

As far as cannabis seed goes, that last point is key.

As Canada will allow the sale of edible cannabis products starting in December 2019, Baute says varieties that lend themselves to the production of edibles and other products which use cannabis extracts (as opposed to varieties grown for the flowers themselves) represent a major untapped market researchers like him are just beginning to select for.

"If you're making an edible, for example, it's still the flower you're after, but you don't care what it looks or smells like. That relieves some of the selection pressure as a breeder. You only need to talk to a few producers to know where most of the costs in breeding go, and right now that's for cloning. It's labour intensive," Baute says.

"There are lots of annual crops that can be propagated clonally, but no one does that because seed works so much better. Annual plants have evolved to grow from seed. Everyone is thinking the same thing — the question is how fast we get there. How fast can we make seed that has good enough quality and the desired uniformity that we can use those seeds for large-scale production?"

Trading Scissors for Combines

Right now, cannabis harvesting in North America looks very different from other crop kinds, Baute notes. In U.S. states where cannabis is legal, he says you



can already see cannabis production from seed at some scale and producers — especially those harvesting cannabis varieties for their CBD as opposed to THC — are struggling to stay cost competitive.

"They're harvesting plants with a chainsaw and throwing them through a wood chipper and dragging them to a corn silo to dry. In Canada, for highend flower, you're trimming with a pair of scissors and inspecting each one by hand and hand packaging it. For a combine-scale operation, you need seed."

One of the pioneers of high-CBD cannabis varieties in the United States is John McKay of New West Genetics (NWG), which has created the first certified American hemp seed. McKay is director of genetics for New West and a professor in the Bioagricultural Sciences and Pest Management department at Colorado State University.

The company was founded five years ago when the United States first legalized hemp research, and is focused on creating high-yielding, combine harvestable hemp varieties that are adapted to U.S. and newly-legal production environments. NWG announced in March of this year that its proprietary hemp varieties, NWG-ELITE and NWG-RELY, placed in the top of dual-purpose (fibre and grain) trials conducted last summer at the University of Kentucky.

McKay and the NWG team made pilgrimages to Europe and Canada to see what other countries were doing to breed new varieties of hemp, but he



An artist's rendering of the Cannabis Innovation Centre.

says New West's products are uniquely American.

"It was useful to understand the agronomy angle and see how to breed to maximize yield under those production systems, but there simply hasn't been enough dollars put into hemp breeding in Canada or Europe for us to gain a great deal of breeding knowledge from them," McKay says.

"In the U.S., big seed companies spend billions a year on cutting-edge breeding approaches but only invest heavily in crops that are planted on at least 30 million acres. In Europe, it's largely federal legacy breeding programs that aren't well funded that have developed and maintained open pollinated grain and fibre varieties over time. We're actually learning more from other domesticated species where serious technology has been applied and then we're applying that to hemp."

For McKay and New West Genetics, one of the best places to look to learn how to breed hemp actually has nothing to do with plant breeding at all.

"You basically have to look to cattle to find how to run an intensive breeding program for a species like cannabis that has both male and female plants," he adds. "There are some fruit trees that are dioecious, but they generally don't have high-tech breeding programs attached to

them. We're having to look more to the animal model, because plant breeders aren't typically familiar with dioecious plants."

In addition to fibre and grain, NWG is also breeding for large-scale production of non-THC cannabinoids.

With CBD becoming a hot commodity for its use in tinctures, ointments and more, NWG is carving a niche for itself in a market previously untapped.

"Given our regulatory system, right now people are using clonal propagation and manual labour to harvest hemp for CBD production. Where we come in is having these varieties optimized for mechanical processing, but still have good CBD yields on a per dry weight basis and superior yields on an acre basis," says McKay.

Genetics is Just the Start

Despite the promise held by new varieties of hemp that promise higher CBD levels, Jan Slaski of InnoTech Alberta has a few words of warning.

Over the last 17 years, Slaski has



Hemp breeder Jan Slaski of InnoTech Alberta.



John McKay, director of genetics for New West Genetics.

been leading research aimed at the introduction and breeding of hemp varieties that suit the needs of the fibre and food industries on the Prairies. To fully realize potential residing within the hemp plant and to ensure whole crop utilization, he assembled a breeding program that includes three domains: breeding and agronomy, fibre processing and product development.

According to Slaski, the excitement surrounding CBD and other cannabinoids produced in the hemp plant will be tempered as producers learn more about just how complicated the process can be when it comes to getting a quality product for processing.

"I get five to eight calls every day from people asking how they can make money on CBD and claiming to have access to high-CBD lines. The fact is, genetics is only one of three factors when it comes to successful CBD production," he says.

Currently, no varieties of high-CBD hemp are registered to be grown in Canada. Because hemp is simply



BARLEY:

CDC Copeland **CDC Austenson** CDC Thompson

CANOLA: Roundup Ready **Liberty Link**

SOYBEANS: NSC Leroy RR2Y NSC Watson RR2Y

OATS: AC Morgan WHEAT:

AAC Connery AAC Penhold AAC Brandon **AAC Viewfield CDC Landmark VB AAC Crossfield AC Andrew** CS Accelerate (2021) AAC Wheatland (2021) AAC Goodwin (NEW)

Parata (NEW) FLAX: **AAC Marvelous**

Ellerslie (2021)

PEAS:

CDC Spruce (NEW) AAC Barrhead **CDC Amarillo** AAC Chrome (NEW)

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cannabis that is bred to contain low THC levels (by law, it must contain no more than 0.3 per cent THC), hemp producers in Canada looking to sell their product for CBD extraction must use hemp varieties that contain comparatively low levels of CBD, generally in the two per cent range.

"For years, very few breeding programs in the world focused on improving CBD levels in industrial hemp varieties. They looked primarily at early maturity, short stature, something that suited the needs of grain growers," Slaski says.

"I've been regularly approached by people claiming to have access to lines with 10 to 15 per cent CBD. Health Canada is very firm on what needs to be done to get high-CBD varieties on the list of approved cultivars — three years of field trials in Canada and no more than 0.3 per cent THC."

In other words, it's going to be a little while before high-CBD hemp varieties are approved in Canada.

Until then, Slaski says producers hoping to capitalize on the CBD from

hemp have to think hard about a variety of factors, genetics being just one.

"Growing conditions are very important. Environment influences CBD levels in industrial hemp," he says.

The other factor is crop management, something Slaski says is often forgotten in the rush to extract CBD from hemp.

"You can lose up to 80 per cent if you don't know what you're doing, like drying it excessively or not handling it with care.

"High-CBD hemp is grown in the U.S. in an orchard style. Each plant is harvested by hand and then handled and dried in a shed. Everything is manual. Such farming practices are useless at a large commercial scale in Canada due to our large number of acres," he says.

Greg Baute envisions a future in which new varieties of cannabis are available for just such a purpose.

"The question is how high can you push CBD content without going over that threshold of 0.3 per cent THC," Baute says.

Marc Zienkiewicz

THC vs CBD

When talking about cannabis/ hemp, it's important to know the difference between these two key cannabinoids.

Tetrahydrocannabinol (THC) is one of at least 113 cannabinoids identified in cannabis. THC is the principal psychoactive constituent of the plant and is what causes the "high" feeling that people describe when using certain varieties of cannabis.

Cannabidiol (CBD) is a nonpsychoactive cannabinoid. As of 2018, preliminary clinical research on cannabidiol included studies of anxiety, cognition, movement disorders, and pain. Although hemp is low in THC, it typically has higher levels of CBD.



Tackling Trade Disruptions

Crop value chains are working hard to meet customer needs and keep markets open for Canadian crops.

WITH EXPORTS being so crucial to the success of Canadian agriculture, the current trade disputes really underline the importance of ongoing efforts to resolve and prevent such problems. National associations that bring together crop growers, processors, exporters and others in the value chain are playing a vital part in these efforts. The associations are using a range of strategies to tackle market access issues, focusing on meeting the needs of customers.

One of their key strategies is a proactive program that advises Canadian crop growers on the latest best practices to ensure their farm's products will meet end-user needs. It's an important tool to help growers do their part in keeping our markets open.

A Quick Look at Trade Issues

These days, trade disruptions are affecting a number of Canadian crops. Tariffs and non-tariff issues — like biotechnology, sustainability requirements, and phytosanitary specifications related to plant diseases, weed seeds and pesticide residues — are limiting or preventing market access for Canadian grains.

"There are some significant market access issues for Canadian cereals at the moment," says Cam Dahl, president of Cereals Canada, a national organization that involves all sectors of the cereals value chain.

"We have serious concerns because of country of origin labelling in Italy, which has significantly reduced our durum exports. Peru has notified the World Trade Organization of phytosanitary concerns with Canadian [wheat] shipments because of weed seeds, threatening over one million tonnes of exports a year. Saudi Arabia currently issues their tenders with the notice they can have any origin but Canada, so that market continues to be closed to us. And Vietnam is essentially closed to Canada because of thistle seeds; Vietnam is part of the TPP [Trans-Pacific Partnership trade agreement] and a market we were hoping to expand into," says Dahl.

"We depend on trade, and every time a market is restricted or greater uncertainty comes into a market, that comes with a cost. Every one of these trade issues hurts farmers' bottom lines."

Canada's current dispute with China about canola seed is a high-profile example of the trade challenges for canola. "When it comes to canola, we export 90 per cent of everything we grow. Market access has always been a major priority for this sector because trade disruption is really damaging," says Brian Innes, who is the vice-president of public affairs with the Canola Council of Canada — which includes grower associations, processors, exporters and life science companies.

"The Canola Council has been working on market access issues for many years. Throughout that time, we have seen a number of issues that have stopped our exports," he says.

"We have seen canola meal being disrupted because of salmonella regulations in the United States. We've seen canola seed be disrupted in going to China as far back as 2009, and our canola meal exports to China were stopped from 2013 to 2015. We've also seen a number of market access issues related to technology that have prevented farmers from using the latest seed genetics or pesticides. And we've seen an inability for canola to be used in the biofuel markets in the United States and Europe."

The Canadian pulse sector's most important trade challenge involves exports to India. "The world really changed for our pulse industry in 2017 with the imposition of various restrictive trade policies in what was our largest market historically — India," says Mac Ross. He is director of market access and trade policy at Pulse Canada, a national association of growers, traders and processors of Canadian pulse crops.

"Right now, India has import tariffs of 33, 50 and 66 per cent for lentils, peas and chickpeas, respectively, as well as quantitative import restrictions limiting pea imports into India to 150,000 tonnes from April 2019 to April 2020.

"We shipped 40 per cent of our pulses to India as recently as 2016. That has really decreased in the last few years. In 2018, we were at about 85 per cent of our usual exports to India, and this year we have climbed up a little bit. India is probably our third largest market this crop year, but our exports to India are still nowhere near the magnitude that they have been in the past. Anytime you lose such a large market and such a large percentage of your overall export market, the farmers are going to feel that at the farm gate," says Ross.

Trade Disruptions a Fact of Life?

International trade disputes seem to be constantly in the headlines. Are continued trade disruptions in Canadian crop exports expected?

Agriculture and the food sector have always been sensitive to trade disruptions because consumers and governments are concerned about food safety and because farmers in importing countries are concerned about how the imports might affect them, says Innes. However, Canada is facing unprecedented uncertainty in the world of international trade, he adds. "Geopolitics is affecting trade in a way that it hasn't in the past."

From Dahl's perspective, world trade has gone through a major change over the past two or three years. "Prior to that, we had a time where the world was looking for ways to facilitate trade. We were negotiating trade agreements that were reducing trade barriers, like the agreement with Europe or the TPP," he says.

"Now, we have moved to a new age of protectionism where countries are pulling back from supporting multilateral and global trade. They are looking to put up trade barriers; Italy is a prime example of that. And often countries look to phytosanitary issues, such as disease or pesticide residues or weed seeds, they can use to block trade. I expect to see more of these trade issues going forward."

Ross views the pulse industry's current trade issues as a symptom of two inherent realities of the industry. "One is that Canada is super reliant on the export market. We have only 37 million mouths to feed here in Canada, so we can't eat all that we produce. We are able to grow a lot of high-quality, safe, food, but we depend on the export market to purchase it and for the continued success of our industry," he says. "And in the case of pulses specifically, we have been over-reliant on one or two export markets. When some uncertainty arises in one or two of these markets, the effects can really reverberate right through our entire industry."

Still, Ross agrees with Innes and Dahl that we are seeing a higher level of uncertainty in the global marketplace at present.



Cam Dahl is the president of Cereals Canada. PHOTO: CEREALS CANADA



Mac Ross is the director of market access and trade policy for Pulse Canada.

"Canada has done a very good job over the past few decades of entering into free trade agreements with a lot of key export markets. We like to say we are the only G7 country that has a free trade agreement with every other G7 country. But now that we have secured duty-free access, we are seeing countries are using other non-tariff means to keep products out if they wish to do so."

Strategies to Keep Markets Open

Pulse Canada, the Canola Council and Cereals Canada are each actively working with their value chains, Canadian government agencies, and others to find solutions to current trade issues and prevent market access problems from emerging in the future.

The Canadian pulse industry and Pulse Canada have a strong emphasis on market diversification. "Pulse Canada has developed a '25 by 2025' strategy which aims to move 25

per cent of Canadian pulse production, or 2 million tonnes of pulses, into new markets and use categories by the year 2025. The strategy is focused on developing inroads into food and pet food manufacturing, processing, and food service industries in markets with the greatest volume potential for pulse ingredients," explains Ross.

"Finding new opportunities for Canadian pulses is critical given the uncertainty we face in markets we've relied on for decades. The growing demand for plant protein and interest in sustainability in markets like the U.S. and Europe present exciting new opportunities for Canadian pulses."

As well, Pulse Canada is working with others to improve access to the Indian marketplace. "We're working with other pulse-producing nations to try and insert predictability and transparency into India's policy decisions. That is being done through the Global Pulse Confederation and their relationships with various government bodies in India," says Ross.

"We also are experiencing a technical barrier with India as pulse imports from all origins are required to be fumigated prior to arrival in India or be subject to additional charges. We feel this measure is technically unjustified due to Canada's demonstrated ability to consistently meet India's technical requirements without the need for fumigation. That is a science-based issue and we're seeking a science-based solution for it, with Canada dealing with India on a bilateral basis."

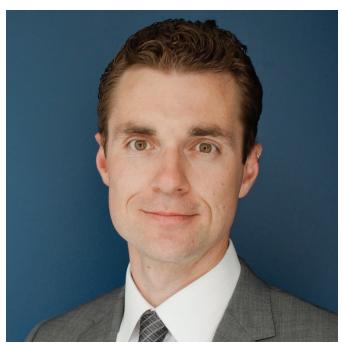
Dahl highlights a few examples of Cereals Canada's ongoing efforts to enhance market access for cereals. "We're working with Global Affairs Canada and our embassies abroad as well as the Canadian Food Inspection Agency and the Canadian Grain Commission to address market issues and keep markets open," he says.

"We also work directly with regulators in our importing countries and with industries in those countries. For instance, we just had a visit from Peruvian regulators to audit the Canadian [grain] system — starting with the farm and going through the handling and country elevators and terminal elevators and the regulatory system. Hopefully that will help lead to a resolution of the issues with Peru."

Dahl adds, "We also have ongoing outreach with major customers. The annual New Crop Missions are an example of that, which we carry out with the Canadian International Grains Institute and the Canadian Grain Commission. We visit our top customers, about 20 countries every year in about six weeks, to review the quality, milling attributes and processing attributes of the crop that is coming off."

The Canola Council works with the Canadian canola value chain, the federal government and import partners to create solutions to trade issues that meet the needs of all involved. "It is critical that we bring solutions to the table and work with our customers and their governments to find ways to resolve market access issues and encourage stable trade of our products," says Innes

One example is the issue of blackleg on canola seed. "The blackleg issue was identified by a customer, and we worked with our value chain to understand more about it. We implemented solutions here in Canada, such as supporting research and extension for improved blackleg management to help show the customer how we are taking action to control the risk.



Brian Innes is the vice-president of public affairs for the Canola Council of Canada. Photo: CANOLA COUNCIL OF CANADA

"Another example of the Canola Council's market access efforts, is we bring together our exporters and our customers in foreign markets so we can increase understanding and help our customers work with their governments to promote stable trade. We have done that in Japan for over 40 years. We've done that in China over the last number of years. And we just recently did that in Korea in June," says Innes.

The Canola Council, Cereals Canada and Pulse Canada are also involved in various other strategies that contribute to improving market access. For example, they monitor pesticide residue requirements in different markets and work with crop protection companies to address potential market risks. And they work with the Canadian government to encourage more consistent review processes and standards for crop commodities in international markets.

Traceability Increasingly Important

Traceability and quality assurance systems are important components for ensuring ongoing market access. "When it comes to the grain handling system, traceability is the responsibility of the processors and exporters," explains Innes. "For instance, to meet the food safety requirements in the United States, our processors have to be able to trace their products through the system."

"All the grain handlers keep records of where grain is coming from, so if there are issues, then we can address them very quickly, and not have an entire market close on us," adds Dahl.

Ross notes, "In the global marketplace, consumers increasingly want more transparency to understand where their product came from and how that product was grown. In addition to the regulatory oversight we already have here in Canada, the industry is ensuring their own quality assurance oversight along the entire value chain because that is what the end-user is looking for."



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Essential Role of Growers

Cereals Canada, Pulse Canada and the Canola Council have teamed up to create another initiative to help keep markets open. It's a proactive outreach program for crop growers called Keep It Clean (keepingitclean.ca).

"Our growers do a great job. We want to help them continue to do that. These days, more countries are testing for pesticide residues, and more countries are setting their own limits for residues rather than relying on international standards. There is also the ability to detect very low levels of residues in products. We want to ensure that our products are meeting the [regulatory and contractual] requirements of our end-users. With the Keep It Clean program, we are ensuring that growers are aware of what they can do to ensure our exports meet these requirements and to maintain market access," explains Ross.

Dahl says Keep It Clean's key message is what happens on the farm really matters in international markets. "Farmers need to be taking the steps necessary to keep our markets open because just a little bit of something that is not supposed to be there can close a market. As an example, often pesticide residues are measured in parts per billion, but one part per billion is [equivalent to] one second in 32 years. And mycotoxins are often measured in parts per trillion, which is one second in 32,000 years. These are miniscule levels, and yet these are the standards that everybody is being held to internationally. It really does matter what individual farmers do."

Keep It Clean identifies five basic tips for all crop growers:

- 1. Use acceptable pesticides only
- 2. Always read and follow the label
- 3. Grow disease-resistant varieties and use practices that reduce infection
- 4. Store your crop properly
- 5. Deliver what you declare

As well, the Keep It Clean website has sections specifically for cereal growers, canola growers and pulse growers. Those sections explain how the basic tips relate to each of these three crop sectors.

In addition, these crop-specific sections provide details on top concerns for market access. For example, Keep Cereals Clean highlights issues like Fusarium and glyphosate. Keep Canola Clean focuses on blackleg, malathion and glyphosate. And Keep Pulses Clean highlights glyphosate and pulse-specific tips on applications of crop protection products. For each of the three crop sectors, the list of pesticides that could cause marketing concerns for growers is updated every year, and growers are encouraged to check the website for the latest updates or speak with their grain buyers.

Particularly during this time of unusual uncertainty in international trade, Canadian crop growers and the rest of the value chain need to continue to be vigilant in following practices that meet the requirements of our customers and their governments. It's key to helping markets remain open to Canadian crops.

· Carolyn King







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Seed Quality

New tests and technologies and what you need to know about seed quality issues this year.

NOW, MORE THAN EVER, seed testing provides excellent value as a very small but critical input cost in producing the best crop.

"For a relatively small amount of money, you get a large degree of assurance," says Morgan Webb, owner and senior seed analyst at Seed Check Technologies in Leduc, Alta. "From vigour, germination and presence of disease, to mechanical purity and seed size, more and more farmers are realizing the value of testing. The cost is so low compared to what you are getting, and spending money on all the other crop inputs when you don't know your seed quality just doesn't make any sense. It's the most affordable and important place to start when putting your crop in."

Holly Gelech agrees seed quality is the foundation of all crop farm profitability. "With seed quality that's poor or unknown, there is no remedy that can be applied later on," says the manager of business development at SGS Biovision, which has locations in Sherwood Park and Grande Prairie, Alta., and Winnipeg, Man. "Seed testing sets the stage for a successful future."

Gelech says when SGS BioVision's seed analysts give test results to growers, those clients usually have a suspicion there will be a quality issue due to rain or frost, and they want to know how much of an impact these conditions have had on seed quality. However, no matter what the growing season has been like, Gelech believes more and more farmers now understand that ensuring seed quality is a critical step in their journey to reach their targeted yield the following year.

Sarah Foster, president and senior seed analyst at 20/20 Seed Labs in Nisku, Alta., echoes these thoughts. She says seed testing is important because it can



For a relatively small amount of money, you get a large degree of assurance when you seed test, says Morgan Webb, owner and senior seed analyst at Seed Check Technologies in Leduc, Alta. PHOTO: SEED CHECK TECHNOLOGIES

dispel incorrect beliefs and prevent poor decisions resulting from those beliefs.

"People underestimate the sensitivity of seed and think that if the seed looks good, it must be good," she explains. "However, a seed is a living organism and it often can be struggling to hold onto its vigour due to poor environmental conditions during the growing period. Even uneven maturity can lead to germination issues, and if you don't get testing after harvest, you will not know what problems will arise at seeding time."

Gelech also believes the most important testing time is post-harvest. She says it's "incredibly important" to do testing then, because if you do your testing in April right before cleaning, you may discover you have seed that's too low in quality and you may not be able to purchase what you need at that point. It may be sold out.

Pedigreed growers, Webb says,

generally get tests done post-harvest and also pre-seeding in the spring. This allows them to monitor seed quality throughout the storage season, to see if there are any differences between the fall and after cleaning and storage, and spurs on investigation of the situation if discrepancies are found. If seed is harvested dry and stored well, the seed can hold its vigour, he notes, but many growers find it valuable to do both fall and spring tests to verify that. "Test results in the spring can help pinpoint any storage issues," he says, "and growers can then hone procedures so that future problems are prevented." Every year is obviously different, but even if no problems are found, the value of verification either way is very large.

Evolution of Testing

There are three basic tests, Foster says, when used together are the most

powerful pieces of information growers need in order to eventually plant their seed with confidence. A germination test determines what percentage of seeds germinate. A higher percentage of seeds must germinate in order for pedigreed seed to be sold with the blue tag of certification. A disease test is needed to determine extent of disease presence. as most diseases will result in some loss of seed viability. A vigour test, the most important in Foster's view, will tell you how robust your seed is and how well it will sustain its viability during storage — an indication of how it will perform in the spring, which is particularly important if it's looking like you'll have to seed it into cold and stressful conditions.

With disease testing, Gelech says growers generally have preferences of which fungi to test for depending on their geographical area, but they tend to either want one fungal species or a full fungal scan. Full scans are becoming the norm, she says.

"Many farmers are also asking for a 1000-kernel weight test in the spring on their cleaned samples," she adds. "Farmers are truly grasping that not only germination and disease matter. Seed size matters, because if you don't know your 1000-kernel weight, you will overplant, causing competition for nutrients and moisture. You also don't obviously want to plant too little seed. For pulses, if the stand is inadequate, the weed population has less competition,



Sarah Foster, president and senior seed analyst at 20/20 Seed Labs in Nisku, Alta., says seed testing is important because it can dispel incorrect beliefs and prevent poor decisions resulting from these beliefs.

and if this happens in cereals, you can get tillering, which is good for yield but can cause variability in maturity."

Webb agrees. He says this year in southern Alberta where the weather has been really dry, checking 1000-kernel weights is particularly important as seed size will be low and vigour also might be a concern. In the north, where this year there has been so much rain and maturity levels are all over the place, he says smut levels in barley will be important to test, as well as all the fungal diseases in peas.

New Tests and What's to Come

Seed Check Technologies now offers a "radical emergence test" for cereals, which measures vigour. "They keep adding more crop kinds to this test," Webb notes, "and it provides a better comfort level for vigour for farmers."

20/20 Seed Labs is now using a thermogradient table, a device that can find the sweet spot for seed to germinate under various temperatures. Foster says it's been very successful.

This year, SGS Biovision went through the audits and documentation submission to receive accreditation from the International Seed Testing Association. This allows the company to test seed for export, and Gelech says she and her colleagues are working with association staff to investigate which new tests that are currently being used in other countries make sense for use in the Canadian Prairies

• Treena Hein



HELP WANTED

Studies warn of the growing shortage of skilled labour in agriculture.

LABOUR SHORTAGES are not new in agriculture. In the early 20th century, "harvest trains" travelled from east to west providing farm hands on threshing crews. Back then, you just needed a strong back and a willingness to work from dawn to dusk. Times have changed and a new labour shortage is looming, but now it isn't a strong back that is needed, it's a good understanding of technology.

A large-scale survey of the farming sector called *Agriculture* 2029: An *Update on How Labour Challenges Will Shape the Future of Agriculture* by the Canadian Agricultural Human Resources Council (CAHRC) determined the current 1,100 unfilled positions in grains and oilseeds cost Canadian farmers \$594 million in lost sales or 2.6 per cent of all sales. "This is the largest loss of sales as a result of labour shortages in all of agriculture," reports Debra Hauer of CAHRC. There were \$2.9 billion in losses in agricultural sales across all sectors of agriculture, she adds, which is double that of 2014. "The reason the number is so high in grain and oilseeds is due to increased productivity and mechanization."

While it is true more crops can be grown with fewer people to do the work thanks to larger equipment, technological advances, and the efficient use of herbicides, someone still needs to drive the combine, and it is helpful for another person to be there with a truck to empty the hopper. Smaller families and young people unable or unwilling to take over the farm, as well as the desire of the baby boom generation of farmers to retire, could mean a future with fewer people raised into the industry to do the work.

It isn't easy to pluck someone from the city and give them a job driving the combine or operating the seeder, as modern equipment can look like the cockpit of an airliner requiring knowledge or training. In addition, wages can no longer be a minimum with an offer of room and board or a cot in the barn loft. In order to attract someone from the city to settle in a small town to work in the fields, growers need to pay competitive wages and, if possible, offer benefits.



 $\label{thm:condition} Humphrey \, Banack is a \, grain \, grower \, and \, member \, of the \, Canadian \, Agricultural \, Human \, Resources \, Council \, board \, of \, directors.$

"Our grain farms are growing, and you end up with a business you cannot run by yourself," says Humphrey Banack, a grain grower from Camrose and a member of the CAHRC board of directors. "From a seed growers' perspective, you have to maintain quality and you need someone working for you who understands the importance of maintaining that quality. How can you expand your seed growing acres if you can't find help to manage the expansion?"

Also aware of the labour shortages and how agriculture will be affected is the Royal Bank of Canada (RBC). The bank recently published Farmer 4.0, a comprehensive examination of the issue and an identification of how the industry needs to change to meet its future needs.

"Over the last two decades, agriculture has outpaced the rest of the economy with annual 5.5 per cent productivity gains,





even as the sector has lost about one-third of its workforce," explains Andrew Schrumm, senior research manager with RBC.

"In recent years, however, these gains have slowed to the national average. Looking to 2030, if we continue a downward slide, agriculture could drop to a 1.8 per cent productivity gain year over year. With these losses, compounded by mounting labour shortages, Canada could leave \$11 billion in potential GDP on the table." He adds that agriculture has been a standout over the years in learning how to use technology to replace people, but it is now clear the technology needs people to maintain and use it. What happens when the 37 per cent of farmers who have been using the technology and are eligible to retire at the end of 2020 leave the industry? Who will be trained and ready to take their places?

All the research points to a need to encourage young people to consider a career in agriculture. To do that, the industry must convince students interested in STEM (Science, Technology, Engineering and Mathematics) that agriculture offers satisfying and challenging careers. Across Canada, agricultural degree and college programs try to attract young people raised in cities to their programs because there are no longer enough rural youth to fill the classes.

"We have three generations working on our farm and each has a different perspective on our farm," Banack explains. "Generations starting school today can expect to have three careers, not three jobs. So how do we change our recruitment process to attract people to agriculture who want a career? When I started farming, I just wanted to drive a tractor and now I'm a human resources manager. We need to learn how to recruit. Perhaps we need to study how other industries are recruiting."

Understanding the technology used in a high clearance sprayer isn't the only technology farmers need to master, according to Banack. He says growers need to tap into social media because a lot of job searches now happen that way.

He says if the industry wants to present itself as a viable career option, growers have to be willing to pay fairly. "It's possible we might have to pay an employee more than we pay ourselves," Banack continues. "We have to offer attractive wage packages."

But paying more for help doesn't answer the question of where to find the qualified people to do the work. On-the-job training is always a possibility if a grower can find someone who wants to learn, but it would be more time-efficient to be able to hire someone with the required skills who can step into a combine or sprayer and get to work.

"We'd like to see the federal government create a national skills strategy for agriculture," says Schrumm. "We need to envision a long-term strategy to cultivate skills to attract young people to the industry."

Hauer suggests apprenticeship and co-op programs could help fill the labour shortage. Giving students in agricultural programs opportunities to try their new skills and get paid for it might convince them that a career in agriculture offers fulfillment and a future.

Dale Steele of Steele Ag Insight in Lethbridge says he sees a disconnect between what is needed and getting it done. He has worked with Olds College and University of Alberta and he sees the labour shortage issue as multi-pronged.



Andrew Schrumm is a senior research manager with RBC



Dale Steele is the owner of Steele Aa Insiaht



Debra Hauer works for the Canadian Agricultural Human Resource Council.

"There are fewer farmers and fewer sons and daughters," Steele says. "Enrolment by Canadians in agricultural programs is declining but foreign students are filling the spots. However, most of the foreign students are taking their learned knowledge back to their countries. How do we get non-farm people interested in working in agriculture? This industry leads in automation and technology, which should be attractive."

Steele sees an immediate limitation in teaching the technology skills to fully utilize the computers and data that are part of all modern equipment. He suggests colleges and universities should explore curriculum changes to expose students to the new tools, technologies and digital agricultural platforms that are currently being used by farmers.

"Supply and demand should help solve the issue because high wages should encourage people to check out the skills needed," Steele continues. "But how do we convince urban dwellers to move to underpopulated areas of the country in order to take a job operating a sprayer?"

Back to supply and demand, Steele says if the sprayer is worth \$300/hr and it is sitting for lack of an operator, perhaps it makes sense to pay \$30/hr to get someone to run it. "Universities and colleges should be training students in the latest technology, but I'm not seeing that."



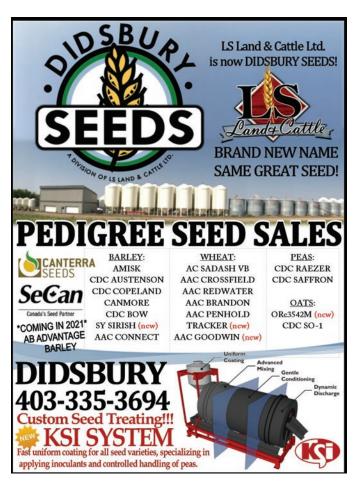
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Ron & Lee Markert Box 1150 • Vulcan, Alberta TOL 2BO 403-485-6708 • www.markertseeds.com info@markertseeds.com Schrumm agrees a long-term strategy needs to be put in place to attract young people to the industry. "We need to get away from agricultural stereotypes."

Modern agriculture is vastly different than the style practiced when the harvest trains came west. Anyone working in agriculture today needs to "crunch numbers," according to Schrumm, and that person needs to generate spread sheets to satisfy inspectors who are tracking food from seed to bread. Computer literacy is needed to operate high-tech equipment to manage GPS, precision application, and to manage storage systems to ensure temperature and moisture are maintained.

Hauer believes that agriculture, as always, will adapt, and will determine how to attract employees and will support outside training as needed. "Agricultural producers are extremely innovative," she says. "Adaptation will continue."

However, will the industry adapt quickly enough and be supported by colleges and universities to reduce the predicted labour shortage to a news headline and not a prolonged problem? Steele is concerned the lack of skilled labour for agriculture will become chronic.

"My kids are approaching their college or university years and there are no Canadian universities where they can learn about soils, plants, biology and business along with the basics of GIS, remote sensing and computer science in an agriculture program to prepare for the future," he says. "Imagine if dentistry or medical students didn't have access to the new tools and procedures used in their fields?"

Banack encourages growers to visit the CAHRC website to learn how to manage the labour issue. "We have to recognize there are changes happening and get involved now. The Alberta Federation of Agriculture is involved in labour laws, compensation packages and workers' compensation. If we want to attract people, we have to provide safe workplaces." He adds the CAHRC information can be used by colleges, universities and governments, not just farmers, to minimize labour shortages. Banack suggests a five-year plan could be developed and then acted on.

Schrumm agrees. He believes as farmers continue to evolve into agricultural business people, rather than sticking with the old stereotype of a traditional family farm, potential employees will begin to see agriculture as a technologically challenging career path. But growers will have to pay to get the best people and keep them, which could require, as Banack did, becoming a human resources manager along with being the technology manager, the chief financial officer, and the equipment mechanic.

In reality, farm operations and their managers will continue to be what they have always been — multi-dimensional businesses — but more emphasis will be placed on training employees or recruiting agriculture program graduates and then paying them fairly in order to keep them on the farm.

• Rosalie I. Tennison



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The Future of Disease Management in Western Canada

Lab capacity, growing expertise and techniques for molecular tools, and tailoring variety choice and cropping decisions on the virulence spectrum in a field are all part of an exciting future in disease management.

KELLY TURKINGTON is an Agriculture and Agri-Food Canada research scientist and plant pathologist based in Lacombe, Alta., who brings more than 35 years of experience with cereal and oilseed diseases and their management to the industry. From the importance of field-based knowledge and correct disease identification to spore trapping and molecular tests to tailor a farmer's variety selection and in-crop disease management program, Turkington discusses the issues and tools he sees affecting the future of disease management.

ASG: What do you consider one of the most important aspects influencing disease management in the future in Western Canada?

KT: It will be critical to maintain a level of field-based knowledge with respect to disease management, which involves correct disease identification. Although advances in technology will play an important role in the future, it'll be crucial for those people entering the industry to still have a good educational background and/or field expertise. Educational resources, field-based research and technology transfer, and on-one-on mentoring will be critical to develop and maintain this capacity.

As we see advances in technology — whether related to molecular biology and phenomics, including alternative strategies for assessing disease, like satellite or drone-based imagery — we need to make sure what we're identifying based on these new technologies is actually verified in the field in terms of a particular disease issue.

ASG: Is there anything else industry stakeholders, including farmers, can do to improve disease management?

KT: We need to understand the life cycles of the pests we're trying to manage — how they survive, how and when they develop, and their levels within a field or harvested grain. For example, if a pathogen is only present in small amounts, it will likely have a limited impact on yield, quality and net returns, thus, in-crop fungicide may not be needed. Therefore, understanding the issues you're trying to manage is key to identifying the most suitable disease control strategies and if they are needed. We can't underestimate the importance of foundational knowledge regarding the crop we are growing and any potential disease issues.

We get focused on the latest, greatest and newest technologies, but we also need to remember we're dealing with a biological system. You need to have an understanding of the crop's biology and the pest species or disease attacking that crop. All farmers may not need that if they are working with an experienced and knowledgeable crop advisor or consultant. The message is, don't underestimate the need for good field sense, the importance of expertise, and an understanding of the basics.

ASG: Do you see challenges ahead with respect to an understanding of the basics?

KT: It relates to what appears to be a generational shift. At some of the recent farmer meetings I've attended, there are more young women and men. Their levels of understanding and field-based expertise may not be the same as some of the older generations of farmers. When it comes to understanding crop production, such as soil fertility, agronomics and pest management, we can't lose focus of the importance of acquiring knowledge, whether that's through formal education, technology transfer or mentoring on-farm. We need a certain

level of knowledge and awareness, whether the farmer has that, or whether it's in combination with an experienced crop consultant

ASG: Are there any other factors that will directly affect disease management in Western Canada, including Alberta?

KT: There are many factors that influence farmers' cropping choices and rotations, and these factors may overshadow concerns related to disease management. Cropping choices may simply reflect commodity prices, the economics of production, or disease issues — for example, farmers may love to grow field peas, but can't effectively manage Aphanomyces. From a broad perspective, we need a wider suite of cropping options that farmers feel comfortable growing: they know how to manage the crops and the pest issues that affect them.

As important, there must be an established market for the commodities farmers produce and the prices must be reasonable. To me, having a suite of cropping options is a foundational element we need because if farmers have a range of different crop species they know they can get paid reasonably well for, and be successful growing and managing any pest issues that arise, then they can start looking at two or three or more years between host crop species. This non-host rotational interval combined with good volunteer and host weed control allows for decomposition of infested crop residues and the loss of viability of pathogen survival structures.

ASG: How do molecular tools fit into the future picture of disease management?

KT: Western Canada is in a unique position in that we have a series of private sector or commodity group-supported labs, which have built capacity as far as molecular biology is concerned. In many cases these labs started out primarily testing cereal seed for *Fusarium graminearum* using traditional agar plating, but then transitioned into DNA-based testing technologies.

This molecular expertise continues to expand. Nowadays, labs offer canola residue tests that identify the virulence group of a blackleg pathogen. Therefore, producers can look at the resistance genetics in the varieties they are growing and the nature of the pathogen in their fields, and with the assistance of a crop consultant come up with a resistance management plan. That capacity and molecular expertise is at producers' fingertips. That, to me, is very exciting and continues to grow. Molecular approaches are another tool for assessing the prevalence and nature of a particular pathogen species.

In terms of planning crop rotations, producers can test the virulence spectrum of the blackleg pathogen in a field, for example. Based on the test results, growers can make decisions about the varieties they grow and the rotation they want to follow. Moreover, in the next five to 10 years, there'll likely be similar approaches to other disease issues in other crop species.

In cereals, we may be able to look at the virulence spectrum of cereal leaf spot pathogens. Growers could take in-season or end-of-growing-season infected plant tissues to the lab. Test results may indicate the farmer has a particular type of pathogen virulence group, which will help dictate the varieties and rotations a grower should use.

ASG: Are there other ways you see molecular techniques influencing disease management?

KT: Fortunately, in Western Canada, our fungicide use patterns have typically been fairly limited up until the last 10 to 15 years. Now, we're seeing fungicide being put on at flag leaf emergence or before, and once again after head emergence — to top up leaf disease control as well as for Fusarium suppression.

In some cases in Europe and Australia — where there is a much longer history of fungicide resistance development in various pathogens, usually due to repeated use within a growing season or between growing seasons — researchers are investigating the use of molecular techniques to assess infected plant samples or spores captured out of the air by spore traps. The molecular characteristics of the pathogens and their virulence spectrums can be assessed, which can, as mentioned previously, indicate what resistance genes in the host may still be effective in terms of the virulence spectrum of the pathogen. Research efforts are also looking at using molecular markers related to fungi sensitivity.

When I was a student, spore trapping was more of a research-focused activity because it was cumbersome and took a lot of time. Nowadays, with advances in molecular biology, results from spore traps or plant samples are available within one day. Interest in spore trapping technologies is increasing, which may lead to more practical commercial applications. Still, spore traps are focused mainly on research activities, but we're seeing that change. One option right now is the Spornado technology from 20/20 Seed Labs, which is a passive spore trap.

Kari Belanger

FightingFusarium Head Blight

Two Alberta experts share their views on best practices for managing the fungal disease in cereal crops.

FUSARIUM HEAD BLIGHT (FHB) is a growing threat in Alberta. This serious fungal disease of wheat, barley, oats and corn first appeared in southern Alberta crops in the 1990s and has been slowly spreading north and west since then.

While there is no "silver bullet" available to growers to ward off FHB in their crops, there are steps they can take to reduce the impact of disease.

According to Kelly Turkington, an Agriculture and Agri-Food Canada plant pathology researcher based in Lacombe, Alta., the two primary weapons used to combat FHB, fungicides and resistant varieties, don't provide the same measure of control they do for some other important cereal diseases.

That's why Turkington believes an integrated approach that utilizes a series of best practices from seeding to residue management at harvest offers the best chance of success for FHB control.

We asked Turkington as well as Clair Langlois, a cereal extension specialist with Alberta Agriculture and Forestry, about management practices they feel can help growers minimize the presence and effect of FHB on their farms.

Resistant Varieties

Turkington believes the first line of defence against FHB is to grow varieties with the best available level of resistance against *Fusarium graminearum*, the predominant Fusarium species in Alberta.

Emerson is a winter wheat rated Resistant (R) to FHB and AAC Tenacious is a Canadian Prairie Spring Red variety that also has an R rating. There are a number of other spring wheat varieties rated Moderately Resistant (MR), and among the durums, Intermediate is the best rating.

Turkington says resistance to FHB is harder to achieve in wheat than it is for some other pathogens, so the level of disease control typically isn't as high as it would be for a stripe rust resistant variety, for example. But he says when used as part of a disease management program, varieties with an R or MR rating still offer some assurance against *F. graminearum* infection.

"That doesn't guarantee you won't have problems, but it greatly reduces your risk compared to a highly susceptible variety," says Turkington.



Barley infected with Fusarium head blight. ${\tt PHOTO:T.K.TURKINGTON.E}$

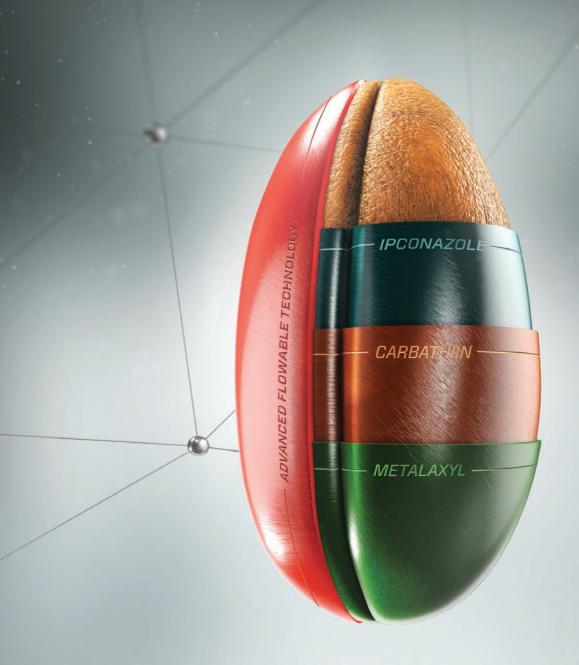
Healthy Seed

Turkington states another key to FHB control is using good quality certified seed, or at the least, seed tested for the Fusarium pathogen.

"To fully understand what you're facing in your field or in your area, that means testing, making sure the seed you're planting is tested for *F. graminearum*," he says.

Langlois agrees it's important for growers to do their due diligence when procuring secure seed.

When buying certified seed, he says growers should ask for a seed health report with testing results specifically for *F. graminearum*. Using seed of the highest quality with high germination and vigour scores, and the lowest disease levels as possible. Langlois also recommends growers keep a representative sample of the seed they purchased.



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In addition, Langlois believes it's a good idea for growers who opt to test their seed to ask their seed labs to perform both an Agar-plate test and a DNA test, since this will not only tell you if *F. graminearum* is present in the seed, but just how much of it is there.

Seed Treatment

Langlois believes treated seed is an important strategy to help limit FHB-related seed and seedling issues. He says while seed treatments can't prevent FHB infection caused by wind-borne spores later in the growing season, they can help limit seedling blights caused by *F. graminearum* and other seed- and soilborne pathogens.

Langlois says regardless of whether FHB is present in an area, it's a good practice for growers to always treat their seed with a registered fungicide that includes Fusarium control on the label. He says this will not only help avert seedling blight but also reduce the potential spread of *F. graminearum* in a field or area that hasn't had it before.

Another benefit of using treated seed is it can help cereal crops get off to a good start and in a better position to ward off FHB.

"You want to start off with good, high-quality seed and then couple that with a good quality seed treatment using good application technology, which will help ensure rapid uniform seed germination, seedling growth and emergence, and stand establishment," Turkington says.

"If you have a high level of Fusarium infection, and you'll pick that up in your seed tests, you'll see a reduction in germination. Seed treatments can help mitigate some of that if the level of infection isn't too high."

Seeding Rates

Langlois recommends growers utilize higher seeding rates, since this will promote a more uniform stand, reduce tillering in plants, and result in a shorter flowering period for the crop (which is the key growth stage for *F. graminearum*).

As Turkington points out, uniform crop development will ensure more uniform head emergence and a more uniform target for farmers spraying fungicides to limit FHB later on in the growing season.

"You need to get fungicide on the plant tissue you want to protect. If plant tissue is still in the boot, it's totally unprotected, and the fungicide will be deposited on the flag leaf sheath instead. You need to have head tissues physically out so you can spray fungicide on them," Turkington says.

"If you use a lower seeding rate, that means there's more secondary development and a wider window for potential infection to occur since there's a much more variable target."

Turkington recommends growers avoid planting seed too deep, since this can also result in more variable stand establishment.

He suggests growers pay close attention to the amount of seed-placed fertilizer to avoid phyto-toxicity that high levels of seed-placed fertilizer may cause.

"You want to have good separation of your seed and fertilizer, especially nitrogen. This will help to promote more even germination and better stand establishment," says Turkington.

Sprayer Technology

Turkington stresses when applying fungicides in-season to fight FHB, it's essential to make sure the field sprayer is working properly and calibrated correctly, so the fungicide is distributed as evenly and accurately as possible.

He says spray nozzles and nozzle combinations that maximize spray coverage on all sides of the wheat heads are particularly effective.

"You need to look at an angled nozzle setup," says Turkington. "The fungicides we're using provide suppression at best. That may just be the nature of the disease we're trying to control and the target we're trying to hit, which is more of a vertical target. That's why it's important to use the right nozzle technology to try and improve coverage."

Limiting Residue

Turkington says because *F. graminearum* can overwinter in crop stubble, anything that can be done to facilitate decomposition of this residue will help remove a potential source of inoculant. He says one of the steps growers can take is to chop up crop residue and spread it widely over the field.



"The smaller the pieces, the better, because the more rapidly it will decompose," says Turkington. "If you get good spread of the material, you won't have the thick sort of swath of chaff that might take a bit longer to decompose in subsequent growing seasons."

Crop Rotation

Allowing more time for crop stubble to break down before reintroducing another cereal crop to the field is another way to reduce the risk of Fusarium infection. Langlois says a short or continuous rotation of cereal crops can allow for a buildup of F. graminearum on infested residues, so it's recommended growers leave at least two years between host crops.

Because corn is also susceptible to *F. graminearum*, Langlois says it should be avoided in rotation with small grain cereals.

"You have to be careful what you pick for a rotation, and corn is definitely not one," he says.

Turkington agrees. "If you look at history, corn is an important host for *Fusarium graminearum*, and that means it's an important host crop for subsequent small grain cereal crops in terms of future risk. So certainly, corn exacerbates the risk you may have."

For many Alberta grain farmers, canola is a popular rotation choice with cereals. Both Langlois and Turkington say field peas are an excellent rotational crop growers should consider as well.

Field location can also be an important consideration for FHB control since wind-blown *F. graminearum* spores can easily travel from one field to the next. Langlois says for this reason, it makes sense for growers to try to avoid planting small grain cereals right beside cereal or corn fields where *F. graminearum* levels are known or suspected to be high.

Combination of Practices

Turkington says in those areas where the fusarium pathogen is well established, relying on crop rotation alone is likely not enough when it comes to FHB prevention.

"You might have a good rotation, at least two, if not three years between susceptible crops, but your neighbour next door may not necessarily be following that type of crop rotation," he says. "What you might find are spores literally being blown across a gravel road from one field to one that's immediately adjacent, and those fields would be most at risk."

Turkington says that's why using multiple tactics to fight FHB is the most effective strategy, and he's optimistic with new research into areas like variety development, seed health and enhanced agronomic practices, farmers will eventually have a larger and more effective toolbox to work with.

"In Alberta, Fusarium head blight is a big issue that can cause some significant problems," he says. "The tools we have [to fight it] do not necessarily work as well as we would like them to right now, but there's lots of research and activity going into improving that, so I'm hopeful."

Mark Halsall

To: All agricultural producers in Alberta Re: Fusarium graminearum status in Alberta

Fusarium graminearum (Fg) was declared a pest in the Pest and Nuisance Control Regulation under the Agricultural Pest Act in Alberta as an eradication strategy in 1999. Since then, infection levels and spread of the pathogen are increasing across Alberta. For example, in 2016, 26.5 per cent¹ of cereal fields surveyed, and 85.3 per cent¹ of corn fields inspected contained the pathogen. Forecasts for 2019 point towards a higher incidence of infection in high rainfall areas of Alberta, especially in crops that received rain during flowering.

Alberta Seed Growers and Alberta Seed Processors through their work in a multi-faceted industry working group launched by the Alberta Wheat Commission have put forward the following request of the Alberta Government:

Modernize the current Pest and Nuisance Control Regulation to

move away from a seed-infection based regulatory approach to mitigation and management. Instead, we recommend a focus on the use of best management practices to control the disease.

This regulatory change would allow for the free and transparent movement of seed with minor levels of Fg infection for propagation and research. It would also emphasize a focus on the more effective disease management of employing best management practice tools.

Following are the consequences of maintaining status quo of Fg as a pest in the current Pest and Nuisance Control Regulation:

Economic Disadvantage for Alberta Producers

- Alberta farmers are at a competitive disadvantage to access newer varieties available to farmers in other provinces; it is becoming more difficult to find pedigreed seed that has non-detectable levels of Fg.
- High-quality pedigreed seed with very low infection levels of Fg (0.5 per cent) is being shipped out of province or dumped as commercial grain, leaving farmers with less opportunity to purchase pedigreed seed.
- Maintaining a focus only on seed infection increases the risk of producing fusarium infected crops, as it takes the focus off wind-borne spore infection from infected cereal and corn fields.

Alberta's Seed Industry is Not Sustainable

- Seed growers are finding it increasingly difficult to find higher generations
 of the newer varieties with improved fusarium resistance, resorting to
 growing older varieties; which does not help farmers trying to manage
 fusarium.
- Seed production companies are at a tipping point where it is next to
 impossible to justify multiplying varieties in Alberta where they are at
 substantial risk of producing seed with detectable levels of fusarium.
 These new seed varieties, when detectable levels of fusarium are present,
 are then shipped out of province, where out-of-province producers are at a
 huge advantage of gaining quicker access.

Please join us, along with other members of the fusarium working group, to support the amendment of the Pest and Nuisance Control Regulation to address the current fusarium reality. Email your support for change or any comments to the fusarium working group: info@albertawheat.com.

Sincerely,

Alberta Seed Processors and Alberta Seed Growers

¹ Harding, Michael; Research Scientist, Plant Pathology Crop Research and Extension Branch Alberta Agriculture and Forestry Summary of Surveys for Fusarium Head Blight caused by Fusarium graminearum in Alberta Wheat Fields, ACIDF Project # 2015C017R

Holmstrom Seed Farm: **Family and Integrity First**

Principles and focus on relationships keep the people at Holmstrom Seed Farms working — and singing — in harmony.

FARMERS COME IN two types: those who farm to live, and those who live to farm. Killam, Alta.-based seed grower Darrell Holmstrom is entirely the second. Though he has logged a full three and a half decades in the certified seed business, he's just as excited about this year's harvest as he's ever been.

"You don't know until you're actually out there. It can look good when you're walking the field, but you just don't know until it's actually coming down," he says. "We had rain and rain and rain, but the barley looks incredible, and I'm amazed at the quality in the peas. I just want to get into it so we can see how some of our newer varieties did."

Holmstrom has been growing pedigreed seed since 1985. Today, he grows 950 acres of pedigreed wheat seed, 350 acres of pedigreed barley, 330 acres of pedigreed green peas, and a few acres of both pedigreed oats and flax, as well as hybrid canola.

He's particularly excited to be growing a new midge-tolerant CWRS wheat called AAC Wheatland. Unlike full-sized Unity, which he tried in 2010/2011 but found it had so much straw it kept the soil cold long into the following spring, AAC Wheatland is a strong-strawed semi-dwarf.

"We got amazing yields out of Unity. Amazing. But then we had frozen canola the next year, so it ended up costing money. What I like about Wheatland is that its yield potential is incredible, it stood up well through this year's rain, and it doesn't have the straw mass of Unity, so it's not going to hold cold in the ground," he says.

Watch for AAC Wheatland to launch in the fall of 2020.

He also grows ACC Elie, an early season, high yielding, semidwarf CWRS with good fusarium head blight resistance, and ACC Redberry, an early maturing, high yield and high protein full-size CWRS.

"Last year was a dry year, so a lot of Redberry got lodged in this year's rains because of a carryover of fertilizer. It was pretty high-yielding, but you have to be careful about overfeeding Redberry. Elie, you can feed pretty heavy, so that was probably a better fit this year."

Holmstrom's barley acreage is divided between three varieties. The newest is CDC Fraser, a 2-row malting barley, which is impressing him so far with its "tremendously high" yields and decent standability. That said, this is just year one



Farming is a family affair at Holmstrom Seed Farms. In the above photo is Ryan and Rebecca Steel. Rebecca is Holmstrom's youngest daughter.



Alberta seed grower Darrell Holmstrom

of growing the crop, so he's not yet ready to make a definitive recommendation to growers.

"It's looking like it's on the heavier side of heavy. It looks excellent in the field but we haven't got to it yet so I can't make a definite judgement, and even then I won't know for sure. It takes me about two to three years to really feel comfortable and confident recommending a variety."

His top pick for peas is CDC Greenwater, a high protein, semi-leafless field pea that resists bleaching.

Given the number of varieties he's growing of each crop type, administration and record-keeping are key. "Rotation is everything. We have to keep track of where we've been with everything," he says. "Details are important in farming, especially if you're a seed grower."

Administration isn't the only thing he is committed to doing right. From growing and harvest to cleaning and storage to final sale, Holmstrom believes in doing things well the first time.

"From my perspective, doing things the right way is always important. The right way is the right way. When a bin is clean, it's not sort of clean or mostly clean, it's clean. When things are done right, you can move on to the next thing confidently."

He feels the same about his word.

"It all comes down to standing by what you do and what you say. I come from a family where that mattered. My dad had integrity. He passed it on to me and I tried to pass it on to my own kids."

Holmstrom also believes deeply in the importance of supporting research, development and innovation. He was part of starting the Battle River Research Group out of Forestburg in 1987. He's played a vital role in increasing seed stocks for various up-and-coming varieties at the Lacombe Research Station. And he has regularly handed over plots of his land for various research trials.

While his willingness to let researchers use his land is publicly beneficial, it's not entirely altruistic: he believes he gets as much value from the trial as the researchers.

"Having trials done on my farm lets me learn from excellence. I see it as an investment in my own farm because it lets me get better myself. Rather than just thinking my own thoughts and using my own ideas, having a trial here means I can work with these top-level, behind the scenes people and learn from them to improve my own decision-making," he says.

Allowing research to be done on his farm also means that he gains location-specific insight.

"You can't always follow advice from another geographic location. You have to figure it out specific to your land. In my case, I benefit from excellent research minds helping me determine what will work best on my farm."

What he learns via this research, he's happy to pass on to other farmers.

"Being part of these trials helps me be a better teacher to my customers. All the information I gain, I'm a conduit to transfer that knowledge to other people." The information transfer isn't only one way, of course.

"I love loading out trucks and talking with people. Big and small farms come here. Whether people buy a little or a lot of seed, we treat them all the same. I've learned a lot over the years by making time to listen to people.

"We had people come for four pails of wheat once and they ended up talking for two hours. They were trying to do their best with very little. Other people come in for seed for 20,000 acres. We get all different types of people. They've all got something to say that's worth hearing."

"I've learned a lot over the years by making time to listen to people."

Darrell Holmstrom

Holmstrom Seed Farm services customers from as far as Manitoba and from southern to northern Alberta.

"The weather in this area treats us a bit better. We're known for not getting too much frost, for being a little drier than other areas, which means our seed stock has good vigour," he says.

Holmstrom and his wife, Barb, are proud that three of their five children have followed in their farming footsteps. The oldest daughter, Laurel, who happily drove the swather from age 12, began growing seed for Holmstrom Seeds this year with her husband, Dave. Their third daughter, Jodi, and her husband, Phil, farm land nearby as well as working part time for Holmstrom Seeds. Youngest daughter, Rebecca, and her husband, Ryan, recently joined the family business full time while raising AB Cattlelac barley as seed and managing a herd of cattle.

"We're in the process of transitioning to more family involvement on our farm," says Holmstrom. "It's good. It's really good. But it takes effort to make that transition."

The Holmstroms don't just farm together, they sing — often in multi-part harmony — together, too. Holmstrom sees a lot of parallels between learning a new song and learning to farm together.

"Creating harmony together doesn't automatically happen: you have to work at it and practice. You can't just be thinking about your part, you have to appreciate that everyone has a different part. And when you start adding in extra parts — the kids' spouses who have different backgrounds and different experiences — you have to figure out how they fit in. But it's an amazing thing that happens when we get the harmony right."

• Madeleine Baerg

Big Steps Forward for Spring Triticale and Wheat

Triticale is holding its own thanks to Alberta Agriculture and Forestry plant breeder Mazen Aljarrah.

THIRTY-FOUR YEARS into breeding wheat and triticale, Mazen Aljarrah, a researcher at Alberta Agriculture and Forestry's Field Crop Development Centre (FCDC) in Lacombe, Alta., is as excited about the work he's doing now as he was at the outset.

"I enjoy every moment working in this centre. As a plant breeder, you have a hope and a dream every year that you're going to get a super variety next year. When you go through the advanced material and you see the babies, you always hope that one day we'll get one variety that is perfect: that will satisfy all of a farmer's needs. Will that happen? Maybe not, but every year we're making progress in a good way that adds value."

Progress, indeed. Over the last three years, Aljarrah has released three new winter triticale varieties to the market. The real excitement — and, for the past five years, exclusive emphasis — of his breeding program today, however, is in the spring varieties.

Spring Triticale

Since 2018, Aljarrah has released four new spring triticale varieties. More are coming soon. Much more important than numbers, however, is the quality of the new lines.

"When I meet with farmers and livestock producers, I say: don't ever judge triticale by old triticale varieties," he says. "Try the new ones and then let me know. It's not the same crop as it used to be."

Given Alberta's strong livestock sector, Aljarrah's priority with triticale is to continuously improve the crop's forage traits. In addition to dry matter and forage yield, Aljarrah is focusing on a host of forage attributes including digestibility, lodging resistance, reduced awn and disease resistance.

"I'm not worried about productivity in triticale. Our new varieties produce at least 15 per cent higher than barley. They're pretty similar to oats, which used to be No. 1 for productivity. My challenge is to enhance the other features to make triticale a top forage crop," he says.

Currently, triticale ranks between barley and oats for digestibility. Aljarrah hopes to bring triticale's digestibility closer to that of top-ranking barley. Already, his newest varieties show a significant jump in the right direction. In order to improve digestibility further, Aljarrah is reshaping the crop, a move that also tackles triticale's tendency to lodge.

"Usually the reason triticale has lower digestibility than barley is that it has a high quantity of lignin, mainly in the stem. What I'm doing is reshaping triticale to have shorter stems but



Mazen Aljarrah has been breeding wheat and triticale for 34 years.

bigger and more fertile heads. The heads of the new varieties contribute 45 per cent of biomass during cutting compared to maybe only 30 per cent. The change maintains good biomass yield but improves the forage quality and achieves much better lodging resistance."

Meanwhile, he is also striving to improve the smoothness of triticale's traditionally rough awns and increase both ergot and fusarium head blight (FHB) resistance.

"All the lines we registered this year and last year have very low ergot infection compared to checks. Many farmers believe all triticale gets ergot, but that is not the case."

While FHB is not province-wide, infection levels are on the rise. There's little question that FHB will be an increasing concern in Alberta in the future.

"FHB is something we really have to pay attention to," says Aljarrah. "Triticale is sensitive to FHB so we are trying to increase FHB resistance level in our genotypes. Most of the lines we've developed have an MS [moderate susceptible] rating, which is acceptable. However, the last variety we developed —

one called T267 — may be the very first line of triticale available with moderate FHB resistance."

Unfortunately, he says, breeding for FHB resistance is very difficult because he does not have FHB resistant resources in his triticale germplasm. Compounding that issue is the fact he can't easily borrow outside germplasm as he might with a crop like wheat because few centres breed triticale anywhere in the world, and most of those that do are private sector. In fact, the FCDC in Lacombe is currently the only research station with a spring triticale breeding program anywhere in Canada.

He's working to solve the challenge of germplasm development through creative means.

"Triticale is crossable with wheat, and then I can cross back or top cross to triticale. It's a long process but it can work to bring more good traits from wheat to triticale," he says.

One such trait he's hoping to breed in from wheat is enhanced ergot resistance, given that wheat is much less susceptible to ergot than triticale. He also hopes to increase grain quality (specifically, reduce grain shriveling) by transferring wheat genetics.

Several years ago, Aljarrah also started making crosses between winter and spring triticale, given that they have entirely different genetic backgrounds. Already, he has some populations at the yield trial stage.

Farmers and seed companies are taking notice of Aljarrah's successes. Seed companies that never before opted for triticale are starting to choose some of Aljarrah's lines, both winter and spring.

"There is a big change in the interest level and more is coming. During the International Triticale Symposium in Lethbridge last July, we met with U.S. producers and buyers who showed a huge interest in our triticale."

Currently, the market is exclusively oriented towards forage and green feeding. Aljarrah believes huge potential lies ahead in another direction: biofuel.

"The complaint is there's not enough production of triticale for grain. They use wheat for ethanol production right now, but triticale is much more efficient than wheat. There is a huge market coming up for triticale for biofuel; we're just not there yet. I'd say maybe five years from now."

He anticipates bringing multiple new triticale lines to market next year, with varying usage fits.

"Our plan is to put in the market different genotypes and phenotypes that fit different markets. Most of our lines are dual purpose, so they go well for grain or forage production," he says.

A real challenge for Aljarrah's program is maintaining funding. Because triticale remains a minor crop in Western Canada, and likely also because it is primarily a forage crop, funding agencies show little interest.

"My hope is that maybe there is an opportunity for groups like Alberta Beef Producers to continue helping provide funding to enhance barley and triticale for forage use, as they have done in the past."

Spring Wheat

Aljarrah's spring wheat program is only four years old but holds exciting promise.

"For many years, I collected wheat because it helped me enhance triticale. Later, we found out that our germplasm for spring wheat was very good, so the decision was made to also focus on spring wheat," he says.

So far, he has three lines in cooperative trials: a Canadian Prairie Spring (CPS), a Canadian Northern Hard Red (CNHR), plus a very high-yielding special purpose wheat that he hopes to release in February 2020.

Unlike triticale, many researchers representing both public research programs and private companies are actively involved in spring wheat research. Aljarrah is very pleased that much of his work on spring wheat is conducted in collaboration with colleagues from Agriculture and Agri-Food Canada and companies like Syngenta and Limagrain Cereals Research Canada.

"We are swapping trials because having more locations in Western Canada is very critical to success. And, we are working with private companies to evaluate our germplasm for quality," he says. "The main challenge in our wheat breeding program is finding a place I can evaluate a lot of material for FHB. So far, we don't have that in Alberta, but Syngenta has a site in Rosebank. That is an example of why collaboration is so important."

In addition to screening for FHB, Aljarrah's main priority in CPS is milling quality.

"We have a long history of breeding both winter and spring triticale, so I'm confident we can achieve excellent improvements in wheat too. We have approached a good level for germplasm, so from now on we will have great varieties coming from our program."

While Aljarrah's entire career to date has focused on wheat and triticale, his work hasn't always been based in Canada. Aljarrah was born and raised in Syria and spent the first 22 years (1985-2007) of his career based primarily out of the International Centre for Agricultural Research in the Dry Areas (ICARDA) based in Aleppo, Syria. His earliest research priorities included screening durum wheat for drought resistance and multiple disease resistances (stripe, stem and leaf rust, among others). Over the last 12 years of his career in Syria, he shifted primarily from durum to winter wheat (as well as some work with triticale), furthering his skills with collaborative projects in Turkey and with the International Maize and Wheat Improvement Center (CIMMYT) in Mexico.

Unlike the many Syrians who have been forced to leave their country because of war, Aljarrah immigrated to Canada in 2008 entirely by choice.

"Back then, Syria was great on the political side. There were no problems and no war. I didn't need to leave. But during my whole time with ICARDA, it was always one of my dreams to work on wheat breeding in Canada. I always had a huge poster in my office in Aleppo of the wheat fields on the Canadian Prairies: that's where I wanted to be."

In 2008, Aljarrah, together with wife, Zuka, and two sons, left Syria for Canada with great hopes of finally fulfilling his dream.

"I still remember the interview I had at the Canadian embassy. They asked me what province I'd like to choose and I was allowed to pick two. I said, 'Alberta and Saskatchewan.' They asked me why I'd pick those two [because] B.C. is warmer. I said, 'I don't mind! Over there is the wheat!'"

Eleven years later, he's still certain he made the right choice.

Madeleine Baerg

Wetaskiwin Seed and Grain Co-op: Open for Everyone and Everything

Small-town charm, service, selection and location keep customers coming back to this seed plant.

WHEN WETASKIWIN AREA farmers head to town to grab a burger, see a movie or do a little shopping, they have the option to add one extra item to their "get it done in town" list: having their seed cleaned. Wetaskiwin Seed and Grain Co-op (WSGC) has been a fixture on the southeast edge of Wetaskiwin since the early 1970s. Though the city has grown up around it over the past 50 years, WSGC holds true to its small-town charm and know-your-customers-by-name style of service.

What sets WSGC apart? Obviously, the plant's purely operational benefits draw many farmers, says WSGC's plant manager, Mike Mullin. "Our location is a bonus being on the edge of Wetaskiwin. We offer seed treating in the spring, which only maybe a third of plants offer. And we distribute multiple varieties of wheat and barley — probably about 10 of wheat and six of barley — so growers have lots of choice."

A factor that is at least as important, though, is the personal connection and service WSGC offers its customers.

"We've been around here for a long time. Farmers know us and trust us, and know we'll do an excellent job. We try to accommodate everyone as best we can. We'll get the producers who clean 150 bushels and the producers who clean 15,000. We value all our customers whether they're big or small," says Mullin.

WSGC cleans about 450,000 metric tonnes of grain annually. It has the storage capacity to handle approximately 300 metric tonnes of incoming grain and store approximately 600 metric tonnes of clean grain. Yet, a quick calculation of the many white bins standing in WSGC's bin-yard shows significantly more bin space than WSGC allocates for incoming and stored grain. That's because WSGC stores and distributes seed for Wetaskiwin Co-op (formerly Parkland Fertilizers) and Nutrien Ag Solutions (formerly Viterra), and also stores seed that is owned and ultimately marketed by individual seed growers.

"We have approximately 1600 metric tonnes of bin space, which includes about 30 bins. Most are owned by Co-op or Nutrien. We don't sell those seeds; we just distribute it to people who arrange with those companies to buy it."

Acting as a seed distribution point for just a couple major companies is a real change from the business model a couple decades ago.

"At one time, we probably had 50 bins outside, all belonging to different seed growers. They'd grow their pedigreed seed and sell it through our plant, and then we'd get a commission for handling it. Over the years, it's gradually got to the point that people wholesale their seed to big companies rather than selling it on their own."

That shift began in the early 2000s, when Viterra first



Wetaskiwin Seed and Grain Co-op has been a fixture on the southeast edge of Wetaskiwin since the early 1970s.

approached Mullin with the suggestion. For WSGC, it added a new component and revenue stream to their business. For Viterra, it freed up valuable bin space in the spring at their own plants.

"They asked if they could use our plant as a testing ground for seed distribution. It hadn't been done before that," says Mullin. "They do it at other plants now, too, but we were the first to prove it would work."

In order not to be in competition with its own clients, WSGC does not sell any certified seed of its own. It does, however, sell common seed of varieties that are not covered by plant breeders' rights. On average, WSGC sells approximately 5,000 bushels of barley each year and approximately double that in oats.

WSGC's geographic pull is large. In addition to drawing many of the 1,300 farms in the Wetaskiwin area, almost 40 per cent of the Co-op's business comes from Leduc and Nisku. More farmers drive in from the Camrose and Ponoka areas.

The Wetaskiwin area is quite competitive for seed cleaning. Portables do a fair amount of business in the area; Warburg, Camrose, Bashaw and Ponoka all have plants as well.

"Ultimately, producers have a lot of options. That's a good thing for farmers," says Mullin. "The portables have their place. They are a total convenience for the farmer, but they can never do the job that a seed plant can do. There will always be a place for seed plants. Seed plants are here to stay."

WSGC is here to stay, yes, but perhaps not in exactly the location it occupies now.

"When our plant was built, it wasn't built with a lot of extra space. Some additions have been put on over the years, but we're tight for space. Ideally, the next step for us would be to buy some land outside in the country where we could stretch out more."

While additional space would make managing the plant easier, the existing plant is entirely up to date with sorting and cleaning equipment.

"As far as the cleaning goes, you won't find it done better anywhere else," says Mullin.

Similar to all 67 other co-operative seed plants across Alberta, WSGC is run by a board of directors. Producers who purchase a share for \$250 get \$0.10/bushel off the cleaning rate, which means a share is essentially paid off after cleaning 2500 bushels. The co-operative model typically offers growers greater service — private seed cleaning plants typically only clean the limited number of varieties they grow. Co-ops are "open to everyone and everything," says Mullin. "We're here for the guys who grow certified seed but we're also here for those that grow grain for feed or to sell to elevators."

While Wetaskiwin's growth has constricted WSGC's ability to expand at its current location, one new building near the city may directly support the co-op's continued success: a new 42,000 tonne grain elevator is slated to open later this fall south of Wetaskiwin.

"They are only a couple miles away from us. If people start hauling to that elevator, we may capture some new business if they bring us their grain to clean en route to the elevator." Mullin has one key message he wishes all farmers would take to heart: farmers sometimes need to invest a little to make a lot. His is a two-part investment recommendation.

First, update your seed, preferably every two to three years.

"You need to keep your seed fresh, so to speak. Older seed loses vitality and vigour. Yes, older seed will grow but if you add any stress — disease, cold, drought or moisture, or pests — you'll see a visible difference in growth and yield," he says. "Seed is your cheapest input. It's not the place to try to save a few dollars."

Second, virtually every farmer should be treating their seeds every year.

"I'd recommend it for every seed that goes in the ground. It's very cheap insurance," he says. "If you have wet falls like we've had the past few years, you definitely need to treat your seed in the spring because there is so much disease and bacteria that will be in your seed. But even after a dry fall, you want to treat your seed to hold off diseases that will attack your seed while it's trying to grow, especially if it's a cool, slow spring."

Mullin has committed almost 25 years to WSGC so far. He says he's got at least a few more still in him.

"I'm a born and raised country boy. Agriculture is my life. Ag is looked down on because it's not always as dynamic or exciting as other industries. The money isn't as good as the oil patch. But you know what? The farming industry in Alberta is a constant. Every year, it's there. In a good year, a bad year, it's still there. That's why I'm still here. I believe in this industry and the farmers who make it happen."

· Madeleine Baerg



Beyond Breeding

The 2019 meeting of the Prairie Grain Development Committee saw breeders focus not just on how they do their work, but why — and what the implications are for the future.

FOR JAMIE LARSEN, an exciting part of this year's meeting of the Prairie Recommending Committee for Wheat, Rye and Triticale (PRCWRT) was a new assessment tool created in large part by Robert Graf.

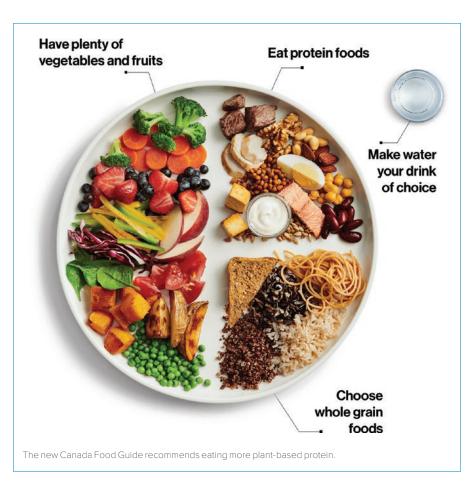
It allowed breeders who planned to put new lines forward for recommendation to run those lines through the tool, which told them whether or not the line was likely to be recommended for registration or would need to be discussed in more detail by the committee.

Graf, a winter wheat breeder with Agriculture and Agri-Food Canada (AAFC), noted the assessment tool was part of a comprehensive review led by Brian Beres (research scientist at AAFC Lethbridge) and Curtis Pozniak (wheat breeder at the University of Saskatchewan's Crop Development Centre).

"When Rob came up with the idea, it was a points-based system to weigh certain traits, but evolved to the point where if a line was equal to or better than the checks it would go through, and if it was worse than the checks in some way, it would be flagged and then the breeder would have to explain why it has merit," committee chair Larsen said.

"It offers the breeder a chance to put forth a good argument to explain why the variety has merit to be registered."

The tool has resulted in new efficiencies for the PRCWRT, he added. "The meetings used to be hours, and this has cut that down so we can focus on other topics of discussion."



Focusing on the big picture was a big component of this year's Prairie Grain Development Committee (PGDC) meeting held in Saskatoon, Sask., during the last week of February. "Beyond Breeding" was the chosen theme of this year's plenary session, which PGDC chairperson Mitchell Japp said was picked in order to highlight the long road

faced by lines put forth for registration at the annual gathering.

"What happens to those lines after they become varieties? How are varieties adopted by industries and consumers? How are varieties compared in post-registration trials? We're looking at all of that this year," Japp said.



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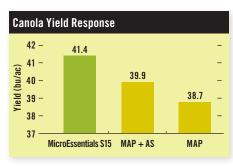
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What's Up in Wheat

The PRCWRT looked at a record number of lines this year — 37 to be exact, according to Larsen.

W569 winter wheat (CWRW) from Graf's program was supported for registration on Feb. 28. It met or exceeded all agronomic, disease and quality parameters for the class, Graf noted.

Some exciting new lines from Richard Cuthbert's program were also included, among others.

That, combined with the new assessment tool developed by Graf, are just a taste of what's to come in the world of wheat, Larsen noted.

"Hybrid wheat is coming, and that will have interesting implications from a registration perspective. Also, there's the topic of forage wheat and how we handle that. Whether we ask for it to be put through the special purpose class or have a special forage test is up for discussion," he said.

"The past few years have been dry on the Prairies, so having more annual forages available would be handy for the livestock industry. The thing is, wheat is wheat — there's no forage wheat or wheat for grain. If you want wheat for forage it needs to go through all the qualifications for grain production. Do we ask for things to change or have that forage data generated afterwards so producers have that info?"

Barley for Brewing

Six barley lines were put forth for recommendation this year by the Prairie Recommending Committee for Oats and Barley (PRCOB), coming from the programs of Patricia Juskiw, Joseph Nyachiro and Yadeta Kabeta (Field Crop Development Centre in Lacombe) as well as Aaron Beattie (Crop Development Centre, University of Saskatchewan).

Ana Badea, chair of the PRCOB's Breeding & Agronomy Evaluation Team, is already looking forward to next year. Although she didn't have any lines up for recommendation in 2019, the barley breeder from AAFC Brandon in Manitoba says she's hopeful that next year could see the unveiling of a line called TR17255,



Mitchell Japp, chair of the PGDC.



Jamie Larsen, chair of the PRCWRT.



Glen Hawkins, chair of the PRCPSC

PGDC Plenary Highlights 2019

The theme of this year's PGDC plenary session was Beyond Breeding. Here are some snapshots of the discussion.

Oat Whisky is a Thing

Wheat whisky, triticale whisky and malt barley whisky. They've all been made by Saskatchewan's Black Fox Farm & Distillery. But the award-winning spirits maker has also tried its hand at making an oat whisky.

"Want a nice spirit? Use oats. Problem is, oats don't yield a large alcohol amount," says distillery co-owner Barb Stefanyshyn-Cote. She says that while working with oats produces a terrific whisky, the inherent qualities of the grain make it a challenge to work with.

Agronomics aside, if there's something she would like breeders to deliver in oats, it's taste. "I want different flavours, something that sets me apart from everyone else. That's what will help us make breeders more money."

She says grain varieties with a unique flavour component would be highly prized by distillers like herself.

"We can charge consumers more for unique flavour. Right now, everyone is excited about heritage varieties. We know heritage varieties aren't really grown anymore because they're not disease resistant and don't store well. But one thing they have is flavour. The end consumer is who [the product is] going to, and if we can't differentiate ourselves that way, then we have a problem."

Barley Sector too Slow to Change

AC Metcalfe barley was registered in the late 1990s, CDC Copeland in 2003. Seventy-five per cent of barley acres in Western Canada are still seeded to Metcalfe and Copeland, noted Jill McDonald, executive director of the SaskBarley Development Commission.

"That's very concerning from my board's perspective when it comes to variety acceptance. AC Synergy is picking up some acreage, but our market is still dominated by two older varieties. That must change."

So, SaskBarley looked at why the sector has a variety acceptance problem. The key, she says, is to engage all levels of industry to be involved in advancing new varieties.

"For years we've heard that it's the maltsters' fault because they won't accept new varieties, or it's the brewers, or it's the seed companies' fault because they're not increasing. We're beyond that. We need to move together for this to happen. We're moving toward a coordinated approach and I believe we'll make considerable progress over the next year or two."



John Cote and Barb Stefanyshyn-Cote are the founders of Black Fox Farm & Distillery.

Australian Variety Trial Model Offers Possible Alternative

Jason Reinheimer, senior breeder for Limagrain Cereals Research Canada, spoke about Australia's Variety Registration Trials (NVT) system. Reinheimer grew up in Australia and spoke about some of the advantages of this system over Canada's current variety registration model.

The NVT model is run by Australia's Grains Research and Development Corporation (GRDC). NVT is a national program of comparative crop variety testing with standardized trial management, data generation, collection and dissemination. This is managed through an internet-accessed database that ensures a common approach and uniformity across the system.

Crops tested are wheat, barley, canola, chickpea, faba bean, field pea, lentil, lupin, oat and triticale.

Breeding in Australia is essentially the same as in Canada, Reinheimer noted. The major difference is Australia has no registration system for varieties. Breeders get through their testing and make a determination whether a line has merit for the marketplace or not. Once internal testing is complete, a line is entered into the NVT system and that results in a minimum of two years of testing before it is released to the market.

"This system ensures farmers have power. They have independent data and they make the choice," Reinheimer said. "Instead of regulating things that come through the system, it is left open and farmers have the best information to make decisions on their farms."



Ana Badea, chair of the Breeding & Agronomy Evaluation Team for the PRCOB.

a hulled or covered variety that could be ideally suited to the mainstream industry and a replacement for AC Metcalfe.

"The continuous challenge we have is to try to see into the future. We don't have a crystal ball — it's a challenge trying to predict what will be needed in 10 years by farmers and seed companies, malt houses, breweries. The key is making sure we develop the right germplasm needed to be the foundation of those new varieties needed by different users," she says.





Tom Warkentin, pulse breeder.

The PRCOB also put forward five oat lines for registration courtesy of breeders Jennifer Mitchell-Fetch (AAFC Brandon) and Jim Dyck of the Saskatoon-based Oat Advantage.

In Pulses. Protein's the Name of the Game

With the release of the new Canada Food Guide in January, plant-based protein is a major topic among the public, and pulse breeders are aware of it.

This year, the Prairie Recommending Committee for Pulses and Specialty Crops (PRCPSC) supported for registration four bean lines, five lentil lines, six yellow pea lines and one green pea line.

"In pulses, we really have to hold the line on protein — it's a value-added component of pulses," said Glen Hawkins, breeder for DL Seeds and chair of the PRCPSC.

All seven pea lines were from the breeding program of Tom Warkentin at the University of Saskatchewan.

"One expanding area would be for selecting higher protein content in yellow pea, especially since there's a growing market for fractionation," Warkentin says. "We want to combine higher protein without losing good agronomic performance. We don't want high protein and low yield."

For Warkentin and Hawkins, the topic of value creation is top of mind in order to reward breeders for their innovations and help fund the creation of new varieties for producers and processors.

"At DL Seeds we've been working for the past 10 years in the pulse market with little to no return in terms of royalties. Developing these lines isn't free," Hawkins says. "In all crops where producers use farm-saved seed, it's imperative we put dollars back into the pockets of the breeders."

Warkentin agrees.

"I hope we have mechanisms in place soon for self-pollinated crops so there are better incentives for breeding them," he said.

No lines were put forward this year by the Prairie Recommending Committee for Oilseeds.

Marc Zienkiewicz

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Can Wheat Save the World?

The wheat genome is way more complex than the human genome — can we figure it out in time to feed a growing world population?

A HALF-CENTURY AGO, human beings took their first steps on the moon.

At first, it's hard to imagine what that has to do with wheat, but for attendees of the first International Wheat Congress held in Saskatoon, Sask., earlier this year, the connection was apt.

"I was 12 years old when that happened. Being a young child and seeing this on a small black-and-white TV was impressive. Two men walked on the moon, but the fact is, the moon landing was the result of 500,000 people working together," said Martin Kropff, director-general of the International Maize and Wheat Improvement Center (CIMMYT), who spoke on the opening day of the congress.

"If we can put a man on the moon, we can solve 800 million people going to bed hungry every day. Wheat is a crucial part of that challenge."

Hosted by the University of Saskatchewan, the event brought together 900 researchers, agronomists and other scientists from 50 countries to talk about all things wheat and durum.

The challenges ahead was the main focus as attendees zeroed in on the fact the world population is growing and more food is needed, specifically cereals — which Kropff said will comprise a third of all calories and protein in the human diet in the future.

But for food prices to remain constant, annual yield gains in wheat would have to increase from 1.2 to 1.7 per cent. "That's no small challenge," Kropff added.

Feeding the World Without Destroying It

As noted by Tim Searchinger, senior fellow at the World Resources Institute (WRI), the reality is that agriculture occupies half the world's vegetated land. That means for agriculture, the sheer task of feeding the world is a huge challenge for biodiversity and ecosystems — especially since agriculture produces a quarter of the world's greenhouse gas emissions.

Searchinger presented the WRI's recent report Creating a Sustainable Food Future, for which he was lead author. It is laid out as a five-course menu of solutions to ensure we can feed 10





billion people by 2050 without increasing emissions, fueling deforestation or exacerbating poverty.

Searchinger noted that between 2010 and 2050, food production must rise 56 per cent in order to feed a growing population — and reduce greenhouse gas emissions by two-thirds in the process.

Wheat can play a huge role in that, he said.

According to the report, to provide continuing yield gains, breeding will need to become more nuanced.

"In the past, much yield gain in the major cereals like wheat resulted from shifting biomass from vegetative parts to seeds and shortening and stiffening of the stems so they could support more grain (resulting from higher fertilizer application) without falling over. These traits, which were largely responsible for the Green Revolution, are in some cases reaching their biological limits; crops can only grow so close to one another before they have no more space, and crops can only direct so much of their growth into edible portions before they will no longer stand upright," the report's authors state.

"These limits, plus the need to boost crop yields even faster than in historical trends, present the crop breeding challenge."

As a result, four major related opportunities exist to increase crop yields through improved breeding: speeding up crop breeding cycles, marker-assisted and genomics-assisted breeding, improvement of "orphan" crops — or crops whose acreage does not support research activities — and genetic modification. Searchinger emphasized that all these technologies play a role in creating new wheat for the world.

"That's why we're here. The work you're doing is incredibly important," he said, and added that four recommendations to enable innovation in wheat include boosting breeding budgets, sharing genomic advances, leveraging new technologies, and increasing research on orphan crops.

The Funding Challenge

According to the WRI report, the world probably devotes only around 1.4 to 1.7 per cent of agricultural GDP to agricultural research and development, which is less than the rate of total research spending relative to the total global economy (2.1 per cent).

Richard Gray, agricultural economist at the University of Saskatchewan, gave a talk titled "Successes and Failures in International Wheat Royalty Collection." He said strengthening plant breeders' rights through royalty collection is one way to ensure more stable funding for variety development, an initiative currently underway in Canada through an attempt to create a value creation system via either a trailing royalty or endpoint royalty.

But there are challenges. According to Gray, UPOV 1991 Plant Breeders' Rights alone has generally failed to create a viable private wheat breeding industry.

"Producer support is an essential element of increased royalty collection and support has come where producers have some long-term ownership in wheat breeding programs," he said. "Public and producer partnerships have played an important role in providing additional breeding resources while enhancing knowledge sharing."

Bringing Researchers Together

This first IWC event was a merger of two previously parallel wheat symposia: the International Wheat Genetics Symposium that took place every five years and the International Wheat Conference held every four years. The two groups agreed to join their efforts to create IWC, said international organizing committee chair Hermann Bürstmayr.

"Wheat is in terms of acreage the largest crop on our globe. Wheat is needed for food, feed and materials in countless ways and wheat is a staple food for around two billion people, many of whom live in [developing] countries. Research has to play its role to deliver know-how, improved production tools and improved cultivars to make wheat production sustainable," he said.

"Challenges are plentiful, as they have always been. Certainly, the more erratic weather extremes will be an important issue, cultivars need possibly more resilience and buffering capacity than before. Heat stress is very likely to increase. Also, resource efficiency — particularly nutrient efficiency, such as nitrogen and phosphorous efficiency — will gain more relevance. And wheat production is expanding into non-traditional areas, such as sub-Saharan Africa, which means production systems need to be established for these regions."

Creating a new generation of wheat that is tolerant to heat stress, drought stress, excess moisture and a constantly-evolving army of pests will require ongoing efforts to collaborate globally, which in many ways is already happening. University of Saskatchewan researchers — led by wheat breeder Curtis Pozniak who helmed the event's Canadian organizing committee — played a key role in mapping the wheat genome as part of an international consortium.

"The bread wheat genome is five times bigger than the human genome — it's a beast. The effort required to undertake cutting-edge research like wheat genome sequencing is massive," said Richard Cuthbert, wheat breeder at the Agriculture and Agri-Food Canada, Swift Current Research and Development Centre.

"There are over 110,000 genes in bread wheat. Employing new technologies like gene editing will depend on how we can dissect complex traits to identify the genes that underlie them and how those genes work together. We're standing on the cliff of the next frontier in wheat. Now that we know what the genes are, we need to know how they work and interact with each other."

Also during the event, Genome Canada announced an investment of \$11.2 million to go toward some exciting new research spearheaded by Pozniak and fellow wheat researcher Sylvie Cloutier of Agriculture and Agri-Food Canada.

Known as 4D Wheat — Diversity, Domestication, Discovery and Delivery — this research will use wild-wheat relatives and elite germplasm along with industry-leading genomic techniques to better understand wheat's genetic potential. The study will also examine the economics and policies of using wild-wheat germplasm sources and germplasm from international sources.

Pozniak and Cloutier's work will be based out of the Crop Development Centre at the University of Saskatchewan and Agriculture and Agri-Food Canada's Ottawa Research and Development Centre, respectively.

Marc Zienkiewicz

Stay Vigilant When it Comes to Clubroot Management

Across Alberta, cases of clubroot are on the rise — even in once clubroot-free areas in southern Alberta. The Canola Council of Canada offers solid advice for those who have clubroot, and those who don't want it.

IN 2018, researchers from Alberta Agriculture and Forestry and the University of Alberta surveyed 543 canola crops for clubroot occurrence and spread. The surveys resulted in 79 newly recorded cases of the disease. County and municipal personnel identified another 221 cases, bringing the total of new cases for 2018 to 300 and the grand total to 3,044 confirmed cases since 2003. While the outbreak is still most severe in central Alberta, the disease continues to spread in the Peace Country and in southern Alberta, albeit more slowly.

Results for 2019 surveys continue to come in. At the time of this report, many regions were still under surveillance.

The first cases of clubroot appeared in Rocky View County, a municipality that surrounds Calgary in southern Alberta, in 2018. Jeff Fleischer, manager of Agricultural and Environmental Services for Rocky View County, oversees services like weed and pest control, and inspections and surveys. His department is responsible for the countywide clubroot survey, an area that covers nearly one million acres. This year, students hired on as crop inspectors surveyed about 350 canola fields, each about 160 acres in size.

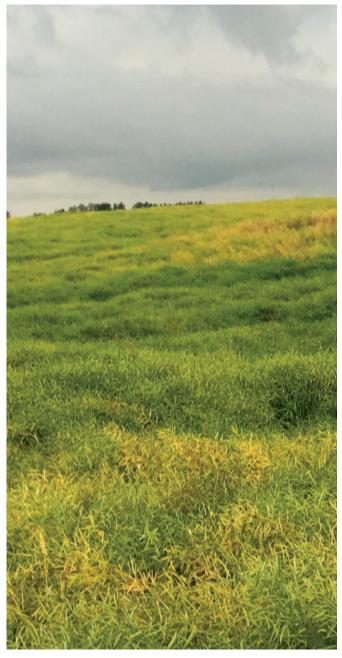
Surveying, which started in May and wrapped up in October, involves inspecting plant roots at the main approach of each field. Last year, crop inspectors found four new cases of clubroot in Rocky View County. That number may have risen to five as of this year.

"We're about halfway through our survey for this year, and we do have one potential new case," said Fleischer. "We're just waiting for lab results."

These numbers are not alarming when compared to the region around Edmonton where there are hundreds of infected fields. What is alarming is last year was the first time they found cases in this region, which indicates further spread in southern Alberta.

"If we don't happen to find clubroot in the approach, it doesn't necessarily mean that it's clubroot-free, but in most cases that's the main location where clubroot is found," said Fleischer.

Clubroot is a named pest under the Agricultural Pest Control Act of Alberta, which means growers are issued a notice when new cases arise. Once clubroot is found in an approach, crop inspectors will return to examine the field more thoroughly. At that point, the municipal government will begin to work closely with affected farmers, teaching them how to manage the problem and reduce the risk of spread. They teach farmers how



Clubroot continues to spread in the Peace Country and southern Alberta.
PHOTO: DAN ORCHARD

to disinfect equipment in order to limit soil transfer from one field to another, and discuss the merits of extending rotation to limit the host crop's ability to produce new spores. They also advise growers on new clubroot-resistant varieties.

"We do restrict the growing of canola for three years if we find clubroot in a canola field," said Fleischer.

Fleischer reminds growers that clubroot spores will still be present in infected fields even when they are not in canola production. And spores in the soil can be carried on equipment going in and out of the field.

"Just because there are no visible symptoms on wheat and barley, doesn't mean you're not going to transfer spores from that infected field to another canola field, where you're going to spread the disease," said Fleischer.

Since soil can be transferred via wind and water. Fleischer recommends leaving soil covered to further stop spread.

Weed control also plays an important role in spread as well. Brassicaceae family weeds, like stinkweed, flixweed, wild mustard, volunteer canola and shepherd's purse, act as vectors as well and can aid in spore reproduction. If there is no host crop, then the spores will just die out, but that could take up to 20 years, said Fleischer.

Dan Orchard is the Canola Council of Canada's lead contact on clubroot. He echoes Fleischer's advice saying that it is important to make sure no outside soil is introduced to the farm. "Some of the means of clubroot transmission could be hard to

control, and maybe impossible, but doing all you can to reduce the chances of contaminated soil entering your land is critical,"

The Canola Council of Canada is still working on a clubroot "recipe." The idea, said Orchard, is if the recipe is followed then the desired result is likely. If ingredients are left out, however, the desired result will not be achieved.

The basic recipe is as follows:

- SCOUT, SCOUT, SCOUT!
- Take a minimum two-year break from canola
- Use clubroot-resistant varieties before clubroot establishes
- Reduce tillage/soil movement
- Control host weeds within three weeks of emergence
- · Limit the introduction of foreign soil

"Spore numbers seem to be the key," said Orchard. "Keeping spore loads low and local is a bit of a tagline."

When a susceptible crop is grown in a clubroot-infested field the amount of spores produced is astronomical. Per plant, more than 16 billion spores could be produced. It's an amount that Orchard says is "unmanageable."

Clubroot spread is patchy and variable, and soil sampling isn't reliable enough to detect its presence in some cases. Growers need to use a combination of resistant varieties and rotation as a proactive management strategy, said Orchard.

Although Clubroot Steering Committee members have discussed proper rotation of resistant varieties to avoid the

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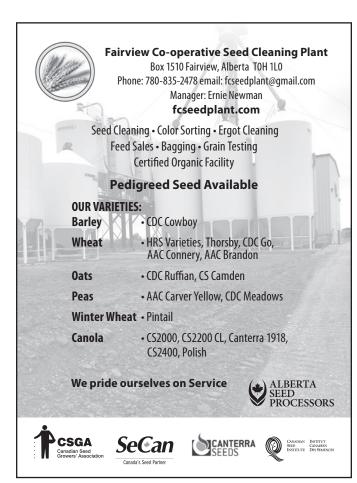
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Brian Ellis Phone: 403-556-2846 Fax: 403-556-6604 gseed@telusplanet.net









development of resistance at great length, they still don't have direct recommendations. For now, the best recommendation is to not use the same resistance source over and over, said Orchard.

"Having a good rotation and using different sources, generations, or mechanisms of resistances is the best management," he said.

"Doing all you can to reduce the chances of contaminated soil entering your land is critical."

Dan Orchard

Disinfectants and a New Scouting Method

To prevent the spread from one field to the next, clubroot experts say the best management practice is to remove loose dirt, wash equipment and then apply a disinfectant. However, not all disinfectants are created equal. To determine which ones worked best, Alberta Agriculture and Forestry research scientist and plant pathologist Michael Harding spent the last two years evaluating products and methods for equipment sanitization.

Pathogen spread is caused for the most part by the movement of infected soil via equipment. Movement can be prevented by sanitization, which involves removing soil and plant debris, and then disinfecting with a chemical that will kill the resting spores of the clubroot pathogen. This is important between fields, as well as for contractors moving farm to farm.

In his research, Harding measured the effectiveness of 24 chemical disinfectants by exposing the spores to the chemicals at different concentrations and then testing for viability. Of the disinfectants evaluated, seven were able to kill more than 90 per

The most effective disinfectant was sodium hypochlorite (bleach), which killed nearly 100 per cent of the resting spores at concentrations above 1.7 per cent.

The second most effective disinfectant was "Spray Nine," which killed almost 100 per cent of the resting spores. The third most effective products were chlorinated degreasers called Adhere NC and Premise Degreaser. They killed more than 95 per cent of spores at product concentrations of approximately 10 per cent.

The fourth most effective product was AES 2500. It achieved a 95 per cent spore mortality rate at product concentrations above 50 per cent. Finally, ethanol and SaniDate were able to kill more than 95 per cent of spores at concentrations of 75 per cent and 90 per cent, respectively.

Additional details can be found in a sanitization fact sheet found on the Alberta Agriculture website (alberta.ca).

Harding is just wrapping up a second project, funded by Alberta CAP dollars, which looked at whether or not dogs could be trained to detect clubroot in crops without pulling up plants.

He worked in partnership with Ken Coles of Farming Smarter and a New Brunswick-based trainer. Four dogs, including a Black Labrador, a German Shepherd and a rescued Golden Doodle, were trained to detect clubroot and then trialed in Alberta canola crops.

"That project has been quite successful in the fact that we've shown dogs definitely can be trained to detect clubroot," said Harding.

"We don't know yet if this is going to have any real impact on the industry," he continued. "We'll have to wait and see if somebody's willing to do the adaptive research. We've proven that it can be done, but the dogs were quite novice."

University of Alberta Focuses on Clubroot Research

Harding isn't the only one doing clubroot-related research. Steve Strelkov, professor of plant pathology at the University of Alberta, is probably the province's foremost researcher on clubroot. He and his team are working on four separate projects at the moment.

First, they have been leading research to identify the pathotypes (strains) of *P. brassicae*. This information is important for understanding how different sources of host resistance could perform.

"We have identified 'new' pathotypes that can overcome host resistance in canola, and have been tracking the emergence of these new strains," said Strelkov. "We have also worked with Michael Harding with AAF and many of the counties and municipalities to track the spread of the disease."



Spore numbers seem to be the key and keeping spore loads low and local is important, says Dan Orchard. PHOTO: DAN ORCHARD.

Furthermore, Strelkov and his team are leading research into the development of a molecular assay to detect *P. brassicae* pathotypes from plant and soil samples.

On top of that, Strelkov is working on a project that looks at the possibility of pH-insensitive strains of the pathogen.

Finally, working in collaboration with colleague Sheau-Fang Hwang at the University of Alberta, Strelkov is leading work on several strategies to manage the clubroot pathogen, including soil liming.

Melanie Epp



Seeing the Value in an SVUA

Additional perspective on the models to support plant breeding in Canada.

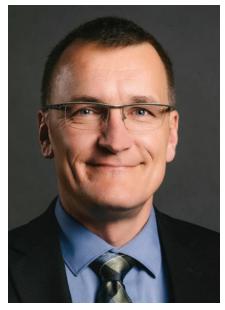
AS PUBLIC consultations on value creation began in 2018, producers and seed growers had a lot to decide: which of the two models introduced would best generate funding for plant breeders while ensuring seed growers and farmers were happy with the model selected?

The first option, of course, is an endpoint royalty — where a royalty would be collected at the elevator upon grain delivery and be given to the breeder of the variety.

The second proposed option is a trailing royalty, where the producer would sign a Seed Variety Use Agreement (SVUA) upon buying a new variety of seed that has an SVUA attached to it - enabling the breeder of that variety to collect the royalty each and every year that seed was saved and planted.

As discussions about value creation continue, some high-profile members of the seed and agriculture industries are rallying around the trailing royalty (SVUA) option as the model to go with to ensure plant breeders have a healthy stream of revenue to create new varieties of cereals.

"We need breeders to continue to invest in Canada and breed new and better varieties. If we keep the status quo, they will fall further and further behind the rest of the world. The sooner farmers understand that. I think we can move ahead with the trailing royalty model," says Gunter Jochum, a Manitoba farmer and seed grower, who spoke as part of a panel on value creation at the annual



Gunter Jochum is president of the Western Canadian Wheat Growers Association

meeting of the CSGA and CSTA in Whistler, B.C., in July. He's also president of the Western Canadian Wheat Growers

Jochum sees the trailing royalty/ SVUA model as the best way to ensure producers have access to cutting-edge new varieties, but he didn't arrive at that opinion overnight. Like many farmers, he has had a lot of learning to do about value creation in a short time.

"I got involved with the Western Canadian Wheat Growers Association and attended a Grains Roundtable meeting in 2017, and that's the first time I found out about seed value creation to fund breeding of cereals in Canada.

As I got more familiar with it I realized it was a very important topic. There isn't a big investment in cereal breeding in Canada, not like we see in canola, corn and soybeans. That has to change," he

"Sure, we have good cereal varieties right now, but the more I looked into it I realized the funding for cereal breeding and research is modest at best, and if anything, it's stagnant in Canada to the point of going backwards. Government is reluctant to add new money into breeding and, if anything, they're just maintaining what we have now."

With parts of the world like Australia, France, and the United Kingdom having successful royalty collection systems of their own for cereals, Jochum says it's time to get behind the trailing royalty model and implement it.

"I think the majority of the pushback from farmers in regard to the trailing royalty model results from farmers not understanding what's at stake. They worry their farm-saved seed rights will be taken away, which isn't true. Breeders just want to be paid for the work they do. You can still save your seed, you simply must declare what you're saving and planting and pay a royalty on varieties that have an SVUA attached to them," Jochum says.

"Yes, there will be a cost to farmers." but there will be a return down the road. It might take five to 10 years to see the fruits of that, but if we don't do this, I think we give up way too much as far

as new varieties coming to market are concerned. Change is scary but falling behind the rest of the world is even scarier."

Encouraging Certified Seed Use

Laurie Wakefield, past-president of the Saskatchewan Seed Growers' Association and the owner of Wakefield Seeds, says in terms of safeguarding his business, the trailing royalty option is the way to go. He also spoke as part of the value creation panel in Whistler.

"We wouldn't want to support any kind of system that could be a deterrent to people buying certified seed. The trailing contract system would allow producers greater choice of either buying certified seed or not, and at the same time know what it is going to cost them," Wakefield says.

"With an end-point royalty system, they're going to pay the royalty anyway on what they produce. Of the two options, the trailing royalty model is the way to go."

A third proposed model for value creation has been put forward by a few producer groups. At the July meetings in Whistler, a model referred to as the Collective Research Model was introduced by the Alberta Federation of Agriculture, Keystone Agricultural Producers and the Agricultural Producers Association of Saskatchewan

The Collective Research Model is proposed as being similar to an endpoint royalty collected on delivered grain but would distribute one portion of the funds collected to plant breeding programs and another portion to a "collective pool." A new producer



Laurie Wakefield is a past-president of the Saskatchewan Seed Growers' Association

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"Government is reluctant to add new money into breeding and, if anything, they're just maintaining what we have now."

—Gunter Jochum

organization would be tasked with identifying the collective research priorities and distributing funds to projects addressing those priorities.

Neither Jochum nor Wakefield sees it as a viable option.

"That concept could easily be incorporated into a trailing royalty system without a lot of difficulty if we wanted to go down that path," Wakefield says.

Jochum doesn't believe farmers are thrilled with the proposed Collective Research Model.

"I don't see it attracting any private business. Without the private sector, all it does is drive up the cost of current variety development without bringing anything new to the table. What we want is a model that will encourage private investment as well as public breeding — that will create competition and should keep the price of seed reasonable," Jochum says.

"It should not be a runaway market. There's a lot of fear about private sector breeders getting into cereals, but the fact is they will have to do their best to bring great varieties to market in order to be competitive with the public sector, which already breeds very good cereal varieties."

Wakefield believes seed growers and producers are beginning to come around and see the value in the trailing royalty option.

"For some time, a lot of people didn't have their eyes on the prize, on what the desired outcome was. The trailing royalty model will have the least detrimental effect on the pedigreed seed system. It's important to think of it that way, because a lot of people are apprehensive when it comes to change and no doubt this will have big implications for certified seed growers," Wakefield says.

Note: Visit seed.ab.ca for a spotlight on the Australian and French seed systems.

Marc Zienkiewicz

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AGRONOMY SOLUTIONS How to Utilize Data When Selecting Seed Varieties

ERNIE NYCHOLAT Manager of Agronomic Services · Nutrien Ag Solutions · Nutrien Ag Solutions.ca

FOR MANY GROWERS these days, it's important to get accurate, current and regional information on new seed varieties in order to stay competitive.

There are a lot of places growers can find data to help inform their seed-buying decisions, as government agencies, universities, industry groups and seed companies are all good sources of variety information.

With so many options to consider, how do growers know what's the best way to get the seed information they need?

My advice is to consider the big picture first.

Looking at data from third-party sources, such as the Canola Performance Trials and the Alberta Regional Variety Trials for cereal and pulse crops, is a great place to start. The *Alberta Seed Guide* does an excellent job of packaging this information, and many growers consider it their go-to source for finding out what seed varieties offer in terms of yield, agronomic and pest/disease resistance attributes.

This information is particularly useful, not only because it's unbiased, but because the field trials are often conducted over a wide area. You'll see performance data for a variety, but you may also get a sense of the consistency of the trial results and how well that variety performs under different conditions.

Of course, seed companies also provide a lot of data, and other resources such as Agriculture and Agri-Food Canada and university Ag programs can be very useful as well when seeking out variety information.

Once you've completed your variety research, the next step is to apply this data to your own situation. No two farms are alike, so it's important that any varieties you select mesh with your operation.

Yield is always a key consideration when choosing a seed variety, but depending on where you farm, it may not be the most important. Soil types and local growing conditions need to be taken into account, as well as which weeds, insects and diseases pose the greatest threats in your area and if you have any weed or pest resistance issues in your geography. For instance, midge tolerant wheat varieties will only be top of your list if midge is a concern for you.

There also needs to be a match with your farming system and other factors, such as maturity, plant height, and standability, and the end-use qualities you're seeking in your crop are important considerations as well.

When it comes to making a final decision about which variety to choose, I believe local input is invaluable. This is where discussions with your neighbours, agronomist, ag retailer and seed grower come in.

It's really important to talk to everyone, particularly if you're fortunate to have a trusted advisor you rely on — ask questions about new varieties you may be considering and whether they're a good fit for your farm. It's a conversation that's well worth the time.

Some varieties may only be available in limited supply — call your local representative for more information. The companies that were asked to supply information are responsible for any claims contained within the list. Remember, 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

 $\mathsf{R}-\mathsf{Resistant}$ 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

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

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	BARLEY						
	Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
	ALLIANCE SEED	Alliance Seed 1-877-270-2890 allianceseed.com	AB Cattelac Forage & Feed 6-Row	Equal to AC Metcalfe	109% of AC Metcalfe	R - Loose Smut MS - FHB	Semi smooth awned, great for forage 10% higher forage tonnage than vivar Excellent RFV, R to loosesmut, V-HIGH test weight
	Ag Solutions Ag Solutions Proven*	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444 NutrienAgSolutions.ca ProvenSeed.ca	Claymore Feed Grain and Silage 2-Row	+2 days to AC Metcalfe	116% of AC Metcalfe	R - Various Smuts I - Net/Spot Blotch I - FHB	Superior straw strength High test weights Highest yielding feed barley in 2016 co-op testing
			Oreana Feed Grain 2-Row	+2 days to AC Metcalfe	114% of AC Metcalfe	R - Various Smuts MR - Net/Spot Blotch	Well suited for high input operations and manured soils Excellent yield potential and test weight Very short stature/straw length
)	BROMEG	RASS					
	Company		Variety Name/ Type	Use (Hay or Grazing)	Winter Hardiness	Merit Tested in Canada (Y/N)	Highlights
	DLF PICKSEED SEEDS & SCIENCE	DLF PICKSEED 1-800-661-GROW dlfpickseed.ca	Succession Hybrid Brome- grass	Hay	Excellent	Yes Replicated Private Trials	Interspecies cross of Smooth & Meadow Brome- grass Excellent winterhardiness Very good forage quality Early spring growth Good seasonal growth pattern
	CANOLA						
	Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
	■ • BASF We create chemistry	BASF 1-877-371-2273 agsolutions.ca/InVigor	INVIGOR® L345PC LL	1 day earlier than InVigor L252	111.9% of the checks (InVigor 5440 & Pioneer® 45H29)*	R - Blackleg 1st Generation Clubroot Resist- ance	InVigor is excited to introduce the NEW 300 Series canola hybrids including the NEW InVigor L345PC. This hybrid has demonstrated exceptionally high yield potential, with both high external WCC/RRC trial results and internal InVigor trial results. Patented Pod Shatter Reduction technology Suitable for all growing zones LibertyLink technology system *in the 2017/2018 WCC/RRC trials 111.4% of InVigor L233P (n=28, 2018)

□ • BASF We create chemistry	BASF 1-877-371-2273 agsolutions.ca/InVigor	INVIGOR® L352C LL INVIGOR® Choice LR344PC LL/RR	1/2 day later than InVigor L252 Over 1 day earlier than InVigor L252	108.6% of the checks (InVigor 5440 & Pioneer 45H29)* 104.1% of the NEW checks (InVigor L233P and Pioneer® 45H33)*	R - Blackleg 1st Generation Clubroot Resistance R - Blackleg 1st Generation Clubroot Resistance	New 300 series InVigor L352C has shown higher yields with a similar maturity to InVigor L252. This hybrid is ideal for growers who prefer to swath their canola. Suitable for all growing zones LibertyLink technology system *in the 2017/ 2018 WCC/RRC trials 104% of InVigor L252 (n =28, 2018) Introducing the first ever InVigor Choice canola hybrid, a 300 series hybrid with both the LibertyLink® and TrueFlex™ herbicide technology system Patented pod shatter reduction technology - suitable for all growing zones LibertyLink technology system and TruFlex™ canola with Roundup Ready® Technology *in the 2018 WCC/RRC trials 103.6% of InVigor L233P (n=12, 2018)
BAYER BAYER ER	Bayer DEKALB® 1-888-283-6847, cropscience.bayer.ca	DKTF 96 SC TruFlex™ Canola with Roundup Ready® Technology	Early Maturity	102.3% or 74-44 BL	Blackleg - R Rating Fusarium Wilt - R	DEKALB TruFlex canola hybrid bred for straight cutting with improved pod integrity offering high yield potential and multi-genic blackleg resistance (AC).
		DKTF 98 CR TruFlex™ Canola with Roundup Ready® Technology	Early Maturity	104.4% or 75-42 CR	Clubroot - R Black Leg - R Fusarium Wilt - R	The latest high performing multi-genetic club- root resistant hybrid from DEKALB. Offering very good standability, with clubroot multi-genetic resistance to pathotypes 2,3,5,5X,6,8 and moderate resistance to 2B pathotype.
		DKTFLL 21 SC TruFlex™ Canola with Roundup Ready® and LibertyLink® Technologies	Early Maturity	102% of 74-44 BL	Black Leg - R Fusarium Wilt - R	The first DEKALB TruFlex canola with Roundup Ready and LibertyLink® Technologies. Offering improved pod integrity for straight cutting, flexibility in spray timing and rates, with very good standabilty and high yield potential. Complete with multi-genic blackleg resistance (ACG).
		DKLL 82 SC LibertyLink®	Early Maturity	101.3% of DKLL 81 BL	Black Leg - R Fusarium Wilt - R	The next addition to DEKALB's LibertyLink® offering and built for straight cutting. Complete with high yield potential and multi-genic blackleg resistance (ACG).
BrettYoung.	BrettYoung 1-800-665-5015 brettyoung.ca	BY 6207TF	2.9 days	100% of WCC/RRC Checks	Blackleg R-C Clubroot: R 2,3,5,6,8,3A,5X, 2B plus other minor patho- types	Multi-genic clubroot resistant Truflex hybrid Excellent standability and yield performance Big strong plant with very good resistance to blackleg
		BY 6204TF	0.1 days	102% of WCC/RRC Checks	Blackleg R-CE1 Clubroot: R 2,3,5,6,8	Clubroot resistant Truflex suited to all canola zones Excellent resistance to Blackleg Consistent yields and excellent lodging resistance
CORTEVA ogriscience part speed includings */* BREVANT. seeds	Brevant™ Seeds/ Corteva Agriscience 1-800-667-3852 brevant.ca	B3010M	Mid	100% of InVigor L233P from 2016-2018 R&D small plot trials	R to Clubroot - New Source R to Blackleg	New, high-yielding canola hybrid with the Liber- tyLink® trait. Industry-leading clubroot resistance (including a new source of resistance - resistant to current pathotypes 2, 3, 5, 6, and 8 and emerging pathotypes 3A, 2b, and 5X). Harvest flexibility of the propriety Corteva Agriscience HarvestMax trait.
		B3010M	Mid	100% of InVigor L233P from 2016- 2018 R&D small plot trials	R to Clubroot - New Source R to Blackleg	New, high-yielding canola hybrid with the Liber-tyLink® trait Industry-leading clubroot resistance (including a new source of resistance - resistant to current pathotypes 2, 3, 5, 6, and 8 and emerging pathotypes 3A, 2b, and 5X) Harvest flexibility of the propriety Corteva Agriscience HarvestMax trait.

CVV Varieti						
CORTEVA ogriscience ogriscience W BREVANT. seeds	Brevant™ Seeds/Corteva Agriscience 1-800-667-3852 brevant.ca	B3011	Mid	102.6% of InVigor L233P from 2017- 2018 R&D small plot trials.	R to Clubroot R to Blackleg	New, high-yielding canola hybrid with the Liber- tyLink® trait Strong yield potential, excellent early growth, and a very good lodging score
		1028 RR	Mid-Late	104% of DeKalb® 75-42CR and 105% of CS2000.	R to Clubroot R to Blackleg	High-yielding canola hybrid Outstanding disease package May be suitable for delayed swathing
		2028 CL	Mid-late	109% of CS2500CL and 105% of Bret- tYoung® 5545CL.	R to Clubroot R to Blackleg	Clearfield® canola hybrid Excellent disease package Good early season vigour
		B3010M	Mid	100% of InVigor L233P from 2016- 2018 R&D small plot trials	R to Clubroot - New Source R to Blackleg	New, high-yielding canola hybrid with the Liber- tyLink® trait Industry-leading clubroot resistance (including a new source of resistance - resistant to current pathotypes 2, 3, 5, 6, and 8 and emerging patho- types 3A, 2b, and 5X) Harvest flexibility of the propriety Corteva Agrisci- ence HarvestMax trait.
		B3011	Mid	102.6% of InVigor L233P from 2017- 2018 R&D small plot	R to Clubroot R to Blackleg	New, high-yielding canola hybrid with the Liber- tyLink® trait Strong yield potential, excellent early growth, and a very good lodging score

trials.



CORTEVA Opticience Opticienc	Brevant™ Seeds/Corteva Agriscience 1-800-667-3852 brevant.ca	1028 RR	Mid-Late	104% of DeKalb® 75-42CR and 105% of CS2000.	R to Clubroot R to Blackleg	High-yielding canola hybrid Outstanding disease package May be suitable for delayed swathing
		2028 CL	Mid-late	109% of CS2500CL and 105% of Bret- tYoung® 5545CL.	R to Clubroot R to Blackleg	Clearfield® canola hybrid Excellent disease package Good early season vigour
CORTEVA agriscience test Applied Technologies PIONEER.	Pioneer®/Corteva Agriscience™. 1-800-667-3852 pioneer.com	P501L	Mid	105% of InVigor® 5440*	R to Clubroot R to Blackleg	New, superior-yielding canola hybrid with Pioneer Protector® and LibertyLink® traits. Very good for lodging * in Pioneer® brand research plot data yields in Western Canada as of November 2018.
		45CM39	Mid	103% of Pioneer® brand 45H33	R to Clubroot - New Source R to Blackleg	New canola hybrid that contains the Pioneer Protector® HarvestMax CR trait. Excellent early growth Resistant to current pathotypes 2,3,5,6 and 8, and emerging pathotypes 3A, 2B, and 5X
		45CM39	Mid	103% of Pioneer® brand 45H33	R to Clubroot - New Source R to Blackleg	New canola hybrid that contains the Pioneer Protector® HarvestMax CR trait. Excellent early growth Resistant to current pathotypes 2,3,5,6 and 8, and emerging pathotypes 3A, 2B, and 5X
CANTERRA SEEDS	CANTERRA SEEDS 1-866-744-4321 canterra.com	CS2600 CR-T Hybrid <i>napus</i> TruFlex™ Canola with Roundup Ready® Technology	Early	112% of 75-42CR	R-C - Blackleg R - Clubroot	TruFlex [™] canola Earlier maturity Enhanced clubroot package Additional resistance to 2B + 5X pathotypes





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- AAC Goodwin
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- CDC Terrain

CWSP WHEAT

- KWS Alderon

CW SOFT WHITE WHEAT

- AAC Chiffon VB

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P7417AM	2125 HU	12.6 bu/	P7417AM is a
		acre yield	product with
		increase	tion
		over a	Consistent yi
		Pioneer®	stalk strengt
		hybrid	Taller plant, o
		P7213R	Southern Alb

P7417AM	2125 HU	12.6 bu/ acre yield increase over a Pioneer® hybrid P7213R corn hybrid*		P7417AM is an Optimum® AcreMax® corn seed product with above ground corn borer protection Consistent yielding corn product with very good stalk strength Taller plant, good option for Western Manitoba & Southern Alberta *in 8 large-scale grower and IMPACT sites averaged across Western Canada in 2017 and 2018.
P7527AMXT	2150 HU	8.7 bu/ acre yield increase over a Pioneer® brand corn P7632AM™*	Average Goss's Wilt resistance rating	New Optimum® AcreMax® Xtreme corn seed product with below and above ground corn borer protection Excellent corn borer and root worm protection. It has very good grain dry down and drought tolerance scores. Very good grain dry down and drought tolerance scores * in 25 large-scale grower and IMPACT sites averaged across Western Canada in 2017 and 2018.
P7861R	2200 HU		Good Goss's Wilt Rating	Excellent silage hybrid Very good stalk and root strenght scores
P7861AM	2250 HU	5.3 bu/ acre yield increase over Pioneer® brand 39V09AM™*	Good Goss's Wilt resistance score	Optimum® AcreMax® corn seed product with above ground corn borer protection Excellent dual purpose corn product with Consistent, High yielding corn product *in 26 large-scale grower and IMPACT sites aver- aged across Western Canada in 2017 and 2018
P7940AM	2275 HU	4.7 bu/ acre yield increase over Pioneer® brand 39V09AM™*	Average Goss's Wilt resistance rating	Optimum® AcreMax® corn seed product with above ground corn borer protection Excellent yielding grain corn product with very good stalk and root strength Good test weight scores *in 26 large-scale grower and IMPACT sites averaged across Western Canada over 2017 and 2018.
P8352AM	2425 HU			New, dual purpose Optimum® AcreMax® corn seed product Very good stalk and root strength Good product for silage in Southern Alberta and Manitoba
P8407AM	2450 HU		Average Goss's Wilt resistance rating	Optimum® AcreMax® corn seed product with above ground corn borer protection Very good root and stalk strength scores Exceptional drought tolerance

Good Goss's

5 = Average

6 = Good0-9 scale

score

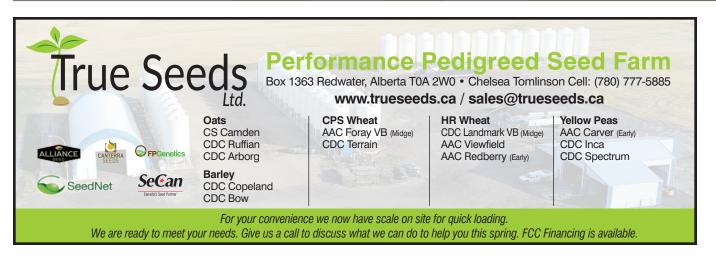
Wilt resistance

Optimum® AcreMax® corn seed product with

Very good root strength, good stalk strength

above ground corn borer protection

Taller plant, great product for silage



2550 HU

P8736AM



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New Valle	1100					
DLF PICKSEED SEEDS & SCIENCE	DLF PICKSEED 1-800-661-GROW dlfpickseed.ca	PS 2321VT2P RIB Grain/Silage	2225 CHU RM 76	Excellent	GENVT2P	Early flowering hybrid Flint kernel grain type Tall plant height
		PS 2563GSX RIB Grain/Silage	2400 CHU RM 82	Very Good	GENSS	Excellent stalk strength Very good disease resistance package Medium plant height
		PS ExSeed LF RR Silage	2450 CHU RM 83	Very Good		Leafy silage specific hybrid Contains the Floury starch gene Tall plant height
		PS ExPand LF RR Silage	2625 CHU RM 88	Excellent		Leafy silage specific hybrid Contains the Floury starch gene Very Tall plant height
WNorthStar Genetics	NorthStar Genetics 1-204-262-2425 northstargenetics.com	NS 72-521 VT2PRIB VT2PRIB	2100 HU 72 Day	Very Good for Maturity	Good Goss's Wilt rating Good Drought Tolerance Very Good Tolerance - Northern Leaf Blight	High performing determinate early hybrid Very good stalk strength, root rating and drydown Excellent seedling vigour, staygreen and test weight
		910S Conventional Silage Specific, Floury	2050-2150 HU 73 Day	Excellent	Very Good - Goss's Wilt Rating Good Tolerance - Northern Leaf Blight	Early floury silage hybrid - excellent yield and quality silage Excellent stalk strength and lower ear height Long silage harvest window - short storage period Highly digestible starch - easily digestible fibre - long rumen retention
		913S RR2 Silage Specific, Floury	2100-2200 HU 75 Day	Excellent	Very Good - Goss's Wilt Rating Good Tolerance - Northern Leaf Blight	Early floury silage hybrid - excellent yield and quality silage. Excellent stalk strength and lower ear height. Long silage harvest window - short storage period. Highly digestible starch - easily digestible fibre - long rumen retention
		932S RR2 Silage Specific, Floury Leafy	2300-2400 HU 89 Day	Excellent	Excellent Goss's Wilt Rating Good Tolerance - Northern Leaf Blight	Floury leafy silage hybrid - excellent yield and quality silage. Long silage harvest window - short storage period. Highly digestible starch - easily digestible fibre - long rumen retention Tall leafy plant with excellent stalk strength and lower ear height
		191 VT2PRIB	2325 HU 80 Day	Excellent	Very Good Disease Tolerance Rating Very Good - Goss's Wilt Rating Good Tolerance - Northern Leaf Blight	Vigourous spring emergence, excellent seedling vigour and stalk strength Excellent staygreen, root rating and drydown - very good test weight Responds well to intensive management



Wheat
AAC Brandon
AAC Crossfield
AAC Goodwin - NEW

PeasCooper (Green)

Faba BeansSnowbird

Greg & Clifford Cyre Cell (780) 307-4332 gcyre@xplornet.com









					New Varieties
Nutrien Ag Solutions/ Proven Seed 1-855-569-9444	PV 60172 RR	2050 CHU	110% of P7332R	Roundup Ready 2 Corn	Ultra-early hybrid Vigorous emergence Suitable for grain, silage or grazing
NutrienAgSolutions.ca ProvenSeed.ca	PV 61180 RIB	Dekalb 23-17 RIB Complete Superb yield Elite grain RIB 2350 CHU 103% of VT2Pro RIB Excellent sil.	Excellent stalk strength, drydown and yield Superb yield potential Elite grain		
			VT2Pro RIB Complete	Excellent silage characteristics Excellent stalk strength, yield and quality Excellent staygreen	
	PV 62384 RIB	2350 CHU 103% of Dekalb Complete Excellent Exc		Dual purpose hybrid Suited to high yield environments Excellent grain yield and silage tonnage potential	
PRIDE Seeds 1-800-265-5280 www.prideseed.com	A3993G2 RIB Grain, Grazing	2025 chu		ground insect protection and	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.
	AS1027RR EDF Silage/High Moisture Corn	2375 chu	Excep- tional silage and high	Roundup Ready® 2	NEW introductory Roundup Ready® 2 choice for silage feed, high moisture corn. Features consistent heavy top-end tonnage. Excellent choice for beef feedlot producers. Very tall plant

moisture yield

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commodities

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Canada

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Interest-bearing portion at prime less 0.5%

with consistent ears that produce flint kernels

on white cob. Slow grain and plant drying rate preserves reliable and consistent feed quality at ideal moisture content. Additional staygreen

nature for a wider harvest window.



Thunder Seed 1-204-750-2192 Thunderseed.com



TH4072 RR Grain	2025 HU	Excellent	RR	Super early maturity with very good test weight and fast dry down. Great emergence and seedling vigour for early planting. Nice fall appearance with good stalks, staygreen and intactness
TH6875 VT2P Grain/Silage	2100 HU	Excellent	VT2P	Attractive plant with great staygreen and test weight. Nice ear size and plant height adds to silage yield potential. Solid agronomics overall including very good vigour and stalks
TH4076 HDRR Silage	2150 HU	Excellent	RR	High-digestibility hybrid specifically for silage and grazing. Slower drydown provides longer chopping window. Combines tonnage with total plant digestibility
TH7578 VT2P Grain/Silage	2225 HU	Excellent	VT2P	Proven standout with strong performance across various environments Excellent roots, staygreen and plant health Extremely reliable hybrid with good silage potential
TH4126 RR Silage	2250 HU	Excellent	RR	Quick out of the ground and great seedling vigour Great yield, grain quality and digestibility Flint/dent hybrid sets kernels quickly but dry- down is slower
TH7681 VT2P Grazing/Silage corn	2375 HU	Excellent	VT2P	Very good grain yield adds to silage quality Ideal for highly productive fields; strong and steady growth Great agronomics including staygreen; good for silage and grazing

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Company		Variety Name/ Type			Disease/Pest Resistance	Highlights
prairie fava	Prairie Fava Ltd 1-204-721-4715 prairiefava.com	DL RICO Low-tannin, Low Vicine/ Convicine	Equal to CDC Snowdrop	102% of CDC Snow- drop	Improved Disease Resistance MR - Chocolate Spot	Excellent early vigour Excellent lodging resitance High protein content First ever low-tannin, low vicine/convicine variety registered in Canada
RIDDELL [®] SEED CO	Riddell Seed Co. 1-204-227-5679 riddellseed.com	DL Tesoro Low Tannin Fababean	Medium	Highest Yielding Low Tannin Fababean, 108% of		Medium/Large seed size for opportunties in both food and feed markets.

Snowbird



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FESCUE						
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	SWAJ	Hay & Pasture	Excellent	Yes	Excellent winterhardiness Soft leafed Excellent yield and quality
PICKSEED SEEDS & SCIENCE	DLF PICKSEED 1-800-661-GROW dlfpickseed.ca	Laura Meadow Fescue	Hay	Very Good	Yes Replicated Private Trials	Very good spring vigour Very good winterhardiness Early spring growth Good forage yield Endophyte free
FESTULO	LIUM (RYEGR	ASS TYP	E)			

Company		Variety Name/ Type	Use (Hay or Grazing)	Winter Hardiness	Merit Tested in Canada (Y/N)	Highlights
PICKSEED : SEEDS & SCIENCE	DLF PICKSEED Canada 1-800-661-GROW dlfpickseed.ca	Lofa	Hay	N/A	Yes Replicated Private Trials	Meadow Fescue X Italian Ryegrass Excellent forage yield in the seeding year Excellent forage quality Excellent disease resistance Excellent seasonal growth pattern

Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
FPGenetics.	FP Genetics 1-877-791-1045	AAC Marvelous Brown Flax	106 Days	104% CDC Bethune		Excellent lodging resistance Strong disease package



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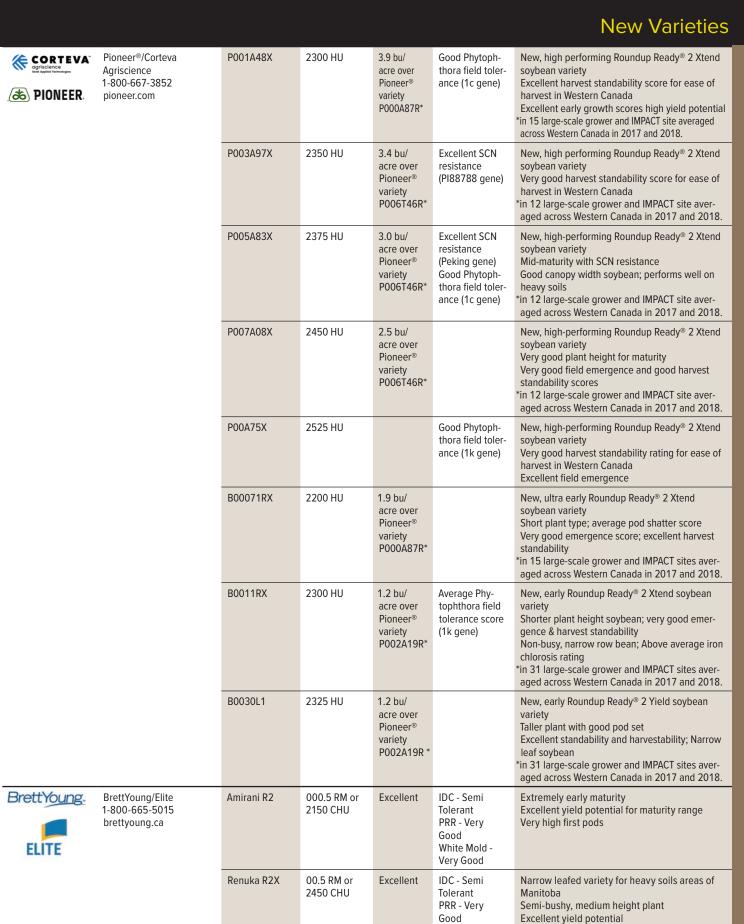


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- Mobile and on-site treating

Ν	lew Varieti	es					
	OATS						
	Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
	FPGenetics.	FP Genetics 1-877-791-1045 fpgenetics.ca	CDC Arborg White Milling Oat	93 days	of CDC S - Stem Rust Dancer R - Smut		Very high yelding Strong straw and excellent standability Early maturing Excellent milling properties - high beta glucan, high plumps and low thins, high groat percentage
	PEA						
	Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
	CANTERRA SEEDS	CANTERRA SEEDS 1-866-744-4321 canterra.com	AAC Comfort Green Pea	Medium	100% of CDC Limerick	Fair - Fusarium Wilt	Rounder seed shape Good colour intensity and bleaching tolerance
	FPGenetics 1-877-791-1045 fpgenetics.ca		AAC Chrome Yellow Pea	95 days	109% Agassiz	R - Powdery Mildew	High yielding Easy to harvest Excellent standability
			DL Delicious Forage Pea				Very high yielding; 114% over 40-10 peas Improved standability over 40-10 peas Early maturing
	RIDDELL ⁹ SEED CO	Riddell Seed Co. 1-204-227-5679 riddellseed.com	DL Goldeye Forage Pea	Early Forage Pea	Very high forage yields when used in annual forage blends		Small seeded, Ideal maturity for blending with forage cereals, High Biomass, Upright Leafy Type
	RYE						
	Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
	FPGenetics.	FP Genetics 1-877-791-1045 fpgenetics.ca	KWS Progas Forage Rye	Silage and Grazing	Excellent		Hybrid fall rye for silage and grazing Very high whole crop yields Excellent protein Excellent standability Disease resistant package Double cropping potential
	SOYBEAN	IS					
	Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
	CORTEVA ogriscience surf Applet Technologies PIONEER.	Agriscience 1-800-667-3852	P0007A73X	2175 HU	7.7 bu/ acre over Pioneer® variety P0007A65R*		New, ultra early Roundup Ready® 2 Xtend soybean variety Excellent early growth scores High yield potential for the maturity *in 4 large-scale grower and IMPACT sites averaged across Western Canada in 2017 and 2018.
			P000A52R	2275 HU	1.8 bu/ acre over Pioneer® variety P000A87R*	Good White mold tolerance score	New, high-performing glyphosate tolerant soybean variety Excellent harvest standability score Very good iron chlorosis score *in 15 large-scale grower and IMPACT site aver- aged across Western Canada in 2017 and 2018.



White Mold -Very Good

WHEAT						
Company		Variety Name/ Type	Maturity	Yield	Disease/Pest Resistance	Highlights
ALLIANCE SEED	Alliance Seed 1-877-270-2890 allianceseed.com	SY TORACH CWRS	Early -1.5 days to Carberry	110% over Carberry	MR - FHB (strong MR) MR - Loose Smut	Very short straw Higher protein than checks Great milling quality
CANTERRA SEEDS	CANTERRA SEEDS 1-866-744-4321 canterra.com	CDC Credence CWAD	Early	106% of Strongfield	MS - FHB R - Stripe, Leaf and Stem Rust	A great combination of high yielding and early maturity with very high yellow pigment concentration and best FHB resistance in its class (one of only three current varieties)
		CS Tracker CWRS	Early	106% of Carberry	R - Stripe, Leaf and Stem Rust I - FHB	An early maturing variety with excellent rust resistance package and great quality attributes suitable for a broad geography
		CS Jake CWRS	Early	104% of Carberry	R - Stripe and Stem Rust MR - Leaf Rust	A very early maturing variety, with excellent stripe rust resistance and high protein content. An excellent candidate for the short-season growing areas
CANTERRA SEEDS	CANTERRA SEEDS 1-866-744-4321 canterra.com	CS Daybreak CWRS	Medium	103% of AAC View- field	MR - Stripe and Leaf Rust R - Stem Rust I - FHB	A high yielding variety with strong disease resistance package and excellent physical and functional quality atributes
		CS Accelerate CPSR	Early	Tillow over Carberry (strong MR) (strong MR) (strong MR) (strong MR) (strong field (and Stem Rust I - FHB) (Sarberry (Sarberry) (Sar	A very high yielding semi-dwarf variety with excellent standability, best rust resistance package and improved milling quality attributes.	
FPGenetics.	FP Genetics 1-877-791-1045 fpgenetics.ca	AAC Succeded VB CWAD	101 Days		R - Leaf Rust R - Smut R - Bunt I - Stripe Rust	Leading standability in varietal blend
		AAC Goldrush CWRW	217 days		R - Leaf Rust I - Stripe Rust I - FHB	Strong straw Medium height
Nutrien Ag Solutions Proven*	Nutrien Ag Solutions/ Proven Seed 1-855-569-9444	CDC Dynamic CWAD	+1 day to Strongfield			Very good protein and yield
SEED	NutrienAgSolutions.ca ProvenSeed.ca	AAC Entice CPSR	-1 day to 5700PR			Strong disease package

Alberta and British Columbia Pedigreed Seed Growers Directory of Varieties Produced in 2019

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)

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

BARLEY - FEED SIX ROW				Bright, David / New Norway / (780) 855-2240	
DARLET - FEED SIX ROW	S	F	R	Brummelhuis, Mitchell & Mack / Vauxhall / (403) 65	4-7
				Card, Gordon B. & Rhett / Magrath / (403) 758-3444	
AC ROSSER				Carl's Ag Ventures Ltd. / Hays / (403) 725-2213	
BI: AAFC (Brandon), DIST: SeCan Members	C+			Clark, Todd / Edmonton / (780) 499-5060	
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		Corns, Whitney / Grassy Lake / (403) 360-0833	
AMISK®				Davidson, E. Daryl & Dean / Kitscoty / (780) 846-24	56
BI: FCDC (Lacombe), DIST: SeCan Members				Dyck, Heinz W., Colin, Alan & Kelton / Rosemary / (4	403)
Benci Seed Farms / Carmangay / (403) 643-2294			R	FCIIO RIQUE SEEUS / SIEITIEL / 14031 883-/503	
LS Land & Cattle / Didsbury / (403) 335-3694 Mans, John / Nobleford / (403) 824-3585			K	Fabian Seed Farms / Tilley / (403) 377-2000	
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713				roster, Norman R. / Beaverlouge / (780) 354-2107	
St. Paul Municipal Seed Cleaning Plant / St. Paul / (780) 645-3939				Galloway Seeds Ltd. / Fort Saskatchewall / (780) 95	98-3
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535				Hadialia, Edward / Baldollilei / (250) 793-9746	
Webber, Curtis / Parkland County / (780) 963-6897			R	Hallett, Dale R. & Richard / Carstairs / (403) 337-30	72
Wildeman, Russell / Clive / (403) 784-3695		F	R	nditziei, Leolidiu / Caistalis / (403) 337-2410	
CDC EARL		l ' .	11	Holl, Peter Edward / Gleichell / (403) /34-2140	
BI: CDC, DIST: SeCan Members				Jones, Greg T. & Tristan / Ponoka / (403) 783-6495	
Airth, Jock & Linda / Brooks / (403) 362-4372				Kemp, Richard L. / Red Deer County / (403) 227-48:	
CHIGWELL ®				Killiak, Nathan J. & Anderson, Tim / Foremost / (40-	3) 8
BI: FCDC, DIST: SeCan Members				Klapstein, Dallas / Calmar / (780) 819-4993	
Feenstra, Lloyd / Barons / (403) 757-3737				Klassen, Ethan / Coaldale / (403) 345-3770	
SUNDRE ®				Klassell, Kell / Roselllary / (403) 378-4408	
BI: FCDC (Lacombe), DIST: Mastin Seeds				Limoges, Richard / McLennan / (780) 324-2335	
Feenstra, Lloyd / Barons / (403) 757-3737				Markert Seeds Ltd. / Vulcan / (403) 485-6708 C McNelly Seed Farms Ltd. / Clyde / (780) 348-5749	
Hallett, Dale R. & Richard / Carstairs / (403) 337-3072				C Meinczinger, Matthew Jr. / Busby / (780) 349-2456	
Jones, Danny / Beaverlodge / (780) 354-8089			R	Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	
Lyster, Norman / Stettler / (403) 742-4456				C Metzger, Marty / Carbon / (403) 572-3284	
Mastin Seeds / Sundre / (403) 556-2609			R	Mueller, Richard J., R.R. & Rosemary / Barrhead / (780
TROCHU 🕸				Nemetz, Charlie, Jerritt & Lewis / Stettler / (403) 74	
BI: FCDC (Lacombe), DIST: SeCan Members				Niemela, Terrance & Tracy / Sylvan Lake / (403) 746	
Kittle Farms Ltd. / Viking / (780) 336-2583				C Oatway's Seed Farm Ltd. / Clive / (403) 784-3001	, 20
Webber, Curtis / Parkland County / (780) 963-6897				C Pare, Raymond A. / Wainwright / (780) 842-2073	
VIVAR 🕲				Penwest Seeds / Three Hills / (403) 443-2577	
BI: FCDC (Lacombe), DIST: SeCan Members				Rasmuson, Dennis G. & Cory D. / Gwynne / (780) 31	12-11
Beamish, Dale / Jarvie / (780) 954-2166				C Richard Gerald / Spirit River / (780) 864-2339	
McDonald, Grant / Didsbury / (403) 335-8188				C Schmermund, Donnie / Sturgeon County / (780) 96	7-28
				SeCan Association / Kanata / (613) 592-8600	
DADLEY FEED TWO DOW				Selte, Donald / Vermilion / (780) 853-2484	
BARLEY - FEED TWO ROW	S	F	R	R C Simco Seeds / Ponoka / (780) 372-2111	
		_		Stamp Seeds / Enchant / (403) 739-2233	
ALTORADO ⊗				Templeton, Doran & Brant / Lethbridge / (403) 345-	-414
BI: WestBred LLC., DIST: Nutrien Ag Solutions/Proven Seed				Webber, Curtis / Parkland County / (780) 963-6897	1
Nutrien Ag Solutions / Regina / 1-855-569-9444	S		R		5
BRAHMA 🗆				CDC COALITION (8)	
BI: WestBred LLC., DIST: Nutrien Ag Solutions/Proven Seed				BI: CDC, DIST: Canterra Seeds	
Nutrien Ag Solutions / Regina / 1-855-569-9444			R		
CANMORE (9)				Felstad, Colin / Dapp / (780) 349-9505	
BI: FCDC (Lacombe), DIST: Canterra Seed				Haney Farms Ltd. / Picture Butte / (403) 738-4517	
Benci Seed Farms / Carmangay / (403) 643-2294		F	R	C Lindholm Seed Farm / New Norway / (780) 352-324	
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C Meinczinger, Matthew Jr. / Busby / (780) 349-2456	
King's Seed Farm Ltd. / Three Hills / (403) 443-3333			R		
Lindholm Seed Farm / New Norway / (780) 352-3240				C BI: CDC, DIST: SeCan Members	
LS Land & Cattle / Didsbury / (403) 335-3694				C Alect Seeds / Three Hills / (403) 443-9599	
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R		
Penwest Seeds / Three Hills / (403) 443-2577				C Barany, Lawrence Walter / Taber / (403) 223-3900	
Plante, Jacques / St. Paul / (780) 645-4604				C Bright, David / New Norway / (780) 855-2240	
Rasmussen, Brian D. & Joel T. / Standard / (403) 644-3800			R		
Rix, Graham / Wetaskiwin / (780) 360-9234			D		
Sendziak Seed Farm / Edmonton / (780) 434-1322			R		
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228		_	R		
Solick Seeds Ltd. / Halkirk / (403) 884-2358		F	R	C Echo Ridge Seeds / Stettler / (403) 883-2503 Eliason, Bruce W. / Wrentham / (403) 222-2258	
CDC AUSTENSON ®				Ellis, Brian / Olds / (403) 556-2890	
BI: CDC, DIST: SeCan Members					74-3
Alect Seeds / Three Hills / (403) 443-9599 Barany, Lawrence Walter / Taber / (403) 223-3900			R		
Benci Seed Farms / Carmangay / (403) 643-2294			IX	C Hadway, W. Tom & Carol / Didsbury / (403) 335-492	
Bener Seed Fairns / Garmangay / (400) 043-2234				5	-

	Brummelhuis, Mitchell & Mack / Vauxhall / (403) 654-7515		F		С
	Card, Gordon B. & Rhett / Magrath / (403) 758-3444				С
	Carl's Ag Ventures Ltd. / Hays / (403) 725-2213			R	С
	Clark, Todd / Edmonton / (780) 499-5060				С
	Corns, Whitney / Grassy Lake / (403) 360-0833				С
	Davidson, E. Daryl & Dean / Kitscoty / (780) 846-2456		_		С
	Dyck, Heinz W., Colin, Alan & Kelton / Rosemary / (403) 378-3321	S	F		С
	Echo Ridge Seeds / Stettler / (403) 883-2503			D	С
	Fabian Seed Farms / Tilley / (403) 377-2000			R	
	Foster, Norman R. / Beaverlodge / (780) 354-2107				C
	Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036	S			С
	Hadland, Edward / Baldonnel / (250) 793-9746 Hallett, Dale R. & Richard / Carstairs / (403) 337-3072	3		R	С
	Hartzler, Leonard / Carstairs / (403) 337-2416			R	С
	Hoff, Peter Edward / Gleichen / (403) 734-2140		F	11	С
	Jones, Greg T. & Tristan / Ponoka / (403) 783-6495		F		С
	Kemp, Richard L. / Red Deer County / (403) 227-4836				С
	Kiffiak, Nathan J. & Anderson, Tim / Foremost / (403) 867-2338				С
	Klapstein, Dallas / Calmar / (780) 819-4993			R	
	Klassen, Ethan / Coaldale / (403) 345-3770				С
	Klassen, Ken / Rosemary / (403) 378-4408				С
	Limoges, Richard / McLennan / (780) 324-2335			R	С
	Markert Seeds Ltd. / Vulcan / (403) 485-6708			R	
	McNelly Seed Farms Ltd. / Clyde / (780) 348-5749			R	С
	Meinczinger, Matthew Jr. / Busby / (780) 349-2456				С
	Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R	С
	Metzger, Marty / Carbon / (403) 572-3284				С
	Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713	S	F	R	
	Nemetz, Charlie, Jerritt & Lewis / Stettler / (403) 742-0436			R	С
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	Oatway's Seed Farm Ltd. / Clive / (403) 784-3001	C	F	R	С
	Pare, Raymond A. / Wainwright / (780) 842-2073	S	F	R	_
	Penwest Seeds / Three Hills / (403) 443-2577				C
	Rasmuson, Dennis G. & Cory D. / Gwynne / (780) 312-1148 Richard, Gerald / Spirit River / (780) 864-2339			R	С
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	Stamp Seeds / Enchant / (403) 739-2233				C
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	Haney Farms Ltd. / Picture Butte / (403) 738-4517			R	С
	Lindholm Seed Farm / New Norway / (780) 352-3240		F		С
	Meinczinger, Matthew Jr. / Busby / (780) 349-2456			R	С
CI	OC COPELAND ®				
	BI: CDC, DIST: SeCan Members				
	Alect Seeds / Three Hills / (403) 443-9599			D	С
	Archer, Nathan / Didsbury / (403) 556-0693			R R	_
	Barany, Lawrence Walter / Taber / (403) 223-3900 Bright, David / New Norway / (780) 855-2240			K	C
	Carlson, David / Gwynne / (780) 352-6871				С
	Dallas, Bradley C. / Bowden / (403) 224-2162			R	С
	Dueck, Ralph E.& Brent / Olds / (403) 556-2602	S	F	R	С
	Dyck, Ernie / La Crete / (780) 821-9445		.	R	ĺ
	Echo Ridge Seeds / Stettler / (403) 883-2503				С
	Eliason, Bruce W. / Wrentham / (403) 222-2258			R	C
	Ellis, Brian / Olds / (403) 556-2890				C *
	Forward Seed Farm / County Of Barrhead / (780) 674-3822				С
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	Hadway, W. Tom & Carol / Didsbury / (403) 335-4929				С

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SERIOUS SEED PROTECTION



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Harris, William P., Linda, Thomas & Alex / Beaverlodge / (780) 354-2823	S	F		С
Hartzler, Leonard / Carstairs / (403) 337-2416			R	С
Kemp, Richard L. / Red Deer County / (403) 227-4836				С
King's Seed Farm Ltd. / Three Hills / (403) 443-3333			R*	С
Kittle Farms Ltd. / Viking / (780) 336-2583				С
Knight, William, Craig & Brian / Tees / (403) 784-3633			R	
Konieczny, Scott / Mannville / (780) 581-5693				С
Kopjar, Gerald M. / Rowley / (403) 368-2409			R	С
Lindholm Seed Farm / New Norway / (780) 352-3240				С
Macyk, Tim / Radway / (780) 699-4073				С
Markert Seeds Ltd. / Vulcan / (403) 485-6708				С
McNelly Seed Farms Ltd. / Clyde / (780) 348-5749			R	
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				С
Moffitt, Kenneth & Raymond / Radway / (780) 818-6550				С
Mueller, Darcy / Three Hills / (403) 820-4115				С
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713			R	
Murray, Bruce & Wesley / Lethbridge County / (403) 327-9389				С
Niemela, Terrance & Tracy / Sylvan Lake / (403) 746-2645			R	
Nisbet, Andrew E. & Diane E. / Mountain View County / (403) 224-3788	S	F	R	
Penwest Seeds / Three Hills / (403) 443-2577				С
Richards, Dan / Sexsmith / (780) 766-2266				С
Schmermund, Donnie / Sturgeon County / (780) 967-2850				С
Selte, Donald / Vermilion / (780) 853-2484			R	С
Sich, Ivan & Martin & Livia / Three Hills / (403) 443-8402				С
Simco Seeds / Ponoka / (780) 372-2111				С
Strathmore Seed Cleaning Plant / Strathmore / (403) 934-3421				С
Svean, Alan Carl & Scott / Rivercourse / (780) 745-2578				С
Unrau, George / La Crete / (780) 926-1133		_	R	
Victoor Seed Farm Inc. / Sturgeon County / (780) 459-3253		F	R	
Wagner, Terry & Loree / Lacombe / (403) 782-2107			R	
Wood, James / Elnora / (403) 596-4189			R	L
Zwack's Seed Farm Ltd. / Daysland / (780) 374-2450				С
DC COWBOY ®				
BI: CDC, DIST: SeCan Members				١.
Benson, Chad / Dapp / (780) 349-1758			R	С
Dechaine, Louis / St. Lina / (780) 635-2235			R	L
Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383				С
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		
McNelly Seed Farms Ltd. / Clyde / (780) 348-5749			R	
Selte, Donald / Vermilion / (780) 853-2484			R	

Stewart, E.Wilbur & Eldon / Big Valley / (403) 876-2784				С
Webber, Curtis / Parkland County / (780) 963-6897				С
CDC MAVERICK (%)				
BI: CDC, DIST: SeCan Members				
Card, Gordon B. & Rhett / Magrath / (403) 758-3444	S		R	С
Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383			R	С
Hadland, Edward / Baldonnel / (250) 793-9746	S	F		С
Hallett, Dale R. & Richard / Carstairs / (403) 337-3072				С
Haralie Seed Farms / Beaver County / (780) 662-2617	S*			
Herzog, Blair / Delia / (403) 857-9596			R	
McDonald, Gerald / Co. Of Grande Prairie #1 / (780) 538-3868				С
Metzger, Marty / Carbon / (403) 572-3284				С
Mueller, Darcy / Three Hills / (403) 820-4115	S			С
Selte, Donald / Vermilion / (780) 853-2484	S	F		С
Shaw, Tom / Country Of Grande Prairie No.1 / (780) 814-4046				С
Webber, Curtis / Parkland County / (780) 963-6897			R	
CDC THOMPSON				
BI: CDC, DIST: N/A				
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535			R	
Trueblood, Brian G. / Dapp / (780) 954-3745			R	
CDC TREY				
BI: CDC, DIST: FP Genetics		_		
Wood Seed Farm Ltd. / Bowden / (403) 588-3548	S	F	R	С
CLAYMORE				
BI: WestBred LLC., DIST: Nutrien Ag Solutions/Proven Seed			_	
Nutrien Ag Solutions / Regina / 1-855-569-9444	S		R	С
CONLON ®				
BI: NDSU, DIST: Seed Depot				_
Airth, Jock & Linda / Brooks / (403) 362-4372 Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228				C
GADSBY @				C
BI: FCDC (Lacombe), DIST: SeCan Members Harris, William P., Linda, Thomas & Alex / Beaverlodge / (780) 354-2823	S	F		
Webber, Curtis / Parkland County / (780) 963-6897	3	F	R	С
OREANA®			K	C
BI: WestBred LLC., DIST: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions / Regina / 1-855-569-9444	S		R	С
Nutrien Ag Solutions / Regilla / 1-600-009-9444	3		И	C

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SEEBE BI: FCDC (Lacombe), DIST: SeCan Members Webber, Curtis / Parkland County / (780) 963-6897				С
BARLEY - MALTING SIX ROW	s	F	R	С
LEGACY BI: Busch Ag Res. Inc., DIST: Nutrien Ag Solutions/Proven Seed Wood Seed Farm Ltd. / Bowden / (403) 588-3548	S	F	R	С
BARLEY - MALTING TWO ROW	s	F	R	С
AAC CONNECT ©* BI: AAFC (Brandon), DIST: Canterra Seeds Eliason, Bruce W. / Wrentham / (403) 222-2258 Ellis, Brian / Olds / (403) 556-2890 Goode, Tim / Lacombe / (403) 506-9424 Haney Farms Ltd. / Picture Butte / (403) 738-4517 Herzon, Brent / Olds / (403) 556-6441	S		R	C C* C C
Lefsrud Seed / Viking / (780) 336-2500 LS Land & Cattle / Didsbury / (403) 335-3694 Penwest Seeds / Three Hills / (403) 443-2577 Raaen, Sylvan / Rolla / (250) 759-4778 Rasmussen, Brian D. & Joel T. / Standard / (403) 644-3800 Richards, Dan / Sexsmith / (780) 766-2266 Sendziak Seed Farm / Edmonton / (780) 434-1322 Solick Seeds Ltd. / Halkirk / (403) 884-2358 Unrau, George / La Crete / (780) 926-1133	3	F	R R R	C C C
BI: AAFC (Brandon), DIST: Syngenta Canada Eliason, Bruce W. / Wrentham / (403) 222-2258 Ellis, Brian / Olds / (403) 556-2890 Gatez, Blaine Gerald / Crossfield / (403) 888-1623 Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268 Holtman, Scott / Taber / (403) 634-4525 Lindholm Seed Farm / New Norway / (780) 352-3240 Markert Seeds Ltd. / Vulcan / (403) 485-6708 Prestville Farms Ltd. / Rycroft / (780) 814-2849 Strathmore Seed Cleaning Plant / Strathmore / (403) 934-3421 Syngenta Canada / 1-877-964-3682 Willms Seeds / Grassy Lake / (403) 655-2434 AC METCALFE	S	F	R R R R	
BI: AAFC (Brandon), DIST: SeCan Members Cornish, Bob / Airdrie / (403(948-3070 Dueck, Ralph E.& Brent / Olds / (403) 556-2602 Eliason, Bruce W. / Wrentham / (403) 222-2258 Lefsrud Seed / Viking / (780) 336-2500 Limoges, Richard / McLennan / (780) 324-2335 McNelly Seed Farms Ltd. / Clyde / (780) 348-5749 Murray, Bruce & Wesley / Lethbridge County / (403) 327-9389 Penwest Seeds / Three Hills / (403) 443-2577 Webber, Curtis / Parkland County / (780) 963-6897 Wheatcrest Farms / Lomond / (403) 792-3696 BILL COORS 100 BI: Molson/Coors, DIST: Stamp Seeds	c		R* R R R R R*	C* C C C C C C

CDC BOW ® BI: CDC, DIST: SeCan Members Alect Seeds / Three Hills / (403) 443-9599 С Assure Seeds Ltd. / Acme / (403) 510-9260 Barany, Lawrence Walter / Taber / (403) 223-3900 Carl's Ag Ventures Ltd. / Hays / (403) 725-2213 R С Eliason, Bruce W. / Wrentham / (403) 222-2258 С Goldstrom, David / Red Deer County / (403) 227-2133 С R Hadway, W. Tom & Carol / Didsbury / (403) 335-4929 R Herzog, Blair / Delia / (403) 857-9596 Kemp, Richard L. / Red Deer County / (403) 227-4836 С Kopjar, Gerald M. / Rowley / (403) 368-2409 LS Land & Cattle / Didsbury / (403) 335-3694 С Metzger, Marty / Carbon / (403) 572-3284 R Nisbet, Andrew E. & Diane E. / Mountain View County / (403) 224-3788 Solick Seeds Ltd. / Halkirk / (403) 884-2358 True Seeds Ltd. / Redwater / (780) 777-5885 С С Wagner, Terry & Loree / Lacombe / (403) 782-2107 Wheatcrest Farms / Lomond / (403) 792-3696 Witdouck Farms Ltd. / Iron Springs / (403) 738-4395 R C



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BARLEY - FEED SIX ROW	s	F	R	c
Sendziak Seed Farm / Edmonton / (780) 434-1322				
BI: CDC, DIST: SeCan Members				١.
CDC CLEAR				
Willms Seeds / Grassy Lake / (403) 655-2434			R	
Syngenta Canada / 1-877-964-3682	S	F	R	(
Prestville Farms Ltd. / Rycroft / (780) 814-2849			R	
LS Land & Cattle / Didsbury / (403) 335-3694			R	
Lindholm Seed Farm / New Norway / (780) 352-3240			R	
Ellis, Brian / Olds / (403) 556-2890			R	(
BI: Syngena Ag, DIST: Syngenta Canada				
SIRISH (1)*			11	
Eliason, Bruce W. / Wrentham / (403) 222-2258			R	
BI: BARI Canada, Dist: Canterra Seeds				
Mueller, Darcy / Three Hills / (403) 820-4115 MERIT 57	5			
BI: FCDC (Lacombe), DIST: SeCan Members	S			
LOWE ®*				
Mastin Seeds / Sundre / (403) 556-2609			R	
BI: AAFC (Brandon), DIST: Mastin Seeds				
CERVEZA				
Wheatcrest Farms / Lomond / (403) 792-3696			R	
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C
Harris, William P., Linda, Thomas & Alex / Beaverlodge / (780) 354-2823		F		
BI: CDC, DIST: SeCan Members				
CDC MEREDITH (b)				
Penwest Seeds / Three Hills / (403) 443-2577				(
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268			R	
BI: CDC, DIST: Canterra Seeds				
CDC GOLDSTAR (9)				ľ
Sayer, Roger / Carstairs / (403) 337-5847				
Oatway's Seed Farm Ltd. / Clive / (403) 784-3001			К	(
Jones, Greg T. & Tristan / Ponoka / (403) 783-6495 Niemela, Terrance & Tracy / Sylvan Lake / (403) 746-2645			R R	(
Holmstrom, Darrell / Killam / (780) 385-3574			R	
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929		F	D	(
Dueck, Ralph E.& Brent / Olds / (403) 556-2602	S	_	R	l.
BI: CDC, DIST: SeCan Members				
CDC FRASER ®*				
Solick Seeds Ltd. / Halkirk / (403) 884-2358	S			
BI: CDC, DIST: FP Genetics				
CDC COPPER				
King's Seed Farm Ltd. / Three Hills / (403) 443-3333	S	F		
SeCan Association / Kanata / (613) 592-8600	S	F		

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Stamp Seeds / Enchant / (403) 739-2233 Wood, James / Elnora / (403) 596-4189		F	R	C
AC RANGER				
BI: AAFC (Brandon), DIST: FP Genetics Airth, Jock & Linda / Brooks / (403) 362-4372				
AIITH, JOCK & LINGA / BIOOKS / (403) 362-4372				
BI: FCDC (Lacombe), DIST: SeCan Members				ı
Assure Seeds Ltd. / Acme / (403) 510-9260				(
Beamish, Dale / Jarvie / (780) 954-2166				(
Dallas, Bradley C. / Bowden / (403) 224-2162				(
Feenstra, Lloyd / Barons / (403) 757-3737				(
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		
BARLEY - TWO ROW HULLESS	s	F	R	(
CDC ASCENT ®*				Ī
BI: CDC, DIST: SeCan Members			_	
Simco Seeds / Ponoka / (780) 372-2111			R	
OATS - FEED	s	F	R	,
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AC MUSTANG				ı
BI: AAFC (Lacombe), DIST: Mastin Seeds				ı
Barany, Lawrence Walter / Taber / (403) 223-3900			R	ı
Feenstra, Lloyd / Barons / (403) 757-3737			_	ľ
Hallett, Dale R. & Richard / Carstairs / (403) 337-3072			R	Į,
Jonk, Nicholas / Westlock / (780) 349-5458 Lyster, Norman / Stettler / (403) 742-4456	S	F		ľ
Mastin Seeds / Sundre / (403) 755-2609	3	Г	R	ı
Richard, Gerald / Spirit River / (780) 864-2339			IX	ŀ
CDC ENDURE				ı
BI: CDC, DIST: Alliance Seed				ı
Selte, Donald / Vermilion / (780) 853-2484	S			ı
CDC NASSER				ı
BI: CDC, DIST: T & L Seeds				ı
Carl's Ag Ventures Ltd. / Hays / (403) 725-2213				ľ
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268	S		R	ľ
King's Seed Farm Ltd. / Three Hills / (403) 443-3333	S		_	ľ
Sand's Seed Farm Ltd. / McLaughlin / (780) 745-2251	S		R	ľ
St. Paul Municipal Seed Cleaning Plant / St. Paul / (780) 645-3939				ľ
CDC SO-I				ı
BI: CDC, DIST: N/A			D	ı
LS Land & Cattle / Didsbury / (403) 335-3694 WALDERN			R	ı
BI: AAFC (Lacombe), DIST: SeCan Members				ı
Airth, Jock & Linda / Brooks / (403) 362-4372				(
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DATS - FORAGE	s	F	R	
DC BALER				ĺ
BI: CDC, DIST: FP Genetics				
Airth, Jock & Linda / Brooks / (403) 362-4372				
Simco Seeds / Ponoka / (780) 372-2111			_	
Wood Seed Farm Ltd. / Bowden / (403) 588-3548			R	
DC HAYMAKER BI: CDC, DIST: SeCan Members				
Archer, Nathan / Didsbury / (403) 556-0693			R	
Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383			R	
Hadland, Edward / Baldonnel / (250) 793-9746				
Hadway, Walter Thomas / Didsbury / (403) 335-4929				
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		
Herzog, Blair / Delia / (403) 857-9596			R	
Jonk, Nicholas / Westlock / (780) 349-5458				
McDonald, Gerald / Co. Of Grande Prairie #1 / (780) 538-3868	C			
Mueller, Darcy / Three Hills / (403) 820-4115 Selte, Donald / Vermilion / (780) 853-2484	S		F	
Shaw, Tom / Country Of Grande Prairie No.1 / (780) 814-4046	3		'	
URPHY ®				
BI: AAFC (Lacombe), DIST: SeCan Members				
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		
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DATS - MILLING	s	F	R	
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C LU BI: AAFC (Lacombe), DIST: SeCan Members Haralie Seed Farms / Beaver County / (780) 662-2617 C MORGAN BI: AAFC (Lacombe), DIST: SeCan Members Benci Seed Farms / Carmangay / (403) 643-2294 Corns, Whitney / Grassy Lake / (403) 360-0833	S*	F	R	
C LU BI: AAFC (Lacombe), DIST: SeCan Members Haralie Seed Farms / Beaver County / (780) 662-2617 C MORGAN BI: AAFC (Lacombe), DIST: SeCan Members Benci Seed Farms / Carmangay / (403) 643-2294 Corns, Whitney / Grassy Lake / (403) 360-0833 Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383	S*	F		
C LU BI: AAFC (Lacombe), DIST: SeCan Members Haralie Seed Farms / Beaver County / (780) 662-2617 C MORGAN BI: AAFC (Lacombe), DIST: SeCan Members Benci Seed Farms / Carmangay / (403) 643-2294 Corns, Whitney / Grassy Lake / (403) 360-0833 Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383 Froese, Cornelius H. / La Crete / (780) 927-4645	S*	F		
C LU BI: AAFC (Lacombe), DIST: SeCan Members Haralie Seed Farms / Beaver County / (780) 662-2617 C MORGAN BI: AAFC (Lacombe), DIST: SeCan Members Benci Seed Farms / Carmangay / (403) 643-2294 Corns, Whitney / Grassy Lake / (403) 360-0833 Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383 Froese, Cornelius H. / La Crete / (780) 927-4645 Haarsma, Edward / Spruce Grove / (780) 964-3517	S*	F	R	
C LU BI: AAFC (Lacombe), DIST: SeCan Members Haralie Seed Farms / Beaver County / (780) 662-2617 C MORGAN BI: AAFC (Lacombe), DIST: SeCan Members Benci Seed Farms / Carmangay / (403) 643-2294 Corns, Whitney / Grassy Lake / (403) 360-0833 Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383 Froese, Cornelius H. / La Crete / (780) 927-4645	S*			
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CLU BI: AAFC (Lacombe), DIST: SeCan Members Haralie Seed Farms / Beaver County / (780) 662-2617 C MORGAN BI: AAFC (Lacombe), DIST: SeCan Members Benci Seed Farms / Carmangay / (403) 643-2294 Corns, Whitney / Grassy Lake / (403) 360-0833 Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383 Froese, Cornelius H. / La Crete / (780) 927-4645 Haarsma, Edward / Spruce Grove / (780) 964-3517 Haralie Seed Farms / Beaver County / (780) 662-2617 Holmstrom, Darrell / Killam / (780) 385-3574	S*	F*	R	
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CLU BI: AAFC (Lacombe), DIST: SeCan Members Haralie Seed Farms / Beaver County / (780) 662-2617 C MORGAN BI: AAFC (Lacombe), DIST: SeCan Members Benci Seed Farms / Carmangay / (403) 643-2294 Corns, Whitney / Grassy Lake / (403) 360-0833 Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383 Froese, Cornelius H. / La Crete / (780) 927-4645 Haarsma, Edward / Spruce Grove / (780) 964-3517 Haralie Seed Farms / Beaver County / (780) 662-2617 Holmstrom, Darrell / Killam / (780) 385-3574 Jonk, Nicholas / Westlock / (780) 349-5458 Kemp, Richard L. / Red Deer County / (403) 227-4836 Klapstein, Dallas / Calmar / (780) 819-4993 Klassen, Ken / Rosemary / (403) 378-4408 Limoges, Daniel / Girouxville / (780) 833-1287 Markert Seeds Ltd. / Vulcan / (403) 485-6708 Meinczinger, Matthew Jr. / Busby / (780) 349-2456 Miller, Brian / Barrhead / (780) 674-5001	S*	F*	R	

RASETTO BI: N/A, DIST: FP Genetics				
RYE	s	F	R	С
Webber, Curtis / Parkland County / (780) 963-6897				С
Shaw, Tom / Country Of Grande Prairie No.1 / (780) 814-4046			R	
Selte, Donald / Vermilion / (780) 853-2484				С
Sekulic, John Jr. / Rycroft / (780) 765-2280			R	
Miller, Brian / Barrhead / (780) 674-5001 Ohrn, Norman / Thorsby / (780) 985-2263			R R	
LS Land & Cattle / Didsbury / (403) 335-3694			-	С
Klassen, Ken / Rosemary / (403) 378-4408				С
Kapitski, Lawrence / Andrew / (780) 365-2134				С
Jonk, Nicholas / Westlock / (780) 349-5458		'	R	С
Hill, Gordon P. & Blair / Taylor / (250) 789-3469 Jones, Greg T. & Tristan / Ponoka / (403) 783-6495	S	F		
Haralie Seed Farms / Beaver County / (780) 662-2617	S	F	R	С
Froese, Cornelius H. / La Crete / (780) 927-4645			R	С
Dechaine, Louis / St. Lina / (780) 635-2235			11	С
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900 Corns, Whitney / Grassy Lake / (403) 360-0833			R R	
Alliance Seed Cleaning Association Ltd. / Alliance / (780) 879-3927			D	С
BI: Oat Advantage, DIST: SeCan Members				
PRE3542M				
Wuthrich, David / Cecil Lake / (250) 781-3527				C
Unrau, George / La Crete / (780) 926-1133				C
Solick Seeds Ltd. / Halkirk / (403) 884-2358 True Seeds Ltd. / Redwater / (780) 777-5885				C
Sendziak Seed Farm / Edmonton / (780) 434-1322				C
Prestville Farms Ltd. / Rycroft / (780) 814-2849				C
Plante, Jacques / St. Paul / (780) 645-4604				C
Penwest Seeds / Three Hills / (403) 443-2577				C
Lindholm Seed Farm / New Norway / (780) 352-3240	5		IX	С
Jonk, Nicholas / Westlock / (780) 349-5458 Lefsrud Seed / Viking / (780) 336-2500	S		R R	С
Beaulieu, Emery / Fairview / (780) 835-8525			R	_
BI: Lantmannen SW Seed, DIST: Canterra Seeds			_	
S CAMDEN ®				
True Seeds Ltd. / Redwater / (780) 777-5885				С
BI: CDC, DIST: FP Genetics				
True Seeds Ltd. / Redwater / (780) 777-5885			R	
Stamp Seeds / Enchant / (403) 739-2233		F	D	
Prestville Farms Ltd. / Rycroft / (780) 814-2849		_	R	
BI: CDC, DIST: FP Gentetics				
DC ARBORG ®*				
Witdouck Farms Ltd. / Iron Springs / (403) 738-4395				C
Webber, Curtis / Parkland County / (780) 963-6897 Wildeman, Russell / Clive / (403) 784-3695				C







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AAC DELIGHT (9* BI: AAFC (Lethbridge), DIST: Fabian Seeds Ltd.				
TRITICALE - SPRING	s	F	R	С
Stamp Seeds / Enchant / (403) /39-2233			К	
BI: AAFC (Swift Current), DIST: SeCan Members Stamp Seeds / Enchant / (403) 739-2233			R	
PRIMA				
Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383			R	
BI: AAFC (Swift Current), DIST: SeCan Members				
WILDOUCK FAITHS ELG. / ITOH Springs / (403) /38-4395 MUSKETEER				(
Stamp Seeds / Enchant / (403) 739-2233 Witdouck Farms Ltd. / Iron Springs / (403) 738-4395				
Benci Seed Farms / Carmangay / (403) 643-2294				C
BI: KWS Lochow GMBH, DIST: SeedNet Inc.				
KWS PROPOWER				
FP Genetics / Regina / (306) 791-1045				C
BI: KWS Lochow GMBH, DIST: FP Genetics				
KWS PROGAS				
FP Genetics / Regina / (306) 791-1045				(
KWS GATANO BI: KWS Lochow GMBH. DIST: FP Genetics				
Stamp Seeds / Enchant / (403) 739-2233				(
Specialty Seeds Ltd. / Bow Island / (403) 545-6018				C
Benci Seed Farms / Carmangay / (403) 643-2294				C
BI: KWS Lochow GMBH, DIST: SeedNet Inc.				
KWS DANIELLO				ľ
FP Genetics / Regina / (306) 791-1045				(
BI: KWS Lochow GMBH, DIST: FP Genetics				
Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383			R	
Benci Seed Farms / Carmangay / (403) 643-2294	S		_	(
BI: AAFC (Swift Current), DIST: SeCan Members				l.
HAZLET				l
Specialty Seeds Ltd. / Bow Island / (403) 545-6018				(
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				(
BI: KWS Lochow GMBH, DIST: SeedNet Inc.				

BI: N/A, DIST: N/A Corns, Whitney / Grassy Lake / (403) 360-0833 Fabian Seed Farms / Tilley / (403) 377-2000			R	С
TRITICALE - WINTER	s	F	R	С
Card, Gordon B. & Rhett / Magrath / (403) 758-3444 Corns, Whitney / Grassy Lake / (403) 360-0833		F	R	C C
BI: FCDC (Lacombe), DIST: Solick Seeds Ltd. Rix, Graham / Wetaskiwin / (780) 360-9234 Solick Seeds Ltd. / Halkirk / (403) 884-2358 TYNDAL & BI: FCDC (Lacombe), DIST: SeCan Members	S		R	C C
BI: AAFC (Lethbridge), DIST: SeedNet Inc. Benci Seed Farms / Carmangay / (403) 643-2294 Stamp Seeds / Enchant / (403) 739-2233 TAZA		F	R	С
BI: FCDC (Lacombe), DIST: Progressive Seeds Mans, John / Nobleford / (403) 824-3585 SUNRAY				С
BI: N/A, DIST: Seed-Link Inc. Kerschbaumer, John A. & Trevor / Fairview / (780) 835-4508 PRONGHORN		F		С
BI: FCDC (Lacombe), DIST: FP Genetics Airth, Jock & Linda / Brooks / (403) 362-4372 Solick Seeds Ltd. / Halkirk / (403) 884-2358 CIRCUIT	S S			C C
BI: CIMMYT, DIST: N/A Simco Seeds / Ponoka / (780) 372-2111 Webber, Curtis / Parkland County / (780) 963-6897 BUNKER 🕸				C C
Sounding Creek Seeds / Oyen / (403) 664-9617 BREVIS				С
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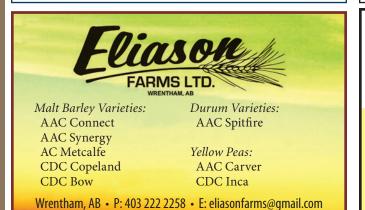
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BI: FCDC (Lacombe), DIST: Haney Farms Ltd.				
Corns, Whitney / Grassy Lake / (403) 360-0833			R	
PIKA				
BI: FCDC (Lacombe), DIST: N/A				
Airth, Jock & Linda / Brooks / (403) 362-4372			R	
WHEAT - CPSR	s	F	R	С
5700PR 🕸				
BI: Syngenta Canada Canada Inc, DIST: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions / Regina / 1-855-569-9444		F		С
Syngenta Canada / 1-877-964-3682	S	F	R	С
AAC ENTICE ®*				
BI: AAFC (Winnipeg), DIST: Nutrien Ag Solutions/Proven Seed				
Nutrien Ag Solutions / Regina / 1-855-569-9444	S	F		С
AAC GOODWIN				
BI: AAFC (Swift Current), DIST: SeCan Members				
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Ellis, Brian / Olds / (403) 556-2890			R	С
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Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036			R	
Klapstein, Dallas / Calmar / (780) 819-4993			R	С
LS Land & Cattle / Didsbury / (403) 335-3694			R	
Miller, Brian / Barrhead / (780) 674-5001				С
Nikkel, Ed & Darren / Lethbridge / (403) 312-4070				С
Ohrn, Norman / Thorsby / (780) 985-2263			R	
Reiman, Kyle / Wanham / (780) 897-3320			D	С
SeCan Association / Kanata / (613) 592-8600 St. Paul Municipal Seed Cleaning Plant / St. Paul / (780) 645-3939			R	С
Victoor Seed Farm Inc. / Sturgeon County / (780) 459-3253				C
AAC PENHOLD (9)				C
BI: AAFC (Swift Current), DIST: SeCan Members				
Amyotte, Phillip / Mallaig / (780) 635-4010				С
Baier, Bill & Dean / Clyde / (780) 348-5791			R	
Beamish, Dale / Jarvie / (780) 954-2166				С

Clark, Todd / Edmonton / (780) 499-5060 Dallas, Bradley C. / Bowden / (403) 224-2162 Davidson, E. Daryl & Dean / Kitscoty / (780) 846-2456			R	CCC
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377 Diachyshyn, Mike / Waskatenau / (780) 691-7104 Ellis, Brian / Olds / (403) 556-2890				C C
Felstad, Colin / Dapp / (780) 349-9505 Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036 Goldstrom, David / Red Deer County / (403) 227-2133		F	R	C
Hadland, Edward / Baldonnel / (250) 793-9746 Hadway, W. Tom & Carol / Didsbury / (403) 335-4929 Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268			R R	C
Hundeby, Arron / Wetaskiwin / (780) 335-5111 Jackson, Thomas / Killam / (780) 385-2332				C C
Jones, Greg T. & Tristan / Ponoka / (403) 783-6495 Kemp, Richard L. / Red Deer County / (403) 227-4836 Lawrence, Cody / Wainwright / (780) 842-0285		F		C C
Limoges, Richard / McLennan / (780) 324-2335 Lindholm Seed Farm / New Norway / (780) 352-3240 Lindholm, Luke & Stevan / Camrose / (780) 781-6077			R	C C C
LS Land & Cattle / Didsbury / (403) 335-3694 Macyk, Tim / Radway / (780) 699-4073 Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713			R	С
Nisbet, Andrew E. & Diane E. / Mountain View County / (403) 224-3788 Oatway's Seed Farm Ltd. / Clive / (403) 784-3001	S	F	R	С
Ohrn, Norman / Thorsby / (780) 985-2263 Pare, Raymond A. / Wainwright / (780) 842-2073 Radke, Bryan Victor / Barrhead / (780) 674-5715	S	F	R	C
Sand's Seed Farm Ltd. / McLaughlin / (780) 745-2251 Sayer, Roger / Carstairs / (403) 337-5847			R	C
Schmermund, Donnie / Sturgeon County / (780) 967-2850 Sendziak Seed Farm / Edmonton / (780) 434-1322 Shaw, Tom / Country Of Grande Prairie No.1 / (780) 814-4046			R R	C C
Simco Seeds / Ponoka / (780) 372-2111 Svean, Alan Carl & Scott / Rivercourse / (780) 745-2578 Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535			R	C C
Wood Seed Farm Ltd. / Bowden / (403) 588-3548 AAC RYLEY ⊛	S	F	К	С
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BI: CDC, DIST: FP Genetics				
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CS ACCELERATE ®				
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Hallett, Dale R. & Richard / Carstairs / (403) 337-3072		_	R	
Lindholm Seed Farm / New Norway / (780) 352-3240	S	F	R	
Sendziak Seed Farm / Edmonton / (780) 434-1322	S	F		
				L
WHEAT - CWAD	s	F	R	_
WIIEAI - OWAD	3	г	ĸ	C
AAC CONGRESS (9)				
BI: AAFC (Swift Current), DIST: Canterra Seeds				
Carl's Ag Ventures Ltd. / Hays / (403) 725-2213			R	С
Haney Farms Ltd. / Picture Butte / (403) 738-4517				C
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R*	C*
AAC DONLOW				ľ
BI: AAFC, DIST: N/A				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	S			
AAC GRAINLAND ®*				
BI: AAFC (Swift Current), DIST: N/A				
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Willms Seeds / Grassy Lake / (403) 655-2434	S	F		
AAC SPITFIRE (9)				
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Specialty Seeds Ltd. / Bow Island / (403) 545-6018				C*
AAC STRONGHOLD ®				
BI: AAFC (Swift Current), DIST: SeCan Members				
Barany, Lawrence Walter / Taber / (403) 223-3900			R	
Benci Seed Farms / Carmangay / (403) 643-2294	S		R	С
Carl's Ag Ventures Ltd. / Hays / (403) 725-2213				С
Crooymans, John, Joseph & Andrew / Bow Island / (403) 545-6333			R	С

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WHEAT - CWESW	S	F	R	C
Stamp Seeds / Enchant / (400) / 30-2233	3			
Nieboer, Nathan / Bow Island / (403) 545-2222 Stamp Seeds / Enchant / (403) 739-2233	S*			(
Benci Seed Farms / Carmangay / (403) 643-2294				(
BI: AAFC (Swift Current), DIST: FP Genetics				
RANSCEND (d)				
Willms Seeds / Grassy Lake / (403) 655-2434				(
BI: CDC, DIST: Nutrien Ag Solutions/Proven Seed				
CDC VIVID (9)			-11	
Stamp Seeds / Enchant / (403) 739-2233			R*	ļ '
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736 Specialty Seeds Ltd. / Bow Island / (403) 545-6018			R	(
Markert Seeds Ltd. / Vulcan / (403) 485-6708				(
Hierath, Philip / Milk River / (403) 647-2281				(
Hierath, Michael Wayne / Milk River / (403) 647-2347				(
BI: CDC, DIST: Alliance Seed				
DC PRECISION ®				
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BI: CDC, DIST: Nutrien Ag Solutions				
CDC DYNAMIC	3	Г		
BI: CDC, DIST: Canterra Seeds Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	S	F		
DC CREDENCE ®				
Stamp Seeds / Enchant / (403) 739-2233				(
Nieboer, Nathan / Bow Island / (403) 545-2222			R	
Benci Seed Farms / Carmangay / (403) 643-2294				(
BI: CDC, DIST: FP Genetics				
CDC ALLOY ®				
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BI: AAFC (Swift Current), DIST: Nutrien Ag Solutions/Proven Seed				
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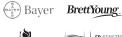
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Richard, Gerald / Spirit River / (780) 864-2339				С
Rix, Graham / Wetaskiwin / (780) 360-9234				С
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Sayer, Roger / Carstairs / (403) 337-5847				С
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Plante, Jacques / St. Paul / (780) 645-4604				С
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Sendziak Seed Farm / Edmonton / (780) 434-1322	S	F	R	ľ
AAC ELIE 🕸	-			
BI: AAFC (Swift Current), DIST: Alliance Seed				
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AAC REDBERRY ®			К	C
BI: AAFC (Swift Current), DIST: Alliance Seed				
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Alliance Seed Corporation / Winnipeg / (204) 272-2890			R	ľ
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Ellis, Brian / Olds / (403) 556-2890			R*	С
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Hierath, Michael Wayne / Milk River / (403) 647-2347		F	R	С
Hierath, Philip / Milk River / (403) 647-2281				С
Holmstrom, Darrell / Killam / (780) 385-3574			R	С
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Konieczny, Scott / Mannville / (780) 581-5693			R	



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Forward Seed Farm / County Of Barrhead / (780) 674-3822			R	C
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Geldreich, Dave / Bow Island / (403) 545-2222	S	F		
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Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268 Hoff, Peter Edward / Gleichen / (403) 734-2140		F		C
Kapitski, Lawrence / Andrew / (780) 365-2134				C
King's Seed Farm Ltd. / Three Hills / (403) 443-3333		F*		R
Lindholm Seed Farm / New Norway / (780) 352-3240 Markert Seeds Ltd. / Vulcan / (403) 485-6708			R	C
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BI: U of Minnesota, DIST: N/A				
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BI: CDC, DIST: Nutrien Ag Solutions/Proven Seed		_		
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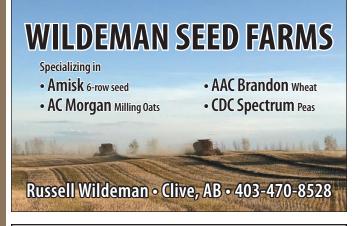


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Wuthrich, David / Cecil Lake / (250) 781-3527	S			
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Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036		_	R	
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SHEBA ®				
BI: U of Alberta, DIST: N/A	_	_		
Penwest Seeds / Three Hills / (403) 443-2577	S	F		
STETTLER (S)				
BI: AAFC (Swift Current), DIST: SeCan Members				
Foster, Norman R. / Beaverlodge / (780) 354-2107 Harris, William P., Linda, Thomas & Alex / Beaverlodge / (780) 354-2823		F		С
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Unrau, George / La Crete / (780) 926-1133	3	F		
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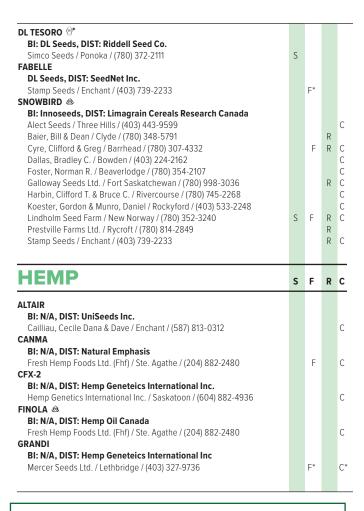
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BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932					
BI: N/A, DIST: N/A BI: N/A, DIST: BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 NORGOLD BI: N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Chaibos, Terry & Melissa / Guy / (780) 837-8111 FESCUE S F R C SOREAL BI: AAFC (Beaverlodge), DIST: Nutrien Ag Solutions/Proven Seed Carlstad, Tyler / Bear Canyon / (780) 835-0505 DLF Moore Seed Inc / Debolt / (780) 957-3964 Jones, Danny / Beaverlodge / (780) 354-8089 Richard, Gerald / Spirit River / (780) 864-4239 Richard, Michel / Spirit River / (780) 864-4220 SRYNN BI: N/A, DIST: N/A Foster, Norman R. / Beaverlodge / (780) 354-2107 Wuthrich, David / Cecil Lake / (250) 781-3527 DRACLE BI: AAFC (Beaverlodge), DIST: N/A Foster, Norman R. / Beaverlodge / (780) 354-2107 Foster's Seed & Feed Ltd. / Beaverlodge / (780) 354-2107 Hill, Brian / Taylor / (250) 789-3581 ORCHARDGRASS SCILLARNEY BI: AAFC, DIST: N/A CARG, Gordon B. & Rhett / Magrath / (403) 758-3444 EARLY ARCTIC BI: N/A, DIST: N/A CARG, GORDON B. & Rhett / Magrath / (403) 758-3444 EARLY ARCTIC BI: N/A, DIST: N/A CARG, GLENVIEW BI: N/A, DIST: N/A Whitney, David / Fairview / (780) 835-4897 SAINFOIN ACC GLENVIEW BI: AAFC (Lethbridge), DIST: N/A			F		C
BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 VORGOLD Bit N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Chaibos, Terry & Melissa / Guy / (780) 837-8111 FESCUE S F R C BI: AAFC (Beaverlodge), DIST: Nutrien Ag Solutions/Proven Seed Carlstad, Tyler / Bear Canyon / (780) 835-0505 DLF Moore Seed Inc / Debolt / (780) 957-3964 Jones, Danny / Beaverlodge / (780) 358-4889 Richard, Michel / Spirit River / (780) 864-2339 Richard, Michel / Spirit River / (780) 864-2339 Richard, Michel / Spirit River / (780) 864-220 BRYNN BI: N/A, DIST: N/A Foster, Norman R. / Beaverlodge / (780) 354-2107 Wuthrich, David / Cecil Lake / (250) 781-3527 PRACLE BI: AAFC (Beaverlodge), DIST: N/A Foster, Norman R. / Beaverlodge / (780) 354-2107 Foster's Seed & Feed Ltd. / Beaverlodge / (780) 354-2107 Hill, Brian / Taylor / (250) 789-3581 ORCHARDGRASS S F R C CKILLARNEY BI: AAFC, DIST: N/A Card, Gordon B. & Rhett / Magrath / (403) 758-3444 EARLY ARCTIC BI: N/A, DIST: Northstar Seed Ltd. Northstar Seed Ltd. / Neepawa / (204) 476-5241 RYEGRASS S F R C SWIFT BI: N/A, DIST: N/A Whitney, David / Fairview / (780) 835-4897 SAINFOIN S F R C CACCILENVIEW BI: AAFC (Lethbridge), DIST: N/A					
Bit N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8111 F Chaibos, Terry & Melissa / Guy / (780) 837-8101 F Chaibos, Terry & Guy / (780) 838-8089 Chaibos, Terry & Guy / (780) 848-8239 Chaibos, Terry & Guy / (780) 848-8239 Chaibos, Terry & Guy / (780) 864-8220 Chaibos, Terry & Guy / (780) 864-8220 Chaibos, Terry & Guy / (780) 864-8220 Chaibos, Terry & Guy / (780) 854-2107 F Chaibos, Terry & Guy / (780) 854-2107 F Chaibos, Terry & Guy / (780) 854-2107 Ch					
### BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Chaibos, Terry & Melissa / Guy / (780) 837-8111 F	NORGOLD				ľ
### STATE CONTRICTORY Page 1	BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932		_		
BOREAL BI: AAFC (Beaverlodge), DIST: Nutrien Ag Solutions/Proven Seed Carlstad, Tyler / Bear Canyon / (780) 835-0505 DLF Moore Seed Inc / Debolt / (780) 957-3964 Jones, Danny / Beaverlodge / (780) 354-8089 Richard, Gerald / Spirit River / (780) 864-2339 Richard, Michel / Spirit River / (780) 864-4220 BRYNN BI: N/A, DIST: N/A Foster, Norman R. / Beaverlodge / (780) 354-2107 Wuthrich, David / Cecil Lake / (250) 781-3527 DRACLE BI: AAFC (Beaverlodge), DIST: N/A Foster, Norman R. / Beaverlodge / (780) 354-2107 Foster's Seed & Feed Ltd. / Beaverlodge / (780) 354-2107 Hill, Brian / Taylor / (250) 789-3581 ORCHARDGRASS S F R C CKILLARNEY BI: AAFC, DIST: N/A Card, Gordon B. & Rhett / Magrath / (403) 758-3444 EARLY ARCTIC BI: N/A, DIST: Northstar Seed Ltd. Northstar Seed Ltd. / Neepawa / (204) 476-5241 RYEGRASS SWIFT BI: N/A, DIST: N/A Whitney, David / Fairview / (780) 835-4897 SAINFOIN S F R C AAC GLENVIEW BI: AAFC (Lethbridge), DIST: N/A	Citatious, Terry & Melissa / Guy / (780) 837-8111		Ĺ		
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BI: N/A, DIST: N/A Whitney, David / Fairview / (780) 835-4897 SAINFOIN S F R C ACC GLENVIEW BI: AAFC (Lethbridge), DIST: N/A	RYEGRASS	s	F	R	d
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AAC GLENVIEW BI: AAFC (Lethbridge), DIST: N/A	RI: N/A DIST: N/A				C
BI: AAFC (Lethbridge), DIST: N/A			_		H
1 9 11	Whitney, David / Fairview / (780) 835-4897	s	F	R	C
	Whitney, David / Fairview / (780) 835-4897	s	F	R	C

TIMOTHY	s	F	R	С
ALMA BI: N/A, DIST: Moore Seed Processors Inc.				
DLF Moore Seed Inc / Debolt / (780) 957-3964 CATAPULT				С
BI: N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Collins, Michael / Spirit River / (780) 864-3407				C C
CLIMAX BI: N/A, DIST: DLF Pickseed				
General Feed & Grain Inc. / Bonners Ferry / (208) 267-3185 COMER BI: N/A, DIST: DLF Pickseed				С
DLF Pickseed Canada Inc. / Winnipeg / (204) 633-0088 Wirth, Jason / Valleyview / (780) 524-4736 COMTAL				C C
BI: N/A, DIST: N/A DLF Pickseed Canada Inc. / Winnipeg / (204) 633-0088				С
BI: N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932				С
BI: N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Wuthrich, David / Cecil Lake / (250) 781-3527		F		С
PROMESSE BI: N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 SUMMERGRAZE				С
BI: N/A, DIST: BrettYoung Seeds Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 TENHO				С
BI: N/A, DIST: Moore Seed Processors Inc. DLF Moore Seed Inc / Debolt / (780) 957-3964 TITAN				С
BI: N/A, DIST: Northstar Seed Ltd. BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 TUUKKA				С
BI: N/A, DIST: Moore Seed Processors Inc. DLF Moore Seed Inc / Debolt / (780) 957-3964				С
WHEATGRASS	s	F	R	С
AC GOLIATH				Г
BI: AAFC , DIST: N/A Laliberté, Adam & Vos, Henry / Fairview / (780) 835-5286				С
AC SALTLANDER BI: AAFC (Swift Current), DIST: SeCan Members				
Miller, Kenneth F. / Milk River / (403) 647-2127 Nutrien Ag Solutions / Regina / 1-855-569-9444 ELBEE		F		C C
BI: AAFC (Lethbridge), DIST: SeCan Members Card, Gordon B. & Rhett / Magrath / (403) 758-3444 Limoges, Daniel / Girouxville / (780) 833-1287				C
FAIRWAY BI: N/A, DIST: N/A Nutrien Ag Solutions / Regina / 1-855-569-9444				С
GREENLEAF BI: N/A, DIST: SeCan Members				
Card, Gordon B. & Rhett / Magrath / (403) 758-3444				
				С
KIRK BI: AAFC (Saskatoon), DIST: SeCan Members BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932		_		C C
KIRK BI: AAFC (Saskatoon), DIST: SeCan Members BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Kerschbaumer, John A. & Trevor / Fairview / (780) 835-4508 Limoges, Daniel / Girouxville / (780) 833-1287 Meiers, Mark / Charlie Lake / (250) 827-3843		F		C
KIRK BI: AAFC (Saskatoon), DIST: SeCan Members BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Kerschbaumer, John A. & Trevor / Fairview / (780) 835-4508 Limoges, Daniel / Girouxville / (780) 833-1287 Meiers, Mark / Charlie Lake / (250) 827-3843 Nutrien Ag Solutions / Regina / 1-855-569-9444 NEWKIRK		F		C
KIRK BI: AAFC (Saskatoon), DIST: SeCan Members BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Kerschbaumer, John A. & Trevor / Fairview / (780) 835-4508 Limoges, Daniel / Girouxville / (780) 833-1287 Meiers, Mark / Charlie Lake / (250) 827-3843 Nutrien Ag Solutions / Regina / 1-855-569-9444 NEWKIRK BI: AAFC, DIST: N/A Limoges, Daniel / Girouxville / (780) 833-1287 REVENUE		F		C
KIRK BI: AAFC (Saskatoon), DIST: SeCan Members BrettYoung Seeds Ltd. / St. Norbert / (204) 261-7932 Kerschbaumer, John A. & Trevor / Fairview / (780) 835-4508 Limoges, Daniel / Girouxville / (780) 833-1287 Meiers, Mark / Charlie Lake / (250) 827-3843 Nutrien Ag Solutions / Regina / 1-855-569-9444 NEWKIRK BI: AAFC, DIST: N/A Limoges, Daniel / Girouxville / (780) 833-1287		F		C C C

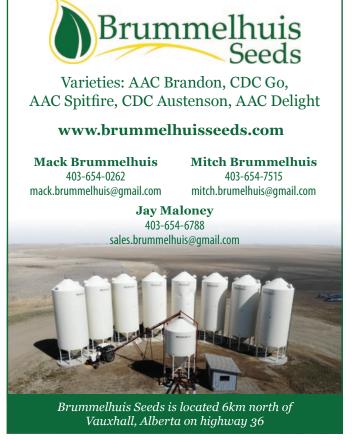
CANARYGRASS	s	F	R	C
CDC CIBO ©* BI: CDC, DIST: Canterra Seeds				
Jonk, Nicholas / Westlock / (780) 349-5458			R	
CHICKPEAS	s	F	R	(
CDC EBONY				Γ
BI: CDC, DIST: N/A		F	R	
Willms Seeds / Grassy Lake / (403) 655-2434 CDC LEADER		F	K	
BI: CDC, DIST: N/A				
Penwest Seeds / Three Hills / (403) 443-2577				١
Willms Seeds / Grassy Lake / (403) 655-2434				١
CDC ORION				
BI: CDC, DIST: N/A Kiffiak, Nathan J. & Anderson, Tim / Foremost / (403) 867-2338				l,
CDC PALMER				ľ
BI: CDC, DIST: SeedNet Inc.				
Willms Seeds / Grassy Lake / (403) 655-2434			R	
FABA BEANS	s	F	R	(
219-16 ⁽³⁾				Ī
BI: CDC, DIST: N/A				
Stamp Seeds / Enchant / (403) 739-2233	S	F		
Willms Seeds / Grassy Lake / (403) 655-2434	S	F		
CDC SNOWDROP BI: CDC, DIST: N/A				
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		
Klempnauer, Joerg / Vauxhall / (403) 330-5480	3	ļ'	R	
Simco Seeds / Ponoka / (780) 372-2111				
DL RICO ®*				
BI: DL Seeds, DIST: Prairie Fava				

Stamp Seeds / Enchant / (403) 739-2233

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GRANMA				
BI: N/A, DIST: N/A			_	
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R	
LENTILS	s	F	R	С
LEITHES	3	г	ĸ	·
CDC IMPULSE ®*				
BI: CDC, DIST: SeCan Members				
Nieboer, Nathan / Bow Island / (403) 545-2222				С
CDC LIMA				
BI: CDC, DIST: SeCan Members				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S	F		
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736	S	F		
Willms Seeds / Grassy Lake / (403) 655-2434	S	F		
CDC NIMBLE ®*				
BI: CDC, DIST: Sask. Pulse Growers				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S			
Geldreich, Dave / Bow Island / (403) 545-2222	S			
CDC PROCLAIM (9)				
BI: CDC, DIST: SeedNet Inc.				
Benci Seed Farms / Carmangay / (403) 643-2294	S	F		С
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736			R	
Penwest Seeds / Three Hills / (403) 443-2577			R	
Sleepy Hollow Seeds Ltd. / Milk River / (403) 647-2228			R	С
Witdouck Farms Ltd. / Iron Springs / (403) 738-4395			R	
CDC REDMOON (b)				
BI: CDC, DIST: SeCan Members				
Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S			
MUSTARD	_	_	_	
MOSTARD	S	F	R	С
AAC ADAGIO ®*				
BI: AAFC (Saskatoon), DIST: N/A				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				С
AC VULCAN				
BI: AAFC (Saskatoon), DIST: N/A				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C*

ANDANTE				
BI: AAFC (Saskatoon), DIST: N/A				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				С
Nutrien Ag Solutions / Regina / 1-855-569-9444				С
CENTENNIAL				
BI: N/A, DIST: Nutrien Ag Solutions/Proven Seed				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736		F		С
Nutrien Ag Solutions / Regina / 1-855-569-9444				С
CUTLASS				
BI: N/A, DIST: Nutrien Ag Solutions/Proven Seed				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736		F		С
Nutrien Ag Solutions / Regina / 1-855-569-9444				С
FORGE				
BI: N/A, DIST: Nutrien Ag Solutions/Proven Seed				
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				C,
Nutrien Ag Solutions / Regina / 1-855-569-9444				С
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PEAS - FORAGE	s	F	R	С
	S	F	R	С
CDC HORIZON	S	F	R	С
CDC HORIZON BI: CDC, DIST: Mastin Seeds	S	F		С
CDC HORIZON BI: CDC, DIST: Mastin Seeds Foster, Norman R. / Beaverlodge / (780) 354-2107	S	F	R	С
CDC HORIZON BI: CDC, DIST: Mastin Seeds Foster, Norman R. / Beaverlodge / (780) 354-2107 Froese, Cornelius H. / La Crete / (780) 927-4645	Ì			
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CDC HORIZON BI: CDC, DIST: Mastin Seeds Foster, Norman R. / Beaverlodge / (780) 354-2107 Froese, Cornelius H. / La Crete / (780) 927-4645 Hadland, Edward / Baldonnel / (250) 793-9746 Jonk, Nicholas / Westlock / (780) 349-5458 Mastin Seeds / Sundre / (403) 556-2609 CDC LEROY BI: CDC, DIST: N/A Chin Ridge Seeds Ltd. / Taber / (403) 223-3900 DL DELICIOUS ©* BI: DL Seeds, DIST: FP Genetics Nieboer, Nathan / Bow Island / (403) 545-2222 DL GOLDEYE ©* BI: NDL Seeds, DIST: Riddell Seed Co. Simco Seeds / Ponoka / (780) 372-2111 DL LACROSS ©*	s s	F	R R	



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Prestville Farms Ltd. / Rycroft / (780) 814-2849			R	
BLUEMAN BLUE Soods DIST: Sood Not Inc				
BI: DL Seeds, DIST: SeedNet Inc. Stamp Seeds / Enchant / (403) 739-2233		F		
Wheatcrest Farms / Lomond / (403) 792-3696	S	F		
CDC DAKOTA				
BI: CDC, DIST: N/A Klempnauer, Joerg / Vauxhall / (403) 330-5480	S			С
Stamp Seeds / Enchant / (403) 739-2233	S			
CDC FOREST ®*				
BI: CDC, DIST: SeCan Members Baier, Bill & Dean / Clyde / (780) 348-5791			R	
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377			R	
Hallett, Dale R. & Richard / Carstairs / (403) 337-3072			R	
Hoff, Peter Edward / Gleichen / (403) 734-2140 Penwest Seeds / Three Hills / (403) 443-2577	S	F	R	
Thompson, M. Ellwood & Kelly / Red Deer County / (403) 728-3535		F	K	
CDC GREENWATER				
BI: CDC, DIST: Saskatchewan Pulse Growers			-	_
Holmstrom, Darrell / Killam / (780) 385-3574 Willms Seeds / Grassy Lake / (403) 655-2434		F	R R	С
CDC LIMERICK		'	IX	
BI: CDC, DIST: Saskatchewan Pulse Growers				
Ellis, Brian / Olds / (403) 556-2890			-	С
Haralie Seed Farms / Beaver County / (780) 662-2617 Howard, Fred / Wanham / (780) 694-2427	S *	F*	R	
Lindholm Seed Farm / New Norway / (780) 352-3240	5	'	R	С
McDonald, Gerald / Co. Of Grande Prairie #1/ (780) 538-3868				С
Sendziak Seed Farm / Edmonton / (780) 434-1322 CDC RAEZER				С
BI: CDC, DIST: N/A				
Kapitski, Lawrence / Andrew / (780) 365-2134				С
Krywko, Ronald / Sturgeon County / (780) 939-1719				С
LS Land & Cattle / Didsbury / (403) 335-3694 Plante, Jacques / St. Paul / (780) 645-4604				C
CDC SPRUCE				C
BI: CDC, DIST: SeCan Members				
Archer, Nathan / Didsbury / (403) 556-0693				С
Baier, Bill & Dean / Clyde / (780) 348-5791 Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377				C
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036				C
Lampron,Claude / St. Vincent / (780) 614-1413				С
CDC STRIKER				
BI: CDC, DIST: N/A Simco Seeds / Ponoka / (780) 372-2111				С
CDC TETRIS				
BI: CDC, DIST: N/A				
Richard, Gerald / Spirit River / (780) 864-2339				С
BI: Innoseeds, DIST: Canterra Seeds				
Cyre, Clifford & Greg / Barrhead / (780) 307-4332				С
GARDE BI:N/A, DIST: Bob Park				
Alect Seeds / Three Hills / (403) 443-9599				С
Hegland, David Olaf / Wembley / (780) 766-2450		R		С
Lohner, Kevin / Daysland / (780) 679-6309				С
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				С
				_
PEAS - MAPLE	s	F	R	С
				_
AAC LISCARD				
BI: AAFC (Lacombe), DIST: N/A	S	F	R	
	S	F	R	
BI: AAFC (Lacombe), DIST: N/A Stamp Seeds / Enchant / (403) 739-2233 CDC BLAZER BI: CDC, DIST: SeCan Members	S	F	R	
BI: AAFC (Lacombe), DIST: N/A Stamp Seeds / Enchant / (403) 739-2233 CDC BLAZER	S	F	R	С
BI: AAFC (Lacombe), DIST: N/A Stamp Seeds / Enchant / (403) 739-2233 CDC BLAZER BI: CDC, DIST: SeCan Members	S	F	R	С
BI: AAFC (Lacombe), DIST: N/A Stamp Seeds / Enchant / (403) 739-2233 CDC BLAZER BI: CDC, DIST: SeCan Members	S	F	R	С
BI: AAFC (Lacombe), DIST: N/A Stamp Seeds / Enchant / (403) 739-2233 CDC BLAZER BI: CDC, DIST: SeCan Members	S	F	R	С
BI: AAFC (Lacombe), DIST: N/A Stamp Seeds / Enchant / (403) 739-2233 CDC BLAZER BI: CDC, DIST: SeCan Members	S	F	R	С
BI: AAFC (Lacombe), DIST: N/A Stamp Seeds / Enchant / (403) 739-2233 CDC BLAZER BI: CDC, DIST: SeCan Members	S	F	R	С

PEAS - YELLOW	c	F	D	_
	S	г	R	<u> </u>
AAC ARDILL BI: AAFC (Lacombe), DIST: N/A				
Hartzler, Leonard / Carstairs / (403) 337-2416				С
Penwest Seeds / Three Hills / (403) 443-2577 Sand's Seed Farm Ltd. / McLaughlin / (780) 745-2251	S		R	C
AAC BARRHEAD &			IX.	C
BI: AAFC (Lacombe), DIST: N/A				С
Hadland, Edward / Baldonnel / (250) 793-9746 Jackson, Thomas / Killam / (780) 385-2332				C
Konieczny, Scott / Mannville / (780) 581-5693		_	D	С
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713 AAC CARVER (2)		F	R	
BI: AAFC, DIST: Canterra Seeds				
Assure Seeds Ltd. / Acme / (403) 510-9260 Beaulieu, Emery / Fairview / (780) 835-8525			R R	
Benci Seed Farms / Carmangay / (403) 643-2294	S		R	С
Boisvert, Marc / Girouxville / (780) 618-4724				C
Carl's Ag Ventures Ltd. / Hays / (403) 725-2213 Echo Ridge Seeds / Stettler / (403) 883-2503			R	C
Eliason, Bruce W. / Wrentham / (403) 222-2258				С
Ellis, Brian / Olds / (403) 556-2890 Felstad, Colin / Dapp / (780) 349-9505	S	F		C*
Goode, Tim / Lacombe / (403) 506-9424				С
Haney Farms Ltd. / Picture Butte / (403) 738-4517			R	
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268 Jonk, Nicholas / Westlock / (780) 349-5458				C C
Kapitski, Lawrence / Andrew / (780) 365-2134				C
King's Seed Farm Ltd. / Three Hills / (403) 443-3333				С
Meinczinger, Matthew Jr. / Busby / (780) 349-2456 Penwest Seeds / Three Hills / (403) 443-2577	S	F	R	C C
Plante, Jacques / St. Paul / (780) 645-4604				С
Prestville Farms Ltd. / Rycroft / (780) 814-2849 Richards, Dan / Sexsmith / (780) 766-2266			R	C C
Rix, Graham / Wetaskiwin / (780) 360-9234			П	С
Sendziak Seed Farm / Edmonton / (780) 434-1322			R	
Solick Seeds Ltd. / Halkirk / (403) 884-2358 Specialty Seeds Ltd. / Bow Island / (403) 545-6018			R	C C
True Seeds Ltd. / Redwater / (780) 777-5885				C*
Unrau, George / La Crete / (780) 926-1133			R	С
Wuthrich, David / Cecil Lake / (250) 781-3527 AAC CHROME ®*			R	
BI: AAFC (Lacombe), DIST: FP Genetics	_			
Benci Seed Farms / Carmangay / (403) 643-2294 Chin Ridge Seeds Ltd. / Taber / (403) 223-3900	S		R R	С
Galloway Seeds Ltd. / Fort Saskatchewan / (780) 998-3036			R	
Geldreich, Dave / Bow Island / (403) 545-2222	S	F F		
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268 King's Seed Farm Ltd. / Three Hills / (403) 443-3333		F		
Markert Seeds Ltd. / Vulcan / (403) 485-6708			R	
Nieboer, Nathan / Bow Island / (403) 545-2222 Prestville Farms Ltd. / Rycroft / (780) 814-2849			R R	
Simco Seeds / Ponoka / (780) 372-2111	S		R	
Solick Seeds Ltd. / Halkirk / (403) 884-2358	_	F	R	
Stamp Seeds / Enchant / (403) 739-2233 AAC DELHI	S	F	R	
BI: AAFC (Lacombe), DIST: SeedNet Inc.		_		
Specialty Seeds Ltd. / Bow Island / (403) 545-6018 Stamp Seeds / Enchant / (403) 739-2233	S	F F		
Wheatcrest Farms / Lomond / (403) 792-3696	S	F		
AAC LACOMBE ®				
BI: AAFC, DIST: SeedNet Inc. Alect Seeds / Three Hills / (403) 443-9599				C*
Benci Seed Farms / Carmangay / (403) 643-2294				C*
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377 Ellis, Brian / Olds / (403) 556-2890	S	F	R*	C*
Forward Seed Farm / County Of Barrhead / (780) 674-3822	3			С
Moffitt, Kenneth & Raymond / Radway / (780) 818-6550			n	С
Mueller, Richard J., R.R. & Rosemary / Barrhead / (780) 674-6713 Stamp Seeds / Enchant / (403) 739-2233		F	R	
Victoor Seed Farm Inc. / Sturgeon County / (780) 459-3253		F		
Witdouck Farms Ltd. / Iron Springs / (403) 738-4395 AAC PROFIT **				С
BI: AAFC (Lacombe), DIST: N/A				
Geldreich, Dave / Bow Island / (403) 545-2222	S			
ABARTH (!) BI: Limagrain, DIST: FP Genetics				
Nieboer, Nathan / Bow Island / (403) 545-2222			R	
Stamp Seeds / Enchant / (403) 739-2233			R	С

CDC AMARILLO				
BI: CDC, DIST: Saskatchewan Pulse Growers				
Alect Seeds / Three Hills / (403) 443-9599			R*	C*
Davidson, E. Daryl & Dean / Kitscoty / (780) 846-2456			R	С
Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383				С
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377				C*
Harbin, Clifford T. & Bruce C. / Rivercourse / (780) 745-2268				C C
Harris, William P., Linda, Thomas & Alex / Beaverlodge / (780) 354-2823 Limoges, Richard / McLennan / (780) 324-2335	S			С
Lindholm Seed Farm / New Norway / (780) 352-3240	3			С
Mueller, Darcy / Three Hills / (403) 820-4115				С
Pare, Raymond A. / Wainwright / (780) 842-2073			R	Ŭ
CDC ATHABASCA (9)				
BI: CDC, DIST: SeCan Members				
Harris, William P., Linda, Thomas & Alex / Beaverlodge / (780) 354-2823	S			
CDC CANARY ®*				
BI: CDC, DIST: SeCan Members		_		
Degenhardt, Keith, Terry L. & Kerry / Hughenden / (780) 856-2383		F	D	
Kittle Farms Ltd. / Viking / (780) 336-2583 Klapstein, Dallas / Calmar / (780) 819-4993		F	R R	
Metzger, Marty / Carbon / (403) 572-3284			R	
Pare, Raymond A. / Wainwright / (780) 842-2073	S	F	IX	
Wood, James / Elnora / (403) 596-4189	Ü		R	
CDC INCA ®				
BI: CDC, DIST: SeedNet Inc.				
Airth, Jock & Linda / Brooks / (403) 362-4372			R	
Assure Seeds Ltd. / Acme / (403) 510-9260		_		С
Benci Seed Farms / Carmangay / (403) 643-2294	S	F	R	C
Dewindt, Harry & Hoyme, Renee / Thorhild / (780) 398-2377			D	C*
Eliason, Bruce W. / Wrentham / (403) 222-2258 Hoff, Peter Edward / Gleichen / (403) 734-2140			R	C
Jackson, Thomas / Killam / (780) 385-2332			R	С
Jacula, Dean S. & Shawn D. / Vermilion / (780) 581-9011	S	F	R	С
Klassen, Ken / Rosemary / (403) 378-4408	Ü			C
Lindholm, Luke & Stevan / Camrose / (780) 781-6077				С
Markert Seeds Ltd. / Vulcan / (403) 485-6708	S	F	R	С
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736				С
Oatway's Seed Farm Ltd. / Clive / (403) 784-3001				С
Sayer, Roger / Carstairs / (403) 337-5847				С
Sich, Louis John / Trochu / (403) 442-2112			D	С
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Specialty Seeds Ltd. / Halkink / (403) 684-2338 Specialty Seeds Ltd. / Bow Island / (403) 545-6018				С
True Seeds Ltd. / Redwater / (780) 777-5885				С
Wheatcrest Farms / Lomond / (403) 792-3696				С
Willms Seeds / Grassy Lake / (403) 655-2434				С
Wood Seed Farm Ltd. / Bowden / (403) 588-3548				С
CDC LEWOCHKO				
BI: CDC, DIST: SeCan Members		_		
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929	_	F		
Lindholm Seed Farm / New Norway / (780) 352-3240	S S			
Mercer Seeds Ltd. / Lethbridge / (403) 327-9736 CDC MEADOW	3			
BI: CDC, DIST: N/A				
Benci Seed Farms / Carmangay / (403) 643-2294				С
Echo Ridge Seeds / Stettler / (403) 883-2503				C
Felstad, Colin / Dapp / (780) 349-9505				С
Hadway, W. Tom & Carol / Didsbury / (403) 335-4929			R	
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		_
Hartzler, Leonard / Carstairs / (403) 337-2416				С
King's Seed Farm Ltd. / Three Hills / (403) 443-3333		F*	R*	С
Kittle Farms Ltd. / Viking / (780) 336-2583 Klapstein, Dallas / Calmar / (780) 819-4993				C
Limoges, Richard / McLennan / (780) 324-2335				С
Markert Seeds Ltd. / Vulcan / (403) 485-6708				С
Meinczinger, Matthew Jr. / Busby / (780) 349-2456				С
Metzger, Marty / Carbon / (403) 572-3284				С
Nemetz, Charlie, Jerritt & Lewis / Stettler / (403) 742-0436				С
Page, Dan / Didsbury / (403) 335-4563				С
Penwest Seeds / Three Hills / (403) 443-2577			_	C*
Radke, Bryan Victor / Barrhead / (780) 674-5715			R	
CDC SAFFRON BI: CDC, DIST: N/A				
Fabian Seed Farms / Tilley / (403) 377-2000				С
Fletcher, Tyler / Smoky Lake / (780) 656-0507				С
Haralie Seed Farms / Beaver County / (780) 662-2617	S*	F*		
Klassen, Ethan / Coaldale / (403) 345-3770				С
Kopjar, Gerald M. / Rowley / (403) 368-2409			R	
Lefsrud Seed / Viking / (780) 336-2500			R	С
LS Land & Cattle / Didsbury / (403) 335-3694				С

BI: CDC, DIST: SeCan Members Carl's Ag Ventures Ltd. / Hays / (403) 725-2213				С
Dyck, Ernie / La Crete / (780) 821-9445 Hoff, Peter Edward / Gleichen / (403) 734-2140	S	F	R R	C
Jonk, Nicholas / Westlock / (780) 349-5458 Kopjar, Gerald M. / Rowley / (403) 368-2409 Nikkel, Ed & Darren / Lethbridge / (403) 312-4070 Sand's Seed Farm Ltd. / McLaughlin / (780) 745-2251 Sekulic, John Jr. / Rycroft / (780) 765-2280 True Seeds Ltd. / Redwater / (780) 777-5885 Wildeman, Russell / Clive / (403) 784-3695	S	F	R R	C C C C
Willms Seeds / Grassy Lake / (403) 655-2434 LN4228 BI: Limagrain, DIST: Lindholm Seed Farm				С
Lindholm Seed Farm / New Norway / (780) 352-3240			R	С
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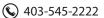


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Strengthening the Seed Chain in the Americas Benefits Everyone



Scott Horner, General Manager, HyTech Production

WHEN ASKED "WHAT'S NEW?" I always have to stop and pause. If you've asked me this and wondered why the pause, it's not because of a lack of issues we are working on or that I'm thinking of the proper words. Working on issues in the seed industry is like building a cathedral. It's slow, it's planned, it's intentional and it's a continual layering of stone and other materials.

The Seed Association of the Americas (SAA) is committed to promoting and facilitating the seed business in North and South America. The main topics common to both continents are phytosanitary matters, with the focus of facilitating trade; biotechnology and innovation in genetic improvement; treatments and technologies applied to seed; and finally, innovation in genetic plant breeding, intellectual property and breeder's rights.

Held in conjunction with the Argentine seed association, SAA held its 7th Seed Congress of the Americas Sept. 10 – 12 in Buenos Aires, Argentina. This meeting brings representatives from the seed industry together with those who work in regulatory roles, allowing for productive dialogues and debates needed to work through some of the most important issues at hand.

Regarding phytosanitary matters, it's been two years since the International Plant Protection Convention approved the International Standard for Phytosanitary Measures (ISPM) No. 38. The Working Group continues its work with national associations to evaluate efforts made by official organizations, by industry and the interaction of both on these issues. Our goal here is to identify and analyze new challenges and to capitalize on the advances to solve phytosanitary issues within the SAA countries. We're also promoting the implementation of and defining actions that help facilitate the international movement of seed.

One of the constraints to the movement of seed within the Americas is treated seed. We are working to better understand the characteristics and benefits of treatments and technologies applied to seed, as well as the regulatory aspects that must be considered when moving treated seed internationally. Given the tremendous growth in the trade of treated seed among the Americas and throughout the world, there needs to be a space where we can answer frequently asked questions. The Seed-Applied Technologies



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"SAA seeks to promote plant breeding innovations ..."

-Scott Horner

Working Group focuses on providing information that industry and regulating entities might need to help foster the movement of treated seed. Expanding on those efforts to inform, it also offers the public a clearer vision of how these new technologies benefit farmers and the environment in a sustainable way.

In addition to promoting advancements in seed-applied technologies, SAA seeks to promote plant breeding innovations,

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such as CRISPR-Cas9 and other gene editing techniques. While technology has quickly evolved, country-specific regulatory frameworks have not, potentially delaying the availability of new products for farmers. I'm proud because our region, the Americas, is the vanguard region where governments have issued regulations for gene editing. Clearly separating GMO regulations from those that regulate gene editing, which does not involve transgenesis, is crucial to continuing rapid innovation. Academia, research institutes and companies of all sizes consider gene editing a tool of the highest potential. SAA partners with other international seed associations at a regional and global scale to support and encourage the development of regulatory frameworks based on science and that allow for and promote continued plant breeding innovations that benefit all stakeholders, from farmers to consumers.

Another piece of the puzzle that must be in place to help advance innovation is a strong intellectual property environment. The effective protection of intellectual property in such cutting-edge technology developments is crucial for the future of the sector and the agri-food chain; however, it is a big challenge. The Intellectual Property Working Group explores the regulatory frameworks, coexistence of rights, the generation of value through the collection of royalties and the enforcement tools of these innovations. It's also monitoring the potential use of molecular markers for the identification and differentiation of

Each time SAA members meet, it's a stimulating experience and we all appreciate how the SAA ultimately benefits growers back at home. Our working groups and staff are empowered through the excellent exchange of information, experiences and opinions. This fosters new ideas, solutions and strategies to advance our mission, to promote and facilitate the business of seed in the Americas.

To a farmer in Alberta, South America may seem far away, but working together through an international platform like SAA has a ripple effect that spreads to not only the Canadian seed industry, but ultimately back to farm fields everywhere. •



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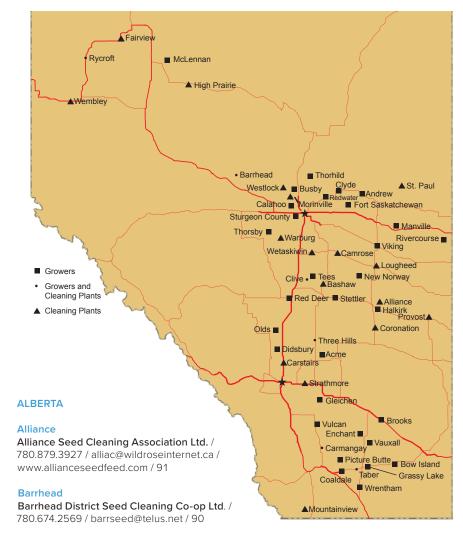
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Discovery of Sorghum Gene that Controls Bird Feeding Could Help Protect Your Crop

A single gene in sorghum controls bird feeding behaviour by simultaneously regulating the production of bad-tasting molecules and attractive volatiles, according to a study published Sept. 23, 2019, in the journal *Molecular Plant*. This gene, called Tannin1, controls the synthesis of bird-deterring astringent polyphenols called tannins. The authors suggest the findings could lead to novel control strategies to protect major cereal crops worldwide.

Damage by birds causes great loss to agricultural production worldwide. With cereal crops, birds cause damage by pecking seeds and sucking the juice of immature seeds, preventing full development of many grains and frequently encouraging mildews and other plant diseases. Currently, there are few efficient control measures to protect field crops from bird damage.

Some cereal crops most vulnerable to bird damage include wheat, barley, rice, sorghum, and millet. Sorghum is a major global cereal crop that is a steady source of calories for more than 500 million people worldwide and is also an important source of biofuels. Sorghum yield losses caused by birds have been reported to reach as high as 52 per cent. Some evidence suggests that bird taste preferences depend on various properties of sorghum, but the underlying molecular or chemical basis has not been clear.

By conducting a genome-wide association study, co-senior study authors Qi Xie and Yaorong Wu of the Chinese Academy of Sciences discovered that Tannin1 regulates bird feeding behaviour. The sorghum lines avoided by birds contain the wild-type version of Tannin1, while the bird-preferred sorghum lines have a mutated version of the gene. *Source: Cell Press*

Soap from Straw: Scientists Develop Eco-Friendly Ingredient from Agricultural Waste

A scientist has discovered a way of using one of the world's most abundant natural resources as a replacement for man-made chemicals in soaps and thousands of other household products.

An innovative research project, published this month and led by the University of Portsmouth, has demonstrated that bails of rice straw could create a "biosurfactant," providing an alternative non-toxic ingredient in the production of a vast variety of products that normally include synthetic materials, which are often petroleum based.

The biotechnology project set out to solve one of the planet's most pressing environmental problems, looking for a way of reducing the amount of man-made chemicals in everyday life. It has been co-supervised by the University of Portsmouth's Centre for Enzyme Innovation, working in conjunction with Amity University in India and the Indian Institute of Technology.

The study was looking for a natural replacement for chemical surfactants, a main active ingredient in the production of cleaning products, medicine, sun cream, make-up and insecticides. *Source: University Of Portsmouth*

Harnessing Tomato Jumping Genes Could Help Speed-Breed Drought-Resistant Crops

Researchers from the University of Cambridge's Sainsbury Laboratory (SLCU) and Department of Plant Sciences have discovered that drought stress triggers the activity of a family of jumping genes (Rider retrotransposons) previously known to contribute to fruit shape and colour in tomatoes.

"Transposons, more commonly called jumping genes, are mobile snippets of DNA code that can copy themselves into new positions within the genome."

Transposons, more commonly called jumping genes, are mobile snippets of DNA code that can copy themselves into new positions within the genome — the genetic code of an organism. They can change, disrupt or amplify genes, or have no effect at all. Discovered in corn kernels by Nobel prize-winning scientist Barbara McClintock in the 1940s, scientists are increasingly realizing that transposons are not junk at all but actually play an important role in the evolutionary process, and in altering gene expression and the physical characteristics of plants.

Their characterization of Rider, published in PLOS Genetics, revealed that the Rider family is also present and potentially active in other plants, including economically important crops such as rapeseed, beetroot and quinoa. This highlights its potential as a source of new trait variations that could help plants better cope with more extreme conditions driven by our changing climate. This wide abundance encourages further investigations into how it can be activated in a controlled way, or reactivated or re-introduced into plants that currently have inactive Rider elements so that their trait diversification potential can be regained. Such an approach has the potential to significantly reduce breeding time compared to traditional methods. Source: University of Cambridge Sainsbury Laboratory

Study Opens Door to Flood-Resistant Crops

Of all the major food crops, rice is the only crop that can survive flooding. New research conducted by scientists at the University of California Riverside (UC Riverside) could soon change this as some of the genes involved in adaptation in rice also exist in other plants. The scientists found that a wild-growing tomato, a tomato for farming, and a plant similar to alfalfa share at least 68 gene families that are activated as a response to flooding. The UC Riverside team hopes to use the knowledge about rice in activating the genes in other plants to help them survive waterlogging.

The research team examined cells located at the roots' tips, as roots are the first responders to flood. Root tips and shoot buds are also where the plant's prime growing potential resides. These two regions contain cells that can help a plant become more resilient to flooding. *Source: ISAAA*



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