Grow With Us

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LAKELAND AGRICULTURAL RESEARCH ASSOCIATION

IN THIS ISSUE

Investigating the impact of low-growing clovers and nitrogen rates on silage crop yield, weed pressure, cereal leaf disease levels, and forage quality

by Lance Ouellette, LARA

According to Farm Credit Canada, crops planted and grown in 2023 were the most expensive to ever be put in the ground (Vossler 2024). Producers are thus looking for alternatives to reduce the costs of production, while maintaining and/or increasing crop yield. The solution may lie in under-seeding the cereal crop with an annual low-growing clover. Subterranean clover (Trifolium subterraneum L.) is an annual legume with high palatability. A native of the mediterranean region, it can tolerate warm and drought conditions. White clover (Trifolium repens L.), on the other hand, may be more familiar to producers in Alberta. It is a cool seasoned legume that is often put in pasture mixes. It has good shade tolerance. It can overwinter in Alberta if conditions are not too extreme (mild winters with ample snow cover). It differs from Subterranean clover in that it can tolerate cool and wet conditions. Some pasture mixes will include both clovers to cover both environmental scenarios. In terms of nutrient content, white clover, for example, has a crude protein content of 25% (over 6 times higher than straw). Total digestible nutrient (energy) is high (~80%). Calcium content is estimated to be 1.5% (almost ten times that of straw). Phosphorus content is estimated to be 0.4% (almost four times that of straw). White clover can fix from 100 to 150 lbs of N/acre. Some of which would invariably be uptaken by the removal of above-ground biomass (i.e. grazing).

In this scenario, producers would first harvest their silage crop in late July or early August, which would open the canopy for the clover undergrowth to access sunlight and maximize plant growth before freezing up (6-8 weeks). The primary goal of this practice would be to offer producers another grazing window prior to winter feeding, such as swath and bale grazing. The secondary goal of this practice would be to reduce N fertilizer rates, and thereby reducing input costs, as cereal-legume intercrops typically require lower N rates. The third goal would be to offer a competitive environment where weeds are out competed early in the season.

Figure 1: Oats (Avena sativa L.) under-seeded in a mixed row to Subterranean clover (Trifolium subterraneum L.). Photo taken at the LARA Research Farm (Ft-Kent, Alberta) on July 2nd, 2024.

Objectives

With these goals in mind, the Lakeland Agricultural Research Association (LARA) set forth a research trial in 2024 with objective is to evaluate the effects of either feed barley (Hordeum vulgare L.) or oat (Avena sativa L.) into a relay crop of either with white clover (Trifolium repens L.) or subterranean clover (Trifolium subterraneum L.) on: 1) weed pressure, 2) cereal leaf disease levels, 3) silage yield, and 4) forage quality, 5) N set as either 50 and 75% of recommended rate (RR), respectively.

Table 2. Least squares means and p-values for the interaction effect of clover, cereal and nitrogen rate. Study was conducted at LARA's research farm (Fort-Kent, Alberta) in 2024 (n=40).

Effect	Clover	Cereal	Nitrogen rate (% of RR)	Estimate (tons/ac)	Standard error	Degrees of free-dom	T val-ue
Clover*Cereal*N	Subterranean	Oat	50	2.3 c	0.19	27	12.15
Clover*Cereal*N	Subterranean	Oat	75	2.3 c	0.19	27	12.54
Clover*Cereal*N	None	Oat	100	2.4 c	0.19	27	12.94
Clover*Cereal*N	White	Oat	50	2.7 bc	0.19	27	14.33
Clover*Cereal*N	White	Oat	75	2.7 bc	0.19	27	14.36
Clover*Cereal*N	Subterranean	Barley	50	3.0 ab	0.19	27	15.83
Clover*Cereal*N	Subterranean	Barley	100	3.2 ab	0.19	27	17.13
Clover*Cereal*N	White	Barley	50	3.3 a	0.19	27	17.54
Clover*Cereal*N	None	Barley	100	3.3 a	0.19	27	17.75
Clover*Cereal*N	White	Barley	75	3.4 a	0.19	27	18.2
	P value*						
Clover	0.0512						
Cereal	**<0.0001**						
N Rate	0.713						
Clover*Cereal	0.728						
Clover*N Rate	0.721						
Cereal*N Rate	0.725						
Clover*Cereal*N Rate	**<0.0001**						

*Least squared means were significant at an alpha level of <0.05.

Preliminary Results from 2024

The 2024 growing season did not follow long-term weather trends. It was unseasonably dry in the months of June, July and August. This was reflected in below average yields for oats and barley, respectively (Table 2.) Likewise, we did observe noticeable differences forage quality for the clover+cereal mixes. Yet despite the drought conditions, significant differences were observed with cereal type (P<0.0001) as well as the interaction of cereal*clover*nrate (P<0.0001). Feed barley outyielded oats. These results were not out of the ordinary as barley tends to tolerate drought conditions better than oats. It was also noticed that we had a better establishment of subterranean clover compared to white clover, which likely influenced the grain yield in those mixes. In the cereal+white clover mixes, thus behaved more as a monocrop instead of an intercrop. These results demonstrate that there was a yield decrease in the cereal+subterranean plots. This decrease was most likely exacerbated by the drought conditions, where the established clover was competing with the cereal for access to soil, water and nutrients.

For more information on this trial, visit www.laraonline.ca.

Full results are published in our annual report.

This project was supported by:

Practical Tools to Protect Canadian Livestock from Foot and Mouth Disease

by Beef Cattle Research Council

Beef producers feel the responsibility of keeping their herds and those in contact with their cattle safe, and they appreciate practical tools that support their disease prevention practices. When it comes to biosecurity practices on beef cattle operations, limiting hazards and appropriately responding with good management are key in disease prevention. These practices ultimately protect the herd and the Canadian livestock industry from the animal health and economic impacts of foreign animal diseases, including Foot and Mouth Disease (FMD).

To increase awareness of available tools for farmers and ranchers, a collaborative effort between the BCRC and Animal Health Canada (AHC) is currently underway ensuring that prevention and emergency response resources are being tailored specifically to the needs of Canadian beef producers.

Foot and Mouth Disease is a highly infectious virus that has serious consequences for the beef industry and populations of beef cattle and other cloven-hoofed animals worldwide, including severe economic and animal health impacts. Canada currently has an FMD-free without vaccination trade status and maintaining this status is the responsibility of all sectors within the industry.

Everyday Biosecurity Practices That Protect Cattle

Daily habits go a long way to reduce or prevent the spread of disease. Understanding the every-day risks of introducing disease to a beef cattle herd helps protect the animals and the people who care for them.

It is helpful to consider potential ways disease could enter your herd, including:

- shared fencelines,
- buying replacement heifers or bulls,
- borrowing trailers or other equipment,
- outsourcing farm work or
- hosting visitors from another farm or other countries.

Implementing biosecurity strategies that work on your farm can stop disease from entering, spreading and leaving your herd:

- Cleaning and disinfecting protocols
- Good management techniques, including vaccination protocols and animal husbandry to keep animals at a low risk of infection
- Good hygiene practices, including working with animals with the least exposure to pathogens to the animals with the greatest exposure to pathogens
- Quarantine protocols for animals leaving or entering the operation
- Hygiene protocols for people, animals and equipment leaving or entering the premises

On a broader scale, the biosecurity measures you implement are essential to keeping the Canadian Livestock industry thriving and free of reportable diseases and trade-limiting diseases including FMD.

For more information on Foot and Mouth Disease (FMD) please visit the Beef Cattle Research Council website at:

www.beefresearch.ca/fmd

Evaluating Virtual Fencing Technology at Field Scale Today

by Beef Cattle Research Council

Fencing is costly, running between $1,560 to $4,660/km in AB and $17,270 to $20,000/km in BC. This cost limits the adoption of both optimal grazing (e. intensive rotational grazing) and environmental (e.g., protection of sensitive habitats and riparian areas) management practices. Fences are prone to cutting and fire and moose and need maintenance. The lack of fencing is also a big deterrent to using cattle to graze crop residues, etc. on neighbouring operations.

Virtual fencing can solve these issues. The user defines GPS boundaries, accurate to within two meters, to fence cattle in or out of an area. The cattle wear a collar fitted with a battery, GPS antennae, LTE radio, and a "bump" to conduct electricity. When the antenna senses the cattle approaching a defined boundary, the collar emits audible electrical signals to discourage the cattle from approaching. The closer they get to the boundary, the stronger the signals get. The system works off LTE cellular technology when animals are in cell range, and GPS when they're not. Pasture moves can be done remotely by re-defining the boundaries. The technology also indicates where the cattle are to enable ranchers to keep tabs on their animals.

We previously developed the user interface to visualize the virtual fencing; this is a desktop application with basic tablet functionality. We tested the software with ranchers in the field and received positive feedback.

Objectives

- Development of a second generation collar built using learnings from previous trials that address the hardware issues encountered with the previous version of the collar by making gen 2 more robust with improved functionality.

What they Did

We designed and developed 20 second generation collars. These collars are a brand new design, started completely from scratch, that offer significantly improved physical robustness and functionality over our previous prototype.

Our team went through a rigorous process that included the development of a thorough power model, design and testing of multiple product configurations, hardware design and development, manufacturing, firmware programming, API development, and experiment design. The collars are now lighter than our previous design with a smaller surface area and more comfortable strap. We additionally anticipate that the collars will be more affordable. Crucially, these second generation collars will resolve the hardware failures we encountered with our first generation collars.

We have performed a promising fit test in Kamloops, BC and will next be performing additional field testing in the Burns Lake area to inform further development.

What They Learned

An experienced rancher in the community performed a fit test with one of the new collars while our team monitored for support and to collect feedback. The fit test was recorded and photographs were taken. We identified some opportunities for improvement around the stability of the collar, as the collar could slide down to the side when the head was shaken aggressively. The stimulus terminals remained in contact with the animal and the animal was comfortable with the collar after a few minutes.

We have designed and planned a complete field test for April 2023 which will confirm that we have resolved the hardware issues we encountered with our first prototypes. Our goal is to confirm that cattle respond to the stimuli at the chosen parameters and then learn the association between the stimuli and the geofence. Once the field test is successful, rancher feedback about the product's usability and technical data from the collars will inform on our priorities for future product development towards commercialization.

What It Means

We believe the next stage is a commercial generation of collars. After performing the primary field testing in April and processing the results, we will develop a concrete plan for development over the summer of 2023. Depending on the primary field test results, actual hardware modifications between the second and third generation may be either minimal or more significant, but we anticipate hardware modifications will be minimal and development will be largely focused on the control software.

We anticipate that development over the summer will lead to another small scale test in the Fall, followed by production of at least 100 but less than 1,000 collars. These collars would be tested for a complete season with multiple ranchers over the 2024 grazing season. If our 2024 season test was successful, the hardware would be ready for a commercial launch.

This project was funding by The Beef Cattle Industry Development Fund, Beef Cattle Research Council, Canadian Beef Cattle Check-off and the BC Cattlemens Association.

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Cattle wearing virtual fencing collars. Photo source: Canadian Cattlemen Magazine.

Performance Evaluation of Two-Row and Six-Row Forage Barley Mixtures

by Momna Farzand, LARA

The production of high-yielding and high-quality forage has been a big challenge for Alberta livestock producers because of severe drought conditions across multiple regions of the province since 2021. Water stress and associated crop and pasture failures leave many growers producing insufficient quantities of forage for livestock operations. The shortage of available forage indicates that producers may need to adopt new strategies to get the most yield possible when water is limited due to drought conditions. Perennial forages (grasses or legumes) create a good basis for livestock farming systems, but many perennial forages go dormant as a survival mechanism under drier conditions (Taleb et al., 2023). Annual forages are known to use water more efficiently than perennial forages and could be utilized as additional livestock feed during times of limited rainfall and perennial pasture shortage. Barley is one of the most widely grown annual forage crops in western Canada because it is highly adaptable to diverse growing conditions. It is more water use efficient than other small grains, making it a valuable annual forage crop during moisture-stressed periods.

In 2023, approximately 157,000 hectares of silage barley was harvested, with the total estimated production of 2.3 million tonnes in Alberta (Wong, 2024). Anecdotal accounts from cattle producers in Northeastern Alberta have indicated that higher forage yields may be obtained when growing two-row and six-row barley mixtures. However, there have been no assessments performed in an applied research settings to endorse this claim in Northeastern Alberta. A field study conducted by Gill et al. (2013) in the Peace region of Alberta revealed that two-row barley are superior to six-row barley in terms of forage yield and nutritional quality. Therefore, we hypothesized that mixing and planting a suitable ratio of phenotypically contrasting barley varieties would increase forage biomass and improve the overall nutritional profile of a blend. To test this hypothesis, four new barley varieties in the Lakeland region of Alberta, each representing a unique combination of spike type, two-row or six-row, were utilized in a field trial with the following principal objectives.

Objectives

1. To determine the performance of two-row and six-row barely pure stands as well as their binary mixtures in three seeding ratios (1:1, 1:3, and 3:1) for forage dry matter (DM) yield.
2. To determine the performance of two-row and six-row barely pure stands as well as their binary mixtures in three seeding ratios (1:1, 1:3, and 3:1) for forage nutritional quality.
3. To determine if further research is warranted as this project is a one-year proof of concept project.

Materials and Method

The trial was carried out from May 15, 2024, to Aug 02, 2024, at the LARA research farm (54° 18'N, 110° 37'W; NE 25-61-5-W4) in Fort Kent, Alberta. For weed control, a pre-seed burnoff was carried out with one spray of glyphosate (540g ai/L). The treatments were comprised of 2 two-row (AB Maximizer and AAC Lariat) and 2 six-row (AB Tofield and AB Standswell) varieties in pure stands as well as in twelve possible binary mixtures of 1:1, 1:3, and 3:1 seedling ratio. CDC Austenson was seeded as a check variety. Desired plant density was set to 300 plants/m2 for all plots.

The experiment was planted in a randomized complete block design (RCBD) with four replications of each treatment. LARA Fabro five row seeder was used for seeding with 9" row spacing. Plots were seeded to a depth of 1-1.5" depending on soil conditions and available moisture. As per soil test, the recommend rate of fertilizers (84:43:14 lbs NPK ac-1) was side banded during seeding. In crop spraying of 0.4L/ac of Buctril M was carried out on June 09, 2024. Hand weeding occurred throughout the growing season to maintain the experimental area weed free. The net plot size was 6.9 m2 (1.15 m by 6 m). Harvesting was done when barley grains were at soft dough stage. Individual plots were harvested with LARA Alfalfa-Omega self-propelled forage harvester. The total precipitation accumulated during the growing season was 147.9 mm. For each treatment plot, ~ 400 g of chopped

Table 1. Variety list for the project.

Two-Row	Seeding Rate (lb/acre)	Six-Row	Seeding Rate (lb/acre)
AB Maximizer	149	AB Tofield	134
AAC Lariat	149	AB Standswell	111

forage (sub-sample) was frozen immediately and sent to A & L Canada Laboratories Inc. for quality analysis. A second sub-sample of ~ 250 g of freshly harvested material was taken from each plot and dried to a constant weight for dry matter calculations. The data for forage DM yield and each of the quality parameters were subjected to analysis of variance (ANOVA) and means were subsequently compared by the least significant difference (LSD) test at ≤0.05 probability level using the agricolae (version 1.3-7) package of the R (4.3.2) software.

Results and Discussion

The present study showed that mixtures ought to be more advantageous to farmers than corresponding pure stands when considering forage DM yield as % of check, CDC Austenson. On average, CDC Austenson produced 3.40 t ac-1 of forage DM yield in this trial. The average forage DM yield ranged from 2.44 t ac-1 to 3.70 t ac-1 for the mixtures, with AB Maximizer and AB Standswell sown in 1:3 seeding ratio the lowest yielding mixture and AB Maximizer and AB Tofield grown in 3:1 seeding ratio the highest yielding mixture. Among the varieties seeded in monocultures, the highest forage DM yield was produced by AB Maximizer (3.44 t ac-1) followed by AAC Lariat (3.31 t ac-1) and AB Tofield (2.70 t ac-1). AB Standswell produced the lowest forage DM yield (2.07 t ac-1) in pure stands. A total of two mixtures; AB Maximizer and AB Tofield at seeding ratio of 3:1 and AAC Lariat and AB Tofield at seeding ratio of 3:1 yielded 9 and 7% higher than the check variety, respectively. AB Maximizer was the only variety grown in pure stands, which yielded 1% higher than the check variety. Varieties such as AAC Lariat, AB Tofield and AB Standswell yielded 3, 21, and 39% lower than the check variety, respectively, when seeded as monocrops (Table 2).

Table 2. Forage dry matter (DM) yield, crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), and total digestible nutrients (TDN) for all cropping treatments.

Treatment	DM Yield (% of Check)		CP (% DM)		NDF (% DM)		ADF (% DM)		TDN (% DM)	
AB Maximizer-AB Tofield 3:1	109	a	12.81	abcd	45.68	abcd	27.44	abcd	67.53	abcd
AAC Lariat-AB Tofield 3:1	107	a	11.97	bcd	47.19	abcd	27.79	abcd	67.26	abcd
AB Maximizer	101	ab	13.52	ab	38.81	d	23.97	d	70.23	a
Check	100	abc	13.32	abc	40.17	cd	24.79	cd	69.59	ab
AB Maximizer-AB Standswell 3:1	98	abc	12.47	abcd	43.52	abcd	26.31	abcd	68.40	abcd
AAC Lariat	97	abc	11.25	de	45.99	abcd	25.67	bcd	68.91	abc
AB Maximizer-AB Tofield 1:1	94	abc	11.38	cde	47.78	abc	28.67	abc	66.96	abcd
AAC Lariat-AB Standswell 1:1	90	abcd	11.32	cde	50.38	ab	30.73	a	64.97	d
AB Maximizer-AB Standswell 1:1	90	abcd	11.46	cde	47.08	abcd	28.00	abcd	67.09	abcd
AAC Lariat-AB Standswell 1:3	85	bcd	13.76	ab	41.52	cd	27.08	abcd	67.80	abcd
AB Maximizer-AB Tofield 1:3	85	bcd	12.19	abcd	42.26	bcd	25.92	abcd	68.71	abcd
AAC Lariat-AB Tofield 1:1	84	bcd	11.74	bcde	46.09	abcd	27.05	abcd	67.83	abcd
AAC Lariat-AB Tofield 1:3	84	bcd	11.99	bcd	46.03	abcd	28.74	abc	66.51	bcd
AB Tofield	79	cde	11.73	bcde	48.39	abc	29.84	ab	65.66	cd
AAC Lariat-AB Standswell 3:1	79	cde	9.67	e	52.43	a	30.12	ab	65.44	cd
AB Maximizer-AB Standswell 1:3	72	de	12.96	abcd	43.49	abcd	27.35	abcd	67.58	abcd
AB Standswell	61	e	14.07	a	40.21	cd	26.75	abcd	68.06	abcd
Pr (>F)	0.00128 ***		0.0215*		0.172		0.304		0.343	

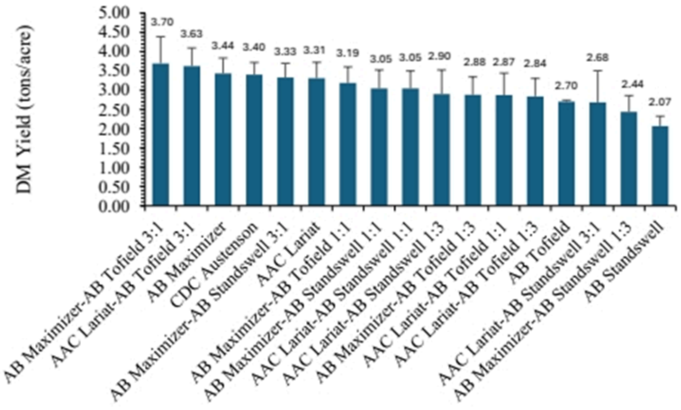

Figure 1. Forage dry matter (DM) yield for variety mixtures and monocultures.

As a general rule of thumb, dietary CP level of 7-9-11% should be maintained to meet the nutrient requirements of beef cows during mid gestation, late gestation and lactation. Of the 12 mixtures tested in this study, 11 had CP content (> 11%) adequate to meet the nutrient requirements for beef cattle after calving. Only CP content (9.67%) of mixture with AAC Lariat and AB Standswell in 3:1 seeding ratio was not sufficient to meet the requirements for beef cattle until post calving. Total Digestible Nutrients (TDN), which is the easiest method to estimate the amount of energy in the feed follows 55-60-65 rule, where beef cows' mid pregnancy, late pregnancy, and post calving require 55, 60 and 65%, respectively. Our results revealed that all mixtures contain ≥ 65% of TDN and would meet the energy demands of lactating beef cattle. The maximum TDN (68.71%) was recorded in AB Maximizer and AB Tofield while in 1:3 binary mixture. The lowest TDN (64.97%) came from mixture with AAC Lariat and AB Standswell at seeding ratio of 1:1 (Table 3).

Conclusions

We may conclude that two-row varieties which showed the highest yield and quality potential in present study, might be responsible for compensation observed within the mixtures. The first two top yielding mixtures had two-row and six-row varieties at seeding ratio of 3:1, suggesting that 3:1 mixture of a high yielding two-row variety and a low-yielding six-row variety could increase the overall forage DM yield and nutritional quality and offer a diet that is able to meet the nutritional requirements for different classes of beef cattle. As our study is conducted in only one type of environment during a single growing season, the strength to produce any broad conclusions is limited. Further research is needed to explore how variety selection, seeding ratios, and experimentation under diverse environmental conditions will affect the ability of these mixtures to stabilize forage productivity and quality over time.

This project was proudly funded by:

The two top yielding mixture of the present study; AB Maximizer and AB Tofield at seeding ratio of 3:1 (Left) and AAC Lariat and AB Tofield at seeding ratio of 3:1 (Right).

How to Interpret Your Seed Test Results - A Step-by-Step Guide

by Alberta Grains

Seed tests are a great way for producers to find out what they are dealing with when it comes to seed quality and health. Whether you are a seed grower or saving your own seed, testing seed after harvest and again in the spring can provide seed management insights. A fall seed quality test provides an indication of the grain's potential as seed. Spring testing gives insight into changes that may have occurred during winter storage. Together, they provide the foundation for appropriate seed use to maximize potential.

Generally, seed tests provide results on:

- Germination
- Vigour
- Thousand kernel weight
- Mechanical damage
- Disease diagnostic profile

Germination test

How does it work?

A germination test looks at what percentage of seeds in a seed lot are capable of germinating. It is conducted under optimal conditions, including optimal temperature, consistent moisture and good aeration. It represents the highest level of seed germination growers can expect in the field.

How to use it?

The resulting germination rate is used to calculate a seeding rate based on the desired plant stand or desired number of seeds per unit area. Refer to the Alberta Grains Seeding Rate Calculator for more details. Germination results and the observation of abnormal seedling growth can indicate the presence of mechanical damage, which can predispose the seed to soil-borne pathogens such as Pythium spp.

Vigour test

How does it work?

A vigour test measures a seed lot's emergence potential under less-than-ideal conditions. Different from germination test, vigour test uses stress such as temperature and moisture to simulate poor seeding conditions. The resulting vigour percentage provides an indication of germination under stressful conditions. Note that this test is not standardized, each seed testing laboratory will implement the test differently.

How to use it?

Vigour test represents the lowest performance level growers can expect from the seed lot. It is more sensitive than the germination test at picking up the loss of vigour. For example, if germination is 90% but vigour is 60%, there are risks of poor germination under stressful seeding conditions and growers may consider utilizing another seed lot.

Thousand kernel weight

How does it work?

Thousand kernel weight (TKW) measures seed size, or the weight of 1000 seeds in grams.

How to use it?

TKW is crucial in calculating seeding rate. For example, assume the target seeding rate is 40 seeds/ft2. For a seed lot that has a TKW of 35g, each acre requires 124 lbs of seeds. In comparison, if a seed lot has TWK of 45g, each acre requires 159 lbs of seeds, a 35lb/ac difference. Use TKW of your specific seed lot to ensure accurate seeding rates.

Disease diagnostic profile

How does it work?

Disease testing assesses seed-borne diseases that may be present on/in the seed. Seed-borne diseases can cause issues with germination and vigour leading to poor plant stands. Additionally, they can also present a long-term risk of introducing or increasing field disease inoculum. Ultimately, both situations can lead to yield and quality impacts.

Disease testing helps growers to make decisions on 1) whether to use the seed lot; 2) use of a seed treatment to mitigate some of the disease impacts on crop germination, yield and quality; and 3) grain end-use and marketing options. Grain lots may be downgraded due to discolouration or the presence of fusarium damaged kernels. A seed test soon after harvest would help to indicate the presence or absence of problematic pathogens and the toxins they may produce. This information can be used to help with end-use and marketing decisions.

When to conduct a seed test?

If the field experienced: sooty mold issues; significant leaf and/or head diseases; or harvested at higher moisture, an overall pathogenic diagnosis is recommended after harvest. For some pathogens, seed-borne infection can represent a disease source in the resulting crop. Alternatively, seed infection may lead to the production of infected crop residue that can be a disease source for future crops. A fungal seed test will help producers know what they are working with and make storage/seeding decisions.

Which pathogens are tested and what does it mean?

Depending on which testing package you choose, a disease diagnostic test might include those listed in the table to the right.

Pathogenic fungi: fungi that cause diseases on live crops

Pathogen	Diseases	Management decisions
Tilletia caries, Ustilago tritici/nuda, Claviceps purpurea	Bunt, loose smut, ergot	Testing should be considered when in-field bunt, loose smut, or ergot issues are noted, especially in susceptible varieties. It is because seed-borne pathogens are sources for these diseases. Consult seed testing professionals regarding tests and threshold levels. Certified seed will help to limit your exposure to these disease issues as levels of some of these issues are regulated depending on seed grade. For example, certified barley may have up to 4% loose smut infection depending on grade)
Fusarium graminearum	Fusarium head blight (FHB)	See below
Fusarium spp. (*F. avenaceum, F. culmorum* etc.)	Seedling blight, root rot, crown rot	If the cumulative infection levels of these fungi are over 10 to 15%, they may impact germination. Use of fungicide seed treatment that has the target pathogens on the label is recommended. When infection level is too high, consider alternative seed sources.
Pyrenophora spp.	Leaf stripe (barley), net blotch (barley), tan spot (wheat)	
Cochliobolus sativus/ Bipolaris sorokinana	Spot blotch (barley and wheat), seedling blight, common root rot	
Parastagonospora spp (formerly Septoria spp.)	Leaf/glume blotch	

Saprophytic fungi: fungi that feed on dead tissues

Pathogen	Issues	Common % seed infection
Alternaria spp.	Sooty mold: blackish-grey discolouration of a swathed or straight-cut crop where harvest is delayed	30-60%
Cladosporium spp.		10-20%
Epicoccum spp.		5-20%

Storage molds: species that cause molds when grain is stored damp

Pathogen	Issues	Common % of seed infection
Aspergillus spp.	- Storage molds (can produce aflatoxin and ochratoxin A (OTA) - Bin burnt seeds - Dry seed rot: when wheat seed planted into dry soil and remain ungerminated for several weeks	<2%
Penicillium spp.		

In some cases, a low germination percentage can be caused by the presence of pathogens. If germination rate is below 80 to 85% range, it is a good idea to look through the fungal test results for potential causes.

Management decisions for Fusarium graminearum:

Consider field disease history. If the field has low inoculum levels, such as no FHB history, no downgrading due to fusarium damaged kernels (FDK) at the elevator, or the producer practices longer rotation between cereal crops, producers should avoid using a Fg infected seed lot as it introduces the pathogen. Seed-borne Fusarium graminearum can lead to infected residues that can act as a disease source for future host crops, especially under shorter rotations.

Management decisions:

If the total percentage of these fungi surpasses 50% and germination or vigour is low, it may be a good idea to contact your seed analyst for a second opinion as a different seed source may be needed. However, if germination percentage and vigour are adequate and seed infection levels are lower, these fungi are of limited concern.

Consider a fungal seed treatment when infection levels are higher, but the seed still has adequate vigour. More specifically:

- The seed was stored damp
- Fungal test results indicate infection levels greater than 10 to 25 percent along with bin burnt seed.
- Germination rates that are adequate, at least 80 to 90 percent with adequate vigour.

A seed treatment with Aspergillus spp. and Penicillium spp. on the label could be considered.

Take home messages:

• Seed tests provide information on germination, vigour, thousand kernel weight, mechanical damage and disease diagnosis.

• Using this information, one can make informed decisions on seed storage, seed lot selection, seed treatment and seeding practices. All of them help the farm to be more profitable.

• It is recommended to test seed right after harvest to know what you are dealing with; and testing again in spring to monitor for changes over winter, especially in relation to germination and vigour.

References:

Fungal seed testing and seed treatments - a practical approach
What are the 3 Critical Seed Tests? – 20/20 Seed Labs
What is a Fungal Screen™ for Cereals? – 20/20 Seed Labs
Podcast - Seed testing and results management with Dr. K Turkington (AAFC) and Carey Matthiessen (20/20 Seed Labs)

On-Farm Efficiency Program

The On-Farm Efficiency Program (2024-2028) aims to support the adoption of innovative technology that optimizes farm efficiency, minimizes agricultural waste, advances the digitalization of an operation, and/or gathers information that will help the producer knowledgably enhance their operation.

Funding List

Refer to the website for the most up-to-date Funding List at www.alberta.ca/on-farm-efficiency-program

Eligible Items are organized into four Streams:

1. Smart Farm Technology
2. Energy Efficiency
3. Farm Security
4. Efficient Grain Handling

Funding (retroactive to April 1, 2023)

Grants will be funded at a **cost-share rate of 50%** and paid in one lump sum reimbursement after item(s) are determined to be eligible and approved.

Funding maximum per Applicant is **$150,000** over the duration of the Program (2024-2028). Funding minimum per application is **$500**.

Sustainable Canadian Agricultural Partnership   Alberta   Canada

Lakeland Agricultural Research Association

Mission Statement:
Lakeland Agricultural Research Association (LARA) conducts innovative unbiased applied research and extension supporting sustainable agriculture.

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