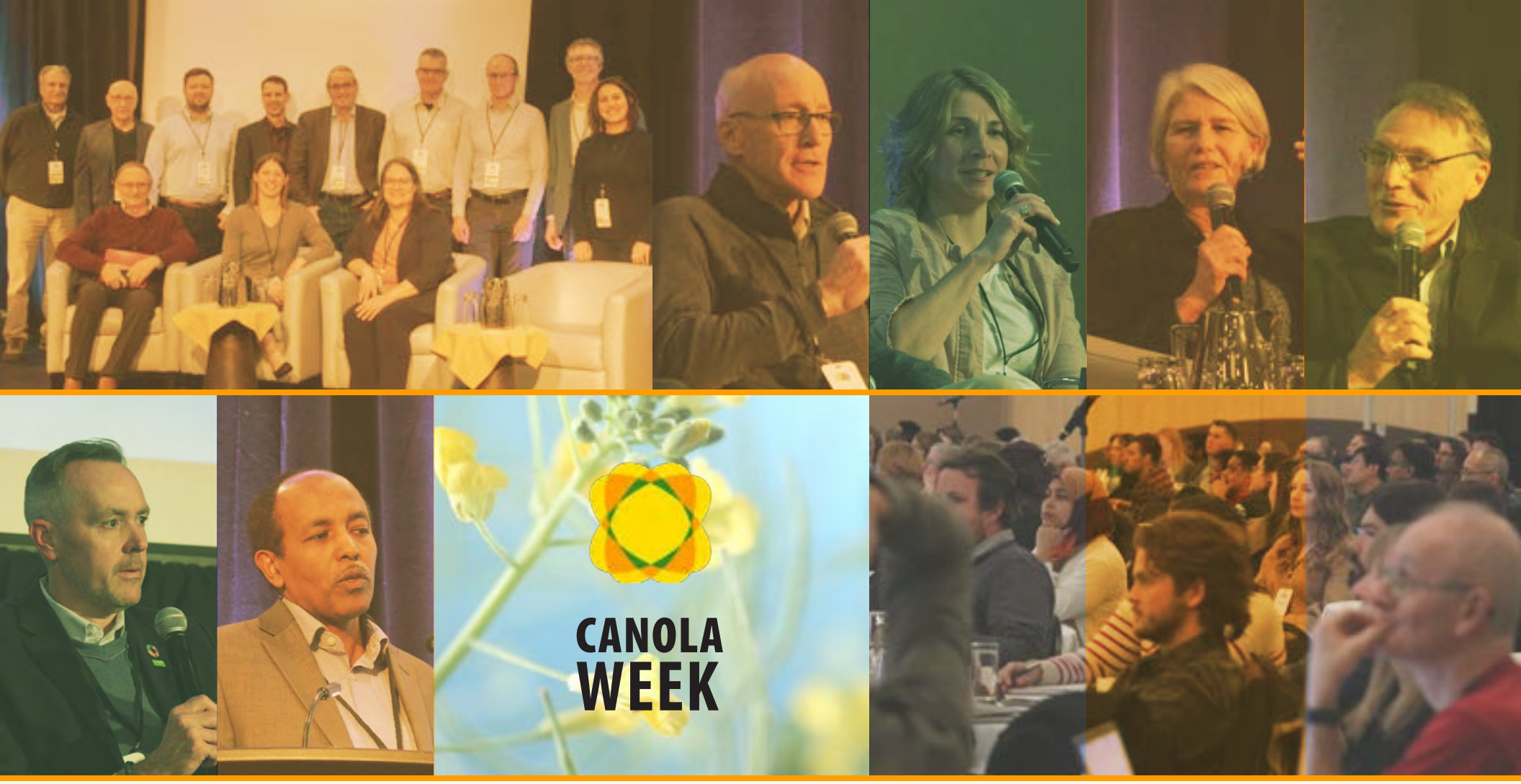


2024 Canola Week Conference Summary

Canola Week was held over three days in December 2024 in Saskatoon, Sask.

The Canadian canola industry faces many challenges. Collaboration and innovation will be key to address these challenges. In December, the canola industry hosted its annual Canola Week conference with agronomists, researchers and farmers in attendance from across Western Canada. Researchers, agronomists and representatives from the canola industry from across Canada, North America and around the world, shared solutions and insights.

Canola Industry and Innovation Overview

The Canola Industry Overview

Chris Davison

Chris Davison, president and CEO of the Canola Council of Canada, presented an update on the industry. He noted that the value of canola to the Canadian economy has doubled to $43.7 billion annually, supporting 206,000 jobs. He discussed challenges like weather extremes, labour disruptions, and trade issues with China, but also highlighted opportunities in biofuels and global markets. Davison emphasized the importance of continued innovation and collaboration for the industry's future.

> *"In September with China's announcement of an anti-dumping investigation into imports of Canadian canola seed…we are confident that Canada's canola trade aligns with international rules-based trade, and are working on supporting fair and competitive access to this important market."*

Increasing the Component Value of Canola Seed

April Nichol

> *"When we think about canola seed, specifically, every increase in oil has multiple benefits. It benefits the farmer, our price and market opportunity, but it also benefits our processors, our crush margin and our export market."*

April Nichol, seeds marketing leader at Corteva Agriscience, discussed the future of canola seed. She highlighted the industry's challenges, including climate change, trade barriers, and the need for renewable energy. Nichol noted a significant increase in crush capacity in Western Canada, which will boost domestic markets. She emphasized the importance of optimizing canola's oil and protein content through breeding and gene editing. Nichol stressed the need for collaboration to ensure canola's sustainability and profitability.

KEY TAKEAWAYS

- In September, China announced an anti-dumping investigation, the Canola Council of Canada is involved but doesn't yet know the full impact on industry.
- Every increase in canola oil benefits multiple fronts.
- In last two years Ukraine has saw an increase in spring canola production to offset reduced winter canola acreage.

Rapeseed Production in Ukraine in Wartime

Petro Vyshnevskyi

Petro Vyshnevskyi, a professor in the Department of Plant Science at the National University of Life and Environmental Sciences of Ukraine and deputy director of the Ukrainian Laboratory of Quality and Safety of Agricultural Products, discussed the impact of the Russian war on canola/rapeseed production in Ukraine. Prior to the war, canola contributed 10 per cent to Ukraine's GDP and USD$22 billion annually to its economy. However, since February 2024, direct asset losses in agriculture reached USD$6.6 billion, with further losses in 2022 and 2023. The harvest of rapeseed and other crops fell by 40 per cent in 2022. Despite these challenges, canola remains a crucial crop, with 95 per cent of varieties having low erucic acid levels.

> *"We're having issues with access to fertilizers and fuel which led to lower production. These factors have resulted in agriculture production, including canola, becoming unprofitable compared to 2021."*

2024 Crop Updates and Reports

2024 Agroclimate Review

David Lee

David Lee, the national agroclimate information service manager at Agriculture and Agri-Food Canada, presented a 2024 agroclimate review. He highlighted that 2023 was a year of low precipitation across the Prairies, leading to low soil moisture heading into 2024. However, above-normal spring rains improved conditions. Despite this, by October, 61 per cent of the Prairie region was abnormally dry. Looking ahead, a La Nina event is predicted to bring colder temperatures and above-average snowfall for the winter, which may alleviate drought conditions.

From Flames to Fields: Understanding the Impact of Forest Fires on Agriculture

Raju Soolanayakanahally

Raju Soolanayakanahally, a research scientist with Agriculture and Agri-Food Canada, discussed the impact of forest fires on agriculture. He highlighted the significant increase in fire events in Canada, with 15 million hectares burned in 2023 compared to the annual average of 2.1 million hectares. Soolanayakanahally noted that smoke from these fires can lead to reduced crop growth and development by increasing vapour pressure deficit, inhibiting photosynthesis, and affecting seed germination. Smoke can also alter the taste and aroma of canola oil. He suggested further research into the mechanisms of smoke absorption by crops and its effects on yield and quality is needed.

> *"What (forest fire smoke) does, especially for ag crops, it inhibits pathogen growth. Because there will be buildup of calcium in the plant system and the dryer microclimate also inhibits fungal growth. On top of it, the fire also improves some of the seed germination of certain forestry and certain ag crops."*

Quality of the 2024 Canola Harvest

Véronique Barthet

Véronique Barthet, program manager oilseeds with the Canadian Grain Commission, shared an overview of the quality of the 2024 canola crop. Oil content was lower compared to the previous year, likely due to hotter conditions. Glucosinolate levels were surprisingly lower, possibly due to genetic changes in varieties. Alpha-linolenic acid levels were higher, contrary to expected trends. The variety distribution showed a 10 per cent increase in varieties with lower oil content, likely due to genetic factors rather than environmental conditions.

> *"This year, actually, the issue is sprouting because of the water that we had. And the other issue is oxidized seed. And the reason why is because the plant was stressed. There was a lot of water, so the plant started stressing because there was too much water, and then there was not enough water."*

2024 Year in Review

Samantha Marcino

Samantha Marcino, acting provincial specialist for oilseed crops with the Saskatchewan Ministry of Agriculture, provided an overview of the 2024 growing season for canola. Canada's total seeded acres decreased by 0.4 per cent to 22 million acres, with a 0.8 per cent yield decrease to 38.4 bushels per acre, and a 1.1 per cent production drop to 18.9 million metric tons. Precipitation variability and topsoil moisture conditions were significant factors affecting canola yields. Diseases like blackleg, verticillium stripe, sclerotinia, clubroot, and aster yellows were prevalent.

2024 Report on Canola Diseases in the Prairie

Alireza Akhavan

Alireza Akhavan, provincial specialist for plant disease with the Saskatchewan Ministry of Agriculture, shared a canola disease report. Saskatchewan reporting 56 per cent of fields affected by sclerotinia stem rot with nine per cent incidence. Blackleg prevalence in Saskatchewan increased to 92 per cent, with incidence rising to 23 per cent. Verticillium stripe prevalence in Saskatchewan rose to over one per cent. Aster yellows affected 25 per cent of fields in Saskatchewan, with 71 per cent of plants showing symptoms.

Insects in Canola: 2024

James Tansey

James Tansey, provincial insect and pest management specialist with the Saskatchewan Ministry of Agriculture, provided an insect report. Flea beetles, particularly crucifer and striped flea beetles, had significant populations reported in Alberta and Saskatchewan. New flea beetle protection products are showing efficacy. Concerns about Group 3 insecticide resistance were noted, but not detected. Diamondback moths, confirmed to be of American origin, were monitored this growing season. Richardson ground squirrels caused significant damage, with effective control methods including zinc phosphide products.

KEY TAKEAWAYS

- La Nina conditions are predicted for winter. This means there will be cold temperatures and above average snowfall.
- Moisture in the air and soil dries out crops on a smoky day, inhibiting pathogen activity but improving seed germination.
- The 2024 growing season started off good for moisture and then went downhill as the year went on with drier conditions happening.
- There was increased moisture this growing season meaning Sclerotinia stem rot was more likely to happen.
- Flea beetle resistance was not detected, but it was observed that they're becoming less sensitive to neonics.
- The canola oil content is down from last year due to there being too much heat with no cool nights for the crop to recover.

Biofuels, Carbon and Sustainability

Lower Carbon Fuel Producer Perspective

Jason MacDonald

Imperial Oil has invested $700 million in a renewable diesel facility in Edmonton, Alta. with a capacity of 20,000 barrels per day, equivalent to 250 million gallons annually, shared Jason MacDonald, fuels policy advisor with ExxonMobil Product Solutions Company. This project will use 2.5 million tons of Canadian canola seed, requiring additional crush capacity and transportation infrastructure. MacDonald emphasized the need for policy support to drive investment and economic benefits in Canada's renewable fuel sector.

> *"Domestic renewable fuel production has real positive benefits. Not only a reduction in greenhouse gas emissions in Canada's transportation sector, but across the entire value chain, certainly including the agricultural sector. Honestly, it's a massive opportunity, but the industry is nascent, durable policy, be it federal or provincial, is really required to support the required investments."*

Carbon and Sustainability in Agriculture

Ray Daniels

BASF's role in sustainability is providing solutions that balance environmental outcomes with economic viability for farmers, shared Ray Daniels, sustainability market development manager with BASF. Key initiatives include enabling farmers to monetize sustainable practices, investing in technology to improve crop efficiency, advocating for smart agricultural policies, and internally reducing emissions. Daniels highlighted the importance of carbon intensity in biofuels, focusing on yield improvement and greenhouse gas reductions. She also mentioned BASF's Center for Sustainable Agriculture and its role in educating and conducting research to support sustainable farming practices globally.

Engineering Crops to Capture and Store More Atmospheric Carbon in Soil

Tim Ulmasov

Cquesta Inc. is working to engineer crops to capture and store atmospheric carbon using root genetics. Tim Ulmasov, CEO of Cquesta, highlighted the global carbon imbalance. Ulmasov emphasized the role of plants in carbon capture and detailed Cquesta's research on deeper root systems, which can store carbon. He shared successes in gene editing, achieving high reproducibility in crops like camelina. Cquesta aims to create a seamless value chain for carbon trading, collaborating with seed companies and carbon aggregators to ensure farmers benefit from carbon sequestration efforts.

KEY TAKEAWAYS

- To make the biofuel industry profitable, it needs supportive policies.
- Carbon intensity is the ratio of inputs to yield. More yield per input lowers carbon intensity, which is good.
- Cquesta is testing gene-edited crops with bigger root systems in fields.

Canola Research Updates

Manitoba Canola Growers Research Update

Amy Delaquis

Amy Delaquis, the research and agronomy manager for Manitoba Canola Growers, provided a research update for the organization. The association's research priorities are yield stability, pest management, and nutrient use efficiency. Its research program is divided into four main areas: research project funding, applied research, research capacity development, and agronomic extension services. Key projects include flea beetle management, verticillium control, and commercial hybrid evaluation. The Manitoba Canola Variety Evaluation Trials launched in 2024, testing 18 hybrids from six companies. The association found it's their most highly sought out information from members. For the 2024 trials, they want to include more seed companies.

Alberta Research Year in Review

Brittany Visscher

Alberta Canola has shifted from predominantly agronomy to including more genetics research, with a focus on improving yield stability in environmental extremes, diseases, and weed management, Brittany Visscher, the research director for Alberta Canola, shared in a year-end review. The 2024 funding targets were established through grower input at research symposiums in Lethbridge and Grand Prairie — these highlighted diverse regional needs. Farmers had the opportunity to vote on which types of research topics to support.

SaskOilseeds Grower-Funded Research Update

Doug Heath

SaskOilseeds is focusing on disease testing for blackleg, verticillium stripe, and clubroot, Doug Heath, research manager for SaskOilseeds, shared in an update. This year there were 133 diagnostic tests done with results showing 112 incidences of blackleg and 18 with Verticillium. Clubroot soil testing received 34 samples with results not available yet. Heath also mentioned the on-farm research trials, Top Notch Farming, expanded from nine to 25 sites in 2024, focusing on nitrogen-fixing biologicals, seeding rates, enhanced efficiency fertilizers, and split nitrogen applications. Results will be available later with applications for the 2025 program now open.

Enhancing the Public Research Contribution to the Success of Canadian Canola

Dave Charne

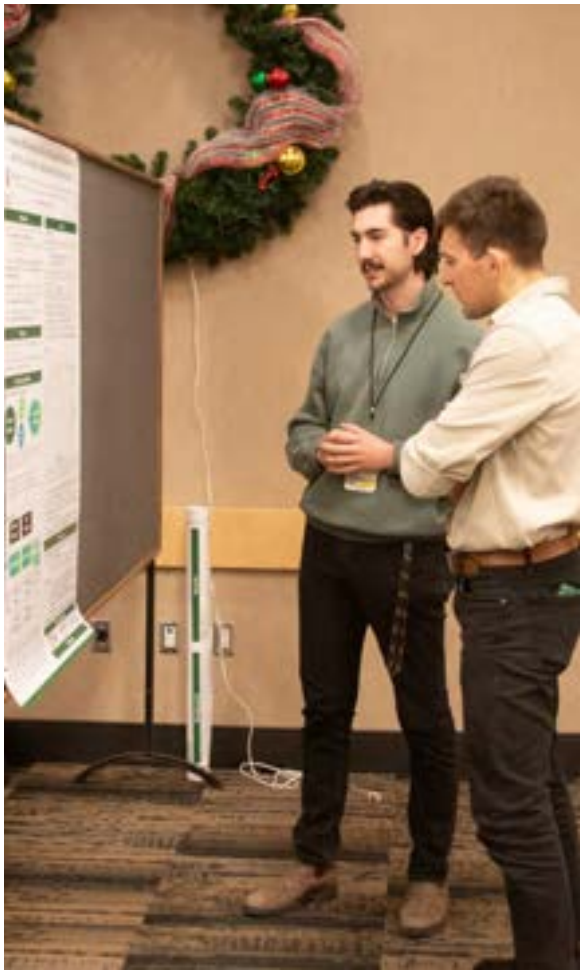
Dave Charne, breeding consultant with Corteva Agriscience, emphasized the importance of public-private collaboration, noting the Canadian canola industry's economic impact has grown from $19 billion in 2013 to over $43 billion today. He estimated investment in upstream research at $150 to $200 million, with $120 to $140 million in seed traits, primarily in the private sector. Charne proposed industry projects to address critical issues like verticillium stripe, blackleg, and abiotic stress, advocating for collaborative funding and execution models.

> *"Historically, I think it's been left more to the public sector to lead these projects, these collaborations. I think we need to think about a different resourcing model, because I know from the private sector side, we would say, 'Well, we're asked to pay three times. We're asked to put in cash up front, and we understand that, because it can be multiplied from project funding sources. But then we're asked also to potentially pay a royalty.'"*

KEY TAKEAWAYS

- The Manitoba Canola Variety Evaluation Trials launched in 2024, testing 18 hybrids from six companies.
- At the Alberta Canola research symposiums, growers voted on which research themes they wanted to support.
- SaskOilseeds runs a free disease testing program for farmers as well as a replicated on-farm trials program.
- To work together, public and private researchers need to start with one goal with both sides taking a lead so it isn't just public researchers doing the work.


The Identification of Quantitative Trait Loci Associated
with Secondary Seed Dormancy and Seed Fibre Traits



Nutrient Management Research Update

Nitrogen Use Efficiency in Spring Canola

Rajeev Dhakal

Rajeev Dhakal, a PhD student at the University of Saskatchewan, discussed nitrogen use efficiency in spring canola. The research focused on genetic variations in nitrogen use efficiency, using 35 historical cultivars and nine hybrids. Key findings included that 60 per cent of nitrogen is in the seed and hybrids are more efficient in utilizing nitrogen. Nitrogen use efficiency metrics varied by trait and environment, with harvest index and yield being highly correlated. Since 2001, yield has increased, but nitrogen uptake efficiency remains stagnant. While diversity in cultivars has improved nitrogen use indirectly, there's still significant room for improvement in nitrogen uptake efficiency. There needs to be more focus on other aspects of nitrogen use efficiency beyond yield.

Does Fall-Applied Fertilizer-N Influence N-loss During the Over-Winter and Spring Thaw Period?

Reynald Lemke

Reynald Lemke, a research scientist at Agriculture and Agri-Food Canada, presented findings on the impact of fall-applied fertilizer on nitrogen (N) loss during the over-winter and spring thaw period. He discussed the various pathways for N loss, including denitrification and leaching, and highlighted the role of moisture and available nitrate in these processes. Lemke's study, conducted at a research farm near Saskatoon, Sask. showed ongoing N transformations and low but significant N_2O emissions throughout the winter. The results indicated that fall-applied urea and a urease inhibitor (SuperU) increased N_2O emissions compared to the control. The study also noted the influence of soil temperature and snow cover on these emissions.

> *"By early March, the CO_2 emissions had pretty much shut down. I don't know for sure if that meant that the activities had stopped, or if in fact, the soil surface had frozen over so well and capped off. And so, it wasn't a long exchange with the atmosphere. But in any case, all indications are that we do have activity through that entire time period."*

Nitrogen Management and Use Efficiency in Canola Production Systems

Mervin St. Luce

Mervin St. Luce, a research scientist at Agriculture and Agri-Food Canada, discussed nitrogen management and use efficiency in canola production systems. He highlighted the importance of nitrogen, noting it's the costliest input and susceptible to losses. Experiments across seven sites from 2018 to 2021 showed that nitrogen use efficiency decreased as nitrogen rates increased, with higher efficiency on wheat stubble. Economic optimum nitrogen rates varied by site, with recommendations ranging from 75 to 230 pounds per acre. Challenges included weather conditions and soil variability, emphasizing the need for soil testing and considering nitrogen supply potential.

KEY TAKEAWAYS

- Ammonia and nitrate levels were very low at the start of winter but then the soil froze and by spring high levels of ammonia and nitrates had accumulated.
- Hybrid cultivars take more nitrogen from soil to plant.
- Nitrogen use efficiency was higher for canola on wheat stubble than on canola stubble.

Future of Field Crop Research

The YEN Effect on Cereal Production in the Maritimes

Aaron Mills

Aaron Mills, a research scientist from Agriculture and Agri-Food Canada, discussed the Yield Enhancement Network (YEN) and its impact on cereal production in the Maritimes. The YEN program, initiated eight years ago, focuses on site-year data to reduce variability and enhance analysis power. It includes yield competitions and awards for the best percentage of potential yield and nitrogen use efficiency. Mills highlighted that YEN growers achieved 20 per cent higher winter wheat yields compared to provincial averages. The program also emphasizes early planting, certified seed, and sophisticated statistical models. Future plans include greenhouse gas sampling, soybean root modulation work, and economic analysis to add value and sustainability.

> *"We're using actual farmer data. We're collecting samples from their fields, and then we hand things over to the modelers. And the modelers are key in that they give us an idea of what the yield potential should be for each one of those fields."*

On-Farm Evaluation of Nitrogen Response in Canola: Systemic Design vs. Traditional Randomization

Jocelyn Leidl

Jocelyn Leidl, a graduate student at the University of Saskatchewan, presented research on on-farm field trial designs. The key takeaway is that the Modulated On-Farm Surface Response Experiment (MORSE) design is easier for farmers to apply and interpret, allowing for direct comparison of treatment effects. The MORSE design's systematic application simplifies on-farm research, potentially increasing farmer participation. Future steps include on-farm trials of the MORSE design. The study emphasized the practicality and precision of systematic designs for on-farm research.

From Trials to Triumph: Effective On-Farm Research with SaskOilseeds Top Notch Farming Program

Kayla Slind

The Top Notch Farming program is a collaborative approach to on-farm research involving farmers, agronomists, and research specialists, shared Kayla Slind, lead research associate at Western Applied Research Corporation (WARC). The program aims to enhance future projects through farmer and agronomist input. Slind detailed her role as project lead, emphasizing communication and organization for successful data collection and management. She explained the importance of replication and randomization in trials to ensure statistical significance. The program also offers individual and combined site reports, and a results banquet with hotel expenses covered for participants. For 2025, the program will focus on seeding rates, enhanced efficiency nitrogen fertilizers, and other agronomic practices.

KEY TAKEAWAYS

- YEN (Yield Efficiency Network) is a yield contest that also teaches farmers about best practices to increase yield. YEN also gives awards for highest yields relative to the yield potential in the field.
- The Modulated On-Farm Surface Response Experiment (MORSE) design allows farmers to see the differences between a wider range of testing treatment rates that are suitable for regression analysis, instead of just seeing averages.
- In the Top Notch Farming program producers replicate and randomize the trials. Three reps are needed for each treatment trial in a farmer's field.

Challenges to Productivity and Profitability

Understanding and Managing Ag-Water Interactions in Canola Production

Phillip Harder

Phillip Harder, research director and hydrologist at Croptimistic Technology Inc., discussed water use efficiency in canola production, emphasizing the importance of snow management and stubble retention for improved water retention and yield. Individual crop species have a fairly consistent water use efficiency. We need to increase the rate of transpiration if we want more efficient water use. Crop water use exceeds precipitation, but where is that extra water coming from? We need to understand multi-year soil moisture. Farms can increase soil moisture with stubble to trap snow and reduce the amount of moisture lost to the atmosphere from blowing snow.

> *"If you're able to increase the residue retention on your surface, you will basically disconnect the vapour pressure gradient between your soil in the atmosphere, and you will suppress soil evaporation. That's the long story to a very scientific explanation for if you keep it covered, the water doesn't evaporate nearly as much."*

BMP Adoption by Canola Growers – A Case Study Approach

Daniel Heaney

Daniel Heaney with Random Cross Consulting presented a case study on BMP adoption by canola growers. The study highlights the economic challenges farmers face in adopting sustainable practices. Despite the benefits of reduced greenhouse gas emissions off the farm, the costs of implementing best management practices remain on the farm, often outweighing the benefits. Heaney suggests that to make these practices economically viable, external support like a price on carbon should offset the costs borne by farmers. Additionally, undervalued practices like variable rate and section control, which can reduce nitrogen use and nitrous oxide emissions, are discussed. Farmers are also encouraged to reassess non-profitable areas of their farms to optimize production and reduce costs.

Challenges to Productivity and Profitability

Kara Annand

Kara Annand, agrologist with Ag Grow Consulting, emphasized the importance of soil sampling, a relatively low cost that provides valuable insights. Key points included managing seed systems, ensuring proper plant stand establishment (six to seven plants per square foot), and early weed removal. She highlighted the significance of timely fungicide applications, particularly for sclerotinia, and the need to address insect pressure. Annand also stressed the benefits of using desiccants like glyphosate for efficient crop harvesting, urging farmers to be patient for optimal yields.

KEY TAKEAWAYS

- How will farmers be compensated for the cost of emissions reduction? Daniel Heaney doesn't think the government has considered this. Need to use tools like tax incentives and the carbon market.
- Farms can increase soil moisture with stubble to trap snow and reduce the amount of moisture you lose to the atmosphere from blowing snow.
- Understand your farm's seed mortality, and take steps to improve plant stand establishment. Residue management in the fall is an important step. When are you seeding? What are your seeding speed and seed placement with fertilizer?

The Environment – Nitrogen, Emissions and Run-off

A National Collaborative Network for Improved Nitrogen Management and Greenhouse Gas Emission Metrics

Claudia Wagner-Riddle

Claudia Wagner-Riddle, a professor in the School of Environmental Sciences at the University of Guelph, presented on a collaborative network for improved nitrogen management in Canada, CanN2ONet. The network, involving six universities, colleges, Environment Canada and Agriculture and Agri-Food Canada, aims to address nitrogen losses and improve metrics through benchmark studies, data integration, and models. The network plans to use inhibitors and variable rate applications, with a tall tower in Yorkton, Sask. for regional-scale N_2O measurements. The goal is to develop transparent, representative metrics and train the next generation of environmental scientists.

Farmer-Owned, On-Farm Green Ammonia Production: How Does it Work for me?

Ian Clifford

Ian Clifford, co-founder and CEO of FuelPositive Corp, presented on the commissioning and impact of a new on-farm green ammonia production system in Manitoba. Manitoba's green electricity and supportive politics make the province an ideal location. This system, the first of its kind, empowers farmers to own their nitrogen production, reducing costs and supply uncertainties. The system, installed on Tracy and Curtis Hebert's 11,000-acre farm, eliminates 1.8 tons of CO_2 per ton of green ammonia produced.

KEY TAKEAWAYS

- CanN2ONet is a network of partners across Canada that aims to increase nitrogen use efficiency and reduce carbon intensity.
- Each green ammonia production system eliminates 1.8 tonnes of CO_2 per tonne of green ammonia.
- A reduction in the concentration of phosphorus was noted in snowmelt.

The Environment – Nutrient Management to Reduce Loss

Blake Weiseth

Blake Weiseth with Discovery Farm discussed the impact of phosphorus on surface water quality and nutrient management strategies to reduce costs. He highlighted the significance of phosphorus use efficiency and its movement through soil, plant, and runoff water systems. Weiseth emphasized the role of spring snowmelt runoff on the Canadian Prairies, noting that it can lead to significant nutrient losses. He presented a study comparing control and variable rate fertilizer treatments, showing that reduced fertilizer application rates didn't impact crop yields while reducing phosphorus concentrations in meltwater. However, total phosphorus loads varied, indicating the need for further research on straw management to enhance sustainability. There is still a 2025 field season to complete.

> *"What we see is variable rate fertilizer application resulted in statistically comparable yields to the control in every season. Despite that reduced application rate, we saw a reduction in the concentration of phosphorus in the snow melt water. But when it comes to load, we saw this influence of management practice really having an influence on the total nutrient load."*

Unlocking Brassica Genetic Diversity in Modern Breeding

Cabbages & Climate Change: Domestication and Feralization of Brassica

Chris Pires

Chris Pires, a professor and head of the Department of Soil and Crop Sciences at Colorado State University, discussed the domestication and feralization of Brassica species, emphasizing their potential in addressing climate change. He highlighted the importance of new crop development, such as converting wild grasses into crops and using gene editing techniques like CRISPR. Pires shared findings on the origins of Brassica oleracea and Rapa, identifying Eastern Mediterranean and Central Asia as key regions. He also discussed the genetic diversity of feral brassicas and their potential for breeding. Pires emphasized the need for conservation and understanding of wild and feral plants to enhance crop resilience and adaptability in changing environments.

Exploring the Recombination Landscape of Crops

Isobel Parkin

Isobel Parkin, a research scientist with Agriculture and Agri-Food Canada, discussed the importance of recombination in plant breeding, particularly in Brassica napus (canola). She highlighted that recombination drives genetic variation, ensuring fertility and yield. Parkin explained how limited recombination can lead to reduced diversity and yield penalties, using examples from genetic maps and gene editing. She noted that domestication and environmental factors influence recombination rates. Parkin's team used multi-parent populations to study recombination, revealing diverse rates across 20 populations. They also identified genetic modifiers and homologous recombination events that create genetic variation. Future goals include manipulating recombination to enhance breeding efficiency.

> *"It's an interesting sort of take on in this case natural variation works better than the modern approach…Factors that affect recombination, that limit recombination within the genome, there are some fundamental things that we can't change, and then some other things that we have some more control over."*

KEY TAKEAWAYS

- Sometimes a crop is domesticated and then escapes (grows wild) and becomes feral.
- Breeding has led to less diversity in crop varieties and recombination allows for new traits to be introduced.
- Data shows that by adding winter canola to rotations it boosts wheat yields for United States Southern Great Plains farmers.

Prairie Prospects: US Great Plains Winter Canola

Mike Stamm

Mike Stamm, an agronomist from Kansas State University, discussed the challenges and opportunities in the United States Great Plains for winter canola production. He highlighted the decline in wheat acres due to crop rotation and the benefits of winter canola, which boosts wheat yields and quality. Despite initial promise, winter canola acreage has plummeted due to market losses and weather variability. Stamm emphasized the need for hybrid varieties, which showed a 13 per cent yield advantage over open-pollinated varieties in a 2019 study. He also discussed integrating the True Flex trait for herbicide tolerance and improving winter survival rates through genetic research.

> *"Our winter canola acres have certainly plummeted recently. That's primarily driven by the loss of our market. And so, we have a new market now where Scoular, a company, has come in and recommissioned this oilseed processing facility. But we are in an oil challenged environment, and that's primarily driven by us being still reliant on open pollinated varieties."*

Seed and Meal Innovations

The Potential of Reducing Glucosinolates in Seeds by Transport Engineering

Barbara Ann Halkier

Barbara Ann Halkier, coordinator of DynaMo Center and Villum Investigator for the Department of Plant and Environmental Sciences at the University of Copenhagen, discussed the potential of reducing glucosinolates in rapeseed press cake through transport engineering. She highlighted that rapeseed, sunflower, and soybean contribute significantly to Europe's protein intake, but their press cakes are currently low-value due to anti-nutritionals like glucosinolates. Halkier's research identified GTR1 and GTR2 transporters as crucial for glucosinolate accumulation in seeds and UGT29 as a key exporter. By mutating these transporters, they achieved over 60 per cent reduction in glucosinolates in the seed. The goal is to translate these findings into Brassica napus to create high-value food products from rapeseed press cake.

Spatial Metabolome of Canola Seed Development Using the Canadian Light Source

Teagen Quilichini

Teagen Quilichini with the National Research Council of Canada, presented about the Canadian Light Source. The use of synchrotron light at Canadian Light Source for structural and chemical imaging, including micro-CT scans and mid-IR spectroscopy, to analyze seed composition and infection mapping. Quilichini emphasized the potential of synchrotron technology to enhance biological research by combining structural and chemical data with genomic information.

Valorization of Canola Meal to Multiple Products

Bishnu Acharya

There's growing interest in bio-based materials as a sustainable alternative to petroleum-based products, driven by climate change concerns, shared Bishnu Acharya, associate professor and research chair of the Saskatchewan Ministry of Agriculture in Bioprocess Engineering at the University of Saskatchewan. Acharya's research focuses on extracting cellulose, hemicellulose, and lignin from canola straw for various industrial uses. They developed a canola meal extract with 75 per cent protein for microbial fermentation. Additionally, they explored using lignin as a slow-release fertilizer and carbon black in tires, emphasizing a circular approach to plant utilization.

Opportunities and Challenges for Canola Meal in Food Applications

Michael Nickerson

Michael Nickerson, a professor at the University of Saskatchewan, discussed opportunities and challenges for canola meal in food applications. He highlighted the need to address challenges like residual hexane, bleaching agents, and gums in hexane-extracted meal, which limit its use in food. Nickerson emphasized the potential of cold-pressed meal for food applications due to its better nutrient retention and functionality. He also mentioned ongoing research to improve canola protein flavour and functionality through processes like fractionation and the use of absorbent resins. Additionally, he explored non-food applications for canola proteins, such as in adhesives and packaging films, and stressed the importance of market diversification for canola crushes.

KEY TAKEAWAYS

- Researchers have developed a mutant plant that didn't accumulate glucosinolates as much in seeds.
- The Canadian Light Source synchrotron uses light beams to X-Ray seeds, plants (and anything else) to study the physical and chemical makeup of samples.
- Researchers have developed a meal protein extract and are working to develop a startup company for this product.
- Researchers have made a pleasant tasting canola protein, finding it improves solubility.

> *"How can we use adsorbent resins and integrate it into the wet extraction process when we create these isolates to pull out these volatile compounds, or pulling out some non-volatile to reduce that flavour compounds that consumers don't like? And we were actually, we didn't eliminate everything, but we did a pretty good job pulling off these compounds, and it was actually quite a pleasant tasting canola protein in the end."*

Strategies for Canola Disease Management: Insights from Plant-Microbe Interactions

The Immunity Landscape of Oilseed Crops

Darrell Desveaux

Higher ploidy (e.g., hexaploid camelina) correlates with more resistance proteins and a broader range of pathogen recognition, although individual immune responses may be weaker, shared Darrell Desveaux, a professor in the Department of Cell and Systems Biology at the University of Toronto. The research suggests that inducing immunity against one pathogen can provide broad-spectrum protection. Future applications could involve creating immune elicitor cocktails for crop protection, with the challenge being effective delivery. The potential use of non-pathogenic growth-promoting bacteria to deliver these elicitors is discussed.

Clubroot of Canola: Surveillance and Management

Stephen Strelkov

Stephen Strelkov from the University of Alberta discussed the surveillance and management of clubroot in canola. Since 2004, annual surveys have identified clubroot in 47 of Alberta's 66 counties, with 307 cases in 2024. It was found for the first time in Clear Hills County in Alberta this year. Alberta's outbreak is more severe than Saskatchewan and Manitoba, with 55 documented pathotypes, including resistance-breaking types. Qualitative differences in clubroot severity were observed, suggesting potential epidemiological impacts from sub-populations of the pathogen.

KEY TAKEAWAYS

- Oilseed crops recognize more elicitors but can't respond as well to protect themselves.
- The 2024 clubroot survey in Alberta included 691 fields, and found 307 fields with plants infected with clubroot. Of those, 167 had no history of clubroot. It was found for the first time in Clear Hills County in Alberta.
- PENSV20 is a biocontrol agent that can protect canola against sclerotinia.

Biopesticides as a Novel Management Strategy for Sclerotinia in Canola

Tim Dumonceaux

The use of bio-pesticides for controlling Sclerotinia in canola. The project, for which the majority of research was carried out by Susan Boyetchko before her passing, identified Bacillus atrophaeus strain PENSV20 as an effective bio-control agent, demonstrating strong protection against Sclerotinia in greenhouse trials, shared Tim Dumonceaux, a research scientist with Agriculture and Agri-Food Canada. The researchers want to make PENSV20 available to farmers to protect their canola crops. It's a wettable powder that can be sprayed onto the plants. There are field trials coming as they have only completed greenhouse trials so far. They're working with Montana BioAgriculture, who have opened a Canadian division.

Sclerotinia Resistance in Canola Achieved by Constitutively Expressing Single Defense Genes Executor1, Syntaxin of Plants, Lectin-RK or Defensin

Lone Buchwaldt

Lone Buchwaldt, a research scientist with Agriculture and Agri-Food Canada, presented on achieving sclerotinia resistance in canola by constitutively expressing defense genes. The research involved screening a collection of Brassica napus accessions, identifying 30 lines with quantitative resistance, and transferring resistance to elite canola lines. Genetic mapping and transformation using agrobacterium-mediated methods were employed. Key genes included defensin, syntaxin, lectin receptor kinase, and executor 1, which showed reduced sclerotinia severity. The study highlighted that constitutive expression of these genes did not affect plant growth and offered some cross-resistance to clubroot and potential resistance to verticillium.

Reducing Emissions and Carbon Intensity

New Roots for Agriculture

Jonathan Lynch

Deeper-rooted crops can significantly improve water and nitrogen capture, and enhance carbon capture, potentially offsetting carbon emissions. Jonathan Lynch, distinguished professor emeritus at Pennsylvania State University, detailed the development of "topsoil foraging" in common beans and soybeans, which increased yield and incomes in Africa and China. He also described various root traits, such as fewer nodal roots and reduced root respiration, that improve drought and low-nitrogen tolerance in maize.

> *"The point is that you've probably heard about water use efficiency, in terms of the amount of water used by leaves to gain carbon and photosynthesis. But there's another way to look at this, which is carbon use efficiency. So, this is water use efficiency. These are removing water gaining carbon. But here we're looking at the root side of the equation. We're losing carbon to gain water or nitrogen, and that can be manipulated through these phenotypes."*

Evaluation of Canola Nitrogen Use Efficiency: Determining Proportions of Soil-and Fertilizer-Derived Nitrogen

Rachelle McCannell

An initial study on nitrogen use efficiency in canola by Rachelle McCannell, a master's student at the University of Saskatchewan, has found that only 50 per cent of applied fertilizer nitrogen is utilized by plants in the year of application, with the rest of the plant's nitrogen (N) coming from the environment, which may include N fertilizer from previous years, and N-cycling in the soil. The study used 15N isotope tracing over two years at three sites, revealing that soil nitrogen was a primary contributor to total nitrogen uptake, despite low residual soil nitrogen levels. Results showed low recovery of fertilizer nitrogen in harvested seeds and variable nitrogen uptake among canola lines. The study emphasized the need for improved soil nitrogen cycling and suggested potential breeding strategies to enhance this, with further studies required to confirm results.

Sources of Nitrogen Fertilizer in Dry Conditions

Haben Asgedom Tedla

Indoor experiments compared zone delineation methods using urea and enhanced efficiency fertilizers, shared Haben Asgedom Tedla, a research scientist with Agriculture and Agri-Food Canada. Results showed no significant yield differences between urea and enhanced efficiency fertilizers, but soil moisture levels influenced outcomes. Nitrous oxide emissions were higher with urea than enhanced efficiency fertilizers. Data from observations across provinces indicated that enhanced efficiency fertilizers performed better under high moisture conditions, highlighting the importance of soil moisture in nitrogen retention.

KEY TAKEAWAYS

- Researchers have found a number of maize lines with deeper root systems which can store more carbon.
- A study has found that canola plants may be getting more nitrogen from soil reserves than from fertilizer, with further studies required to confirm results.
- Variable rate nitrogen application provides a bigger benefit when there's a difference in soil moisture across the variable rate zones.

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