

KANOLAWEBWERFOPDATERING
CANOLA WEBSITE UPDATE
Februarie/February 2021

Die vorige opdatering is gedoen tot einde Januarie 2020.

Hierdie opdatering strek van die begin van Februarie 2020 tot einde Januarie 2021 en binne die onderstaande breë raamwerk weergegee. Enkele belangtike berigte in Februarie 2021 is wel ook ingesluit.

1. Canola Council of Canada (CCC)
2. Aktiwiteite van saadmaatskappye en *chemiese maatskappye* van Kanada
3. Tendencies / Developments in canola oil quality / speciality oils / canola meal quality
- 4 Australian Oilseeds Federation (AOF)
5. Activities of Australian Grain Research and Development Corporation (GRDC)
6. Universties and Research organizations in Australia
7. Aktiwitete van saadmaatskappye en chemikalieëmaatskappye in Australië
8. Ander sake van belang ivm. Kanola
9. Algemeen

1. Canola Council of Canada (CCC)

1.1 Keep it Coming 2025

Our plan to grow the Canadian canola industry

“Keep it Coming 2025 is the strategic plan guiding the canola value chain as we prepare for opportunities and challenges ahead. The plan supports continued growth, demand, stability and success by setting clear targets and providing the framework to collectively work toward them.

The ultimate aim of our strategy is to achieve an average yield of 52 bu/ac to meet global market demand of 26 million metric tonnes by the year 2025. We’re moving toward that goal by focusing on 1 three strategic priorities: (1) sustainable, reliable supply; (2) differentiated value; and (3) stable and open trade.

Our targets

	2019 Results	2011 & 2012 Average (the initial strategic plan benchmarks)	2025 Targets
Exported Seed	8.2 MMT	8.1 MMT	12 MMT
Domestic Processing	9.6 MMT	6.9 MMT	14 MMT
Acres (Seeded Area)	21 million	20.2 million	22 million
Yield	40 bu/acre	31.2 bu/acre	52 bu/acre
Production	18.6 MMT	14.2 MMT	26 MMT
Oil Content (Average of No. 1 Grade)	44.60%	44.40%	Maintain global competitiveness in oil content (10 yr average = 44.4%)
Saturated Fat Content	6.60%	6.70%	Global leadership position in oil saturated fat content
Meal Crude Protein Content (Oil-free, 12% moisture basis)	38.30%	39.7%*	Increase protein availability by target species (10 yr average = 37.9%)

MMT = Million Metric Tonnes

**8.5% moisture basis*

Priority: Sustainable, reliable supply

In the past, the Canadian industry increased canola production through genetics and additional acreage. In future, growth will come from capturing the full potential of genetic advances with the right agronomy. With a better understanding of each producer's unique circumstances and agronomic pressures, we can grow significantly more canola on about the same number of acres, thereby maximizing the value derived from every seed we plant.

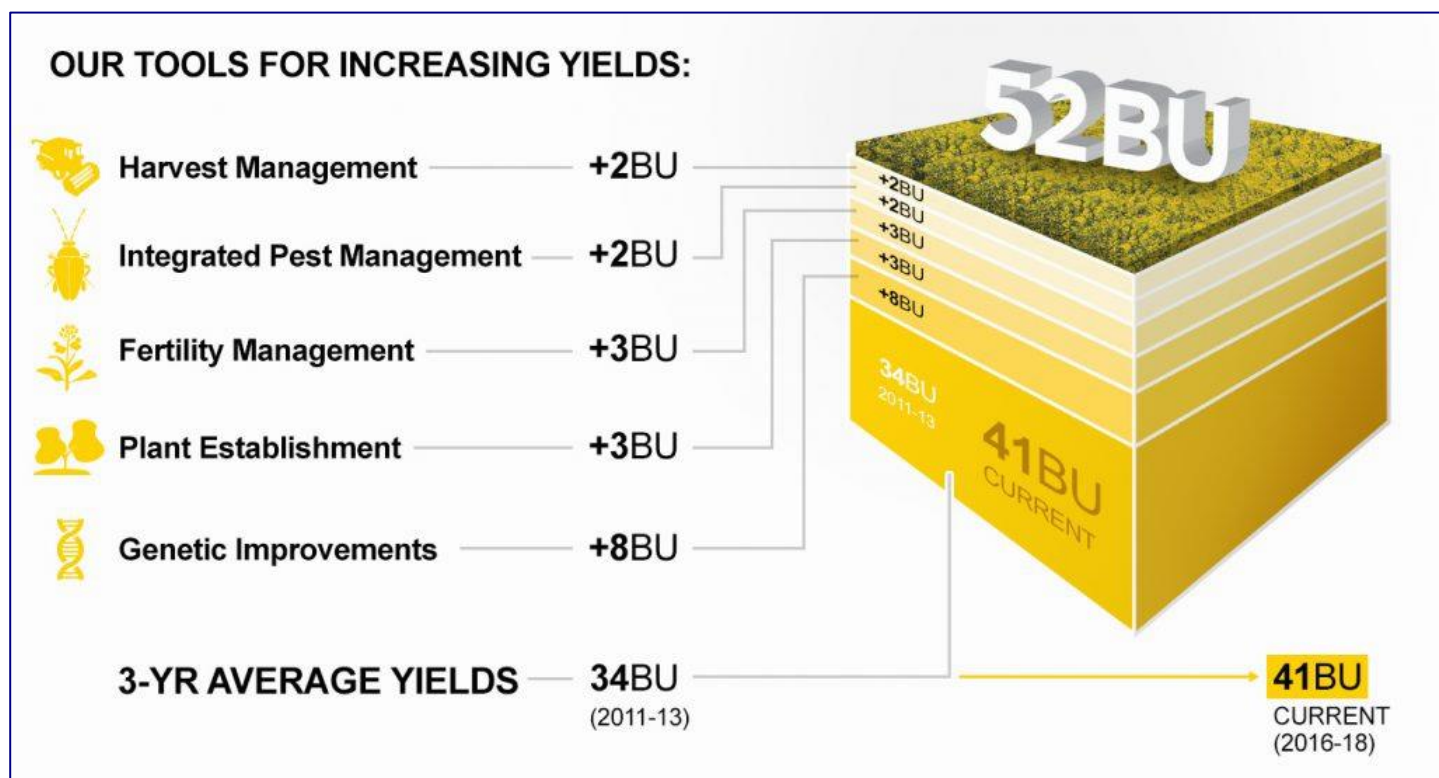
Measures of success

- Average yield of 52 bu/acre
- 26 MMT of canola grown on 22 million acres
- Global leadership in quality characteristics of seed, oil and meal to meet customer requirements
- Increased protein availability in meal by target species
- Achievement of our sustainability goals

How we'll get there

Research shows there is plenty of potential to improve yields by customizing our approaches to soil zones, disease management, insect pressures and weather. The key to growth is providing the best agronomic information and advice for each unique farm operation, based on the latest science.

We can add a total of 18 bu/acre to average yields through continued genetic gains and improvements in four key crop management areas: plant establishment, fertility management, integrated pest management and harvest management.



To learn more, read *52 By 2025: How we'll get there* (published 2014).

2025 sustainability goals

Along with our 2025 production goals, the canola industry has set bold but achievable sustainability targets. These two sets of goals work in tandem: As yields increase, we reduce energy use per bushel of canola produced, increase carbon sequestration and increase land efficiency.

These targets were established through our partnership with the Canadian Canola Growers Association and reflect the science-based approach to which both associations are committed.

Read more about canola's sustainability story.

Sustainability goals for Canadian canola

The Canadian canola industry has set environmental sustainability goals to accompany our 2025 production goals.

Use less energy

18% reduction in fuel use/bushel

Increase land efficiency

40% decrease in the amount of land required to produce one tonne of canola

Sequester more carbon

5 million additional tonnes of greenhouse gas emissions sequestered in Canadian soils every year

Improve soil and water health

Utilize 4R nutrient stewardship practices on **90% of canola acres**

Protect biodiversity

Safeguard over 2,000 species of beneficial insects that call canola fields and surrounding habitat home

[Read more about canola sustainability.](#) (PDF)

The rest of this publication deals with the strategy to grow their canola export market where 90% of Canadian canola is consumed.

<https://www.canolacouncil.org/about-us/strategic-plan/> Date: 2020

1.2 Partnership enables more than \$2.3 million in grower-funded canola agronomic research in 2020

“The three Prairie, provincial canola grower organizations have reviewed and selected six new canola research projects to receive funding under the Canola Agronomic Research Program (CARP) in 2020. This includes an investment of more than \$1.1 million from Alberta Canola, SaskCanola and Manitoba Canola Growers, as well as matching funds from the Western Grains Research Foundation (WGRF), bringing the total investment to over \$2.3 million.

This is the first time that WGRF has partnered with the three provincial canola grower organizations on the program,-----.

This year’s CARP projects focus on:

- germplasm discovery for sclerotinia tolerance,
- investigation of insect pest predators,
- investigation of insect pest predators,
- improving insect pest monitoring,
- protein optimization, and
- high-throughput phenotyping to enable faster screening of stable, high-yielding traits.

The findings from these projects are incorporated into various tools, including canolaresearch.ca and canolaencyclopedia.ca. More information on CARP can be found at canolacouncil.org.

About WGRF

The Western Grains Research Foundation (WGRF) is a farmer-funded and farmer-directed non-profit organization investing in agricultural research that benefits Western Canadian farmers. WGRF is the largest producer funder of field crop research in Canada.

<https://www.canolacouncil.org/news/partnership-enables-more-than-23-million-in-grower-funded-canola-agronomic-research-in-2020/> Dated: March 12, 2020.

1.3 The research behind recommended canola production practices

Certain agronomy practices can improve the chance of sustainably producing a profitable high-quality crop with reduced production risk. Based on the best research findings available, here are some of the key influential studies which support key practices recommended for Canadian canola farmers.

Target 5 to 8 plants per square foot to balance seed yield potential and cost

Steve Shirtliffe (2009) reported that a canola plant stand of three to four plants per square foot is required to maintain full seed yield potential. Other studies have reported that reducing targeted plant populations is possible without compromising seed yield, however, uniform spatial arrangement or seed distribution per unit area must be maintained (Angadi et al. 2003). Currently, Shirtliffe (University of Saskatchewan) leads a project on spatial arrangement and its effect on canola yield. For more research on this topic, check out this study on precision planters and other plant establishment research on the Hub.

Tailor 4R nutrient plans specifically to each field

Nutrient concentrations are inconsistent from field to field and from one year to the next. Regular soil testing of each field is crucial to developing appropriate fertilizer plans based on yield targets for each field. 4R principles are based on applying the Right Source at the Right Rate, Right Time, Right Place. Not only is it economically wasteful to over-fertilize a crop, as environmental stewards of the land it is our responsibility to minimize harmful effects excess nutrient applications pose, including nutrient runoff into water systems (Sims et al. 2000). Bao-Luo Ma (Agriculture and Agri-Food Canada, Ottawa) is currently leading a study looking at improving nitrogen use efficiency in canola, which will improve the decision making process when it comes to the right rate in canola. For more research on this topic, check out the fertility studies on the Hub, including one on the impact of source and placement of nitrogen and sulphur fertilizers.

Time herbicide applications to control early, most costly weeds

Weed species are, in general, easier to control when they are younger. While application timing for best weed control can be a challenge logistically, Clayton et al., (2002), Harker et al., (2004), and Grey et al., (2006) have all reported more effective weed control when herbicides were applied earlier than later. In addition to superior weed control, Harker et al., (2008) found that canola yield declined linearly as herbicide application was delayed beyond the one- to two-leaf stage, therefore early herbicide applications will protect crop yield. For more research on this topic, check out this study led by Bob Blackshaw or this research led by Neil Harker.

Follow insecticide economic thresholds for ROI and biodiversity

To achieve a return on investment (ROI) for insecticide applications, only apply once pests present in the crop have exceeded their respective economic thresholds. Thresholds-based decisions protect the crop while decreasing input expenses and reducing the risk of killing beneficial insects and the vast number

of insects that are of no concern. For an example of new research, Hector Carcamo (2019) found a reliable estimate of cabbage seedpod weevil could be determined with four sets of 10 sweeps taken at paired locations. If weevil counts exceed the current economic threshold of 25-40 per 10 sweeps, then growers might consider a spray. For more research on this topic, check out these studies which Hector Carcamo was involved with.

Seed canola once every three (or more) years to reduce clubroot risk

Clubroot is a major disease and yield robber of canola. A minimum two-year break between canola crops (and other hosts) will help reduce clubroot spore levels in soil, with over 90 per cent of the spores not being viable after a two-year break (Peng et al., 2014). Furthermore, Ernst et al. (2019) recommended that growing clubroot-resistant cultivars should not be solely relied upon to reduce clubroot soil spore loads and that expanding crop rotations beyond susceptible hosts is the most effective approach. Current research is investigating management strategy interactions and effectiveness. This includes resistant cultivars, lime application and control of clubroot susceptible weeds by Brittany Hennig (University of Alberta). For more research, check out clubroot projects on the Hub, such as this one on the management of clubroot in a dynamic environment.

Rotate major resistance genes to stop blackleg

Using the same blackleg resistance genetics every year in the same field will lead to a breakdown in the cultivar's resistance to the disease. In some cases, this breakdown has been reported in as little as two years (Kutcher et al. 2010). Marcroft et al., (2012) found reduced blackleg incidence when cultivars with different blackleg resistance genes were grown consecutively. For this reason, it is important to know the races of blackleg in your fields, and to rotate between effective major resistance genes. Gary Peng (Agriculture and Agri-Food Canada, Saskatoon) leads a research project on monitoring blackleg race dynamics across Western Canada, while Dilantha Fernando (University of Manitoba) is identifying ways to steward blackleg major resistance gene cultivars. For more, check out these other studies Dilantha Fernando was involved with.

Apply sclerotinia fungicides at early flowering

Timing is the most important component of a fungicide application. While the window for control of sclerotinia is between 20 and 50 per cent flowering, spraying at the earlier flowering stage can increase your ROI. Canola petals begin to drop at around 30 per cent flowering, land on lower parts of the plant and serve as a nutrient source for fungal spores to germinate and infect surrounding plant tissue (Bardin and Huang 2001). A fungicide applied just before this time is most effective because the initial dropped petals will be protected, providing sclerotinia control from the beginning of the infection period. Kelly Turkington (Agriculture and Agri-Food Canada, Lacombe) is looking to improve the management of sclerotinia by using fungicides and effective risk assessment tools. For more, check out this predictive modelling study or other sclerotinia projects on the Hub.

Swath canola at 60% color change

Vera et al., (2007) reported increased seed yield with later swath timing. In field scale trials, Brown et al., (2013) reported the highest yield loss when canola was swathed at 10-20 per cent seed colour change, and the lowest yield loss when swathing at 60-80 per cent seed colour change. As always, pod colour change is an inaccurate method in determining swath timing and pods should be split open to examine seed colour change. Straight cutting canola, which achieves the yield advantage of later swathing, is becoming more popular. Chris Holzapfel (Indian Head Agricultural Research Foundation) is exploring pre-harvest herbicide and desiccation options for this practice. See a summary of the Holzapfel project.

Keep canola dry and cool for safe storage

Protect your investment. Canola should be eight to nine per cent moisture concentration for safe storage for up to a year in temperate climates (Jayas 2012). Furthermore, it is critical that canola is cooled to less than 15° for safe storage, especially if moisture concentrations exceed eight to nine per cent. The combination of eight to nine per cent moisture and grain temperature of less than 15° is ideal for safe long-term storage, but check regularly just to make sure. For more on storage risks and conditioning tips, check out the best management recommendations in this interesting storage study.

While these practices are based on the best research we have at this time, further research is in progress on many of these topics. Be sure to browse through the ongoing projects, including those underway through the Canola Agronomic Research Program (CARP) and the Canadian AgriScience Cluster.

To obtain a 'Project Summary' of ongoing research projects (49) open this website and click on underlined 'ongoing projects' in the last paragraph.

<https://www.canolacouncil.org/research-blog/the-research-behind-recommended-canola-production-practices/> Date: January 13, 2021

1.4 Canola Research Hub

Canola Research Hub update provides easy access to the latest agronomic research

“Through a new user-friendly interface at **canolaresearch.ca**, the Canola Research Hub provides growers, agronomists and industry stakeholders with quick and easy access to a comprehensive database of canola agronomic research results. The Hub is a knowledge transfer tool – designed to share the latest canola research findings that can be put into action on the farm to improve canola yields and profitability.

The new platform makes it easy to access results through keyword searches or filtering results by funder, agronomic topic, project status or date. Users can access a full report, short summary or key finding on a specific project quickly, and easily share those results with colleagues or customers (via e-mail, Facebook or Twitter buttons). The Canola Research Hub also includes blog posts to help highlight

timely content throughout the growing season including research behind recommended practices and research program updates.

The 'Key Result' and 'Project Summary' of completed projects can be obtained by opening the Canola Research Hub, scroll down to 'Keyword Search' and click on 'Search Q' and select research project interested in and click on project title under 'Completed'.

<https://www.canolacouncil.org/research-hub/> Date: January 14, 2021

1.5 Crop Production Research Priorities

Current research priorities for canola crop production

“Every year, the Canola Council’s crop production and innovation team identifies the research areas with the most potential to increase yields and improve the sustainability and competitiveness of Canadian canola. These priorities are set through consultation with expert steering groups, the canola value chain and the annual Canola Week.

Sustainability

Evaluation and identification of alternative management tactics and tools for major canola pests

(ex. RNAi, genetic resistance, non-neonicotinoid treatments, enhancement of beneficial insects)

Investigate the role of buffer strips in mitigating nutrient and pesticide runoff

Crop modelling to determine the impact of climate change and landscape modification on canola yield

Investigate nutrient and pesticide loads in tile-drained effluent

Also see insect pest priorities

Integrated pest management

Integrated Pest Management

Insect pests Re-assess pest control thresholds under modern canola densities (less than and within 50-80 plants/m²) and modelling for dynamic thresholds, including beneficial insects and features enhancing or diminishing their impact.

Weeds Investigate and identify novel integrated weed management techniques for enhanced and diversified weed control methods

Understanding of the socio-economic factors impacting on-farm agronomic decision making

Modelling to determine weed species that will become more or less weedy and invasive in a changing climate

Determine modern hybrid canola's "Critical Period of Weed Control" under a range of plant densities and abiotic factors

Sclerotinia stem rot

Improve sclerotinia stem rot forecasting. Evaluate the efficacy of forecasting tools and incorporate into the "Sclerotinia Checklist" (sclerotinia-control decision making matrix)

Investigate fungicide sensitivity to *S. sclerotiorum* to identify potential resistance development

Meta-analysis to determine phenology and biotic factors leading to high levels of sclerotinia infection

Clubroot

Further understand the host – clubroot pathogen relationship

Development of reliable screening techniques to assess the durability of new forms of clubroot cultivar resistance

Identify and categorize new and existing clubroot pathotypes

Development and identification of new clubroot resistance sources

Also see liming priorities

Blackleg

Improve understanding of the blackleg resistance interaction with ascospores and pycnidiospores and how this impacts major and quantitative cultivar resistance

Evaluate the effectiveness of commercial blackleg resistance sources

Identification of novel blackleg resistance genes

Identify and evaluate blackleg management techniques and tools in tight canola rotations

Use of novel, non-GMO approaches, to integrate blackleg resistance genes into *B. napus*

Verticillium stripe

Identify and evaluate control options for *V. longisporum*

Determine environmental conditions conducive to *V. longisporum* infection and development on canola

Liming

Understand the effect of free calcium versus pH in managing clubroot with pH adjustment

Evaluate pH amendment products, pH targets for agronomic enhancement versus clubroot suppression, and physical incorporation strategies that include zero till

Evaluate the impact of liming across crops, including an economic analysis across the rotation

Harvest & storage management

Harvest

Development of an industry standard for rating and evaluation of varietal pod drop and pod shatter

Determine swathed versus straight cut timing to “harvest maturity”

Evaluate frost and pod damage impact on shatter tolerant canola

Measure combine performance and losses using auto drive features

Improve upon and test combine loss and yield sensor technology

Storage

Improve understanding of canola respiration/sweating in storage and the influence of various factors (ex. preharvest and harvest methods, oil content, dockage, etc.)

Determine the impact of storability from elevated dockage and insect parts, green seed and immature seed

Evaluation of conditioning/drying technologies and methods (ex. Horizontal airflow, supplemental heat) and fan control strategies

Development of best management practices for storage of canola in large bins (10-25,000+ bushels)

Validate/update canola’s equilibrium moisture content (EMC) with modern hybrids of relevant oil content

Plant establishment

Understand and quantify biological factors impacting non-germination and non-emergence

Investigate genetic factors conferring greater early season vigour and higher germination and/or emergence potential

Field evaluation of seed placement and uniformity across seeding implements, soil types and environmental conditions

Meta-analysis to quantify the impact of plant density on canola maturity

Fertility management

Investigate “Soil Health” tests and their usefulness and validity for canola production

Investigate nutrient sensors/proximal sensors and their ability to accurately predict nutrient availability

Evaluate 4R nutrient stewardship under modern farming practices

Evaluate the need for increased micronutrients for high yielding canola

Evaluate the impact of high soil reserves of phosphorous and potassium on canola yield

Also see liming priorities”

<https://www.canolacouncil.org/research/agronomic-priorities/#sustainability> Date: 2020

1.6 Canola AgriScience Cluster

Sustainable, reliable supply for a changing world

The Canola AgriScience Cluster is five-year research program funded through Agriculture and Agri-Food Canada's (AAFC) Canadian Agricultural Partnership (CAP) and the canola industry. Announced in 2018, this initiative will invest over \$20 million in funding into six areas of research to advance two priorities of the Canadian canola industry:

- Sustainably and profitably increasing production and quality characteristics, and
- Differentiating and demonstrating the quality of canola products to meet new and existing customer requirements at a competitive price.

To further support the Canadian canola industry, the Canola AgriScience Cluster was amended in 2019 to include activities focused on blackleg and verticillium stripe. This amendment injects another \$5 million in joint funding, comprised of nearly \$3 million through AAFC's Canadian Agricultural Partnership and \$2 million from Alberta Canola and SaskCanola, towards canola research to grow a sustainable, reliable supply for a changing world.

The critical research being carried out under the Cluster program will fill knowledge gaps and lead to new innovative technologies in sustainable canola production which are expected to expand canola's economic value and propel the industry toward our 2025 strategic goals.

7 Themes are currently addressed in this program each focussing on several projects given under each of the 7 themes(32 projects).

Theme 1: Differentiated quality and enhanced environmental performance in food processing.

1. Nutrigenetics, canola oil, and glucose tolerance: Does SCD1 genotype modulate a person's response to canola oil?
2. Novel extraction of oil and antioxidants from canola seed, and functional evaluation of oil, meal, protein & antioxidants from novel extraction in comparison to current commercial oil & meal

(The 'Purpose' of this project is given hereunder as an example of the manner in which reporting is done for all projects.)

Research team: Martin Scanlon (University of Manitoba), John Shi (AAFC Guelph), John Lu (AAFC Lethbridge), Yachaun Zhang (AAFC Lethbridge), Jim House (University of Manitoba), Usha Thiyam (University of Manitoba), Rick Green (KeyLeaf)

Purpose: Concern about the environmental footprint of the use of organic solvents means that alternative technologies are being considered for oilseed extraction. The objective of this project is to develop innovative "green" extraction processes and technologies to produce high quality canola oil and meal protein with rich active health-promoting components while eliminating the need for solvents and high temperatures from the process. The project will examine the performance of two non-organic solvent technologies – supercritical carbon dioxide extraction and microemulsion extraction. Technical evaluation of the extraction processes and the finished products will provide guidance for further investigation and cost/benefit analyses, positioning the canola industry for continued sustainable growth.

Theme 2: Differentiated quality and sustainable livestock production using canola health and digestive physiology of nursery pigs fed canola meal-based diet

Gut health and digestive physiology of nursery pigs fed canola meal-based diets

Canola meal to improve efficiency and sustainability of dairy production: filling knowledge gaps

Understanding the impacts of canola meal on gut microbiota and potential pre-biotic effect of enzymatically-released bioactive fiber components and the long term effects of high levels of canola meal inclusion on sow and litter performance

Accurate determination of the contribution of canola meal to metabolizable protein supply in dairy cows

Evaluation of canola meal as compared to soybean meal in practical California rations: effects upon long term lactational performance, reproductive performance and metabolic disease

Theme 3: Increased production – yield and quality optimization for sustainable supply

Manipulating agronomic factors for optimum canola harvest timing, productivity and crop sequencing

Enhancing yield and biomass in canola by modifying carbohydrate metabolism

Weeding out secondary dormancy potential from volunteer canola

Advancing the functional, nutritional and economic value of canola protein in Canada

Theme 4: Sustainability and climate change – improving nutrient and water use efficiency

Improving nitrogen use efficiency (NUE) and soil sustainability in canola production across Canada

Making of a more sustainable canola: Using genetic diversity to improve NUE

Theme 5: Sustainability and climate change – integrated pest management

Feasibility of using *Trichomalus perfectus* for biological control of cabbage seedpod weevil in the prairies

Integrated approaches for flea beetle control II: incorporating the impacts of plant density, ground predators, and landscape-scale predictive models in the management of flea beetles in the Canadian prairies

Genetic resources for flea beetle resistance in canola

Improving the management of sclerotinia stem rot of canola using fungicides and better risk assessment tools

Development of a biosensor for sclerotinia stem rot disease forecasting in canola

Protection of canola from pathogenic fungi using RNA interference technologies

Resistance to sclerotinia sclerotiorum effectors in canola

CANADIAN CANOLA CLUBROOT CLUSTER PILLAR 1: Integrated disease management

CANADIAN CANOLA CLUBROOT CLUSTER PILLAR 2: Developing novel resistance resources and strategies to address the new threat of clubroot canola production on the prairies

CANADIAN CANOLA CLUBROOT CLUSTER PILLAR 3: Host-pathogen biology and interaction

Theme 6: Putting innovation into action – knowledge and technology transfer

Effective KTT is critical for success, effective dissemination, and practical application of the above research. Theme 6 activities will increase the value of all Science Cluster research by assisting scientists and sharing their findings with growers and other industry stakeholders. The Canola Council's agronomy specialists will translate research results into tangible practices that can be applied on farms. The information will also be widely available through the Canola Research Hub, a state-of-the-art online information resource maintained by the Council.

Theme 7: Maintaining canola supply and trade – blackleg and verticillium

Developing a robust system for efficient assessment of quantitative resistance (QR) in commercial canola varieties for blackleg management

Developing tools for the rapid screening of canola germplasm for quantitative resistance to disease

Understanding the critical infection window that causes blackleg of canola in Western Canada

Improving management of blackleg on canola via better flea beetle control and effective fungicide seed treatment in Western Canada

Improving blackleg resistance durability through R-gene rotation in commercial fields on the Canadian prairies – a science-based stewardship program

Genetic dissection of the Rlm3-4-7-9 blackleg R gene cluster and KASP marker improvement

Verticillium disease etiology and nursery

Genetics and genomics of Brassica-Verticillium interaction.

<https://www.canolacouncil.org/research/agriscience-cluster/> Date: 2020

1.7 Proposed Clean Fuel Standard holds potential for canola

“The Canola Council of Canada (CCC) sees potential in the federal government's proposed rules for the Clean Fuel Standard (CFS) released late last week. The CCC is pleased to see the CFS provides options for Canadian farmers' growing practices to be accepted at a national level without any additional on-farm requirements....

<https://www.canolacouncil.org/news/proposed-clean-fuel-standard-holds-potential-for-canola/>

Date: December 22, 2020

1.8 Try the online tool to compare canola varieties

‘Compare leading varieties based on days to maturity, lodging, height and yield with the Canola Performance Trials (CPT) online database at canolaperformancetrials.ca. Results from 2019 trials are now loaded into the system.

“Yield is just one factor to consider when making canola variety decisions for 2020,” says Keith Fournier, chair of the CPT Governance Committee. “After 2019, many farmers will be paying attention to days to maturity, for example, and will be looking for clubroot resistance and perhaps harvest management traits like lodging and pod shatter tolerance.”

Results from the 2019 trials are based on 31 small plot and 60 field scale trials across the Prairies. The 2019 program had more completed sites than any of the previous four years, and saw a big jump from 27 small plot and 42 field scale trials in 2018.

Using the online searchable database, located at the bottom of the page at canolaperformancetrials.ca, growers can filter CPT results by province, season zone and herbicide-tolerance system. They can also search all varieties or do head-to-head comparisons of two or three varieties. Simply select a year and other filter parameters, and click ‘Search Trials’ to produce graphs and a data table displaying yield, days to maturity, height and lodging comparisons. A map shows the locations for all trials that fit the selections.

The online tool can also compare variety results over a number of years. The CPT program has been running since 2011, and applicable data collected over the past nine years are available.

To see comparison tables with clubroot-resistant varieties and for straight-cut harvesting, please see the PDF results report also available at canolaperformancetrials.ca. The small plot trials included 12 straight-cut sites. Field scale trials had 37 straight-cut locations and 11 clubroot comparisons.

“The CPTs compare leading varieties with traits that farmers are looking for,-----”

<https://www.canolacouncil.org/news/try-the-online-tool-to-compare-canola-varieties/>

Date: February 11, 2020

1.9 Consider herbicide-resistance traits when choosing canola varieties

Q: Should weed populations in my field affect my canola decision?

A: When selecting canola varieties for your operation in 2021, yield potential and pod integrity are front of mind. However, different varieties utilize different herbicide-resistance traits, and this, too, should be considered.

Canola varieties utilizing glufosinate (LibertyLink or LL), glyphosate (Roundup Ready or RR), sulfonylurea (SU) and Clearfield imidazolinone (IMI) traits can be an agronomic fit depending on your operation and the weeds present in your fields.

Glyphosate, especially TruFlex varieties, are a great tool for growers who have significant late-flush weeds or grassy weed populations. TruFlex varieties can be applied later into the season, from cotyledon up to first flower, ensuring late-germinating weeds will not establish late and set seed. For fields with significant grassy weed and wild oat pressure, glyphosate-tolerant varieties are an excellent agronomic fit.

Varieties tolerant to glufosinate have yielded exceptionally well across Western Canada. For optimal control, glufosinate should be sprayed in the heat of day with increased water volumes. Though some growers will be tempted to reduce spray volumes to stretch acres applied during the busy spray season, applying spray solution with at least 15 gallons per acre will help to maximize herbicide efficacy.

*Glufosinate is a Group 10 herbicide that works by contact, and adequate coverage is important. Spraying at reduced volumes can limit coverage and could require a followup application to control missed weeds, reducing yield and is an added cost for an additional pass.

IMI-resistant varieties are often used as a rotational break for fields with significant volunteer RR or LL canola populations. These varieties also carry non-GMO oil contract premiums that can be priced into your operation.

Though an agronomic fit to control volunteer canola, if your operation has a history of Group 2-resistant weeds, other herbicide-resistance systems are a better fit. Sulfonylurea varieties are relatively new to Western Canada, use different Group 2 herbicide-resistance traits and are also non-GMO. For both IMI and SU varieties, ensure plants reach proper staging before applying to reduce crop injury.

When selecting varieties for your operation, it is important to consider the yield potential, herbicide tolerance and agronomics of the varieties as part of a multi-year management strategy. Consider local trial data when selecting the right variety for your farm and always use registered tank mixes with additional active ingredients, when possible, to reduce selection pressure for herbicide resistance on your fields.

**Update:* The article previously stated glufosinate as a Group 14 herbicide.

<https://www.grainews.ca/columns/wheat-chaff/consider-herbicide-resistance-traits-when-choosing-canola-varieties/> Date; January 14, 2021

2. Aktiwiteite van saadmaatskappye en chemiekalieëmaatskappye van Kanada

2.1 New canola varieties for 2021

Almost two dozen canola hybrids will be coming your way, some with improved shatter and clubroot resistance.

“Twenty-three new hybrids will be hitting the market for western Canadian farmers in 2021. Strong standability, improved shatter resistance and clubroot resistance are major themes in the new lineup. Please note, the following list includes only brand new variety releases for 2021.

BASF

InVigor L357P is a pod shatter-reduction hybrid that offers high yield and very strong standability. This hybrid also features the added benefit of excellent blackleg resistance. A new addition to BASF’s 300 series, InVigor L357P suits non-clubroot areas.

InVigor L340PC is a high-yielding, mid-maturing, pod shatter-reduction hybrid that offers first-generation clubroot resistance and strong standability.

InVigor L340PC is a high-yielding, mid-maturing, pod shatter-reduction hybrid that offers first-generation clubroot resistance and strong standability.

BY 5125CL is a strong yielder in the Clearfield segment with excellent disease protection and mid-season maturity (+0.1 days). BY 5125CL also features first-generation clubroot protection (resistance to pathotypes 2F, 3H, 5I, 6M and 8N).

Brett Young

BY 6204TF with Truflex canola system with Roundup Ready Technology, 102% performance rating, mid-maturity (+0.1 days), first generation club-root resistance, DefendR-rated Blackleg resistance, excellent standability.

BY 5125CL Clearfield system, earlier maturing(+4days), higher yielding(106%), first generation club-root resistance, DefendR-rated Blackleg resistance, excellent standability.

Corteva: Brevant Seeds

D3157C is a high yielder (107 per cent of DK 75-42) with very good standability and strong lodging resistance. It offers CR1 resistance to clubroot pathotypes 2F, 3H, 5I, 6M and 8N. Mid-maturing, it is rated R for both blackleg and fusarium wilt.

D3158CM provides high yields (107 per cent of DK 75-42), consistent performance and very good standability. This hybrid includes the HarvestMax trait for straight cut or delayed swathing, offering producers their choice of harvest timing for maximum yield management. D3158CM includes CR1 resistance to clubroot pathotypes 2F, 3H, 5I, 6M and 8N. Mid-maturing, it is rated R for both blackleg and fusarium wilt.

B2030MN is a new Clearfield hybrid with the HarvestMax trait for straight cut or delayed swathing. B2030MN offers very good early-season growth, good yield potential (99.4 per cent of Brevant 2028 CL and 100 per cent of Pioneer 46H75) and very good standability. This hybrid includes CR1 resistance to clubroot pathotypes 2F, 3H, 5I, 6M and 8N and is rated R for both blackleg and fusarium wilt.

Canterra Seeds

CS2600 CR-T is an early-maturing, high-yielding TruFlex canola. The straight cut hybrid offers an enhanced clubroot package with additional resistance to 2B + 5X pathotypes, as well as R-C to blackleg and R to clubroot. CS2600 CR-T yields 112 per cent of 75-42 CR.

CS2700 (registration pending) is a high-yielding, mid-maturing Clearfield canola with clubroot resistance and multigenic (R-AE2) blackleg resistance. CS2700 yields 3.5 per cent more than a market-leading Clearfield hybrid. Contract premiums are available.

Corteva: Pioneer

45H42 is a high-yielding (110 per cent compared to 75-42) Pioneer Protector clubroot canola hybrid with medium-early maturity. 45H42 offers strong lodging resistance and is rated R for both blackleg and clubroot (2F, 3H, 5I, 6M and 8N pathotypes).

45CM44 offers excellent yield (102 per cent of 45H33) and the Pioneer Protector clubroot trait (R to 2F, 3H, 5I, 6M and 8N pathotypes). It also offers the HarvestMax trait, which gives producers the choice of harvest timing for maximum yield management. 45CM44 has strong emergence and excellent early growth, a good lodging score, and an R rating for blackleg.

P506ML is a high-yielding (104.6 per cent of P501L) Pioneer Protector HarvestMaxCR (clubroot resistance and harvest flexibility) canola hybrid with the LibertyLink trait. P506ML offers very good lodging resistance, excellent emergence and early growth, and an R rating for blackleg.

P505MSL is a Pioneer Protector Plus canola hybrid that defends against clubroot (R to 2F, 3H, 5I, 6M and 8N pathotypes), blackleg (R) and sclerotinia, and offers strong yield potential (104.6 per cent of P501L). This hybrid includes the HarvestMax trait, which gives producers the choice of harvest timing for maximum yield management. P505MSL offers very good lodging resistance and excellent emergence and early growth.

P607CL is a Pioneer Protector clubroot canola hybrid with an R rating for blackleg and clubroot (2F, 3H, 5I, 6M and 8N pathotypes) and the Clearfield herbicide tolerance trait. This hybrid offers good yield potential (99 per cent of 46H75) and is very good for lodging.

P508MCL offers Pioneer Protector HarvestMax (for choice of harvest timing for maximum yield management), an R rating for blackleg protection and the Clearfield herbicide tolerance trait. Featuring excellent yield potential (101 per cent compared to 46H75), this hybrid has excellent early growth and emergence and is very good for lodging.

Proven Seed

PV 761 TM is a very high-yielding (102 per cent versus Dekalb 75-65 BL) TruFlex canola with Roundup Ready technology, allowing for a wider spray window and application rate flexibility. The improved pod integrity (pod shatter score equivalent to Dekalb 75-65 RR) allows producers the option of straight cutting and provides flexibility at harvest time. This hybrid features excellent standability and an R rating to blackleg and fusarium wilt. It is suitable to all growing zones of Western Canada.

PV 660 LCM is the first harvest management LibertyLink canola hybrid from Proven Seed. PV 660 LCM includes a strong disease package including clubroot, blackleg and fusarium wilt resistance. This

hybrid offers strong yield (99 per cent of check L233P) and excellent standability. It suits all growing zones across Western Canada.

PV 681 LC combines early maturity with the highest yield potential (100 per cent of L233P) of any LibertyLink hybrid from Proven Seed. Suitable for all growing zones, this early-/mid-season hybrid is a strong choice for geographies at risk of clubroot in Western Canada. PV 681 LC has an R rating for fusarium wilt and blackleg.

Cargill

Victory Canola V25-3T TruFlex is part of the Cargill Specialty Canola Program. This hybrid is the earliest-maturing Victory hybrid. It offers polygenic blackleg resistance, is rated R for clubroot resistance and has resistance to fusarium wilt. Victory Canola V25-3T TruFlex is a strong yielder (104 per cent of 45H33 and L233P in yield trials) and is suitable for all growing regions.

Victory Canola V25-5T TruFlex is a high-yielding TruFlex Victory hybrid that yielded 107 per cent versus 45H33 and L233P in yield trials. It offers polygenic blackleg resistance, is rated R for clubroot resistance, and has resistance to fusarium wilt. This hybrid is suitable for all growing regions.

Croplan

CP21T3P is built for farmers looking to maximize yields in a straight cut system in non-clubroot-affected areas. Featuring excellent shatter resistance and strong standability, CP21T3P is a TruFlex hybrid with improved, multigenic blackleg resistance, medium height and mid-maturity.

<https://www.grainews.ca/features/new-canola-varieties-for-2021/> Date: November 9, 2020

2.2 Major agribusinesses targeted in antitrust investigation

Canadian Competition Bureau looking at practices of BASF, Corteva, Bayer and Cargill in dealings with Farmers Business Network.

“Canadian Competition Bureau obtained court orders on Feb. 11 to advance an ongoing civil investigation into alleged anticompetitive policies or practices of certain manufacturers and wholesalers of agricultural products operating in western Canada, including BASF, Bayer-Monsanto, Cargill, Corteva, Federated Coop, Univar Solutions and Winfield.

The bureau is investigating allegations that a number of manufacturers and wholesalers of seeds and crop protection products (such as insecticides, fungicides and herbicides) have anticompetitively refused to supply or restricted supply to Farmers Business Network Canada (FBN), a retailer of agricultural inputs and operator of an online analytics platform for farmers. It is also investigating whether some of these entities may have engaged in coordinated behavior against FBN.

BASF, Corteva, Bayer and Cargill said they will cooperate with the Competition Bureau’s investigation, which was launched following a complaint from FBN. “

<https://www.feedstuffs.com/news/major-agribusinesses-targeted-antitrust-investigation>

Date: February 6, 2021

2.3 BASF

2.3.1 BASF Digital Farming and VanderSat first to offer access to scalable, daily biomass images unimpeded by cloud cover

- Biomass image service to be integrated with xarvio™ FIELD MANAGER and available in North America by March 2021

- Farmers gain daily access to reliable, highly accurate biomass images derived from satellites
- Consistent crop growth monitoring enhances agronomic decision making

“BASF Digital Farming GmbH, in partnership with VanderSat, will be the first company globally to offer the agricultural industry access to scalable, daily biomass images derived from satellites and unimpeded by cloud cover. The two companies have signed a commercial agreement, which will integrate VanderSat’s innovative, fully operational Cloud-free Biomass product with BASF Digital Farming’s market leading xarvio™ FIELD MANAGER solution. The technology is expected to be available in North America by the end of March 2021.

For more information, please visit www.xarvio.com.”

https://agro.basf.ca/basf_solutions/index/newsrelease_west.html?OpenDocument&id=NR-CREO-BXLPHT Date: January 25, 2021

2.3.2 BASF receives Health Canada PMRA registration on active ingredients for two new pre-seed products

- Certitude® herbicide to provide Canadian canola growers with industry-leading control of resistant kochia and volunteer canola for 2021 growing season
- Certitude is the first-ever group 27 for pre-seed use in canola
- Smoulder™ to be available for the 2022 growing season to provide uncompromised weed control for wheat and barley

“----- BASF Canada Agricultural Solutions received registration from Health Canada’s Pest Management Regulatory Agency (PMRA) on the active ingredient (AI) Topramezone. The first Group 27 herbicide approved for pre-seed use in canola, Topramezone is the AI found in Certitude® – BASF’s new pre-seed herbicide that will provide canola growers with industry-leading control of kochia and volunteer canola for the upcoming 2021 growing season.

Two of the biggest challenges facing canola growers today are kochia and volunteer canola, which can significantly impact yields. Certitude marks a significant addition to BASF’s portfolio, helping growers manage difficult weeds. At the same time, the herbicide supports target plant populations and crop sustainability by managing volunteers that can host pathogens. This includes clubroot and blackleg, ----

-. In addition to Certitude, BASF also recently received PMRA registration for its pre-seed herbicide Smoulder™, containing the active ingredients Saflufenacil and Metsulfuron-methyl. A pre-seed herbicide for wheat and barley growers, Smoulder is a first-of-its-kind solution that provides growers with both residual control of volunteer canola and superior burndown of all group two, four and nine resistant broadleaf weeds. It will be available for purchase in the 2022 growing season--.

https://agro.basf.ca/basf_solutions/index/newsrelease_west.html?OpenDocument&id=NR-CREO-BW6KEK Date: December 10, 2020

2.3.3 BASF commits to targets for boosting sustainable agriculture

- Reduce CO₂ emissions per ton of crop by 30%
- Annually increase sales share of solutions with substantial sustainability contribution by 7%
- Bring digital technologies to more than 400 million hectares of farmland
- Ensure safe use of BASF’s products with right stewardship

“Focusing on the biggest levers that will make agriculture more sustainable and contribute to the most pressing needs of society, the company will help farmers achieve a 30% reduction in CO₂ emissions per ton of crop produced.

Climate smart farming

BASF will support farmers to become more carbon efficient and resilient to volatile weather conditions with technologies that increase yield, make farm management more effective, and decrease environmental impact. These include:

- Nitrogen management products such as Vibelsol[®] and Vizura[®] that reduce greenhouse gas emissions
- Crop protection products such as the herbicide Kixor[®] that enable farmers to grow crops without plowing, reducing CO₂ emissions from the soil and diesel use
- New crop varieties such as InVigor[®] canola seeds providing higher yield stability especially under more severe weather conditions
- Biological inoculants and innovative digital solutions

At the same time, the company is exploring ways to help incentivize CO₂ efficiency and open new value streams for farmers. With these products and solutions, BASF will help achieve a 30% reduction in CO₂ emissions per ton of crop produced.

BASF's R&D pipeline contains solutions that support the efficient use of resources and reduce the environmental footprint. Examples are:

- Solutions based on the fungicide Revysol[®] that enable an increase in wheat yields by 4% on existing land, allowing the farmer to protect natural habitat
- Targeted application of BioSolutions, such as RAK[®] pheromones, that disrupt the mating of certain moths, protecting plants throughout their life cycle as natural partners that complement conventional crop protection
- Breeding innovations such as the mini watermelon Pingo Doce[®] that makes it easier for consumers to avoid food waste .

Some further excerpts are: “Using digital technologies allows farmers to produce more with less, to make farming processes more efficient from field monitoring to the food supply chain. BASF's xarvio[™] digital products enable more precise application of crop protection products, nutrient management, automated buffer zones and monitoring of biodiversity.”

“Using digital technologies allows farmers to produce more with less, to make farming processes more efficient from field monitoring to the food supply chain. BASF's xarvio[™] digital products enable more precise application of crop protection products, nutrient management, automated buffer zones and monitoring of biodiversity.”

“These include protective equipment, customized training, digital solutions, and new and future-oriented application technologies such as drones that reduce working time and minimize potential exposure to agrochemicals. Initiatives using drones have already been launched in China and Colombia. Another example of BASF's continuous efforts to make the handling of crop protection products easier and safer is the closed-transfer-system easyconnect. It was developed with partners and is supported by key players in the agricultural industry with first market launches expected from 2021/22. “

https://agro.basf.ca/basf_solutions/index/newsrelease_west.html?OpenDocument&id=NR-CREO-BVEN4C Date: November 16, 2020

2.3.4 BASF acquires proprietary technology for L-glufosinate ammonium from AgriMetis

- Glu-L will deliver an improved, highly concentrated weed control solution reducing the needed amount of the product by up to 50 percent

- Provides a new production process with broad patent protection

“BASF Agricultural Solutions acquired the proprietary Glu-L™ technology for L-glufosinate ammonium from AgriMetis,™ an industry leader in biotechnological innovations for crop protection. With this technology, BASF will provide farmers with a more efficient solution and improved formulation to protect against troublesome weeds.

Today’s glufosinate products consist of the active L-glufosinate ammonium and the inactive D-glufosinate ammonium. The Glu-L technology converts the latter into active L-glufosinate ammonium. This makes the new product significantly more efficient.

While weed control with Glu-L is equivalent to currently available commercial glufosinate products, farmers applying the new technology can reduce the amount of crop protection they need to apply by up to 50 percent.

In addition, the comprehensive patent protection for this new technology puts BASF in a strong competitive position for the coming years. Glu-L has been submitted to the U.S. Environmental Protection Agency (EPA) and will launch in the next few years upon agency approval. “

https://agro.basf.ca/basf_solutions/index/newsrelease_west.html?OpenDocument&id=NR-CREO-BTFHHT Date; September 14, 2020

2.3.5 Seed Treatment Chemicals Market (Covid-19 Analysis) SWOT Analysis, Key Indicators, Forecast 2028 | BASF, Syngenta, Monsanto Company, Bayer CropScience, Platform Specialty Products

“The Seed Treatment Chemicals market research report provides in-depth analysis of market scenario including present as well as future state of Seed Treatment Chemicals market. It delivers content on emerging trends, and market dynamics with respect to drivers, opportunities and challenges that plays crucial role in the growth of market.”

<https://murphyshockkeylaw.net/uncategorized/1491489/seed-treatment-chemicals-market-covid-19-analysis-swot-analysis-key-indicators-forecast-2028-basf-syngenta-monsanto-company-bayer-cropscience-platform-specialty-products/> Date: January 26, 2021

2.4. Bayer Crop Science

2.4.1 Bayer launches BUTEO® start insecticide seed treatment for superior protection against flea beetle damage in canola

“-----announced the registration of BUTEO® start, an insecticide seed treatment for canola that provides superior protection against striped and crucifer flea beetles. Flea beetles thrive in dry conditions when plants are struggling to grow -----.

A powerful Group 4D insecticide (flupyradifurone), BUTEO start offers immediate and effective flea beetle protection to help reduce the need for in-crop rescue treatments. It works in conjunction with

industry standard base seed treatments and can also be paired with cutworm treatments to allow for targeted pest control. Its systemic translocation from cotyledon to leaf margins reduces the potential for leaf matter damage and enables a quicker-growing canopy. More information on BUTEO start will be available shortly at CropScience.Bayer.ca. “

<https://www.cropscience.bayer.ca/news/2020/bayer-launches-buteo-start-insecticide-seed-treatment>

Date: May 19, 2020

2.4.2 Bayer launches Proline® GOLD for premium protection against sclerotinia in canola

“----- announced the launch of Proline® GOLD, a premium new fungicide for canola that provides superior protection against high sclerotinia pressure. Proline GOLD brings together two highly effective active ingredients with the trusted performance of prothioconazole and the addition of a new active to the canola market, fluopyram,-----.

-----Proline GOLD is an easy-to-use liquid formulation for growers looking for a multi-mode of action fungicide that offers systemic and contact protection. Its two modes of action work together to provide immediate and extended results, so growers can achieve exceptional yields. For more information on Proline GOLD, visit CropScience.Bayer.ca.

“<https://www.bayer.com/en/ca/news/canada-launches-proliner-gold-premium-protection-sclerotinia-canola> Date: September 1, 2020

2.5. Brett Young No news

2.6. Canterra

2.6.1 Canterra Seeds Adds LibertyLink® to Canola Seed Portfolio

“Farmers in Western Canada can now purchase herbicide tolerant canola hybrids on all four major trait platforms from CANTERRA SEEDS with the addition of our new CS4000 LL* LibertyLink® Canola Hybrid into our wide seed portfolio. In our strip trials, CS4000 LL stood up well and had competitive yield results.” Excellent Yield, Excellent Straight Cut Performance, Clubroot Resistance, Blackleg Resistance.” Farmers can visit virtualcroptour.ca to learn more about how CS4000 LL performed across Western Canada this season.

<https://canterra.com/blog/news/canterra-seeds-adds-libertylink-to-canola-seed-portfolio/>

Date: December 18, 2020

2.6.2 CANTERRA SEEDS Launches New Partnership with Agro.Club Canada

“Agro.Club, a U.S.-based startup, has established a new Canadian company to begin transforming the way the Canadian agriculture industry buys, sells and earns. Drawing on the company’s successful origins in the Black Sea market with over 10,000 farmers using the platform, the Canadian company is committed to creating efficient, inclusive technology solutions for the value chain. We want to give the whole industry a more efficient way of doing business digitally,-----.”

<https://seedworld.com/canterra-seeds-launches-new-partnership-with-agro-club-canada>

Date; October 5, 2020

2.7. Cargill

2.7.1 Cargill to advance regenerative agriculture practices across 10 million acres by 2030

“Cargill has announced it is supporting farmer-led efforts to adopt regenerative agriculture practices and systems across 10 million acres of North American farmland over the next 10 years. The initiative will focus primarily on row-crop rotations that include corn, wheat, canola, soybeans, and other staple crops.

Cargill has established multiple partnerships to help implement soil health practices and provide dedicated resources to promote regenerative agriculture systems. “

<https://www.agriculture.com/cargill-to-advance-regenerative-agriculture-practices-across-10-million-acres-by-2030> Date: September 16, 2020

2.8. Corteva

2.8.1 Corteva Agriscience Announces 2030 Sustainability Goals to Increase Agricultural Resiliency

“Corteva Agriscience announced today its 10-year commitments to advance sustainability throughout the global food system. The goals span a wide range of initiatives for farmers, the land, communities where employees and customers live and work, and in its own operations. Improvements in soil health, on-farm productivity, climate action, water stewardship, biodiversity, supply chain transparency and worker safety, among others, are included. ???????

The company’s 2030 sustainability goals include: *Three to four goals are given under each of the following areas:*

“Goals to benefit farmers

Goals to benefit the land

Goals to benefit communities

Goals for the company’s operations “

Corteva will report progress toward these goals through an annual sustainability report starting in 2021. For more information on the 2030 sustainability goals, visit www.corteva.ca Date: June 1, 2020

2.8.2 New Mobile Application Measures Environmental Impact of Crop Protection Products

Developed by Corteva Agriscience, IPM Pro Helps Farmers Deliver Sustainable Insect Management Solutions

“ A new mobile application has been launched to help growers protect their crops and secure a more resilient and sustainable agriculture system. By using the IPM Pro app from Corteva Agriscience (available for download from Google Play[®] and the Apple App Store[®]), farmers can measure any potential impact of substances such as Isoclast[™] active, Spinetoram, Spinosad and Methoxyfenozide on beneficial insects and pollinators.

The tool also provides information to ensure safe use of our insecticides, including Closer[™], Runner[™], Intrepid[™], Spintor[™], Tracer[™], Success[™], Delegate[™] and Exalt[™].

After opening the app and selecting a crop, users can access details on pests, beneficial insects and pollinators, as well as stewardship recommendations and Corteva solutions -----In addition, by downloading IPM Pro, growers will be granted free access to the IPM Impact

one of the world's most comprehensive database on potential side-effects of many crop protection molecules on biological agents and pollinators. Corteva will offer this useful tool, worth €500 per year, to the grower for free in addition to the new mobile application.

Store.<https://www.corteva.com/resources/media-center/new-mobile-application-measures-environmental-impact-of-crop-protection-products.html> Date: December 2, 2020

2.8.3 Instinct NXTGEN™ Nitrogen Stabilizer Launches for 2021 Growing Season

“----- Instinct NXTGEN — with improved handling and a lower use rate. The new product has received registration from the U.S. Environmental Protection Agency, as well as label approvals in key states, and is now available for purchase.

Instinct NXTGEN provides the same nitrogen protection as the previous formulations, ----- . Specific improvements include lower viscosity for better overall handling during early spring applications and a lower use rate of 24 ounces per acre versus 37 ounces per acre for better blending when mixing with urea. Instinct NXTGEN nitrogen stabilizer contains Optinyte® technology, which assures up to eight weeks of unrivaled protection of urea, UAN and liquid manure during fall, spring and sidedress applications. Optinyte technology is proven to keep nitrogen in the root zone, ----. The Optinyte technology in Instinct NXTGEN nitrogen stabilizer has been shown to:

- Increase average yield by 5.2% when used with spring applications
- Lessen greenhouse gas emissions by 51%
- Promote 28% greater soil nitrogen retention
- Reduce leaching by 16%

To learn more about Instinct NXTGEN™ nitrogen stabilizer, visit [InstinctNitrogenStabilizer.com](https://www.corteva.com/resources/media-center/instinct-nxtgen-nitrogen-stabilizer-launches-for-2021-growing-season.html) on Corteva.us. “

<https://www.corteva.com/resources/media-center/instinct-nxtgen-nitrogen-stabilizer-launches-for-2021-growing-season.html> Date: August 10 2020

2.8.4 Corteva Agriscience and AgPlenus Announce Collaboration for the Development of Novel Herbicides

“Corteva Agriscience -----, and AgPlenus, a subsidiary of Evogene Ltd., today announced that they have entered into a multi-year collaboration for the development of novel herbicides. The collaboration will combine Corteva's strengths in crop protection product discovery and development with AgPlenus' expertise in designing effective and sustainable crop protection products using predictive biology. By leveraging their complementary expertise, Corteva and AgPlenus will address the rise of global weed resistance, created in-part by the absence of new modes of action (MoAs) for weed control over the past 30 years.

-----AgPlenus will apply a robust computational platform to optimize several of AgPlenus' chemical families. Such chemical families have already been validated for herbicidal activity and are connected to new MoAs. Corteva holds an exclusive license from AgPlenus to commercialize herbicides based on these chemical families. “

<https://www.corteva.com/resources/media-center/corteva-and-agplenus-announce-collaboration-for-the-development-of-novel-herbicides.html> Date: March 25, 2020

2.8.5 Spring pre-seed weed control

“-----Prospect, a new canola pre-seed herbicide from Corteva Agriscience that’s being introduced to western Canadian farmers this year, -----rated Prospect’s weed control performance as excellent, after the herbicide did a “tremendous job” of knocking down problem cleavers on -----.

Prospect contains both Group 4 and Group 14 active ingredients, so when it is tank mixed with glyphosate, this delivers three different modes of action control. This will not only delay the onset of herbicide resistance but also provide more complete control than glyphosate alone. Prospect can also be applied with five to 10 gallons of spray water volume per acre without giving up performance in weed control.

<https://www.topcropmanager.com/spring-pre-seed-weed-control/> Date: April 15, 2020

2.8.6 New Pioneer Protector HarvestMax offers farmers greater flexibility to harvest canola for maximum yield

“Pioneer Protector HarvestMax assists farmers in two critical ways. By allowing canola to remain in the field longer, which fosters a greater seed size, leading to larger yields, and by allowing farmers the flexibility in making harvest operation decisions.

When you combine HarvestMax with other traits from Corteva Agriscience like clubroot, sclerotinia and blackleg resistance, as well as Lumiderm insecticide seed treatment for the best control of flea beetles and cutworms in the industry, you then have a very powerful canola trait package that gives the farmer the best opportunity possible to maximize yields,

Indeed Corteva Agriscience is the global leader in canola hybrid innovation, including its popular Pioneer Protector HarvestMax hybrids that were a first in the Roundup Ready canola market. Now farmers have the confidence going into next year’s season knowing the Pioneer Protector HarvestMax trait is part of Pioneer’s all-star hybrid lineup: P506ML (new); P505MSL (new); P508MCL (new); 45CM39; 45M35 and 45M38. For more information, visit: pioneer.com/Canada

<https://nationalpost.com/sponsored/news-sponsored/new-pioneer-protector-harvestmax-offers-farmers-greater-flexibility-to-harvest-canola-for-maximum-yield> Date: November 17, 2020

2.8.7 Corteva takes another stab at boosting protein in canola

“A consortium led by Corteva, including processors Bunge and Botaneco, is investing \$27.65 million in a project designed to make canola hybrids that will produce more valuable canola meal. The project includes \$13.6 million in funding from Protein Industries Canada.

Dow, which became Corteva after merging with DuPont, had an enhanced canola meal project that was generating excitement in the company about four years ago. The company’s ProPound trait was supposed to create meal with 44 percent protein compared to 37 percent in commodity canola -----,-----were unable to get stable protein levels across different geographies and environmental conditions. Corteva has enlisted help from public and private breeding partners. The team will build on some of the knowledge gained from the ProPound project. Tyler Groeneveld, Corteva’s commercial grains and oils leader for North America ----- expects commercialization of high-protein canola hybrids within the next four years. “

<https://www.producer.com/news/corteva-takes-another-stab-at-boosting-protein-in-canola/>

Date: January 30, 2020

2.8.8 Construction Begins on Corteva Agriscience Center of Seed Applied Technologies

French site to help provide complete package of services for European farmers

“Corteva Agriscience has begun building a new Center of Seed Applied Technologies (CSAT) in south west France, with the goal of helping Europe’s farmers get their crops off to the best start and achieve a successful harvest. The Center in Aussonne is the first in Europe and the third worldwide.” (*other 2 at Formosa, Brazil 2019 & USA*)

<https://www.corteva.com/resources/media-center/construction-begins-on-corteva-center-of-seed-applied-technologies.html> Date : January 12, 2021

2.8.9 First Corteva Agriscience Innovation Farms launched in Germany

“Corteva Agriscience has announced the launch of its first ‘Innovation Farms’ in Germany to find sustainable solutions to challenges facing many farms in the country and beyond. Corteva will support two pilot farms, Uherek in Gröbitz, Saxony-Anhalt, and Redeker in Pattensen, Lower Saxony, in promoting soil health and biodiversity in the field, reducing emissions and preserving ecosystem services, while at the same time ensuring profitability and stabilizing yields. The initiative comes as part of Corteva’s 2030 sustainability strategy. Two livestock farms will be added to the existing Innovation Farm program next year. “

<https://www.corteva.com/resources/media-center/first-corteva-agriscience-innovation-farms-launched-in-germany.html> Date: November 13, 2020

2.9. Croplan

9.1 WINFIELD UNITED CANADA, COUNTRY FARM SEEDS ANNOUNCE PARTNERSHIP

“WinField United Canada and Country Farm Seeds are joining forces----- expanded seed portfolio featuring the WinField United CROPLAN seed brand. The partnership will be effective September 2020 -----.”

<https://www.agrimarketing.com/s/131679> Date: July 27, 2020

2.10. DL Seeds Sien 7.4.3

2.11. FBN (Farmers Business Network)

2.11.1 Sowing the seeds of disruption

Network acquiring Manitoba seed breeder part of a larger plan to take on Big Ag

“Haplotech Inc., a small Winnipeg company that provides technical and consulting services to plant breeders, has been purchased by a large American company keen to make it a piece of its efforts to disrupt Big Ag’s seed business. Silicon Valley-based Farmer’s Business Network Inc. (FBN) has acquired Haplotech as well as the Canadian canola breeding program of San Diego-based company called Cibus.

Haplotech is a 12-year-old company founded and led by Rale Gjurić, a well-known player in the tightly knit global seed breeding business. ----- Gjurić recently retired from his position as director of the Plant Breeding Academy at the University of California, Davis, an institution renowned for its pioneering agricultural research. ----- FBN has a data and analytics platform that helps farmers — more than 14,000 in the U.S. Canada and Australia, covering about 45 million acres — with a range of functions, from pricing to marketing.

FBN’s tagline is that it is on "a mission to create a future of farming that puts farmers first." It’s doing that by developing a data bank where its farmer members share their current costs for things like herbicides and seed and then help producers market their crops and find the best value on inputs.

In previous interviews, FBN's founders spoke about how the ag input businesses have been dominated by a very few players and its goal is to disrupt that business. FBN is said to be looking to become the Amazon for farms.

Eventually the acquisition of HaploTech and the San Diego operation will position FBN Canada to eventually be able to commercialize canola seed, the second biggest crop in Canada and a market that has long been dominated by only a few industry players.

HaploTech, which has a research farm north of LaSalle as well as facilities in Chile, does work for clients around the world. Gjuric said it will continue to do third party work now that it is part of the FBN group. The company is a rising star in the ag tech world, recently raising about US\$250 million, which valued the company at the time at about \$1.75 billion."

<https://www.winnipegfreepress.com/business/sowing-the-seeds-of-disruption-572879921.html>

Date: October 26, 2020

2.11.2 FBN Bets on 'Open-Source' Breeding

Partnering with "independent" breeders to create new varieties is the latest effort by Farmers Business Network to boost its stake in the seed industry.

Some excerpts to illustrate the aim of FBN and can well be evaluated by those knowledgeable of the intricacies of the processes of developing new cultivars.

"After it announced its acquisitions of the Manitoba-based HaploTech as well as the Canadian canola breeding program and pipeline of San Diego-based Cibus back in the fall, the company is forming the FBN Independent Breeder Network, which according to a news release from FBN "will give farmers more choice, competition and transparency in their seed options, and breeders an open source for collaboration and a clearer path to market."

According to Daniel Dyer, head of seed R&D for FBN based in Florida, the Independent Breeder Network will use the concept of open-source development, which will see FBN test what it calls independent breeder germplasm and hybrids, with the option for FBN to in-license and commercialize with royalties within a defined range to independent breeders.

"The problem is — and this is what we're trying to solve — the independent breeders have all the creative thinking but don't have access to two critical resources. One is the best germplasm, which is by and large controlled by a few major companies because they invested a lot of money to get there. The second resource is the big data sets that it really takes these days to be able to make the best breeding decisions. Those data sets are guarded very closely, too."

FBN launched a pilot program last fall to test germplasm and try out breeding combinations from initial network members. At press time, no breeders from the pilot project were willing to speak to media due to what FBN said was the fear of reprisal from within the industry. "For too long, canola farmers have been subject to industry consolidation, leaving them with fewer price choice.

<https://www.seed.ab.ca/fbn-bets-on-open-source-breeding/> Date: December 7, 2020

2.12. Nuseed

2.12.1 Canada approves Nuseed's GM canola for aquafeed

"A genetically modified canola that produces the omega-3 fatty long chain acid DHA (docosahexaenoic acid) has been approved for use in aquaculture and agriculture in Canada. The Canadian Food

Inspection Agency (CFIA) determined that Nuseed's omega-3 canola meal is safe for use in livestock feed and the crude oil derived from the plant is safe for use in fish feeds. CFIA also confirmed that the GM canola poses no increased environmental risk compared to other cultivated canola and is approved for cultivation.

Separately, Health Canada determined that the highly refined oil derived from Nuseed's canola is safe for human consumption as or in foods in Canada. The GM canola has been developed as an alternative to fish oil to be included in aquafeed (marketed as Aquaterra) and for human nutrition (marketed as Nutriterra).

Australia-based international company Nuseed received United States Department of Agriculture (USDA) deregulation approval for cultivation in 2018 -----.

Rothamsted Research in the UK has developed a GM camelina that provides both EPA and DHA, although it is not as far down the path towards commercialisation as Nuseed or Cargill.

<https://www.fishfarmingexpert.com/article/canada-approves-nuseeds-gm-canola-for-aquafeed/>

Date: July 31, 2020

2.12.2 Nuseed Partners with ADM for Omega-3 Canola Processing in the U.S.

"Nuseed announced today it has entered into an agreement with one of the world's leading agricultural processors, ADM, for crushing and processing of Nuseed's proprietary Omega-3 Canola in the U.S., the first land-based source of DHA nutrients. The first scaled crush of the grain harvested by Montana and North Dakota contract growers is anticipated in the second quarter of 2020.

Nuseed Omega-3 Canola, the world's first plant-based source of long-chain omega-3 fatty acids, has been developed in collaboration with Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Grains Research and Development Corporation (GRDC).

<https://nuseed.com/au/nuseed-partners-with-adm-for-omega-3-canola-processing-in-the-us/> Date: 2020

2.12.3 Nuseed ratchets up canola seed competition

"Nuseed has registered its first Canadian hybrid and is selling it to farmers in 2020. The NC355TF hybrid was developed using Australian genetics. Nuseed is a division of NuFarm, an Australian company that controls slightly more than 50 percent of the canola business Down Under.

The variety contains the TruFlex trait, the latest Roundup Ready technology and will be marketed by Federated Co-operatives Ltd. It will be planted on tens of thousands of acres in 2020. ----- anticipates having two or three other offerings next year. -----end game for the company, ---- is to introduce new specialty oil profiles to the canola sector. -----company's Omega-3 oil is rich in docosahexaenoic acid (DHA),----- (11.1 above). Monola ----- is a high oleic canola oil that is produced and sold in Australia.

One key thrust is providing "top-of-the-line" blackleg resistance. If you don't have a tremendous tolerance to blackleg, you don't get anywhere in Australia. Blackleg is a disease that's on the rise in Western Canada.

The other area of agronomic focus is maturity -----. Western Canadian field trials have shown that Nuseed's genetics are "significantly earlier" than check varieties while maintaining equivalent yields. <https://www.producer.com/crops/nuseed-ratchets-up-canola-seed-competition/> Date: May 28, 2020

2.13. Proven Seeds/ Nutrien Ag Solutions No news.

2.14. Syngenta

2.14.1 Syngenta Adds Sclerotinia Control Product to Canadian Line Up (2.8.2 p 20 2020)

“Miravis Bold is meant for managing Sclerotinia stem rot in canola. In the release Syngenta says Miravis Bold has the widest Sclerotinia fungicide application window and can be applied as early as 10 per cent through to 50 per cent bloom. In addition, we have seen Miravis Bold perform consistently, even under significant Sclerotinia pressure, -----.”

<https://www.seed.ab.ca/syngenta-adds-sclerotinia-control-product-to-canadian-line-up/>

Date: January 11, 2021

2.14.2 Rascendo/Visivio insecticide/ seed treatment reported as Fortenza in 2020 (2.8.1 p19)???

RASCENDO™ (Sulfoxaflor) is a systemic insecticide, acts as a neurotoxin to affected insects, and kills through contact or ingestion. Sulfoxaflor is classified for use against sap-feeding insects as a sulfoximine, which is a sub-group of insecticides that act as nicotinic acetylcholine receptor (nAChR) competitive modulators. Sulfoxaflor binds to nAChRs in place of acetylcholine and causes uncontrolled nerve impulses resulting in muscle tremors followed by paralysis and death.

VISIVIO™ seed treatment is a combination of the insecticides thiamethoxam and sulfoxaflor and the fungicides difenoconazole, metalaxyl-M, fludioxonil and sedaxane. VISIVIO™ is registered in canola, rapeseed and oilseed mustard and controls insects including striped and crucifer flea beetles, and diseases such as seed-borne blackleg, seed-borne Alternaria, and the seedling disease complex (damping-off, seedling blight, seed rot and root rot) caused by Pythium spp., Fusarium spp. as well as offers best in class Rhizoctonia protection.

Active ingredient	Sulfoxaflor*, thiamethoxam, difenoconazole, metalaxyl-M, fludioxonil and sedaxane
Mode of action	RASCENDO™ is a seed treatment insecticide that deliver above and below ground protection in canola. RASCENDO™ is sold in the market as VISIVIO™ or FORTENZA® ADVANCED.

<https://www.syngentaseedcare.com/product/crop-protection/rascendotm> Date; October 15, 2020

2.14.3 Syngenta Canada adds new sclerotinia fungicide

“Syngenta Canada announced today three new additions to their Miravis fungicide lineup, including one for Sclerotinia stem rot management in canola.

Miravis Bold fungicide provides growers with a new tool for managing Sclerotinia stem rot – one of canola’s most destructive diseases. Miravis Bold is formulated with Adepidyn, a Group 7 fungicide, which is highly active on the Sclerotinia pathogen.

A key feature of Miravis Bold is that it offers a very wide application window. The product can be applied as early as 10 per cent through to 50 per cent bloom. This gives growers critical additional spray days, so they can protect more acres. In addition, we have seen Miravis Bold perform consistently even under significant Sclerotinia pressure .”

<https://www.topcropmanager.com/syngenta-canada-adds-new-sclerotinia-fungicide/>

Date: January 11, 2021

2.14.4 Syngenta announces new insecticide ingredient

“Syngenta recently announced the global launch of spiropidion, an innovative new insecticide active ingredient. The technology will help farmers protect a broad range of crops against damaging and difficult-to-control sucking pests in a targeted, effective and environmentally sustainable manner.

Syngenta has entered into an agreement with Gowan Company L.L.C., a family-owned agricultural solutions business headquartered in Yuma, Arizona. Gowan has been granted an exclusive license to market and sell a patented spiropidion 300 SC formulation in the United States and Canada.

“Spiropidion is the result of our commitment to bring two new and sustainable active ingredients to the market every year,” said Jeff Cecil, head of marketing, Syngenta Crop Protection, North America.

Syngenta plans regulatory submissions for late 2022 in the U.S. and Canada and anticipates product launch by mid-decade. The first global registration of a formulated product containing spiropidion was obtained in Guatemala in September 2020.

<https://www.dairybusiness.com/syngenta-announces-new-insecticide-ingredient/>

Date; December 15, 2020

2.14.5 Syngenta Canada's new Saltro seed treatment protects canola against airborne

blackleg and soybeans from sudden death syndrome EDIT EDIT!!!!

“Syngenta Canada announces the registration of Saltro®, the first commercially available canola seed treatment to offer protection against airborne blackleg infection at the cotyledon stage.

As an industry, we are learning that earlier, airborne blackleg infections create a bigger risk of stem infection, which can cause lodging and cut off plants completely,” says Karen Ullman, Seedcare Product Lead with Syngenta Canada.

Saltro® delivers protection at canola emergence through to the cotyledon stage and contains ADEPIDYN®, a new Group 7 fungicide belonging to the carboxamide chemical class. Saltro® moves through the plant’s water-conducting system and is taken up into the cotyledon so it is present and active when needed most.

Results from two seasons of University of Manitoba research trials showed that Saltro® is ideal for avoiding early blackleg infections and is highly effective on the blackleg pathogen. Plants treated with Saltro® had significantly lower stem infection than untreated canola, as well as canola treated with current seed treatments that protect against seed-borne blackleg.

For the 2021 growing season, Saltro® will be made available as part of a canola seed treatment package called Helix® Saltro®. This package includes Helix Vibrance® seed treatment for protection against striped and crucifer flea beetles, seed-borne blackleg, Alternaria and seedling disease complex.”

https://www.seedquest.com/news.php?type=news&id_article=120144&id_region=&id_category=&id_crop= Date; August 17, 2020

2.14.6 Syngenta announces TYMIRIUM TM technology brand

- New active ingredient for seed treatment and soil applications with improved sustainability profile
- Broad spectrum control of nematodes and key fungal diseases
- High-performance, easy-to-use, low dose chemistry

“Based on the active ingredient cyclobutirfluram, TYMIRIUM™ technology provides long-lasting protection against a broad spectrum of nematode pests and diseases across all major crops and geographies. Nematodes not only attack crops but also open a path to further fungal infection. TYMIRIUM™ technology offers excellent control of both nematodes and soil-borne diseases, especially *Fusarium species*. By protecting the root mass, TYMIRIUM™ technology plays a critical part in enabling no-tillage and conservation-tillage practices. “

<https://www.syngenta.com/en/company/media/syngenta-news/year/2020/syngenta-announces-tymirium-tm-technology-brand> Date: May 7, 2020

2.14.7 Syngenta Group acquires leading Biologicals company, Valagro (Italy)

- Valagro has a 40-year track record as an innovation pioneer in the field of Biologicals
- Biologicals market set to double in size over the next five years
- Acquisition reinforces Syngenta Group’s strategy to provide farmers with more complementary product and technology choices and underpins its determination to make agriculture more resilient and sustainable
- Valagro will continue to operate as an independent brand in the market, leveraging the resources of Syngenta Crop Protection to accelerate its innovation and growth.

“The investment positions Syngenta Crop Protection as one of the key global companies poised to shape the rapidly growing Biologicals market, ----.

<https://www.syngenta.com/en/company/media/syngenta-news/year/2020/syngenta-group-acquires-leading-biologicals-company-valagro> Date: October 6, 2020

2.14.8 Launch of Syngenta Group – creating a global agtech market leader

“Syngenta Group Co. Ltd., announced today the official launch of Syngenta Group, a new global leader in agricultural science and innovation. Under a single entity, it unites the strengths of Syngenta AG, headquartered in Switzerland, ADAMA, based in Israel, and the agricultural businesses of Sinochem, based in China. The new entity, headquartered in Switzerland, has 48,000 employees in more than 100 countries, and had sales of US\$23 billion in 2019.

From its inception, Syngenta Group is the global market leader in crop protection, the global number three in seeds, the market leader in fertilizer in China and, with its Modern Agriculture Platform (MAP) Farmer Solution Centers, the leading agriculture services provider in China. It offers comprehensive agronomic solutions and digital agricultural services. “

<https://www.syngenta.com/en/company/media/syngenta-news/year/2020/launch-syngenta-group-creating-global-agtech-market-leader> Date: June 18, 2020

2.15 Four-way Seeds Canada merger approved

Four organizations to amalgamate in February without CSGA on board

“Members of the Canadian Plant Technology Agency (CPTA), Commercial Seed Analysts Association of Canada (CSAAC), Canadian Seed Institute (CSI) and Canadian Seed Trade Association (CSTA) have voted in favour of amalgamation, the groups announced Wednesday.

CSTA represents the seed trade, including some farmer-level seed growers, seed retailers and major seed companies such as BASF and Bayer. CSAAC represents seed-testing labs, CSI delivers accreditation and monitoring programs and CPTA supports intellectual property protection for the seeds sector. For now, however, it won’t include the Canadian Seed Growers Association (CSGA), whose

members voted this summer to reject a previous proposal for a five-way amalgamation. The remaining groups announced in October they would put the new four-way merger proposal to their members for a second vote. The CSGA would have been the largest of the five, as it represents pedigreed seed producers, with a membership made up mainly of farmers. It also has statutory power to certify pedigreed seed.

For now, the CSGA, in its role as a CSTA affiliate, is expected to be invited to become an affiliate member of Seeds Canada, as would some provincial seed grower associations.

CropLife Canada, a separate body representing life science companies that develop and sell new varieties and crop protection products, had also originally been part of the proposed group but opted out before the earlier vote this summer. “

<https://www.agcanada.com/daily/four-way-seeds-canada-merger-approved> Date; December 2, 2020

3. Tendencies / Developments in canola oil quality / speciality oils / canola meal quality

3.1 Polyunsaturated Fatty Acids (PUFAs) Market is Expected to Register Highest CAGR of 10.6% During the Forecast Period 2016 – 2026

“In this report, Future Market Insights (FMI) delivers key insights on the global polyunsaturated fatty acids (PUFAs) market in its published report, titled “Global Polyunsaturated Fatty Acids (PUFAs) Market: Industry Analysis and Opportunity Assessment, 2016–2026.”

Segmentation analysis

The global polyunsaturated fatty acids (PUFAs) market is segmented by product type, source, form, and application. Among all the product type segment, the omega-3 fatty acids segment is expected to exhibit the highest revenue growth, followed by the omega-6 fatty acids segment over the forecast period. The omega-3 fatty acids product type segment is anticipated to register a significant CAGR of 11.0% through 2026.”

<https://jumbonews.co.uk/news/1880982/polyunsaturated-fatty-acids-pufas-market-is-expected-to-register-highest-cagr-of-10-6-during-the-forecast-period-2016-2026/> Date: February 17, 2021

3.3 Canola Meal Research

Research into canola meal’s nutritional value

“Scientific research is increasing our understanding of the feed nutrient advantages of canola meal, particularly in the dairy industry. For the latest findings and optimal feed inclusion levels, visit

Canolamazing.com.

Current studies (2018-2023)

- Accurate determination of the contribution of canola meal to metabolizable protein supply in dairy cows.

The general objective of the proposed research is to elucidate the reasons of the underestimation of protein supply when canola meal is included in dairy cow diets as a replacement of other protein sources and propose adequate feeding values of the protein quality of canola meal.

Other projects are:

- Evaluation of canola meal as compared to soybean meal in practical California rations: effects upon long term lactational performance, reproductive performance and metabolic disease.
- Canola meal to improve efficiency and sustainability of dairy production: filling knowledge gaps
- Utilization of canola meal in the diets of early lactation cows
- Understanding the impacts of canola meal on gut microbiota and potential pre-biotic effect of enzymatically-released bioactive fiber components and the long-term effects of high levels of canola meal inclusion on sow and litter performance

Completed research project theme

Theme 1: Maximizing use of canola meal in dairy feeds (2013-2018)

Theme goal: To better understand how the protein and fibre profile of canola meal is utilized by the cow in an effort to understand the mechanism by which dairy cows fed canola meal consistently produce more milk than cows fed other protein sources.

View dairy research on Canolamazing.com

Theme 2: High inclusion levels of canola meal in monogastric rations (2013-2018)

Theme goal: To address the issues associated with high canola meal feed inclusion levels and to demonstrate that canola meal can effectively be used at very high inclusion levels in swine and poultry feeds.

View swine and poultry research

<https://www.canolacouncil.org/research/canola-meal-research/> Date: 2021

3.3 Canola protein a viable aquaculture feed ingredient: study

“Canola protein concentrate is a “highly effective” aquaculture feed ingredient, according to the recently concluded trials conducted by Alberta, Canada-based company Botaneco Inc.

Tests, which began in 2019, have shown that salmon responded “exceptionally well” to the ingredient. Tests also showed high feed intake with full consumption and normal behaviour at all test levels.

The new ingredient uses canola protein, -----.

Botaneco’s ingredient was developed as part of a co-investment project announced by Protein Industries Canada in June 2019. Botaneco, Corteva Agrisciences Canada, and Rowland Farms, are commercializing novel processing technology that will be used to develop new value-added plant-based ingredients for the food, feed and personal care markets.

<https://www.hatcheryinternational.com/canola-protein-a-viable-aquaculture-feed-ingredient-study/>

Date; August 14, 2020

3.4 Rapeseed instead of soy burgers: Researchers identify a new source of protein for humans

Summary:

Rapeseed has the potential to replace soy as the best plant-based source of protein for humans. In a current study, nutrition scientists found that rapeseed protein consumption has comparable beneficial effects on human metabolism as soy protein. The glucose metabolism and satiety were even better. Another advantage: The proteins can be obtained from the by-products of rapeseed oil production.

Journal Reference: Postprandial Metabolic Response to Rapeseed Protein in Healthy Subjects.

Nutrients, 2020; 12 (8): 2270 DOI: 10.3390/nu12082270

Martin-Luther-Universität Halle-Wittenberg. "Rapeseed instead of soy burgers: Researchers identify a new source of protein for humans." ScienceDaily. ScienceDaily, 30 September 2020.

<www.sciencedaily.com/releases/2020/09/200930110124.htm>.

<https://www.sciencedaily.com/releases/2020/09/200930110124.htm> Date: September 30, 2020

4. Australian Oilseeds Federation (AOF)

4.1 South Australian Farmers welcome historic decision

‘South Australian grain growers celebrate the announcement that the moratorium on the commercial cultivation of genetically modified crops will be lifted across mainland SA.

This decision will attract investment to SA’s world-class research and development facilities, -----.’

<http://grainproducerssa.com.au/latest/media-releases/gpsa-welcomes-historic-decision-on-gm-crops/>

Date; November 2, 2020

4.2 On track for success: Australian oilseeds industry releases Australian Oilseed Industry Strategic Plan 2020-2025

“ At the heart of the strategy is the vision for Australia’s oilseeds industry to be a \$5 billion sustainable, internationally competitive, respected and cohesive industry that builds value by meeting market demands .

Opportunities identified, and which underpin the strategy’s vision, include changing consumer trends, changing and growing feed demand, emerging technology, new supply chains, new production regions and end-user driven sustainability requirements.

The fifth five-year industry plan, Australian Oilseed Industry Strategic Plan 2020-2025 is available for download at www.australianoilseeds.com”

http://www.australianoilseeds.com/about_aof/news/on_track_for_success_australian_oilseeds_industry_releases_australian_oilseed_industry_strategic_plan_2020-2025 Date; October 22. 2020

4.3a Quality of Australian canola 2018–2019

“Australian Canola is recognised and highly sought after around the world for its consistent high quality. Australian exporters promote the quality benefits of Australian canola seed, oil and meal which enables them to differentiate their product in a commoditised market place.

Each year the AOF, in conjunction with the NSW DPI, publishes ‘The Quality of Australian Canola’,

which provides a detailed breakdown of key canola quality attributes from the most recent harvest.

Measures of oil, protein, glucosinolate levels and fatty acid breakdown are recorded by primary receival site and/or port zone, and weighted to give a state and national average.

‘The Quality of Australian Canola’ publication provides the industry with a valuable resource database for ongoing comparison and review of Australian canola quality.

Only members can access the latest 2019/20 data. The previous seasons' are available and the 33 page report of the 2018/19 year in detail on matters of climate of the growing season in the 4 states, oil, and protein content of the seed, oil quality and fatty acid composition, glucosinolate and chlorophyll content per state.

Australian quality parameter summary

Average quality of Australian canola 2018

Quality parameter	Australian weighted average
Oil content, % in whole seed @ 6% moisture	45.2
Protein content, % in oil-free meal @ 10% moisture	38.2
Glucosinolates, µmoles/g in oil-free meal @ 10% moisture	15
Test weight, kg/hL	67.23
Oleic acid (C18:1), %*	61.5
Linoleic acid (C18:2), %*	19.8
Linolenic acid (C18:3), %*	9.9
Erucic acid (C22:1), %*	<0.1
Polyunsaturated fatty acids, %*	29.7
Monounsaturated fatty acids, %*	63.1
Saturated fatty acids, %*	7.2
Iodine value	114.2
Chlorophyll content, mg/kg in whole seed as received	5

*Fatty acids are reported as a % of total fatty acids.

http://www.australianoilseeds.com/oilseeds_industry/quality_of_australian_canola Date; 2020

4.3b 2020 Oilseeds, Seed Oil and Meal Review – Call for Submissions

2020 Trading Standards Review commences – call for industry submissions

“The AOF has custodianship of the Trading Standards for oilseeds, seed oils and meals.

These standards are open for review each year, ----.

The formal review of the Trading Standards will commence with the first meeting of the AOF Technical Committee for the year which will take place on March 26th. The process is iterative, consultative and transparent with any proposed changes provided to the broader value chain for review and comment. The new Trading Standards are published on August 1 each year.”

http://www.australianoilseeds.com/about_aof/news/2020_oilseeds,_seed_oil_and_meal_review-call_for_submissions Date

4.5 Updated Variety Listing

“The AOF publishes annually a list of recognised canola varieties, according to their segregation- CSO-1; CSO-1A and CSJ-1A.

Die lyste is pdf dokumente en kan moeilik gekopieer word. Volgens die lyste is 11 nuwe varieteite vrygestel (in geel blokkies aangetoon in die varieteitslyste). Die lyste word gekry deur te gaan na die webwerf van die Australian Oilseeds Federation, te klik op ‘Technical Info’, dan op ‘Variety

*Listing'en dan op die seisoen verlang onder 'Variety Lists'en die pdf dokument dan oop te maak met --
-----?????*

http://www.australianoilseeds.com/Technical_Info/variety_listing Date; 2020

5. Activities of Australian Grain Research and Development Corporation (GRDC)

5.1 Blackleg Management Guide

Quantify the risk, paddock by paddock

“Blackleg can cause severe yield loss, but can be successfully managed. This Guide and the BlacklegCM app (see Useful Resources section) will help growers and advisers effectively manage canola crops against blackleg infection and determine if there is a high-risk situation and what practices need to change to reduce or prevent yield loss. Follow the four steps from this publication, in sequence.

Key points

- Never sow your canola crop into last year's canola stubble.
- Choose a cultivar with adequate blackleg resistance for your region.
- Relying only on fungicides to control blackleg poses a high risk of fungicide resistance.
- If your monitoring has identified yield loss and you have grown the same cultivar for three years or more, choose a cultivar from a different resistance group.
- Monitor your crops in spring to determine yield losses in the current crop.

Leptosphaeria maculans, the causal agent of blackleg disease, is a sexually reproducing pathogen that may overcome cultivar resistance genes. Fungal spores are released from canola stubble and spread extensively via wind and rain splash. The disease is more severe in areas of intensive canola production.”

To open the guide scroll down and click on 'Blackleg Management Guide (PDF 443.8KB) ' to open the six page guide. The guide includes the resistance groups and ratings for the various cultivars.

<https://grdc.com.au/resources-and-publications/all-publications/factsheets/2020/blackleg-management-guide> Date; September 8, 2020

5.1 Gene search aims to combat heat stress in canola

“Identifying the genes that make canola heat tolerant is the aim of a five-year Grains Research and Development Corporation (GRDC) research project now underway, with field trials planted in New South Wales and Western Australia in 2020.

The long-term objective of the research (full story available in GroundCover™ online) is to provide heat-tolerant germplasm to plant breeders. -----lead researcher, Sheng Chen at The University of Western Australia's (UWA) Institute of Agriculture.

Previous research undertaken at UWA has identified that temperatures of more than 30°C during flowering reduce seed yield, “In current canola varieties grown in Australia, losses could be as much as 300 kilograms per hectare for every 1°C increase in mean daily temperature at flowering.”

This project is drawing on GRDC's long-standing international canola collaboration with India and China to source germplasm.”

5.2 a Gene discovery to fight canola crop virus

“Outbreaks of Turnip yellow virus (TuYV) in canola and pulse crops can cost the Australian grains industry millions of dollars in lost yield.

TuYV can be particularly destructive in pulses, since some crops – such as field peas and lentils – are often asymptomatic, yet when tested can be 100 per cent infected and see yield losses at harvest time of up to 50 per cent.

In canola, the yield losses are similar to pulse crops, with more severe losses occurring during the rosette growth phase until stem elongation. The virus can also affect the oil and fatty acid content of the seed.

Carried by green peach aphids into a crop as early as only a few weeks after germination, the virus can infect a plant at any time and, once infected, it remains systemic in the plant for its life span.

Weeds and volunteer crop plants from green bridges allow aphids and virus to survive between cropping periods. Outbreaks of the virus have been linked to wet summers and autumns that result in larger weed and plant loadings going into the seeding period.

In a GRDC-invested global research collaboration, researchers across Australia and at the International Center for Agricultural Research in the Dry Areas (ICARDA) are combing through thousands of germplasm samples in the hope of finding resistant genetics-----.

Australian program manager and New South Wales Department of Primary Industries plant pathologist Joop van Leur says the global search for industry solutions will continue until solutions for growers are found.

Canola

Canola plants infected with TuYV can develop distorted and discoloured leaves and the plant may also have stunted growth, but asymptomatic infection can also occur.

The most devastating documented outbreak of TuYV occurred in South Australia in 2014, where researchers estimated up to 10,000 hectares were destroyed by the virus, resulting in large yield losses at harvest time.

It was estimated only 20 to 25 per cent of crops in the lower and mid-north of SA escaped infection.

In Esperance, on WA’s south-east coast, widespread early TuYV infection contributed to the disappointing average yield of 1.43 t/ha across the 210,000ha of canola crops in 2018.

In responding to the urgent need to find solutions in canola, researchers in WA have screened a wide range of canola and other brassica cultivars, including most commercially available Australian canola varieties, in the search for a host gene resistant to TuYV.

While Australian commercially available canola varieties are currently susceptible to the virus, the good news for canola growers is the discovery of resistance in three older rapeseed lines (one from Germany and two from China), which could provide breeders with materials to create resistant varieties.

Department of Primary Industries and Regional Development (DPIRD) research scientist Ben Congdon, who managed the WA research arm of the GRDC-invested project, inoculated hundreds of canola varieties with TuYV both in the field and in glasshouse conditions, and subsequently screened them for resistance.

Except for ATR Stingray and older varieties Trigold and ATR-Stubby, which exhibited moderate resistance to TuYV infection, all Australian genotypes we tested were highly susceptible,” Dr Congdon says.

He says the discovery of the resistance gene in these three older lines of rapeseed (which are quite different genetically to modern-day canola varieties) presents an exciting opportunity for the canola industry.

“This is an incredibly timely discovery, particularly given we are running out of effective insecticide chemistries to control the green peach aphid.

“Green peach aphid is the most resistant insect in the world and while neonicotinoid seed treatments have previously offered good protection, resistance to these treatments is a developing threat and the likelihood of deregistration is increasing with Europe recently banning these chemicals in all field crops.”

“Since these newly discovered resistant genetics come from two semi-winter lines and one spring line, our screening program will add diversity to this global gene pool.” Further research investigating the impact of heat stress on the resistance genes has shown while there was an increase in infection rates at very hot temperatures, resistance to virus accumulation in the tissue was maintained.

More information: Joop van Leur, joop.vanleur@dpi.nsw.gov.au; Ben Congdon, benjamin.congdon@dpird.wa.gov.au

<https://groundcover.grdc.com.au/weeds-pests-diseases/diseases/gene-discovery-to-fight-canola-crop-virus> Date: July 30, 2020

5.2b Science Partnership project to protect canola crops and growers’ profitability

“A new Department of Primary Industries and Regional Development Science Partnership project is developing new strategies to improve control of the serious canola disease Turnip yellows virus (TuYV).

The department is collaborating with Melbourne-based research and extension organisation, Cesar Australia, on the broad ranging project.

Project lead, department research scientist Ben Congdon, said the new project sought to explore the application of the early warning system in decision support by consultants and industry.

“The system uses Loop-mediated isothermal AMPlification, known as LAMP technology, to detect TuYV in winged migratory aphids on yellow sticky traps before the virus reaches epidemic levels in the crop,” Dr Congdon said.

“While the LAMP assay itself has been field validated, this next step will test the early warning system as a decision tool with follow-up virus testing of the crop to assess the outcomes of management decisions made.

--- will also study the implications of seed treatment use, stubble retention, variety choice and weed control and other relevant variables on virus spread at these sites and in a series of field and glasshouse experiments.”

Another major component of the Science Partnership project aims to identify host resistance in Brassica plants and gain insights into the genetic drivers of resistance in order to develop tools to help breed new and improved varieties. The next step will include a collaboration with DPIRD’s Doubled Haploid program to identify the sources of resistance.

The next step will include a collaboration with DPIRD's Doubled Haploid program to identify the sources of resistance.

Cesar Australia would examine the impact of resistance on aphid survival when exposed to canola sown with different insecticide seed treatments, as well as the impact of ambient temperature on TuYV and aphids in canola.

The department will examine the abiotic impacts, like soil moisture and soil type.

“Identifying potential factors influencing active ingredient uptake and subsequent survival rates of GPA will contribute to an improved understanding of insecticide resistance and control failure risks for this pest,”

<https://www.agric.wa.gov.au/news/media-releases/science-partnership-project-protect-canola-crops-and-growers%E2%80%99-profitability> Date: January 27, 2021

5.3 Early-sown canola may escape blackleg clutches

“Canola crops sown early in warm conditions over recent weeks may escape potentially severe blackleg disease during the growing season.

Some canola crops have been sown early in areas where reasonable summer or early autumn rains were received.

Marcroft Grains Pathology principal Steve Marcroft, who is co-ordinator of the Grains Research and Development Corporation's (GRDC) National Canola Pathology Program investment, says crops sown before April 30 into warm conditions that allowed them to quickly progress through the seedling growth stage are at the lowest risk of developing blackleg.

Dr Marcroft says results from the latest blackleg screenings of canola cultivars have been factored into

the updated ratings for 2020. Blackleg ratings can change from year-to-year if the fungus overcomes cultivar resistance.

Leptosphaeria maculans, the causal agent of blackleg disease, is a sexually reproducing pathogen that may overcome cultivar resistance genes. Fungal spores are released from canola stubble and spread extensively via wind and rain splash. The impact is more severe in areas of intensive canola production.

“Blackleg can cause severe yield loss, but can be successfully managed,” Dr Marcroft says. “Growers are advised to closely follow the recommended strategies for reducing the risk of disease which are contained in the GRDC Blackleg Management Guide.”

<https://grdc.com.au/news-and-media/news-and-media-releases/national/2020/think-ahead-to-following-crops-when-applying-herbicides/early-sown-canola-may-escape-blackleg-clutches> Dat

5.4 Major herbicide research effort enters new phase

“The Grains Research and Development Corporation (GRDC) and the Crop Science division of Bayer today announced that the Herbicide Innovation Partnership (HIP) would be extended for another four years to 2025. The partnership was formed in 2015 and since then the private-public collaboration has delivered promising results in the identification of a number of chemistry candidates for new sustainable modes of action. 2025. -----the partnership with the GRDC puts Australian growers at the next frontier of the development of new molecules -----.

The GRDC investment on behalf of Australian growers has contributed to our scientists synthesising several tens of thousands of new molecules for laboratory and greenhouse testing, and several of these have progressed to the stage of readiness for Australian and international field testing – an important first step in the process of the field evaluation of candidates with potential for commercial development.”

A total of 12 Australian weeds are subject to testing by Bayer under glasshouse conditions, while additional species are taken into account within field testing in Australia. A secondary aim of the partnership is fostering education within Australia in the area of industrial research techniques and herbicide research and development.

<https://www.crop.bayer.com.au/news-and-insights/news/news-container/2020/12/14/03/35/major-herbicide-research-effort-enters-new-phase> Date: December 16, 2020

5.5 Canola – Windrow on time, reap the reward

“Windrowing on time maximises income, avoiding losses due to windrowing canola too early. Crops should be windrowed when 60–80% of seed sampled from the middle third of main stem and branches has changed colour from green to red, brown or black.

Key points

- All varieties should be assessed and treated the same way.
- **Seed colour change** is when a minimum of two-thirds (approx. 67%) of the surface of an individual seed has changed colour from green to red, brown or black.
- Region affects the speed of maturity and seed colour change:** Canola in QLD, northern NSW and northern WA cropping zones will mature much quicker than in southern NSW, VIC, SA and southern WA.
- **Sampling location must be carefully considered:** Crop maturity within a paddock is affected by many factors such as topography, soil type, crop nutrition and plant population. Both the least mature and most mature parts of the paddock need to be considered and assessed when determining windrow timing. Technology such as satellite and NDVI images can be used when identifying suitable sampling locations.”

Copies of this guide are available from GroundCover Direct: Freephone 1800 11 00 44 and email: ground-cover-direct@canprint.com.au. Please quote Order code GRDC1488 – Canola – Windrow on Time – Reap the Reward\$. A postage and handling charge applies.

<https://grdc.com.au/resources-and-publications/all-publications/publications/2020/canola-windrow-on-time,-reap-the-rewards> Date: October 9, 2020

5.6 GRDC Hyper Yielding Crop focus-farm trials for the Riverine Plains

“A new, four-year project is set to examine the yield potential of different varieties grown under various agronomic packages as part of a Grains Research and Development Corporation (GRDC) investment into hyper-yielding cereal crops.

Following on from the success of Hyper Yielding Cereals (HYC) project in Tasmania, the Hyper Yielding Crops project has recently commenced on a national scale, with GRDC Centre of Excellence trial sites established in Victoria, Tasmania, South Australia, NSW, and Western Australia.

Riverine Plains Inc Project Officer, Kate Coffey, explained that a Centre of Excellence has been established at Wallendbeen (near Cootamundra), NSW, with the research site chosen because it had a

water-limited yield potential of 10 t/ha for cereals and 5 t/ha for canola. -----to establish three focus farm sites in southern NSW in support of the Wallendbeen Centre, with a canola site established at Gerogery and wheat sites established at Culcairn and Howlong” she said.

The project combines the expertise of several farming groups, including Riverine Plains Inc, with FAR Australia, SARDI, Brill Ag, CSIRO, DPIRD, TechCrop and CeRDI.

The 2020 focus-farm paddock trials will look at nitrogen and fungicides, while future focus-farm paddock trials will be based on ideas arising from the local Innovation Groups, as well as from growers visiting the Centre of Excellence.

This project will ultimately provide an opportunity to unlock yield potentials by providing a greater understanding of the possible constraints and the agronomic practices required to achieve potential yields in a given season.

For further information, please visit the Riverine Plains Inc website at riverineplains.org.au or contact Riverine Plains Inc Project Officer Kate Coffey on 03 5744 1713 or email kate@riverineplains.org.au

<https://riverineplains.org.au/grdc-hyper-yielding-crop-focus-farm-trials-for-the-riverine-plains/>

Date: August 24, 2020

6. Universities and Research Organization in Australia

6.1 CSIRO

6.1.1 Omega-3 canola

“Nutritionists have recognised the health benefits of omega-3 fatty acids for many years. Omega-3 oils are polyunsaturated fatty acids that are considered 'healthy oils'. Docosa-hexaenoic acid (DHA) is a long-chain omega-3 oil and a key structural component of cellular membranes in the human body. It is vital for early childhood growth and, in particular, brain and eye development. It can also reduce blood pressure and the risk of coronary heart disease as well as stroke, type 2 diabetes, Alzheimer's disease, inflammatory disease and asthma.

DHA and other long-chain omega-3 fatty acids are made by lower plant forms, including marine plants like microalgae. Some land-based plants, like flaxseed, can produce short-chain omega-3 oils, but are unable to produce the more beneficial long chain omega-3 oils containing DHA.

Fish, the world's primary source of dietary omega-3 oils, do not create their own DHA, they acquire DHA when they eat microalgae. Fish accumulate high levels of DHA, which in turn can be consumed by humans as a source of DHA.

The production of plants containing industrially-relevant amounts of these marine-type oils has been a long-standing goal of bioengineers.

Using gene technology, our scientists transferred the ability to produce long chain omega-3 oils from lower plants (the marine microalgae that fish consume) into canola, the world's second largest and Australia's largest oilseed crop. This involved introducing a set of eight transgenes which extended canola's short-chain omega-3 synthesis pathway all the way to marine-type EPA and DHA fatty acids. It is the most complex piece of metabolic engineering so far achieved in plants.

In 2011 we joined forces with the Australian Grains Research and Development Corporation (GRDC) and Nuseed (a wholly owned subsidiary of Nufarm Ltd) to further develop long chain omega-3 canola for commercialisation.

In February 2018 the Australian Office of Gene Technology Regulator (OGTR) announced omega-3 canola has been approved for cultivation and use in animal feed. Food uses of the Omega-3 canola have been reviewed by Food Standards Australia New Zealand (FASANZ) with approval granted for sale and use in food in Australia and New Zealand. In addition, omega-3 canola also received USDA deregulation approval for cultivation in the USA in 2018.

The Grains Research and Development Corporation (GRDC) provided financial support to assist in the development of the technology to make the production of the special canola possible and Nuseed is managing global commercialisation.”

<https://www.csiro.au/en/Research/AF/Areas/Crops/Oil-crops/Omega-3-canola>

Updated : February 25, 2020

6.1.2 Deep-rooted canola holds on in the dry

“RESEARCH over the past couple of years has shown that early sown, longer-season varieties of canola have the potential to perform well during a dry finish, largely due to their root depth.

The 2018 and 2019 seasons showed researchers from CSIRO that stored moisture from summer rain could be capitalised on by sowing canola earlier with varieties that will still flower at the right time to miss heat and frost.

The past two years have confirmed observations from the Optimised canola profitability project, a collaborative study between CSIRO, the Grains Research Development Corporation and others.

The project had suggested that earlier sown, slower-maturing varieties had a yield advantage over later varieties in seasons where there is stored soil moisture but it turns dry in the spring.

On average, across about 20 trials, in yield ranges from 1.5 to 3.5t, the research team was getting a 0.4 tonnes a hectare advantage from the earlier sown varieties.

However, there are agronomic issues to consider, especially the impact on deep stored soil moisture that may no longer be available to the following crop. -----that canola is going to use a lot of water and nitrogen.

Another agronomic issue is that canola is a big user of nitrogen, so longer season, earlier sown crops will not only use the water but also use the nitrogen. Canola needs about 80 kilograms of nitrogen per tonne of grain expected, so that supply needs to be there."

Overall, a lot of summer rain and stored soil moisture gives growers both the opportunity and the confidence to sow canola early, with a slower maturing variety, knowing they've got a bank of water at depth for the roots to access. “

<https://www.farmweekly.com.au/story/6746877/deep-rooted-canola-holds-on-in-the-dry/>

Date: May 6, 2020

6.1.3 Development of a *Brassica napus* (Canola) Crop Containing Fish Oil-Like Levels of DHA in the Seed Oil

“Plant seeds have long been promoted as a production platform for novel fatty acids such as the ω 3 long-chain ($\geq C_{20}$) polyunsaturated fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) commonly found in fish oil. In this article we describe the creation of a canola (*Brassica napus*) variety producing fish oil-like levels of DHA in the seed. This was achieved by the introduction of a microalgal/yeast transgenic pathway of seven consecutive enzymatic steps which converted the native substrate oleic acid to α -linolenic acid and, subsequently, to EPA, docosapentaenoic acid (DPA) and DHA. This paper describes construct design and evaluation, plant transformation, event selection, field testing in a wide range of environments, and oil profile stability of the transgenic seed. The stable, high-performing event NS-B50027-4 produced fish oil-like levels of DHA (9–11%) in open field trials of T₃ to T₇ generation plants in several locations in Australia and Canada. This study also describes the highest seed DHA levels reported thus far and is one of the first examples of a deregulated genetically modified crop with clear health benefits to the consumer. “

<https://www.frontiersin.org/articles/10.3389/fpls.2020.00727/full> Date: Plant Sci., 12 June 2020 |

6.1.4 Precision crop stubble grazing to benefit farmers in vulnerable times

The nutritional value of crop stubble for grazing sheep has been reassessed for the first time in 25 years. A new tool will also help farmers review their practices to get the most benefit.

Changing nutritional availability for livestock

“New research funded by Meat & Livestock Australia and Australian Wool Innovation sought to address the changed circumstances of mixed enterprise farmers.

Lead by Dr Dean Thomas from CSIRO Agriculture and Food, a two-year project worked to quantify the value of modern crop stubbles in the face of the summer-autumn feed gap when they are a critical source of feed for sheep in the mixed farming regions.

The research team found that on average around 20 per cent of the seasonable feedbase comes from crop stubble. Around 60 per cent comes from green and dry pastures, and the remainder comes from forage crops, dual-purpose crops, perennial forage species, or supplementary feeding.

----- nitrogen content in cereal stubbles was found to have decreased by about 25 per cent compared with previously reported values. Consequently, there may be an increased need for protein supplementation compared to historic requirements.

There is some good news for **canola growers**, though. The increased use of chaff lines and chaff carts means that any unharvested canola seed, high in protein and energy, will be easier to find and more likely eaten.

However, large variability between crops types, flock and paddock sizes, and animal factors such ewe weight, condition score and stage of pregnancy have left farmers needing to guestimate the value of their crop stubble for their livestock.

Consequently, as part of their research the team have been developing a decision support tool called the Stubble Grazing Calculator for farmers to use when calculating the needs for their flocks.

Recalculating crop stubble inputs

CSIRO is actively working towards developing new technologies and practices for farmers to adapt to a changing climate, which tests their ability to operate at peak productivity.

In response to this challenge, the Stubble Grazing Calculator will predict liveweight gain or loss in adult ewes based on their size, condition and reproductive status, the type and condition of crop stubble

(wheat, barley or canola), and the provision of supplementary feed. Dr Thomas said the calculator is fundamentally a scenario testing tool and is designed to assist farmers estimate the number of grazing days available to stock on stubbles based on conditions in their fields and guide their next steps.

“People have basically been guessing on how long sheep should be grazing stubbles. The stubble calculator gives me that understanding of when crop stubbles no longer provide the nutritional value required and when to start feeding,”----

Further testing of the Stubble Grazing Calculator is now being planned to ensure that it is ready for widescale use by the industry.”

<https://ecos.csiro.au/precision-crop-stubble-grazing/> Date: November 26, 2020

6.1.5 CSIRO helms multidisciplinary research initiative to develop fish-free omega-3 oils

“Australia’s national science agency has signed an 18-month partnership agreement with the Brisbane-based arm of Pharmamark Nutrition Pty Ltd to develop omega-3 oils, proteins and bioactives from marine microbes. The organisation has developed new technology to culture and extract omega-3 from specific strains of the ‘unique and endemic’ microscopic marine organism known as *thraustochytrids*.

The organisation has developed new technology to culture and extract omega-3 from specific strains of the ‘unique and endemic’ microscopic marine organism known as *thraustochytrids*.

These proteins and omega-3 oils are vegan and environmentally friendly. Their production will be safe and cost-effective, with the ability to bring the proven benefits of nutrients like omega-3 oils to many more people.” -----said CSIRO research scientist and project lead Dr Kim Lee Chang. ‘

<https://www.futurefoodsystems.com.au/byte/csiro-helms-multidisciplinary-research-initiative-to-develop-fish-free-omega-3-oils/> Date: July 22. 2020

6.1.6 Plant Phenomics

“The Australian Plant Phenomics Facility (APPF) is a distributed network of national research infrastructure platforms offering open access to state-of-the-art plant phenomics technologies, tools and expertise not available at this scale or breadth in the public sector anywhere else in the world.

Access to our infrastructure is available to academic and commercial plant scientists, from Australia and around the world, to address complex problems in plant and agricultural sciences.

Undertake your research using our state-of-the-art facilities

Each of the three APPF nodes has unique, specialised facilities that interlink to provide a complementary, seamless service to users. The APPF also provides opportunities for more distantly placed researchers to utilise our facilities, either in person or remotely, through engagement of APPF staff, while mobile equipment is available for field deployment anywhere in Australia.

<https://www.plantphenomics.org.au/> Date: January 15, 2021

6.1.7 Linkage mapping and whole-genome predictions in canola (*Brassica napus*) subjected to differing temperature treatments

Crop and Pasture Science 71(3) 229-238 <https://doi.org/10.1071/CP19387>. Excerpts from the “Abstract:

Canola (*Brassica napus* L.) is grown on >8 Mha in Canada and is sensitive to high temperatures; therefore, research on breeding methodologies to improve heat-stress tolerance is warranted. This study utilised a doubled-haploid population created from two parents (PB36 and PB56) that differed in their ability to set seed following growth at high temperatures. The experiment was designed to identify potential quantitative trait loci (QTLs) responsible for conferring tolerance to increased temperatures, and to utilise this population as a test case for evaluating the prospects of whole-genome prediction.

The prediction accuracies ranged from 0.14 (yield) to 0.66 (1000-seed weight). Prediction had higher accuracy within the stress treatment than within the control treatment for seven of the nine traits, demonstrating that phenotyping within a stress environment can provide valuable data for whole-genome predictions.”

<https://www.publish.csiro.au/cp/Fulltext/cp19387> Date: April 1, 2020

6.2 Charles Sturt University’s

6.2.1 Oils ain’t oils: How many times can you fry your chips with canola oil?

- Charles Sturt University research finds extraction and processing methods can significantly impact on the frying life of canola oil
- The number of times you use canola oil for frying impacts on the taste and health properties
- The number of times you use canola oil for frying impacts on the taste and health properties

“The project at the Australian Research Council (ARC) Industrial Transformation Training Centre for Functional Grains examined the quality of canola oil samples used to fry potato chips for 36 to 48 cycles.

Charles Sturt postdoctoral researcher Dr Randy Adjonu (pictured) presented the research at the recent World Congress on Oils and Fats in Sydney.

“Our research has found the extraction and processing method can significantly impact the frying life of canola oil, with differences of up to 30 per cent.

“It’s not as simple as saying one extraction or processing method is better than another in terms of frying life though, as there were differences between samples extracted using similar techniques.

“More research is needed to pinpoint how extraction and processing influences frying life, so processors can use this information to improve their product.

The research has also been published in the journal *Foods*. “

<https://news.csu.edu.au/latest-news/oils-aint-oils-how-many-times-can-you-fry-your-chips-with-canola-oil#> Date: March 13, 2020

6.2.2 Charles Sturt partners with manufacturers and growers to tackle greenhouse gas emissions on-farm

“The project will partner with farming systems groups, Riverine Plains Inc, FarmLink Research and Central West Farming Systems to identify opportunities to reduce inputs and increase productivity, while also ensuring the long-term health of their most valuable asset, the soil.

The project will also gather data to evaluate the online greenhouse gas calculator, Cool Farm Tool, to quantify emissions in an Australian farming context so we can effectively measure and track changes in farm over time.'

<https://news.csu.edu.au/latest-news/charles-sturt-partners-with-manufacturers-and-growers-to-tackle-greenhouse-gas-emissions-on-farm> Date: October 26, 2020

6.2.3 National herbicide resistance survey in weeds to begin

“The survey will be led by Charles Sturt University and will determine the resistance status of major cropping weeds to key herbicides.

- This is the first time the entire Australian grain-growing region will be surveyed for herbicide resistance in the one growing season using the same methodology.
- The survey will provide important information about the prevalence of herbicide resistance that will guide growers and the weed control industry on strategies for weed management.

The survey will be led by Charles Sturt University (*Dr. John Broster*) with collaboration from the University of Western Australia, University of Adelaide, University of Sydney and Queensland Department of Agriculture and Fisheries.”

<https://news.csu.edu.au/latest-news/national-herbicide-resistance-survey-in-weeds-to-begin>

Date: September 15, 2020

6.2.4 Charles Sturt research project on novel weed management identifies tactics for mixed farming systems

“An innovative long-term research project investigating weed management strategies for no-till and mixed farming systems in southern Australia has identified some novel and effective tactics for growers to implement on-farm.

The project, 'Weed Management in Mixed Farming Systems: Strategies to Combat Herbicide Resistance', was a collaborative partnership involving the Grains Research and Development Corporation (GRDC), Charles Sturt University and the University of Adelaide (UA). A separate, but concurrent project supported by Meat and Livestock Australia ensured the research addressed weed management across the entire farming system.

Conducted at sites across southern New South Wales, southern Victoria, the Victorian Mallee, and South Australia's Eyre Peninsula and Mid North, the research trialled diverse weed control and management approaches in a range of agroecological zones over five growing seasons.

Trials focused on key weeds identified as having varying levels of herbicide resistance through comprehensive surveying conducted early in the project. These targeted weeds included annual ryegrass, brome grass, windmill grass, fleabane, wild radish and Indian hedge mustard.

As part of this research, trials were established to assess the weed suppression mechanisms of competitive wheat, barley and canola, targeted weed control strategies combining chemical and cultural tactics and the impact of long-term rotational strategies on in-crop seasonal weed management and seedbank dynamics.

Charles Sturt Research Professor of Plant Biology Leslie Weston (pictured), from the Graham Centre for Agricultural Innovation, led the multidisciplinary team-----.

The key findings from our research were that rotations with diverse and competitive crop types, along with early crop vigour and high total crop biomass in canola, barley and wheat varieties, correlated strongly with effective weed suppression across multiple locations and years in New South Wales, Victoria and South Australia,” she said.

Some excerpts of the findings:

- The key findings from our research were that rotations with diverse and competitive crop types, along with early crop vigour and high total crop biomass in canola, barley and wheat varieties, correlated strongly with effective weed suppression across multiple locations and years -----.

Post-harvest weed management in fallow was significantly influenced by the type and amount of crop residue and its decomposition. ----- different crops, including cereals and annual pasture legumes, release significant quantities of metabolites into the soil during breakdown that appear to influence weed suppression. ---- found evidence that the breakdown of different crop residues resulted in the release of compounds into the soil that were strongly correlated with summer weed suppression in the field and phytotoxicity in the laboratory.

- found across multiple locations in non-moisture limiting conditions was the weed seed density of annual weeds was successfully depleted under rotations which featured diverse and competitive grain crop genotypes, ----.

- early crop vigour and high total crop biomass in canola, barley and wheat correlated strongly with effective weed suppression in all locations, in all years.

- The ability of wheat and barley to develop a canopy that is dense and reduces light at the soil surface also proved critical in reducing in-crop weeds.

- Interestingly, some wheat genotypes were observed to release weed suppressive metabolites (phenoxazinones) during the growing season, offering potential for in-crop weed suppression in the area immediately surrounding the wheat roots.

- The project also evaluated different canola varieties for their ability to suppress annual weeds under high, medium and low inputs over multiple years-----.

- found newly released cultivars of hybrid canola exhibited competitive traits and, in combination with chemical controls, were most effective in suppressing weeds for season-long management.

- have been able to identify why specific weeds such as barley grass are a problem in continuous cropping and mixed farming systems and determine their impact on crop, pasture and livestock production, -----.

“Understanding and evaluating these different management approaches to weed control in an environment where herbicide resistance has proven to be problematic has been a key part of offering growers genuine information about what works most effectively, in which situation.”

Professor Weston said findings from the project would help equip southern Australian growers with the tools to optimise the use of both chemical and non-chemical weed control tactics in no-till cropping and mixed farming enterprise.”

Tools and tactics for weed control are available. For more information about this research check out the following articles – Drive down weed seed bank with three pronged attack; The war on weeds latest

tips; Delivering weed competitive wheat breeding lines to growers; Pre-emergence and crop competition the wine and cheese of weed control in canola and Revealing canola's super powers.

<https://news.csu.edu.au/latest-news/charles-sturt-joins-research-project-on-novel-weed-management-tactics-for-mixed-farming-systems> Date; July 24, 2020

6.2.5 Taiwan Opens Door to all Australian Quality | The Cultivator Spring 2020

"In 2018, it (*The Diner- a restaurant-group in Taiwan*) switched to the Australian canola oil auzure – made by MSM Milling in Central Western New South Wales – making it the first Taiwanese restaurant to adopt the healthier Non-GM oil with a long frying life in all its kitchens.

----- swear by auzure, using it for all the sauces, marinades as well as stir, shallow and deep frying in their kitchens. In addition, they sell the retail bottles so their customers can take home the healthy Australian oil they trust in their restaurants.---- we needed to find a healthy oil that performed well in the kitchen and produced crispy golden foods. auzure does not smoke like the other oils we have used so our chefs are very happy.

----new independent Australian university study which has found that auzure outperforms other Australian canola oils. ----- undertaken by the Australian Research Council Industrial Transformational Training Centre for Function Grains at Charles Sturt University, compared expeller pressed ("expeller pressing mechanically squeezes the canola oil from the seeds, without the use of chemicals") auzure canola oil to canola oil from two other Australian processors to examine the impact of different processing techniques on the frying life of the oil.

The findings confirmed that processing methods greatly influence the frying life of canola oil, with the expeller pressed auzure oil outperforming oil that was processed using other techniques including solvent, or hexane extraction. Not only did auzure record the longest frying life, it also outperformed the other oils with tocopherol retention and antioxidant activity.

Charles Sturt University post-doctoral researcher, Dr Randy Adjonu, found that auzure expeller pressed oil lasts up to 30 per cent longer than oil produced by other Australian processors. Dr Adjonu's study compared the performance of the oils by frying potato chips for 36 to 38 cycles, until the limit of Total Polar Materials (TPM) was reached. TPM is the international index for determining the quality and safety of frying oils."

<https://www.manildra.com.au/taiwan-opens-door-to-all-australian-quality-the-cultivator-spring-2020/>

Date: November 6, 2020

6.2.6 Genes prove global pest from South America

"Scientists have traced the origins of a very hungry caterpillar in efforts to halt the spread of the diamondback moth, a pernicious, pesticide-resistant pest costing the world's farmers more than \$5 billion per year.

The first insect to adapt to DDT - the toxic 1950s poison of choice banned in Australia since 1987 - the moth is a common pest in vegetable gardens and farms.

It is resistant to all major classes of insecticide, making control difficult.

The diamondback moth originated in South America, and started moving about 500 years ago, ----.

has adapted to feeding on native, brassica weeds as well as important crops, ----. Now researchers know where the moth came from they can focus on finding a natural predator or parasite to help control it, ----.

Researcher Geoff Gurr, professor in applied ecology at Charles Sturt University, ----- . Funded by the Chinese government and led by researchers from Fujian Agriculture and Forestry University, the expensive study illustrated how serious the pest is to global food security, -----.”

<https://www.portnews.com.au/story/6753043/genes-prove-global-pest-from-south-america/?cs=9397>

Date; May 11, 2020

6.3 University of Western Australia's

6.3.1 New canola varieties to be heat tolerant

“CANOLA breeders are set to be provided with heat tolerant germplasm that can be incorporated into

new commercial varieties, as a result of research being conducted at The University of Western Australia (UWA).

The research is part of a nationally co-ordinated five-year project being led by UWA's Institute of Agriculture and funded by the Grains Research and Development Corporation (GRDC), alongside other research partners. Project supervisor Sheng Chen, UWA, said extended periods of high temperature stress and short periods of heat shock were major threats to canola grain and oil yield in canola grown regions in Australia.

The project is built upon the achievements from UWA's previous research on canola heat tolerance ---- -. The project, which started in 2019, is investigating the genetic correlations between heat tolerance, environment and field performance in order to make that knowledge available to canola breeders to enable them to efficiently deploy heat tolerance genes for target environments. Dr Chen said the plan was to distribute the heat tolerant canola genotypes, confirmed by multi-environment field trials, to Australian canola breeders.

----- genotypes varied in heat stress tolerance, based on their ability to set seed after heat stress during flowering.

The major research work including the seed increase and screening of canola germplasm for heat tolerance under controlled environment, the physiology and genetics under heat stress, and the development of methodology and protocols for heat tolerance screening is based at UWA, while the heat tolerance validation and demonstration under field condition is a national program.

<https://www.farmweekly.com.au/story/7125105/new-canola-varieties-to-be-heat-tolerant/>

Date: February 16. 2021

6.4 Flinders University, Adelaide

6.4.1 Bricks made from plastic, organic waste

New binding solution targets construction uses

“Revolutionary 'green' types of bricks and construction materials could be made from recycled PVC, waste plant fibres or sand with the help of a remarkable new kind of rubber polymer discovered by Australian scientists.

The rubber polymer, itself made from sulfur and **canola oil**, can be compressed and heated with fillers to create construction materials of the future, say researchers in the Young Chemist issue of *Chemistry - A European Journal*.

"This method could produce materials that may one day replace non-recyclable construction materials, bricks and even concrete replacement," says Flinders University organic chemist Associate Professor Justin Chalker.

The powdered rubber can potentially be used as tubing, rubber coatings or bumpers, or compressed, heated then mixed with other fillers to form entirely new composites, including more sustainable building blocks, concrete replacement or insulation.

The new manufacturing and recycling technique, labelled 'reactive compression molding,' applies to rubber material that can be compressed and stretched, but one that doesn't melt. The unique chemical structure of the sulfur backbone in the novel rubber allows for multiple pieces of the rubber to bond together.

Reactive compression molding post-inverse vulcanization: A method to assemble, recycle, and repurpose sulfur polymers and composites. *Chemistry – A European Journal*, 2020; DOI: 10.1002/chem.202001841 Flinders University. "Bricks made from plastic, organic waste: New binding solution targets construction uses." ScienceDaily. ScienceDaily, 26 May 2020. <www.sciencedaily.com/releases/2020/05/200526111255.htm>.

<https://www.sciencedaily.com/releases/2020/05/200526111255.htm> Date: May 26, 2020

6.5. University of Queensland

6.5.1 New 12-metre version of Tempo precision planter unveiled by Vaderstad

“Family-owned Swedish farm machinery company, Vaderstad, has released a 12-metre version of its Tempo precision planter.

A Tempo L set a world record in 2017 by planting 502 hectares of maize in 24 hours - an average working speed of 20 to 22 kilometres per hour .

----- the L32 was the largest Tempo planter to date and ideal for controlled traffic farming systems in Australia. University researchers identified just 16 skips and 24 doubles in a sample of 6800 plants conducted two months after planting.----- L32 model maintains this accuracy but significantly increases its capacity to 12 metres,"

<https://www.queenslandcountrylife.com.au/story/7126376/vaderstad-ups-the-tempo-on-its-precision-planter/?cs=4733> Date; February 15, 2021

7. Aktiwitete van saadmaatskappye en chemikalieëmaatskappye in Australië

7.1a 2021 Western Australian Crop Sowing Guide

Google Crop Variety Sowing Guide GRDC and scroll and click on ‘2021 Western Australian Crop Sowing Guide (PDF 5.9MB) as the state producing around 40% of the Australian harvest. Open the guide as pdf document and go to page 90 to 111 for the canola information. The table below lists the

new varieties (page91). Details on all of the available varieties for 2021 are given from page 93 onwards.

CANOLA HERBICIDE TOLERANCE GROUPS AND NEW VARIETY RELEASES

TABLE 1. Canola herbicide tolerance groups

Herbicide tolerance	Abbreviation	Description	New variety releases (maturity)
Triazine tolerant	TT	Tolerant of selected triazine herbicides. Some varieties open pollinated	• HyTTec Trifecta (5) • InVigor T 6010 (6) • SF Dynatron TT (5) • Hyola Blazer TT (4) • AFP Cutubury (4)
Glyphosate tolerant	GT	Tolerant of Monsanto glyphosate herbicide. Includes both Roundup Ready® and TruFlex® varieties	• InVigor R 4520P (4) • Xseed Condor (5)
Clearfield®	CL	Tolerant of Imidazolinone (IMI) herbicides, marketed as Clearfield®	• Pioneer 44Y94 CL (4)
Conventional canola	CC	Only tolerant to clopyralid and grass selective herbicides.	
Triazine tolerant and glyphosate tolerant	TT+GT	Combined tolerance	
Triazine tolerant and Clearfield®	TT+CL	Combined tolerance	• Hyola Enforcer CT (5)
Glyphosate tolerant and Clearfield®	GT+CL	Combined tolerance	• Hyola Garrison XC (5)

Harvest maturity key: 3 = early, 4 = early-mid, 5 = mid, 6 = mid-late (information provided by seed companies).

7.1b Other states

The information on the other main growing areas can be accessed similarly by selecting of the other states listed. On New South Wales data of the 2020 season is given.

<https://grdc.com.au/resources-and-publications/all-publications/crop-variety-guides>

Date: November 2020

7.1. BASF

7.1.1 Australia - BASF brings the farm to customers with launch of virtual innovation tour experience

- Growers can now visit BASF's Australian wheat, barley, canola crop protection and seed variety demonstrations anytime, anywhere on the Virtual Innovation Tour website
- Visitors can use onsite cameras to tour BASF's research sites in real-time, view side-by-side treatment comparisons, listen to industry podcasts and seek technical advice

- Virtual tour showcases BASF's research farm at Longerenong (Vic) with additional highlights from farms at Tamworth (NSW), Wagga Wagga (NSW) and York (WA)

“On the website, visitors can take a self-guided tour of BASF's wheat and canola demonstration plots at Longerenong, Victoria, and, thanks to in-field time-lapse cameras and 360-degree camera technology, view progress across all phases of crop growth, from seed through to harvest.

On the website, visitors can take a self-guided tour of BASF's wheat and canola demonstration plots at

On the website, visitors can take a self-guided tour of BASF's wheat and canola demonstration plots at Longerenong, Victoria, and, thanks to in-field time-lapse cameras and 360-degree camera technology, view progress across all phases of crop growth, from seed through to harvest.

https://www.seedquest.com/news.php?type=news&id_article=120877&id_region=&id_category=&id_crop= Date: September 9, 2020

7.1.2 BASF's New Focused Approach Boosts Agricultural Innovation Pipeline by 25%

“Our aim is to find practical solutions that enable higher yielding and more stress-tolerant crop production, reduce farming's CO₂ footprint and increase biodiversity,

To meet today's farming challenges, BASF's innovation pipeline is focused on new technologies and solutions for four strategic customer segments and their respective crop systems:

- soy, corn, cotton;
- wheat, canola (oilseed rape), sunflowers;
- rice;
- fruit and vegetables.

Seeds & Traits: ----- for this season the company has just launched '300 series' InVigor canola featuring three new hybrids that offer growers improvements either in yield, pod shatter reduction protection, or clubroot resistance. BASF is also leading the industry by launching InVigor RATE, a target plant population recommendation supported with innovative seeding rate-----.

Mid-decade, BASF will be introducing LibertyLink yellow-seed canola which can be grown under more challenging conditions and will provide new rotation options for wheat growers in drier areas of North America, -----.

Herbicides: ----to have access to effective weed management, BASF has developed two novel herbicide active ingredients, Luximo and Tiresor. -----new possibilities to manage difficult-to-control grasses and broadleaf weeds. -----BASF is working on further new mode of actions to manage herbicide resistant weeds -----.

Fungicides: -----recently launched Revysol, a fungicide active ingredient that meets the highest regulatory standards and offers outstanding biological performance against a range of difficult-to-control pathogens in specialty and row crops. -----has classified products based on Pavecto and Revysol as 'Accelerator' products due to their substantial sustainability contribution -----Seed treatment applications based on Broflanilide, marketed under the Teraxxa brand, will target difficult to manage wireworms ----.

Insecticides: ----expand its insecticide portfolio and offer additional solutions to farmers, BASF has developed Broflanilide together with Mitsui Chemicals Agro, Inc. The new active ingredient, to be launched from 2020 onwards, will help farmers protect specialty and field crops -----.

Digitalization Supports Modern Agriculture : With BASF's latest digital outcome-based business model, xarvioHEALTHY FIELDS, farmers benefit from a transparent field- and season-specific crop protection service, reduced workloads through outsourced spray contractors, real-time monitoring, as well as a success guarantee for their fields. xarviodigital products enable more precise application of crop protection products, nutrient management, automated buffer zones and biodiversity monitoring. They are currently helping more than 2.5 million farmers in more than 120 countries.

<https://seedworld.com/basfs-new-focused-approach-boosts-agricultural-innovation-pipeline-by-25/>

Date; February 28, 2020

7.1.3 BASF Innovation Secures – Strong Global Position in Crop Protection Segment

“BASF expanded its pipeline of solutions for agriculture significantly and by 2028, will launch innovations ------. The pipeline contains a wealth of chemical and biological crop protection products, seeds and traits, as well as digital solutions. These are BASF's new innovating pipeline products ----
Luximo® is a new herbicide product from BASF, with active ingredient Cinmethylin, which has received the first new mode of action classification from the Herbicide Resistance Action Committee (HRAC) since 1985.

Luximo® already approved for sale in Australia in 2019, BASF also expects farmers in the EU and UK to benefit from this much-needed herbicide in the future.

Luximo is the first active ingredient in the new HRAC mode of action class “Group Q” or “30”, which stands for the inhibition of the enzyme family Fatty Acid Thioesterase (FAT). These enzymes are vital for plant cell membrane development and function. Their inhibition disrupts germination and thus the emergence of grass weeds.

Luximo® has a novel mechanism of action: Cinmethylin binds to acyl-ACP thioesterase and inhibits plant fatty acid biosynthesis. It is positioned as a specialist grassweed herbicide, with a unique mode of action that will help maintain the effectiveness of integrated weed control programs.

Luximo active ingredient, Cinmethylin, provides pre-emergence residual control against a broad range of grasses, including persistent blackgrass and ryegrass in winter cereals.

Tirexor® herbicide – is a new protoporphyrinogen oxidase (PPO) inhibitor herbicide, its active is Trifludimoxazin that controls PPO-resistant weeds including pigweed and ragweed species.

The herbicide is fast-acting, with foliar effects that can occur in as little as one day. Tirexor's anticipated global use includes application on small grain cereals, corn, soybeans, pulse crops, oil palm, and numerous tree fruit and nut crops.

It is the first new MoA for the foliar burndown of grass weeds in 20 years.

Revysol® fungicide is the first Isopropanol-Azole being introduced to the market. Its active ingredient Mefentrifluconazole, belongs to triazoles fungicide class

- Mechanism of Action (MOA): Inhibition of ergosterol biosynthesis, by inhibition of C14-demethylase (SBI Class I).
- Revysol is highly effective against important diseases, such as Septoria tritici and rusts in wheat or Ramularia in barley.

Broad disease and crop spectrum, further registrations will cover other important crops such as oilseed rape, corn, fruits, grapes and vegetables.

- BASF gains approval for fungicide innovation Revysol® in Europe
- Afidopyropen was discovered through research on microbial metabolites in collaboration with Meiji and the Kitasato Institute and Doctor Satoshi Omura group, which is a totally different insecticidal active ingredient from existing insecticides with a unique chemical skeleton and its insecticidal mode of action is classified into a new subgroup, 9D, by IRAC (Insecticide Resistance Action Committee) classification.

Inscalis® insecticide –new insecticide based on fermentation with favorable environmental profile. Its active ingredient AFIDOPYROPEN.

Afidopyropen provides effective control of insect pests such as aphids, whiteflies and psyllids. At present, afidopyropen is registered for soybean, cotton and a variety of fruits and vegetables in the U.S. The insect pests damage crop yields and lower the values of harvests by piercing and sucking plants, as well as mediating plant virus diseases. Afidopyropen decreases the occurrence of plant virus disease by quick onset of action. Although the problem of resistance to existing insecticides is increasing, afidopyropen controls those insecticide-resistant pests as well. Furthermore, since afidopyropen has a minimal impact on honeybees and as its application dosage is low, it can contribute to sustainable agriculture with the less environmental burden.

Vedira™ –new insecticide based on Broflanilide, which is a Meta-diamides / GABA-gated chloride channel allosteric modulator.

BASF has co-developed Broflanilide with Mitsui Chemicals Agro, Inc. This active ingredient is a powerful and versatile new mode of action insecticide to control chewing pests. Initial market launches are expected in 2020.

Broflanilide received the first registration worldwide by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Further registrations, for uses in crop production, are anticipated in the U.S., Canada, Mexico and India,

Broflanilide is a compound with a novel mode of action (IRAC Group 30), demonstrating excellent efficacy in the control of many problematic chewing insect pests, including caterpillars and beetles in specialty and row crops, and non-crop pests such as termites, ants, cockroaches and flies. It has potential use applications in cereals as a seed treatment for control of wireworms, as well as for foliar use in leafy and fruiting vegetables, potato, soybean, cotton, corn and legumes.

<https://chemrobotics.in/2020/06/15/basf-innovation-secures-strong-global-position-in-crop-protection-segment/> Date: June 15, 2020

7.2. Bayer CropScience/Monsanto

7.2.1 FSANZ Issues Notice on Food Derived from Herbicides-Tolerant Canola

“On January 18, 2021, Food Standards Australia New Zealand (FSANZ) has assessed document provided by Bayer Crop Science Proprietary Limited seeking to permit the sale and use of “Food derived from Herbicides-Tolerant Canola line MON94100”.

- Based on the data provided and other information, food derived from canola line MON94100 is considered to be as safe for human consumption as food derived from conventional non-GM canola cultivars.

-Existing labelling requirements for GM food will apply to food derived from canola line MON94100 in accordance with the Code.

- Various subsections of standards have been listed and food for sale must comply with all relevant labelling requirements imposed by the Code for that food.

Check out the complete Draft Assessment Report on our Food News Monitoring System.

<https://resources.selerant.com/food-regulatory-news/fsanz-issues-notice-on-food-derived-from-herbicides-tolerant-canola> Date: January 21, 2021

7.2.2 Bayer Announces Partnership With Startup Investor To Drive Innovation In Australia

“The Crop Science division of Bayer in Australia has announced it will partner with the SproutX Accelerator, in a move signalling increased interest in the startup community to deliver innovation for large agribusinesses.

SproutX recruits and invests in up to 10 food and agricultural technology startups annually who are solving the biggest challenges across the agrifood system. Through this partnership, Bayer will have early access and deep engagement with these startups to identify promising technologies that can be applied to their business and their customers.

Bayer is also seeking to invest in sustainability, and will prioritise innovations that address biodiversity loss and climate change.

<https://www.seedtoday.com/article/206835/bayer-announces-partnership-with-startup-investor-to-drive-innovation-in-australia> Date: July 27, 2020

7.3 Cesar *Sien 5.2b*

7.4 Corteva

7.4.1 Corteva Agriscience announces Onmira Active as global trademark for fungicides

“Onmira is a highly active strobilurin (Group 11) fungicide used for the control of foliar and soil-borne plant diseases. Corteva Agriscience announced in recent that it is implementing Onmira active as the new global brand name for picoxystrobin, the active ingredient in more than 15 proven fungicides from Corteva.

Onmira is a highly active strobilurin (Group 11) fungicide used for the control of foliar and soil-borne plant diseases. Products with Onmira are labeled for crops including soybean, corn, wheat, rice, sunflower, canola and oilseed rape.”

<http://www.agrospectrumindia.com/news/118/409/corteva-agriscience-announces-onmira-active-as-global-trademark-for-fungicides.html> Date: February 19, 2020

7.4.2 Transform[®] WG Isoclast[®] active

“Transform WG Insecticide with Isoclast active is an insecticide with a novel mode of action for controlling sap-feeding (sucking) insects. Transform controls aphids, mirids and greenhouse whiteflies in cotton, cereals, canola, citrus and soy beans.

Systemic and translaminar activity, excellent fit in IPM programs because it has minimal impact on beneficial insects and predatory mites and does not flare secondary pests, effective against insects which are resistant to other insecticides; applied by ground-rig or by aircraft. Active Ingredient

500 g/L IsoclastTM active. Mode of Action: nicotinic receptor agonist, water dispersible granule .”

<https://www.corteva.com.au/products-and-solutions/crop-protection/transform-wg-isoclast-active.html>

Date: March 4, 2020

7.5 Nuseed

7.5.1 Nuseed in omega-3 oil production from canola to sell to salmon farmers

(Some excerpts from this article are taken to in “Our aim is to find practical solutions that enable higher yielding and more stress-tolerant crop production, reduce farming’s CO₂ footprint and increase biodiversity,” illustrate the present status of the introduction of canola produced omega-3 oil into the market.

“THE first commercial quantities of omega-3 oils grown from canola in the US by Nuseed are ready to sell into the global aquaculture market. And the Nufarm subsidiary plans to double production this year in a bid to rapidly build up stocks of the oil normally derived from fish, such as salmon or trout.

But it may be a few years before Nuseed’s Aquaterra branded product is grown in Australia. ----- according to Nuseed group executive Brent Zacharias, there is already a deficiency of these oils in the human diet, driven by a shortage of their major source: fish. Salmon derive their oil from smaller, fatty fish in the food chain — anchovies and herrings — which, in turn, source their oil from algae. With that in mind, Nuseed set out a decade ago with the CSIRO and the Grains Research and Development Corporation to look at taking the oil genetics out of sea algae and transferring it into canola seed.

(The most common forms of omega-3 oils found in the human supplement market were eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA),

The research into these biofactories has paid off, with Nuseed just finishing the processing of its first commercial omega-3 oil grown from 14,000 hectares of canola in the US for sale to aquaculture operations around the world.

Nuseed was seeking regulatory approval to grow the Aquaterra canola crops in various countries in the world. Nuseed already had the necessary approvals required in Australia for growing the canola but was concentrating its early production in the US. The canola meal by-product was a valuable, high protein cattle feed.

Nuseed believes it can more than double production of the omega-3 oils within 10 years by producing the same oils from canola for feeding to fish or for processing directly into the human dietary supplement market. The company has a human consumption brand, also produced in canola, called Nutriterra. But it was a couple of years away from releasing that product to the nutraceutical market.

(The most common forms of omega-3 oils found in the human supplement market were eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), -----.)

Omega-3 oil from canola plants is not approved for sale yet in the US but it is in Australia. Because the omega-3 canola is a genetically-modified crop, Nuseed was currently seeking government approval for using the by-product in animal feed in the US. Nuseed saw salmon farming in Chile as one of the primary markets for the canola-derived omega-3 product.

Nuseed does not have enough omega-3 oil yet for distribution into Australia and sees Chile as its most profitable market. Until then, Australian salmon farmers will continue to source their omega-3 oils from anchovies and herrings.

When salmon farmers are eventually able to access the Aquaterra oil, they will mix a small amount of into their feed mix. The oil multiplies inside the fish and there is potential to produce and market salmon of a higher omega-3 level.

-----producing omega-3 oils from canola was more sustainable than sourcing them from fish. For every one hectare of canola, it replaces 10-12 tonnes of small oily fish — anchovies and herrings — to get that oil to feed salmon.”

<https://www.weeklytimesnow.com.au/agribusiness/nuseed-in-omega3-oil-production-from-canola-to-sell-to-salmon-farmers/news-story/f0b6f088219b7195470ff7c7591ffb6d> Date: May 29, 2020

7.5.2 Nuseed to release a new breed of canola

(This website does not quote dates with its postings therefor 2020 news items were requested to report on)

“ ----- growers will have even more variety choices from next season thanks to the introduction of a new breed of hybrid triazine tolerant (TT) canola from Nuseed Australia.

Leading the range is HyTTec® Trophy, a medium maturity canola developed to give growers the best of both worlds.

“Our new line of HyTTec canola varieties will combine hybrid seed traits, such as early vigour, a strengthened disease background and excellent yield performance, with the same herbicide tolerance benefits of the TT system,” said Andrew Loorham, Commercial Manager for Nuseed Australia.

Triazine tolerant canola is the most widely grown technology in Australia due to the effectiveness of its weed management system and Nuseed is the market leading TT canola seed supplier.

----- a full pipeline of HyTTec varieties was under development at the Nuseed Innovation Centre in Horsham, Victoria, with trials showing very promising results.

“HyTTec Trophy is currently in the ground in both National Variety Trials and Nuseed’s own grower-based Crop Agronomy Trials across the country, and we look forward to sharing the results at the end of the season,-----”.

<https://nuseed.com/au/nuseed-to-release-a-new-breed-of-canola/> Date: 2020

7.6 Pacific Seeds

7.6.1 The next generation of canola has arrived.

“-----two new dual herbicide stacked products – Hyola Enforcer CT and Hyola Garrison XC, which have been designed for integrated weed management and protection against chemical carryover from previous crops.

these new hybrids will be an important tool in Australian growers integrated weed management (IWM) arsenal.

Hyola Enforcer CT is a non-GM product and the first in a new generation of Clearfield and Triazine (CT) dual herbicide stacked hybrids.

“We’re seeing a rise in popularity for CT hybrids and Enforcer CT is a great tool for IWM and managing Group B imidazolinone (IMI) residues in drier seasons. We have a big pipeline of CT products that we think will be very popular with Aussie farmers,” Mr Kudnig said.

“Hyola Garrison XC is the first release from Pacific Seeds’ next generation of canola hybrids featuring dual TruFlex and Clearfield (XC) herbicide tolerance.

During 2019 trials of Hyola Enforcer CT and Hyola Garrison XC showed impressive financial returns per hectare.

How do I make the most of a hybrid crop?

Can I use hybrid crops with herbicide tolerance to fix a weed blow-out?

Are residues in grain a concern when using stacked trait herbicide tolerant hybrids?

<https://www.weedsma>“The third new canola hybrid to be commercially available in 2021 is Hyola Blazer TT. This product is our latest triazine tolerant (TT) release with very high blackleg resistance” Mr Kudnig said.

“In both extensive Pacific Seeds Research trials and NVT Trials to date, Hyola Blazer TT delivered considerable yield returns which were equal to or greater than popular competitor TT hybrids.’

<https://www.pacificseeds.com.au/the-next-generation-of-game-changing-canola-hybrids/>

Date: September 2020

7.7 Pioneer

7.7.1 How can I maximise the weed control value of my crop rotation?

“A diverse crop rotation is the twine that holds a good farming system together and underpins an effective weed management program.

Kevin Morthorpe, Pioneer Seeds’ Trait & Seed Technology Stewardship Manager says herbicide tolerance traits in crop hybrids can be used to maximise competition against weeds and increase the herbicide options available to growers while optimising yield and profitability of the crop sequence in rotations.

-----growers get both improved crop performance due to hybrid vigour and more flexibility in herbicide use patterns.”

The increased vigour of canola hybrids also generates greater biomass production and early canopy closure that suppresses growth and seed set of weeds that germinate in-crop, complementing the use of pre-emergent herbicides. Hybrids super-charge crop competition through a strong root system and vigorous growth,”-----. “From an economic angle, hybrids optimise yield in both high input and tough environments. In fact, we see more growers selecting hybrids when producing canola in tough conditions.

Since the release of the first herbicide tolerant canola in 1991, the popularity of herbicide tolerance has seen a 98 per cent adoption of canola varieties with tolerance to imidazolinone (Clearfield), triazine (TT) or glyphosate (RR). In the last 15 years, the area sown to hybrid canola has risen to an impressive 47 per cent in Australia. A diverse rotation of crops and pastures is one of the WeedSmart Big 6 tactics, which Pioneer Seeds endorses-----.

The rest of the article deals with the benefits of hybrid canola under the headings:

How do I make the most of a hybrid crop?

Can I use hybrid crops with herbicide tolerance to fix a weed blow-out?Are residues in grain a concern when using stacked trait herbicide tolerant hybrids?”

<https://www.weedsmart.org.au/content/how-can-i-maximise-the-weed-control-value-of-my-crop-rotation/> Date: July 7, 2020

7.8. Syngenta

7.8.1a COMPLETE CONTROL of seedling blackleg, rhizoctonia and pythium in canola

“SALTRO DUO is a powerful combination of two leading seed treatments, specifically designed for Australian Canola growers. Containing Syngenta’s new, unique SDHI fungicide SALTRO and the recognised high performer MAXIM[®] XL, this fighting combination offers the most powerful protection against seedling blackleg, rhizoctonia and pythium.”

<https://www.syngenta.com.au/saltroduo> Date: 2021

7.8.1b Superior seed treatment for blackleg now available | VIDEO

“SALTRO[®] DUO has been extensively trialled throughout Australia and has demonstrated excellent disease protection in canola seedlings as well as unparalleled seed safety. Early protection is absolutely critical,

The early seedling vigour seen with SALTRO DUO has been attributed to the control of not only blackleg but rhizoctonia and pythium, while helping establish crop competition against other pests. The use of SALTRO DUO also means one or two fewer post-emergent foliar sprays, which has logistical benefits, especially in wet times .

Blackleg management is about using all the tools on your belt,” ----- . You are using a flutriafol on the fertiliser, you are using a seed treatment, you are keeping an eye on the crop as it progresses to see whether you need that foliar. It is a multi-pronged approach to make sure you really target a whole bunch of different areas to make sure you get the desired outcomes.”

As the SALTRO DUO name suggests, this seed treatment combines SALTRO with the trusted fungicide MAXIM XL, =====.SALTRO DUO was a standout in the trial for most of the year. It is such a visual product. You could really pick those plots. SALTRO by itself was certainly great but SALTRO and MAXIM XL were better than Jockey and Jockey plus Impact.”

<https://www.syngenta.com.au/news/broadacre/superior-seed-treatment-blackleg-now-available-video>

Date: March 23, 2020

8. Ander sake van belang ivm. Canola

8.1 Yield10 Bioscience obtains positive response from USDA-APHIS on regulated Status of its CRISPR genome-edited C3007 trait in canola; Plans U.S. field tests for 2021

“Yield10 Bioscience, Inc. , an agricultural bioscience company, today announced that it has obtained a positive response from USDA-APHIS’s Biotechnology Regulatory Services (BRS) for its CRISPR genome-edited trait C3007 in canola plant lines developed for increased oil content. Yield10’s submission along with the USDA-APHIS BRS response is posted on the USDA’s website.

In June 2020, Yield10 submitted an “Am I regulated?” letter to the BRS, requesting confirmation of the regulatory status for canola plant lines containing the Company’s novel, CRISPR genome-edited C3007 trait. The positive USDA-APHIS response came in the form of a published letter indicating that the plant lines do not meet the definition of a regulated article under 7 CFR Part 340 regulations. Confirmation of the regulatory status of the plants will enable Yield10 to conduct field tests of CRISPR genome-edited **canola plants** in the United States in the 2021 growing season.

“Our team successfully engineered CRISPR genome-edited versions of C3007 in canola and now clarified their regulatory status through USDA-APHIS, marking major milestones in our development program to produce new varieties of canola with higher oil content,” said Kristi Snell, Ph.D., Chief Science Officer of Yield10 Bioscience. “With the deployment of the C3007 trait in canola as an oil boosting trait, we have expanded the portfolio of traits we are developing targeted towards increasing the performance of canola. We are also developing and/or testing the novel traits C3003 and C3004 to increase seed yield in canola.

The CRISPR edited C3007 trait designed to increase oil content could deliver significant economic value for the commercialization of identity preserved, specialty oilseed crops. This is particularly true where the key economic drivers are altered oil compositions with improved nutritional profiles or oils which have been modified for aquaculture feed or industrial markets.

https://www.seedquest.com/news.php?type=news&id_article=120114&id_region=&id_category=1,&id_crop=27 Date: August 17, 2020

8.2 Sustainable way to increase seed oil yield in crops

“Nanyang Technological University, Singapore (NTU Singapore) scientists have developed a sustainable way to demonstrate a new genetic modification that can increase the yield of natural oil in seeds by up to 15 per cent in laboratory conditions.

----can be applied to crops such as **canola**, soybean and sunflower, ----.

The research team led by Assistant Professor Wei Ma from NTU's School of Biological Sciences genetically modified a key protein in plants which regulates the amount of oil they produce. This results in larger oil reserves in the seed that primarily serves as an energy source for germination.

The team's patent-pending method involves modifying the key protein known as "Wrinkled1" or "WRI1," which regulates plants' oil production. After modification, the seeds have a wrinkled appearance, which is the basis for its scientific codename.

In the lab, these modified seeds have successfully displayed seed oil increase that is able to produce up to 15 per cent more natural oils. The research findings were published in the scientific journal *Plant Signaling & Behavior*.”

Journal Reference: WRINKLED1 as a novel 14-3-3 client: function of 14-3-3 proteins in plant lipid metabolism. *Plant Signaling & Behavior*, 2018; 1 DOI: 10.1080/15592324.2018.1482176

Nanyang Technological University. "Sustainable way to increase seed oil yield in crops." ScienceDaily. ScienceDaily, 20 April 2019. <www.sciencedaily.com/releases/2019/04/190420090534.htm>.

<https://www.sciencedaily.com/releases/2019/04/190420090534.htm> Date: April 20, 2019

8.3 New Study Finds Possible Higher Yielding Canola

by Alberta Seed Guide | Feb 1, 2021 | Industry News, Research

“A study lead by researchers at the University of Calgary used gene editing to modify canola’s genes, producing shorter plants with more branches and flowers which could potentially increase the crop’s yield,-----.

“We showed that gene editing actually works in canola, and simultaneously improved agronomic traits in canola by changing the plant’s architecture,” study co-author Marcus Samuel, professor at the University of Calgary, ----- . We were able to effectively induce such dramatic architectural changes in canola with one single gene,” -----/

This was the first time Samuel’s lab had attempted gene editing in canola, using a wild type strain of the plant. The team targeted the gene BnD14, the receptor for a hormone called strigolactone. After the gene editing, the team then crossbreed the edited canola line to eliminate the DNA used for gene editing to obtain the edited strain of canola without any trace of foreign DNA, -----/

In their modified wild-type canola strain, the team was able to increase the number of branches to about 60 from the typical 20. They also increased the production of flowers by about 200 per cent which ----- /could help increase the yield, ----- . The plants are also shorter making them less susceptible to lodging.

Because the new trait and architecture now exists in the modified canola plants themselves, no need for further genetic engineering is required, making it relatively easy to crossbreed the plants into an elite new line of canola,-----.

The group is now in discussion with Agriculture and Agri-Food Canada to do some field trials this year to confirm whether the new canola strain produces a higher yield.

The team’s study, “Gene-Editing of the Strigolactone Receptor BnD14 Confers Promising Shoot Architectural Changes in *Brassica napus* (Canola),” was published in *Plant Biotechnology Journal*.

<https://www.seed.ab.ca/new-study-finds-possible-higher-yielding-canola/> Date: February 1, 2021

8.4 Virus turns deadly fungus from foe to friend in plants

“Researchers have discovered that a fungal virus (also called a mycovirus) can convert deadly fungal pathogens into beneficial fungus in **rapeseed plants**. Once transformed, the fungus boosts the plant's immune system, making the plant healthier and more resistant to diseases. These findings, published on September 29 in the journal *Molecular Plant*, indicate that some fungal viruses can be used for developing "plant vaccines" to improve crop health and enhance crop yield.

----- rapeseed farms experience significant losses from the fungal pathogen, *Sclerotinia sclerotiorum*, which causes stem rot, lesions and kills the plants within a few days after infection.

"The virus we identified can convert the fungus from a deadly pathogen in different plants to an endophytic fungus like a gentle sheep and protect these plants," says the senior author Daohong Jiang, a professor at Huazhong Agricultural University in China.

When infected by the mycovirus, the rapeseed-threatening fungus loses its virulence. Instead of killing the plant, the virus-infected fungus lives peacefully within the plant and even comes with some benefits. Jiang and his colleagues infected the rapeseeds by inoculating seeds with virus-infected fungus fragments and observed a boost in the plants' immune system, an 18 percent increase in weight and more root growth. These plants not only grew bigger and stronger, but it could also resist other diseases.

In the rapeseed fields, fungus-infected fragments also suppressed stem rot, stimulated plant growth and improved seed yield by 6.9 -- 14.9 percent. Virus-infected fungal pathogens become a novel way to /61 tackle crop diseases by decreasing the virulence of lethal pathogens. Moreover, the researchers found that the fungal virus can be transmitted to other fungal pathogens quickly and efficiently throughout the field, which are ideal traits to develop "plant vaccines."

-----financially supported by National Science Foundation of China, the National Key R&D Program, and the China Agriculture Research System. “

Journal Reference A 2-kb Mycovirus Converts a Pathogenic Fungus into a Beneficial Endophyte for Brassica Protection and Yield Enhancement. *Molecular Plant*, 2020; 13 (10): 1420 DOI: 10.1016/j.molp.2020.08.016

Cell Press. "Virus turns deadly fungus from foe to friend in plants." ScienceDaily. ScienceDaily, 29 September 2020. <www.sciencedaily.com/releases/2020/09/200929123555.htm>.

<https://www.sciencedaily.com/releases/2020/09/200929123555.htm> Date: September 29, 2020

8.5 New research reveals previously hidden features of plant genomes

“An international team led by the Plant Phenotyping and Imaging Research Centre (P2IRC) at the University of Saskatchewan (USask) and researchers at Agriculture and Agri-Food Canada (AAFC) has decoded the full genome for the **black mustard plant** -- research that will advance breeding of oilseed mustard crops and provide a foundation for improved breeding of wheat, **canola** and lentils.

The team, co-led by P2IRC researchers Andrew Sharpe and Isobel Parkin, used a new genome sequencing technology (Nanopore) that results in very long "reads" of DNA and RNA sequences, providing information for crop breeding that was previously not available. The results are published today in *Nature Plants*.

Sharpe said his team is already using this software platform in the Omics and Precision Agriculture Lab (OPAL) at the USask Global Institute for Food Security (GIFS) to sequence larger and more complex crop genomes.

The genome assembly for black mustard that we have developed is a great example of how new Nanopore sequencing technology quickly reveals important genome biology," Sharpe said, noting that this advanced sequencing technology and capability is available to public and private plant breeding organizations through the OPAL at GIFS.

Journal Reference: A high-contiguity *Brassica nigra* genome localizes active centromeres and defines the ancestral *Brassica* genome. *Nat. Plants*, 2020 DOI: 10.1038/s41477-020-0735-y

University of Saskatchewan. "New research reveals previously hidden features of plant genomes." ScienceDaily

<https://www.sciencedaily.com/releases/2020/08/200810115522.htm> Date: August 10, 2020

6.1.2 Macronutrient research in aquaculture nutrition

Comprehensive survey of scientific literature highlights importance of jointly considering protein, lipids and carbohydrates in aquafeed formulations

“Globally, the aquaculture industry supplies 17.1 percent of the total animal protein for human consumption,----- . Aquafeeds play a crucial role in ensuring this level of production, and the global aquafeed industry produced 44.4 million metric tons in 2017, ----- . (Food and Agriculture Organization of the United Nations, FAO; **SOFIA 2020**).

Most efforts on aquaculture nutrition research have been directed towards proteins, then lipids and carbohydrates (CHO).

Noteworthy, although aquatic species have higher protein requirements, their energy expenditure is much lower as they do not regulate their body temperature and inhabit an environment where the cost

of movement is energetically lower. Due to these higher requirements, protein rich ingredients are added at high levels, typically ranging from 30 to 55 percent and consequently are the most expensive component of the diet. Lipids are next, and CHO are the lowest cost of these three ingredients on a volume basis. Although they make up a much smaller component of aquafeed, non-protein macronutrients are essential for growth, and their importance in different fish species may vary, requiring research to determine their optimal inclusion levels.

Compared to protein and lipids, CHO is the least investigated macronutrient in the nutrition of aquacultured species. One reason could be the limited capacity of most fish and crustacean species to digest CHO and/or utilize glucose as a source of energy. Nevertheless, their inclusion in aquafeeds remains critical, ----- an inexpensive and efficient energy source----- CHO ingredients are essential in feed extrusion to manufacture robust, expanded and water-stable pellets.

-----crucial to study their interactions, as all ingredients play a part in feed formulation, muscle accretion, health and fillet quality. Accordingly, this article evaluates research efforts carried out between 1990 and 2020 for protein, lipid and CHO in aquaculture nutrition at a broad level, including the degree of emphasis placed on species with different physiology and ecology, as well as the commercial drivers affecting the focus of research.

Optimizing the protein-sparing effect by supplying lipids and CHO as non-protein energy is key to making diets more cost-effective and environmentally friendly (excess amino acids are excreted as ammonia leading to low water quality and eutrophication).

-----most research has investigated the possibilities to provide terrestrial alternatives as a source of energy and spare those essential lipid sources (particularly omega-3 LC-PUFA). Traditional sources of essential lipids have typically originated from marine-derived resources such as fish, squid and krill oils and residual lipid fractions in their respective meals. Novel sources from marine algae (e.g., *Thraustochytrids*, *Aurantiochytrium* and *Schizochytrium*) and **genetically modified, DHA-rich canola already are commercially available. These will be increasingly used in years to come.**

Traditional sources of essential lipids have typically originated from marine-derived resources such as fish, squid and krill oils and residual lipid fractions in their respective meals. Novel sources from marine algae (e.g., *Thraustochytrids*, *Aurantiochytrium* and *Schizochytrium*) and genetically modified, DHA-rich canola already are commercially available. These will be increasingly used in years to come.

The overlooked CHO component of aquafeeds provides the opportunity to further explore the non-protein related characteristics of various ingredients-----.

While necessary to an extent, dietary protein catabolism [metabolic pathway to break down molecules for their use by the body] is an inefficient and costly source of energy compared to lipids or CHO. Due to the complexity surrounding the “black-box” of protein metabolism in living organisms, an ingredient’s nutritional value is challenging to determine and often species-specific. Significant research efforts have been directed towards balancing the cost of an ingredient and the efficiency of protein conversion.

Balancing the levels of all three digestible macronutrients can lead to nutritional improvements beyond the effect of a single nutrient.

The broad diversity of aquaculture species (over 600 species) makes the nutritional studies on protein requirements particularly essential and challenging. Protein research likely will continue to play a major role in optimizing growth performance, with lipid research focusing on achieving cost-

effectiveness, health and improved product quality (levels of omega-3 LC-PUFA), and CHO research centered around least-cost feed formulations, aquafeed manufacturing and water stability.

Perspectives

Considering the volume of major aquacultured species produced (carps 31.5 percent; tilapia 13.2 percent; and other species such as catfish, marine shrimp, marine fish species and salmon representing 37.6 percent of the global volume) – per data from the Food and Agriculture Organization of the United Nations (FAO 2019) – lipids and CHO-based ingredients are worth at least half of the global aquafeed production costs. These macronutrients represent an essential economic component, not only for the feed mills but for the entire aquaculture industry.

Future research focused on improving not only animal productivity – but also cost-efficiency, health and environmental impacts – will need to shift focus from protein-rich sources and increasingly consider the role of lipids and carbohydrates (CHO) in future formulations.”

<https://www.aquaculturealliance.org/advocate/macronutrient-research-in-aquaculture-nutrition/>

Date: February 8, 2021

9. Ander aspekte van belang

9.1a. Newly discovered trait helps plants grow deeper roots in dry, compacted soils

Crops with stronger, stiffer, lignin-armored roots penetrate hard substrates, promise higher yields “A previously unknown root trait allows some cereal plants to grow deeper roots capable of punching through dry, hard, compacted soils, according to researchers, who suggest that harnessing the inherited characteristic could lead to crops better able to deal with a changing climate.

“This research utilized laser ablation tomography -- known as LAT -- to visualize the anatomy of roots from plants in the study. Lynch's research group developed the unique technology in 2011 for other root-analysis applications. Researchers using LAT can measure the light spectra given off by different cells cut by the laser to differentiate between various tissues.

Called multiseriate cortical sclerenchyma by the researchers -- or MCS -- the phenotype is characterized by small cells with thick walls just beneath the surface of the roots. Roots with the MCS genotype have a greater concentration of lignin -- a complex organic polymer that is important in the formation of cell walls, especially in wood and bark, that lends rigidity.

More lignin gives the MCS roots greater tensile strength and greater root tip bending force compared to non-MCS genotypes. This added rigidity helps roots penetrate hard soil layers.

Genetic variation for MCS was found in each of the cereals examined by the researchers, and heritability was relatively high, they reported, suggesting that this trait can be selected in breeding programs. Of the plant lines reviewed in this study, MCS was present in 30 to 50% of modern corn, wheat and barley cultivars.

--observe MCS in corn, wheat, barley and many other cereal crops, and our work suggests that many of the benefits of MCS may be analogous across different species----. MCS could be an important trait for stress tolerance and increased yields in cereal crops." -----.

Penn State. "Newly discovered trait helps plants grow deeper roots in dry, compacted soils: Crops with stronger, stiffer, lignin-armored roots penetrate hard substrates, promise higher yields."

ScienceDaily. ScienceDaily, 1 February 2021

<www.sciencedaily.com/releases/2021/02/210201155449.htm>.

Journal Reference: Multiseriate cortical sclerenchyma enhance root penetration in compacted soils. *Proceedings of the National Academy of Sciences*, 2021; 118 (6): e2012087118 DOI: 10.1073/pnas.2012087118

<https://www.sciencedaily.com/releases/2021/02/210201155449.htm> Date: February 1, 2021

9.1b. Hard to crack research reveals how crop roots penetrate hard soils

"Scientists have discovered a signal that causes roots to stop growing in hard soils which can be 'switched off' to allow them to punch through compacted soil -- a discovery that could help plants to grow in even the most damaged soils.

Our team's identification that the plant signal ethylene controls root responses to hard soil opens up new opportunities to select novel compaction resistant crops."

The research utilised X-ray Computed Tomography scanners available at the Hounsfield Facility at the University of Nottingham to visualise in situ how plant roots responded to compacted soil. Professor Sacha Mooney from the University of Nottingham and Director of the Hounsfield Facility explained: "Prior to this research we assumed that the hardness of the soil prevented roots growing deeper. By using our imaging approach, we were able to see that roots continued growing in very hard soil when the ethylene signal was switched off. The potential for new crops that can now go deeper in soils and capture previously unavailable resources is really exciting!"

Journal Reference: Plant roots sense soil compaction through restricted ethylene diffusion. *Science*, 2021; 371 (6526): 276 DOI: 10.1126/science.abf3

University of Nottingham. "Hard to crack research reveals how crop roots penetrate hard soils."

ScienceDaily. ScienceDaily, 14 January 2021.

<www.sciencedaily.com/releases/2021/01/210114163917.htm>.

<https://www.sciencedaily.com/releases/2021/01/210114163917.htm> Date: January 14, 2021

9.2 Unexpected discovery: Blue-green algae produce oil

"Cyanobacteria -- colloquially also called blue-green algae -- can produce oil from water and carbon dioxide with the help of light. This is shown by a recent study by the University of Bonn. (*Prof. Dr. Peter Dörmann from the Institute of Molecular Physiology and Biotechnology of Plants (IMBIO)*). The result is unexpected: Until now, it was believed that this ability was reserved for plants. It is possible that blue-green algae will now also become interesting as suppliers of feed or fuel, especially since they do not require arable land. The results have now been published in the journal *PNAS*.

-----they are actually bacteria, even if their trivial name "blue-green algae" suggests otherwise.

-----researched the genomes of various cyanobacteria for a gene that is similar to the genetic make-up of the enzyme involved in plant oil synthesis. With success: They found a gene for a so-called acyltransferase in the blue-green algae; the plant enzyme also belongs to this group. Further tests showed that cyanobacteria do actually produce oil with this enzyme, even if only in small quantities.

The species studied at the University of Bonn produces only very small amounts of oil. "It is nevertheless quite possible that other species are considerably more productive," -----. Furthermore,

blue-green algae can be genetically modified relatively easily, similar to other bacteria. "It is therefore certainly possible that the oil yield could be significantly increased again with biotechnological means."

Journal Reference: Triacylglycerol and phytol ester synthesis in *Synechocystis* sp. PCC6803.

Proceedings of the National Academy of Sciences, 2020; 201915930 DOI: 10.1073/pnas.1915930117

University of Bonn. "Unexpected discovery: Blue-green algae produce oil." ScienceDaily.

ScienceDaily, 5 March 2020. <www.sciencedaily.com/releases/2020/03/200305132125.htm>.

<https://www.sciencedaily.com/releases/2020/03/200305132125.htm> Date: March 5, 2020

jdup

26/2/21