GCIRC News

Global Council for Innovation in Rapeseed and Canola

"Building a World community for Innovation on Rapeseed and Canola"

N° 11, January 2022

Table of contents

Editorial

Happy New Year and welcome to GCIRC Newsletter 11, January 2022.

World production of rapeseed/canola continues to experience headwinds globally, with drought conditions impacting the Canadian crop, floods in parts of Europe, along with the ever-increasing disease and insect pests eroding yields. On a brighter note, the canola crop in Australia has recorded two consecutive years of record production on the back of high canola prices and above average yields (see Australian report later in the newsletter).

Over the past two years, we all have been impacted somewhat by Covid as we go about our usual business and how we adapt to the challenges it brings, especially disruptions to travel, whether domestically or internationally. But with challenge comes opportunity.
How we communicate and interact with colleagues, has been front and centre of conducting business through the ever-evolving IT space.

In September 2021, the GCIRC Technical meeting was successfully conducted on-line, as was Canola week in Canada in late November. The GCIRC board will conduct more regular and proactive contact, hence quarterly meetings have been scheduled for 2022.

I would like to take this opportunity to welcome back existing board members and to extend a warm welcome to the new members joining the board for the next 4-year term. I look forward to working with you all as we have much to accomplish going forward.

The 16th International Rapeseed Conference 2023 will be utilising a hybrid format with a strong focus on delegates present at Sydney, but also accommodating on-line participation for those delegates that could be impacted by Covid travel restrictions. The organising committee are preparing a program, that will deliver both cutting edge science and solutions to maximise the conference theme 'Global Crop – Golden Opportunities' through six thematic pillars.

Robert Wilson, GCIRC President

Activity/ News of the association:

GCIRC General Assembly and new Executive Board

The GCIRC Ordinary General Assembly, chaired by Prof Wolfgang Friedt, was held online for the first time due to the pandemic's situation, in satisfying conditions even if interactions are less than usual in face-to-face meetings, and with the support of a controlled voting device currently used for associations. The attendance was sufficient for voting regular issues, with 65% of present or represented members (61 present, 8 proxies and 37 absent). Following the presentation of the past activities, the financial report for the period was validated. The quality of the organization and contents of the online Technical Meeting was much appreciated, and compliments made to the organizers and moderators of the sessions.

The GCIRC membership grows slowly to 84 active members and 12 Honorary Members in 2021 (71 and 12 in 2019), and with first representatives from USA and Chile. The GCIRC has now 8 sponsors: the AOF from Australia, the Canola Council of Canada, NIAB from UK, PSPO from Poland, SFO from Sweden, SZPO from Czeck Republic, Terres Inovia from France and UFOP from Germany.

The GA key decision was the appointment of the new Executive Board for a period of 4 years. The Board is deeply renewed, several members retiring; we must highlight that for the first time, India and USA are represented in the Board. 97% of the present and represented members approved the new Board (57 votes approving, 2 against, and 4 neutral).

	Board 2017-2021	**Board 2021-2025**
Country	**Appointed Board**	**Suggested replacement**
Australia	MAILER Rod	**WILSON Robert**
China	ZHOU Yongming	**LI Peiwu**
India		**Rakesh ARORA**
Czech Republic	**BARANYK Petr**	**BARANYK Petr**
Denmark	SORENSEN Hilmer	
England	KIGHTLEY Simon	**PETERS Colin**
France	**PILORGE Etienne**	**PILORGE Etienne**
Germany	FRIEDT Wolfgang & FRAUEN Martin	**ABBADI AMINE**
Poland	BARTKOWIAK-BRODA Iwona	**MIKOLAJCZYK Katarzyna**
Sweden	**GUNNARSON Albin**	**GUNNARSON Albin**
Canada	KELLER Wilf	**REMPELL Curtis**
USA		**SERNYK Larry**

The new Executive Board held its first online meeting on December 13th chaired by Rob Wilson, to set the first elements of its coming works towards Sydney 2023. Decision has been taken to meet quarterly.

We thank the former Executive Board team for its action under Wolfgang Friedt leadership: during this 2017-2021 period, we revised the GCIRC strategy, agreed on a new logo and a moto and translated the acronym, revised the statutes and not the least, we decided to open the association widely: all these proposals were validated by the General Assembly, at the time of the very successful congress in Berlin. It makes a strong basis to allow GCIRC to better adapt to a rapidly changing and sometimes unpredictable context.

The GCIRC Technical Meeting 2021

Despite the sanitary situation which led to hold online this Technical Meeting initially scheduled in Poznan, Poland, the 2021 GCIRC Technical meeting was a success with a high quality of the presentations and 165 participants, among them 84 GCIRC members and 81 other participants. Special thanks to Iwona Bartkoviak-Broda and to committees' leaders Samantha Cook and Véronique Barthet who led the sessions and debates on insects pests management and on rapeseed protein production and added value.

Further information on the contents and debates will be given in the next issues of this newsletter.

16th IRC Sydney, Australia, 2023

Planning for the conference is progressing well and meeting time-line milestones. Now that the Christmas – New Year festive season is behind us and normal work has resumed, activities will ramp up.

In line with the conference theme 'Global Crop – Golden Opportunities', the six theme Chairs are assembling their committees (both domestic and international members) to deliver an interesting and dynamic program that will interact with and across all thematic pillars:

- GENETICS, GENOMICS and BREEDING
- CROP PROTECTION
- AGRONOMY, PHYSOLOGY & CROP MANAGEMENT
- QUALITY & PRODUCTS Science and technical focus on oil and protein for food, feed & industrial
- END USE / CONSUMPTION Current needs from end users for - food, feed and fuels
- ECONOMY & MARKETS - Big picture on global oils and fats markets/climate/policies

We look forward to welcoming as many friends and colleagues as possible to Sydney in September 2023. Remember, Sydney ***– "It's closer than you think".***

For further info go to www.irc2023sydney.com

irc 2023 SYDNEY
16th INTERNATIONAL RAPESEED CONGRESS
24 - 27 September 2023
GLOBAL CROP - GOLDEN OPPORTUNITIES

Welcome to New GCIRC members

Welcome to the new members who joined the GCIRC since our last newsletter in August:

LAST NAME	FIRST NAME	INSTITUTION	COUNTRY
WANASUNDARA	**Janitha**	Agriculture and Agri-Food Canada	CANADA
KOSCIELNY	**Chad**	CORTEVA	CANADA
SERNYK	**Larry**	Retired	USA

PARKIN	**Isobel**	Agriculture and Agri-Food Canada	CANADA
DUNCAN	**Robert**	University of Manitoba	CANADA
GACEK-BOGUCKA	**Katarzyna**	IHAR	POLAND
GOURGUES	**Mathieu**	BAYER SEEDS	FRANCE
VAID	**Bhupesh**	CORTEVA	INDIA
GOYAL	**Saurabh**	Kamadgiriseeds	INDIA
YADAVA	**Devendra Kumar**	ICAR	INDIA
NIEMANN	**Janetta**	Poznań University of Life Sciences	POLAND
ZOU	**Jun**	Huazhong Agricultural University	CHINA
HEMKER	**Reinhard**	LIMAGRAIN	GERMANY
PAJIC	**Vladimir**	CARGILL	CANADA
MARJANOVIC JEROMELA	**Ana**	IFVC	SERBIA
YADAV	**Shankar Lal**	SEEDWORKS	INDIA
PAREEK	**Satish**	Rallis India Limited	INDIA
MEENA	**Prabhu Dayal**	ICAR	INDIA
THORENSON	**Dale**	US Canola Association	USA

You may visit their personal pages on the GCIRC website directory, to better know their fields of interest https://www.gcirc.org/online-directory/members-directory

We take this opportunity to remind all members that they can modify their personal page, especially indicating their fields of interest, to facilitate interactions.

Value chains and regional news

2021 Rapeseed harvest over the world

EUROPE

The European rapeseed production has gone through an exciting rollercoaster trip during the last years. Extremely influenced from the 3 dry summers (2018 – 2020) rapeseed suffered a lot from unfavourable conditions and changing management intensity. Farmers went out from the previous cash crop with varying degrees of success. The growing season 2021 with a cooler spring and long flowering period offered excellent conditions for high yield. “Did the rapeseed deliver?”

Review on the climate conditions in 2020/2021

The last year’s favourable conditions during autumn should have enabled a successful establishment before winter.

The start in August and first part of September 2020 underlines again, that we are working with Mother Nature. While farmers in France, Southeast Romania, Bulgaria, or Ukraine suffered from a long-lasting drought, the rapeseed growers in United Kingdom, Belarus, Poland, Czech Republic, or

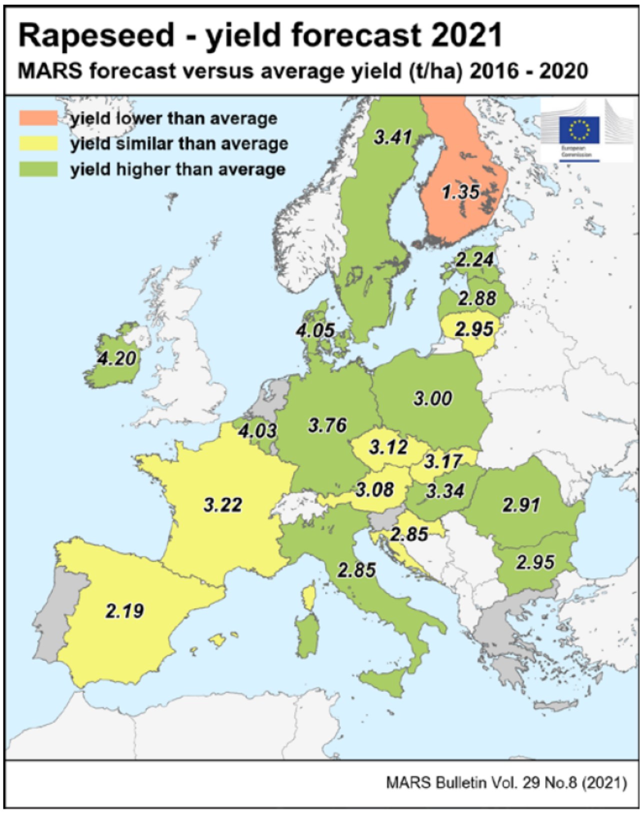
Northwest Hungary faced a rain surplus. As a result, rapeseed was sown with some delay, established slowly or inhomogeneous with the typical difficulties for the further management. During the following weeks, we could observe an opposite picture. While France suffered from rain deficit during August 2020, we saw rain deficit again in March-April (Central Europe, UK, South of France) and then a stronger rain surplus in June -July 2021. But not only in Western Europe, also in larger areas of South Poland, Czech Republic or Northern Hungary continuous rainfalls were dominating. At the same time, a temperature accumulation came up as a broad belt from the Baltics to Bulgaria. (See GCIRC Newsletter N°10, August 2021) In the consequence, spring crops, like sunflower, suffered in their production extremely from these conditions. Finally, also the rapeseed development in Western and Central Europe was regionally behind the typical growth stage in this time of the year.

One highlight during the rapeseed season 2020/2021 was the pretty tough winter, especially the 3 cold waves between beginning of January 2021 and mid of February with temperatures down to -20 or even -25 °C, the dominating opinion at this time was a higher expectation of winter killing, especially in the countries around the Baltic Sea. But except of some smaller winter damages farmers were lucky, as in most cases the rapeseed was protected by a stronger snow coverage (up to 20 cm). Later on, the rapeseed benefited from an untypical cold spring with lower temperatures - and even a cold spell in April on Western and Central Europe and the Balkan - and sufficient rainfall. Even weak developed canopies were able to develop a promising package of side branches during the bud stage. The cold period was helpful to reduce the appearance of insect pests like the critical pollen beetle feeding on the buds before flowering. Additionally, the cooler temperatures in May prolonged the flowering stage, a strong base for higher yield potentials, but the higher moisture also deliver a continuous risk for late infections with Sclerotinia. Later, farmers realized that these wet conditions enabled hidden infections, which had a bigger impact on the results than expected.

Yield estimations during summer 2021

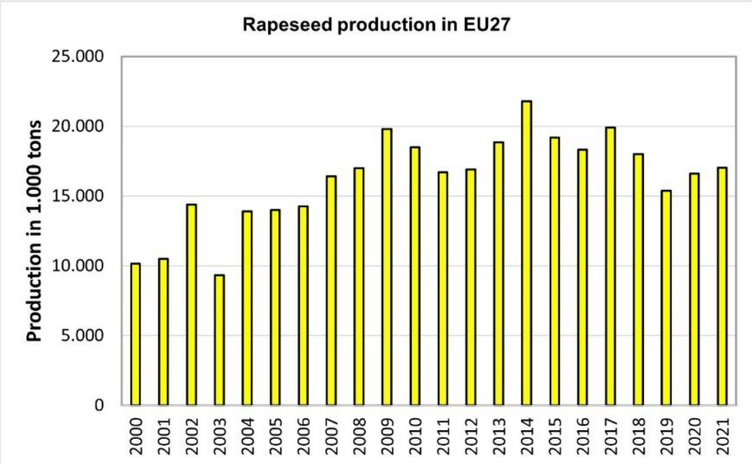
Based on the cold spring, which was favourable for the further rapeseed development, market experts finetuned their harvest estimations step by step. The highly acclaimed MARS Bulletin report present in their March 2021 edition an average yield for EU27 of 3,26 t/ha (4 % more vs. 2020 and 7 % more than 5-year average), especially the countries in Southeast Europe like Hungary (+ 27 %), Romania (+ 30 %) or Bulgaria (+25 %) underline the high expectations in comparison with the yield figures from 2020. The further monthly reports and their yield estimations just repeat the beginning figures and the favourable conditions for rapeseed in 2021, except of a few countries in Northeast Europe. The report of August showed just for Poland with 3 t/ha (- 6 % vs. 2020), Lithuania (2,95 t/ha, -13 %), Latvia (2,88 t/ha, - 6 %) and Estonia (2,24 t/ha, - 22 %) a stronger reduction in comparison with the former satisfying year. While the international market estimations present for France still a high yield forecast from of 3,1 – 3,3 t/ha (3.22 according to MARS) the local mood was depressed as the French farmers lost already around 100.000 ha, mainly due to the problems in autumn respectively higher insect damages. A harvest acreage of below 1.0 Mill. Hectares in France were the lowest production area since 1997. Another country with problematic development was the United Kingdom as they suffered also from their conditions, mainly from the wet autumn and the high cabbage stem flea beetle damage. The final harvest acreage dropped down to a level of just 312.000 ha, less than the half compared with the acreage 2015, the first year without neonicotinoid seed treatment. Luckily the first yield figures were above the 2020 results with 3,3 – 3,5 t/ha.

Country	Rape and turnip rape (t/ha)				
	Avg 5yrs	2020	MARS 2021 forecasts	%21/5yrs	%21/20
EU	3.05	3.12	**3.21**	+ 5.2	+ 2.7
AT	3.11	3.15	**3.08**	– 1.1	– 2.3
BE	3.77	3.80	**4.03**	+ 6.7	+ 6.0
BG	2.76	2.34	**2.95**	+ 6.8	+ 26
CY	—	—	—	—	—
CZ	3.25	3.38	**3.12**	– 3.9	– 7.7
DE	3.33	3.68	**3.76**	+ 13	+ 2.1
DK	3.81	3.84	**4.05**	+ 6.2	+ 5.4
EE	2.15	2.86	**2.24**	+ 4.2	– 22
EL	—	—	—	—	—
ES	2.20	2.72	**2.19**	– 0.7	– 20
FI	1.46	1.27	**1.35**	– 7.4	+ 6.4
FR	3.21	2.91	**3.22**	+ 0.3	+ 11
HR	2.82	2.87	**2.85**	+ 1.4	– 0.5
HU	3.09	2.80	**3.34**	+ 8.2	+ 20
IE	4.02	4.48	**4.20**	+ 4.6	– 6.2
IT	2.70	2.86	**2.85**	+ 5.7	– 0.1
LT	2.85	3.41	**2.95**	+ 3.8	– 13
LU	—	—	—	—	—
LV	2.74	3.08	**2.88**	+ 5.1	– 6.4
MT	—	—	—	—	—
NL	—	—	—	—	—
PL	2.83	3.17	**3.00**	+ 6.0	– 5.6
PT	—	—	—	—	—
RO	2.56	2.13	**2.91**	+ 14	+ 37
SE	3.12	3.46	**3.41**	+ 10	– 1.2
SI	—	—	—	—	—
SK	3.07	3.01	**3.17**	+ 3.4	+ 5.5



Harvest 2021 in EU – overview of biggest rapeseed producing countries

The current rapeseed harvest 2020/2021 is estimated on a level of 17,03 Mill. tons by the international market experts of Strategy Grains. A figure, which is also confirmed by the last report from the USDA. The production surplus of 400.000 t/ha in comparison with 2020 are enjoyable but will not solve the tightness on the European rapeseed market.



The Top-5 rapeseed producers in the EU27 are Germany, France, Poland, Czech Republic and a surprisingly Romania. These countries produce together more than 70 % of the European Union. Based on a last update from OilWorld, Germany was able to reach again the leading position in the EU-27. The graph below also presents the critical development of France, where the rapeseed farmers suffered from the challenging conditions 3 years in a row. The estimation of 3.71Mill. tons for Germany respectively the 1.13 Mill. tons for Romania must be highlighted as new harvest updates speak already about a drop down for Germany (3.5 Mill. tons presented by DRV) and an increase for Romania (1.33 Mill. tons).

Russia emerges since a couple of years to a key rapeseed producer with stronger impact on the global supply, especially to China. The rapeseed season 2021 was a bigger challenge, as the growing conditions in autumn 2020 were not supportive. Based on high temperatures in summer 2020 sowing respectively emergence was not favourable. The consequence was that Russian rapeseed farmers lost more than 100.000 hectares over the winter months, mainly because of inhomogeneous development. According to OilWorld (update Dec 17, 2021), rapeseed yield would reach 1.76 t/ha for a total production of 2,88 MT. Additionally, Russia owns a growing spring rapeseed market with around 1.4 Mill. Hectares also here are the first yield figures promising. Further increase in the rapeseed acreage for 2022 can be expected.

Besides Canada, **Ukraine** is one of the main rapeseed suppliers for the European Union. Based on a growing demand Ukraine increased their acreage during the last years up to more than 1 Mill. hectares. Regarding UkrAgroConsult the acreage 2021 reached 1.05 Mill. hectares. Despite challenging weather conditions (cold prolonged spring, late ripening due stronger summer rainfalls) the delayed harvest reached quite high yield figures with 2,75 t/ha. The OilWord update mentions 1.080 Mha with an average yield of 2.8 t/ha and a total production ranging by 3.06 MT. It can be expected that based on the better production the Ukrainian exports to the European Union will surpass the 2. Mill. tons from last marketing year.

CANADA

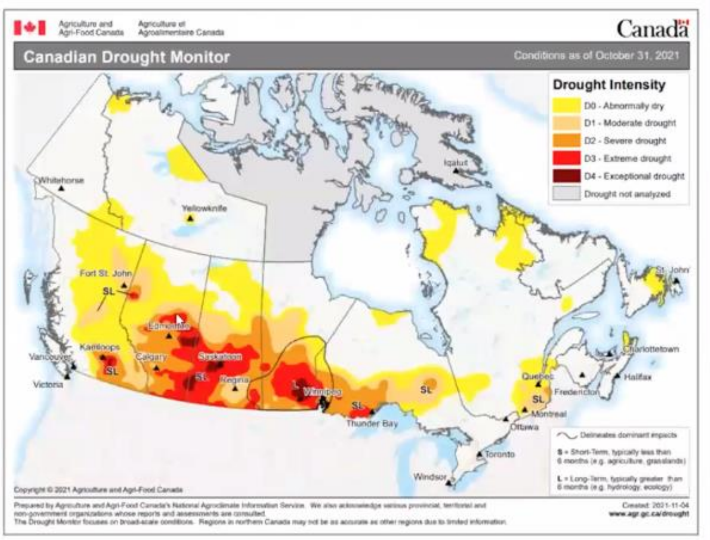
In **Canada,** the dramatic extent of the losses will be more understood if we keep in mind that the Canadian Canola farmers expanded their acreage (+ 8 % vs. 2020), due to a high global plant oil demand and low stocks.

Additionally, the current situation will be intensified through the fact that the production 2021 matches a low canola stock from previous harvest of just 0.7 Mill. tons due to a high export in the last marketing season. One year ago, the Canadian supply was more comfortable with ending stocks of 3.1 Mill. tons.

But what are the main reasons for this dramatic drop down in 2021? The current Canola production suffered from frost in late spring, a higher insect pest appearance and the fatal heat wave in July with temperatures up to 50°C. The situation in Saskatchewan, as largest Canola producer in Canada, confirms the dramatic development during July. It suffered a lot from this heat, as 50 % of Canola fields were in a poor or very poor condition. This is an incredible increase, if we compare this with the previous year, where just 3 % of the fields were in a critical stage.

Through October 2021, severe to extreme drought conditions continued across much of the Prairie region. Statistics Canada projects production decreases for grain and oilseed crops of between 35% and 46% compared to 2020 (Wheat 38,3%, canola 34,4%, barley 33,5%, peas 45%, oats 43,6%, lentils 37% and flax 34%).

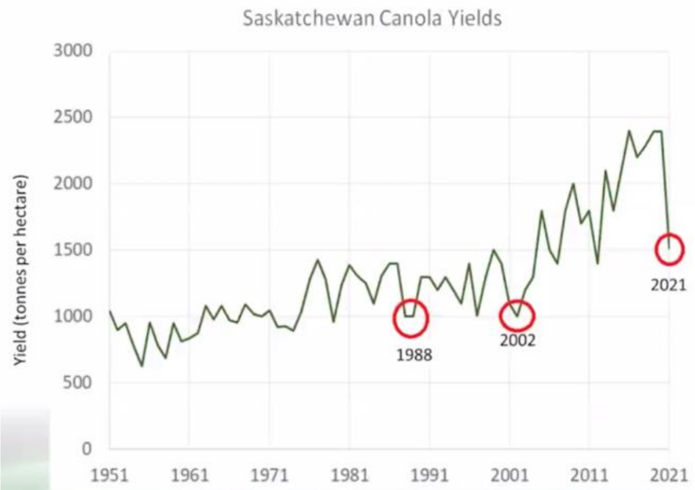
According to Aston Chipanshi, AAFC, the 2021 drought is the most severe drought recorded in intensity an extent: drought covered 94% of the agriculture land in Western Canada. Extreme or exceptional drought covered over 28% of the area. Drought impacted 46 million acres of crop land. Precipitation in late August provided some relief and briefly improved soil moisture, but this precipitation was too late for most crops.



Drought conditions began in the summer of 2020 and intensified through the fall and winter. Lack of spring runoff resulted in early season water supply issues and inadequate soil moisture. Low precipitation combined with high temperatures resulted in high crop stress and reduced vegetation biomass.

Record temperatures in July, unprecedented in intensity and duration, amplified the impact of this drought. The hottest and driest portion of summer occurred during a critical agriculture period significantly lowering yield potential.

Indicators over multiple years show a dry trend across much of Western Canada. The severity of this year's drought is the result of multiple dry years, cumulating with a very hot and dry 2021 summer. 2021 was the most severed and widespread drought in the last 50 years, with 1961, 1988, and 2001-2002. Yield reduction in 2021 were larger compared to the five-year average than seen in previous drought years, but overall yields remain higher relative to long term historical averages due to improvements in technology.



According to the Canadian Grain Commission survey, concerning quality, oil content is affected with only 42% oil in seeds (from 33,9 to 49,4) compared to 44,4 for 10-year average, and protein content is relatively high, with 23,6% (16,4 to 30,5) compared to 20,8 as 10-year average. Glucosinolates are near normal (11 micromol/g of seed, compared to 10 for 10-year average. And the chlorophyl content is at the lowest levels.

High Temperatures before flowering affects oil content, after flowering, the fatty acids composition. Alpha-linolnic and oleaic acid are at 8.8% and 64,2% respectively in the oil (9,4 and 63,1% resp for 10-year average): oleic at the highest and linolenic at low levels. Finally, most samples received meet grade 1 canola.

Finally, the 2021 Canadian canola production would reach around 12.8 to 13 MT in 2021, compared to 19.5 Mt in 2020, the lowest Canola harvest since 2012/2013, where Canada reached just 13.9 Mill. tons.

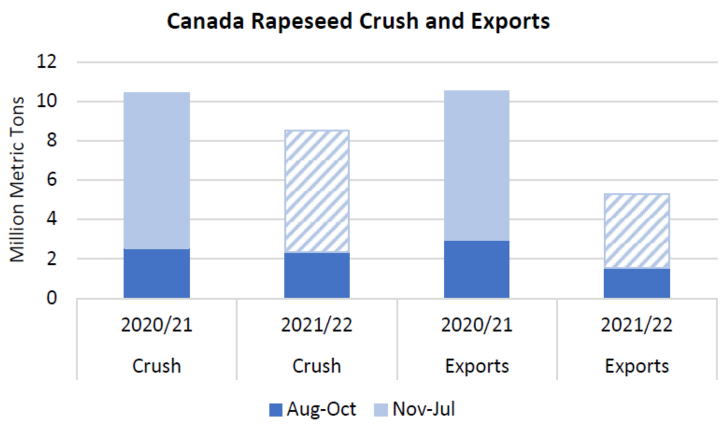
A lucky winner is **Australia** *(see more details in next section)* as they benefit from the global rapeseed rally and the regional favourable growing conditions. They have the chance to compensate the gap on the European rapeseed market, especially in the 2nd half of the marketing year 2021/2022. The more favourable weather conditions led to an optimistic canola production with up to 5.8 million. Tons with an average yield of 1.9 t/ha. Further updates could be expected till harvest starts in mid of autumn 2021.

Consequences for the market

The tight supply on the European rapeseed market and the production issues in Canada led to an unimaginable price rally during the last 12 months.

Based on a robust demand in Europe and not sufficient domestic productions, we can expect ongoing imports on a level of 6 Mill. tons (OilWorld calculate with 6.5 Mill. tons).

Connected to the already mentioned production issues in Canada, the supplies to the market will be tight. According to USDA oilseeds report (9 Dec 2021) "With beginning stocks already tight due to strong demand over the past few years, the smaller crop is suppressing available supplies for both crush and exports. However, due to strong Canadian crush margins, the disruption is disproportion-ately affecting rapeseed exports over crush. Through the first 3 months of the marketing year, crush is down 9 percent while exports are down by almost 50 percent.



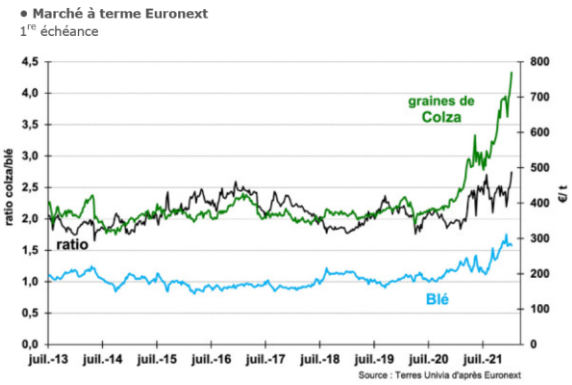
Source: Statistics Canada

It can be expected that the local Canadian processors who invest to increase their crushing capacities (today 11MT/year) significantly by 2025, will secure their quantities to fulfil the strong demand from the market.

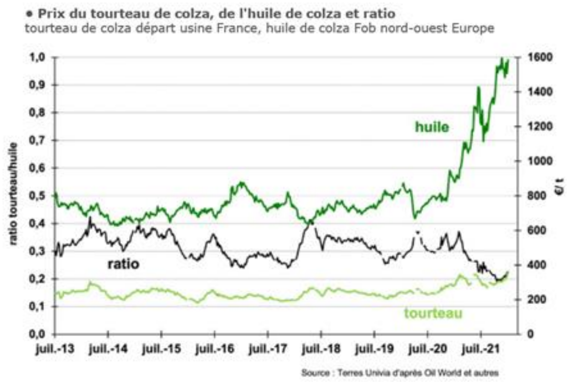
The EU rapeseed balance present with again decreasing opening stocks on a level of 0.94 Mill. tons a tight supply. It will remain exciting, if the European processor will be able to reach again a level of more than 22 Mill. tons, especially if the import quantity from Canada will not come. During the last year they benefit a lot from increasing prices on the global market for vegetable oils. OilWorld calcu-lates EU27 imports at 5.45Mt in 2021/22 with substitutions from Australia notably and a reduction of crushing from 22.9 to 22 MT.

The global European commodity prices are still on an incredible rally, mainly due to a continuously strong demand. Since the first lockdown due to Covid-19 the prices increased by more than 200 €/ton. The key factors were already mentioned above: productions issues in Canada, average pro-duction in the EU27 and low stocks everywhere due to a high demand in the EU respectively China. Consequently, the European commodity prices for rapeseed reached 577 €/ton by end of week 34 (+ 20 € during the week). In the same period the Canadian price jump on a level of 914 CAD, which is around 612 €/ton. At last Rapeseed prices on the European futures market Euronext, reached 769€/t at the end of December and overpassed 800€/ton early January 2022 never seen until now, with a high volatility of prices.

Futures market Euronext. Graines de colza: rapeseed / Blé: wheat / ratio= rapeseed price/ wheat price.



Price of rapeseed meal, rapeseed oil and ratio meal/oil. Tourteau = meal; huile = oil)



As global rapeseed Canola supply continues to worsen in the coming months because of production issues in Canada or low stocks in EU27 and Canada, further impacts will be visible on the feed mar-ket. The supply with rapeseed meal remains tight and with prices between 300 and 320 €/ton for non-GMO rapeseed meal around 30 % higher than one year ago. The uncertain final supply of Canola from Canada will reduce a stronger offer of further rapeseed meal, especially for the end of the year. The consequence is already visible for European animal owners: higher costs and less margin.

R. Brand/NPZ, E. Pilorgé/Terres Inovia-GCIRC;

Elements on Canada situation from presentations during the Canola Week 2021 by Aston Chipanshi, AAFC, and Véronique Barthet/ Canadian Grain Commission

2021 Rapeseed harvest: Australia

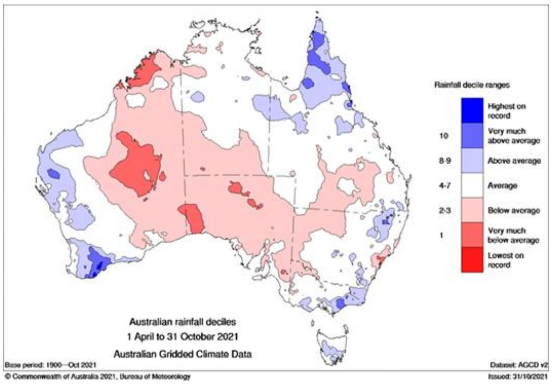
In Australia, harvesting time takes place in December-January.

Firm canola prices at the start of the season triggered a near 30% increase in area sown. Decisions made by growers based on market signals back in March-April have paid off handsomely, despite pockets of disappointment from frosts and waterlogging. Seasonal rainfall for most canola growing regions was average or above average, except for South Australia which had a very dry start to the season, with only the last few months experiencing average rainfall.

NSW experienced another near-perfect season, with good sub soil moisture enabling an early start to the season in many districts. The cooler, moist conditions towards the season's end, with no temperature spikes, hot winds or frosts will help to deliver a very strong crop with good oil levels. Generous use of fungicides has mitigated the risk of the impact of later blackleg or sclerotinia infections, particularly after the incidence of relatively widespread blackleg leaf infections early in the season. The incidence of insect pests has been low. Victoria has experienced similar season to NSW, including isolated instances of water logging. As with NSW, yield estimates are expected to be slightly behind that of last year, as the impact of a drier start and patchy establishment come to the fore. South Australia had a slow start to the season as a result of very dry conditions, although average conditions towards the end of the season will help bring through those well-established crops to an acceptable finish. As with Victoria, crops in the Mallee suffered from a lack of moisture throughout the season.

Pest and disease pressure has been low. Dry conditions at the start of the season kept weed pressure low. Western Australia had a good start to the season, and conditions didn't waver throughout the season with average to above average rainfall being experienced in most growing areas.

The crop production estimates, however, were soon made out of date as the season continued to improve right up to harvest (in November), with the better estimate in the next table (January estimates)



State	Area (Ha)	Tonnes	*10 yr Ave (up to 2020)*
New South Wales	660,000	1,640,000	*800,000*
Victoria	507,000	1,140,000	*710,000*
South Australia	212,000	420,000	*370,000*
West Australia	1,653,000	3,180,000	*1,580,000*
TOTAL	**3,034,000**	**6,380,000**	***3,460,000***

This is certainly a record crop for Australia – the previous record set just the previous year at 4.6 million tonnes.

The Australian Oilseeds Federation Crop Reports can be found at http://www.australianoilseeds.com/oilseeds_industry/crop_report_assets
(Contact: Nick Goddard, AOF)

India

Some news from Reuters dated Dec 15, 2021 reports that "the rapeseed output in India is likely to rise as much as 29.4% this year as farmers plant more area with the winter-sown oilseed" Favourable weather conditions and higher prices encouraged farmers to bring more areas under rapeseed. The production would reach 10 to 11 million tons in the crop year to June 2022, compared to 8,5 Mt in 2020-21 crop year, according to the Central Organization for Oil Industry and Trade (COOIT). *(https://www.reuters.com/world/india/rising-indian-rapeseed-output-could-reduce-vegoil-imports-2021-12-14/)*

China

According to USDA report dated September 1st 2021, "Rapeseed production is forecast up to 14 MMT in marketing year 21/22 compared to 13.5 MMT in MY 20/21. The increase reflects a slight expansion in acreage and higher yield due to generally good weather conditions. Industry sources indicate that rapeseed area has expanded moderately in the Yangtze River region, including Sichuan, Hubei, and Hunan, mainly driven by local demand for rapeseed oil and rising rapeseed prices in 2020. CNGOIC forecast for MY 21/22 rapeseed production is a record 14.5 MMT, up 2.8 percent from the previous year, based on good yield and planted area of 6.9 MHa, a 2.2 percent increase.
Regarding sowings for marketing year 21/22, rapeseed was planted in favorable weather conditions and grew with adequate rainfall and relatively higher temperature facilitating a good yield.
This news from the Chinese TV CGTN gives a well-illustrated view of the blooming crop in the country. *https://news.cgtn.com/news/2021-03-10/2021-blooming-schedule-of-rapeseed-flowers-across-China-YvVcpB8nqE/index.html*

USA: Brassica carinata based biofuels (reported by Wilf Keller):

Researchers from the University of Georgia, USA, estimate that replacing petroleum-based aviation fuel with sustainable aviation fuel derived from Ethiopian mustard *B. carinata*, a type of mustard plant can reduce carbon emissions by up to 68%. The SPARC project, Southeast Partnership for Advanced Renewables from Carinata, is a $15 million project funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture, investigating how to grow carinata in the Southeast (grown as a winter crop), exploring questions related to optimum genetics and best practices for the highest crop and oil yield.

GCB Bioenergy journal published a special issue on B. carinata crop and biofuels including articles on economic and environmental interest of these biofuels, investments need, crop modelling, crop agronomy, physiology and protection, fertilization, crop insertion in local rotations and valorization of co-products.

Read more on context at *https://news.uga.edu/plant-based-jet-fuel-could-reduce-emissions-by-68/*

SPARC website: https://sparc-cap.org/

Special issue of GCB Bioenergy on B carinata based biofuels:
https://onlinelibrary.wiley.com/doi/toc/10.1111/(ISSN)1757-1707.sustainable-jet-fuel

Canola: Canola week 2021

The online event was very good, with 640 participants. All sessions were very well attended on many subjects: crop and research updates, challenges and opportunities, harvest and storage, innovation strategy phenotyping, molecular technologies, new breeding strategies, use of proteins for biopolymers, oil, and brain health aspects, etc… All themes that need to be continued in the future.
A very complete session was devoted to harvesting techniques: proper use of dessicants and straight cut compared to swathing without harvest aid, safe storage management.

Most of the presentations from the three days of Canola Week are now available on the Canola Council's You Tube channel https://www.youtube.com/c/CanolaCouncil/playlists

Within the numerous sessions and very rich contents, we choose to highlight 2 topics:
Biodiesel development in Northern America and canola production:
The development of biodiesel in Canada and US is expected to grow in a very significant way, in such a way that the demand for canola seeds would increase from 1,8 MT today to 3,9 MT in 2025 and 5 MT in 2030 in a medium demand scenario, that could range from 2,8 and 5.0 in 2025 for a low demand scenario to 4,7 to 9,4 in 2030 for a high demand scenario. This perspective of a strong demand of canola on long-term encouraging the crushing industry to invest in new capacities (4 new projects). For the production, yield remains the target number one to reach the 26MT production objective, as well as the critical challenge of climate change and Green House Gas emissions reduction, involving nitrogen management and carbon sequestration in soils (evaluated at 5MT yearly for Canadian canola).

Chris Vervet, director of the Canadian Oilseed Processors Association, gave some figures about the investments in crushing industry for the target crushing capacity of 16,7 MT in 2025 compared to 11MT in 2020 which corresponds to 57% of the total production, aligning with canola production goals to 26MT. This investment strategy is driven by the global demand for oil and meal, and the expanding biofuel demand with low carbon fuels standards and the Clean Fuel Regulation: for US and Canada, the biodiesel demand is expected to grow by 50% to 2030, from 10 to 15 billion litres yearly, and presently, Canada does not have existing capacities for renewable biodiesel production. Cassandra Cotton, from Fertilizer Canada observed that there is few room in Canada to cut fertilizer without impacts to yield, since the nitrogen use efficiency rating of about 70% is above the world average, and that consequently with reduced yields, and crushing capacity expansion, there will be virtually no export capacity for canola seeds.

A challenging crossroad situation. As Jim Everson, President of Canola Council, mentioned, sustainability is a journey and the crop itself is a solution: this time of disruption for the canola industry may also be a time of opportunities.

Human health and canola oil

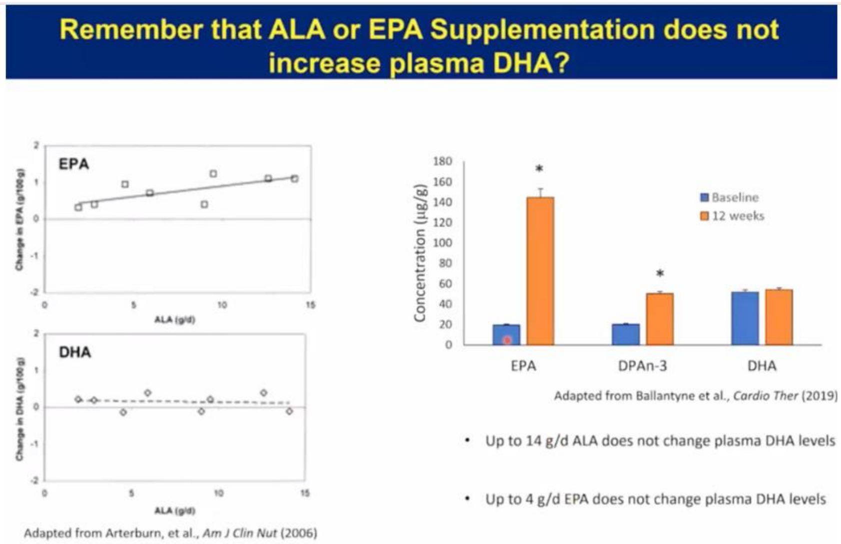
The metabolism of the poly-unsaturated fatty acids (PUFA) in human is still incompletely understood, and this is still field of active research and discoveries. Research in fatty acids metabolism is of utmost importance for the best valorisation of rapeseed/canola oil, the most available and cheapest source of alphalinolenic acid for human nutrition.

Richard Bazinet, professor in Brain Lipid Metabolism, Department of nutritional Sciences of the University of Toronto, gave an outstanding presentation on “Canola as major source of omega-3 fatty acids in the Canadian diet and brain”.

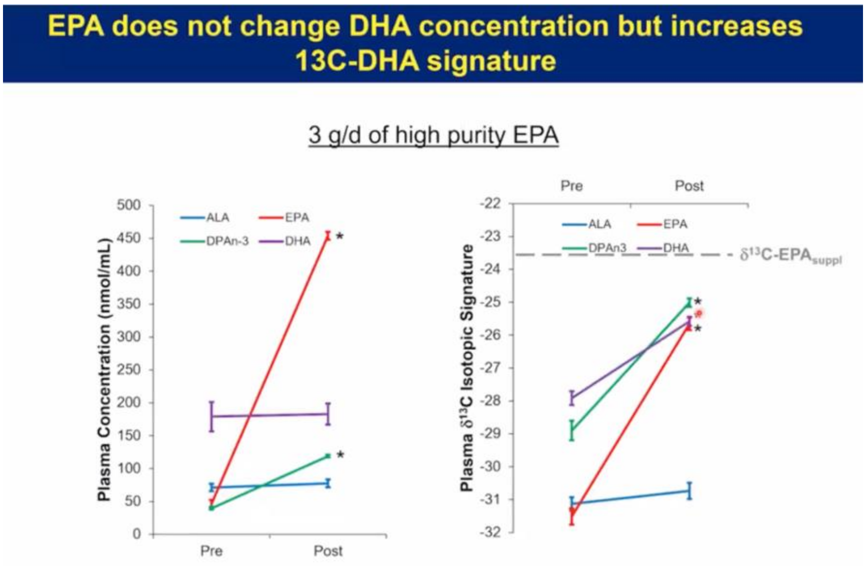
He started reminding that brain is only 2% of body weight but uses 20% of the body energy, up to 50% in infants, that its composition is half fat and half protein, and that this very active tissue cannot directly use lipids from the diet. 10 to 15% of fat in brain is DHA. The -difficult – analysis of brain showed that the brain contains about 4 grams of DHA at a given time, and that the uptake of DHA into the brain is only 4mg/day, much less than we were thinking.

The alpha-linolenic acid (ALA, present in canola oil) is a precursor of DHA. ALA is first converted to EPA and then to DHA. The part of conversion of ALA to EPA by the metabolism is still controversial, evaluated to 2%. But a diet including 2g/day ALA with a conversion ratio of 1% makes 20 mg. There is a metabolic competition with omega-6 fatty acids for the conversion of ALA to EPA, hence the nutritional recommendation of 6 omega-6 to 1 omega-3 in diet. EPA is present in fish and an easy conclusion would be eat fish, but dietary recommendations for the use of fish oils faces a sustainability issue with the erosion of marine resources.

R. Bazinet went on commenting the interest of different methodologies: observational studies of cohorts, which are relatively easy but cannot demonstrate causation and may be subject to bias due to food habits. An example was given with a review of studies on the protective effect of n-3 fatty acids on Alzheimer disease showing 10 cases of beneficial effects, 2 null and 1 harmful. Randomized controlled trials are a gold standard but two main issues are the definition of a placebo in a nutrition study and the interpretation regarding improving brain function versus slowing the decline is difficult. Publications show that the ALA supplementation increases EPA levels, but ALA or EPA supplementation does not increase plasma DHA levels and that make people think that EPA like ALA does not convert to DHA.



A study by R. Bazinet and team of the University of Guelph a randomized controlled trial with 89 subjects using isotope-labelled acids revealed no retroconversion of DHA to EPA but a substantial conversion of EPA to DHA following the diet supplementation. Subjects were divided in 3 groups supplemented with olive oil (control), EPA or DHA. The Olive oil control shows no effect on EPA and DHA concentration in plasma or ^{13}C-n-3 PUFA abundance. At the opposite, the EPA supplementation (3g/day pure EPA) does not change the DHA concentration in plasma but increases the 13C-DHA signature, meaning that there is a rapid flux from EPA to DHA.



"These new findings suggest that: 1) there is substantial synthesis of DHA from EPA in humans, and 2) the increases in EPA upon DHA feeding are the result of slowed EPA metabolism, and not retro-conversion of DHA. Determining δ13C of n–3 PUFA in humans is a remarkably powerful tool that can not only track dietary intake patterns but can also provide novel insights into complex metabolic questions." (1).

This better understanding of PUFA metabolism confirm the interest of alphalinolenic acid in diets.

References:

(1) Metherel, A. H., Irfan, M., Klingel, S. L., Mutch, D. M., & Bazinet, R. P. (2019). Compound-specific isotope analysis reveals no retroconversion of DHA to EPA but substantial conversion of EPA to DHA following supplementation: a randomized control trial. The American journal of clinical nutrition, 110(4), 823-831. https://doi.org/10.1093/ajcn/nqz097

(2) Metherel, A. H., & Bazinet, R. P. (2019). Updates to the n-3 polyunsaturated fatty acid biosynthesis pathway: DHA synthesis rates, tetracosahexaenoic acid and (minimal) retroconversion. Progress in lipid research, 76, 101008. https://doi.org/10.1016/j.plipres.2019.101008

(3) Domenichiello, A. F., Kitson, A. P., & Bazinet, R. P. (2015). Is docosahexaenoic acid synthesis from α-linolenic acid sufficient to supply the adult brain?. Progress in lipid research, 59, 54-66. https://doi.org/10.1016/j.plipres.2015.04.002

European Union: European Commission Publishes Roadmap on Legislative Initiative for Plants Produced by Certain Genome Editing Techniques

On September 24th, 2021, the European Commission published its roadmap to develop a legislative initiative for plants produced by certain genome editing techniques. This initiative will propose a legal framework for plants obtained by targeted mutagenesis and cisgenesis and for their food and feed products. The policy roadmap is based on the findings of a Commission study on new genomic techniques, which was published on April 29th, 2021. The publication of the roadmap is a first step in the legislative process. It began with a 4-week consultation period to provide feedback, which ended on October 22nd, 2021. A more comprehensive public consultation process will take place in 2022.

Source USDA GAIN reports Oct 6, 2021

Scientific news

Publications:

For the Attention of the authors: we identify publications through research with 2 key words only: "rapeseed" and "canola".

If a publication does not contain one of these two words, but for example only Brassica napus or terms implicitly linked to rapeseed/canola (for example names of diseases or insects or genes, etc.…), it will not be detected.

GENETICS & BREEDING

Gao, P., Quilichini, T. D., Yang, H., Li, Q., Nilsen, K. T., Qin, L., ... & Xiang, D. Evolutionary divergence in embryo and seed coat development of **U's Triangle Brassica species** illustrated by a **spatio-temporal transcriptome atlas**. New Phytologist. https://doi.org/10.1111/nph.17759

Katche, E. I., Schierholt, A., Schiessl, S. V., Lv, Z., Batley, J., Becker, H. C., & Mason, A. S. (2021). Genetic factors inherited from both diploid parents interact to affect **genome stability** and fertility in resynthesized allotetraploid *B. napus.* https://doi.org/10.21203/rs.3.rs-552972/v1

Hu, D., Jing, J., Snowdon, R. J., Mason, A. S., Shen, J., Meng, J., & Zou, J. (2021). Exploring the **gene pool of *Brassica napus*** by **genomics**-based approaches. Plant Biotechnology Journal, 19(9), 1693. https://dx.doi.org/10.1111%2Fpbi.13636

Shengyi Liu, Rod Snowdon , Chittaranjan Kole. The ***Brassica oleracea* Genome** Springer 2021 (book) https://link.springer.com/book/10.1007%2F978-3-030-31005-9#page=89

Hou, J., Lu, D., Mason, A. S., Li, B., An, S., Li, G., & Cai, D. (2021). Distribution of **MITE family Monkey King** in rapeseed *(Brassica napus L)* and its influence on gene expression. Genomics, 113(5), 2934-2943. https://doi.org/10.1016/j.ygeno.2021.06.034

Tan, Z., Xie, Z., Dai, L., Zhang, Y., Zhao, H., Tang, S., ... & Hong, D. (2021). Genome-and transcriptome-wide association studies reveal the genetic basis and **the breeding history of seed glucosinolate content** in *Brassica napus*. Plant Biotechnology Journal. https://doi.org/10.1111/pbi.13707

Pal, L., Sandhu, S.K., Bhatia, D. et al. Genome-wide association study for candidate genes controlling **seed yield and its components** in rapeseed (*Brassica napus subsp. napus*). Physiol Mol Biol Plants 27, 1933–1951 (2021). https://doi.org/10.1007/s12298-021-01060-9

Zhou, T., Yue, C. P., Liu, Y., Zhang, T. Y., Huang, J. Y., & Hua, Y. P. (2021). Multiomics reveals pivotal roles of Na+ translocation and compartmentation in regulating **salinity resistance** in allotetraploid rapeseed. Journal of Experimental Botany. https://doi.org/10.1093/jxb/erab215

Mohamed, I. A., Shalby, N., El-Badri, A. M., Batool, M., Wang, C., Wang, Z., ... & Zhou, G. (2022). RNA-seq analysis revealed key genes associated with **salt tolerance** in rapeseed germination through carbohydrate metabolism, hormone, and MAPK signaling pathways. Industrial Crops and Products, 176, 114262. https://doi.org/10.1016/j.indcrop.2021.114262

Ma, L., Bai, J., Xu, J., Qi, W., Li, H., Fang, Y., ... & Wu, J. (2021). Identification of proteins involved in response to **cold stress** and genome-wide identification and analysis of the APX gene family in winter rapeseed *(Brassica rapa L.).* https://doi.org/10.21203/rs.3.rs-538668/v1

Zhu, J., Wang, W., Jiang, M., Yang, L., & Zhou, X. (2021). QTLs Detection for **Low-Temperature Germination** in Rapeseed by QTL-seq and Linkage Mapping Approach. https://doi.org/10.21203/rs.3.rs-923176/v1

Li, J., Duan, Y., Sun, N., Wang, L., Feng, S., Fang, Y., & Wang, Y. (2021). The miR169n-NF-YA8 regulation module involved in **drought resistance** in *Brassica napus L*. Plant Science, 313, 111062. https://doi.org/10.1016/j.plantsci.2021.111062

Wen, Y., Raza, A., Chu, W., Zou, X., Cheng, H., Hu, Q., ... & Wei, W. (2021). Comprehensive In Silico Characterization and Expression Profiling of **TCP Gene Family** in Rapeseed. Front. Genet. 12: 794297. doi: 10.3389/fgene. 2021.794297. Frontiers in Genetics| www. frontiersin. org, 12. https://doi.org/10.3389/fgene.2021.794297

Pi, B., Pan, J., Xiao, M. et al. Systematic analysis of CCCH zinc finger family in *Brassica napus* showed that BnRR-TZFs are involved in **stress resistance.** BMC Plant Biol 21, 555 (2021). https://doi.org/10.1186/s12870-021-03340-8

Chen, H., Wang, Y., Liu, J. et al. Identification of WRKY transcription factors responding to **abiotic stresses** in *Brassica napus L*.. Planta 255, 3 (2022). https://doi.org/10.1007/s00425-021-03733-x

Sobhanverdi, S., Majidi, A., Abbasi, A., Mollabashi, Z. A., Sabokdast, M., Bayat, H., & Niaraki, M. S. (2021). Constitutive Overexpressing At. TC Improves **Drought-mediated Oxidative Tolerance** in Transgenic *Brassica Napus L.* https://doi.org/10.21203/rs.3.rs-751269/v1

Williams, S. T., Vail, S., & Arcand, M. M. (2021). **Nitrogen Use Efficiency** in **Parent vs. Hybrid** Canola under Varying Nitrogen Availabilities. Plants, 10(11), 2364. https://doi.org/10.3390/plants10112364

Wang, Y., Hua, Y. P., Zhou, T., Huang, J. Y., & Yue, C. P. (2021). Genomic identification **of nitrogen assimilation-related gene**s and transcriptional characterization of their responses to nitrogen in allotetraploid rapeseed. Molecular Biology Reports, 48(8), 5977-5992. https://doi.org/10.1007/s11033-021-06599-0

He, X., Zhang, H., Ye, X., Hong, J., & Ding, G. (2021). **Nitrogen Assimilation Related Genes** in *Brassi-canapus:* Systematic Characterization and Expression Analysis Identified Hub Genes in Multiple Nutrient Stress Responses. Plants, 10(10), 2160. https://doi.org/10.3390/plants10102160

Wang, Y., Zhao, Z., Wang, S., Shi, L., & Xu, F. (2021). Genotypic differences in the synergistic effect of nitrogen and boron on the seed yield and nitrogen use efficiency of *Brassica napus*. Journal of the Science of Food and Agriculture. https://doi.org/10.1002/jsfa.11700

Zheng, L. W., Ma, S. J., Zhou, T., Yue, C. P., Hua, Y. P., & Huang, J. Y. (2021). Genome-wide identification of Brassicaceae B-BOX genes and molecular characterization of their transcriptional responses to **various nutrient stresse**s in allotetraploid rapeseed. BMC plant biology, 21(1), 1-16. https://doi.org/10.1186/s12870-021-03043-0

Liu Y, Hua Y, Chen H, Zhou T, Yue C, Huang J. 2021. Genome-scale identification of plant **defensin (PDF) family genes** and molecular characterization of their responses to diverse **nutrient stresse**s in allotetraploid rapeseed. PeerJ 9:e12007 https://doi.org/10.7717/peerj.12007

He, M., Wang, S., Zhang, C., Liu, L., Zhang, J., Qiu, S., ... & Xu, F. (2021). Genetic variation of BnaA3. NIP5; 1 expressing in the lateral root cap contributes to **boron deficiency tolerance** in *Brassica napus*. PLoS genetics, 17(7), e1009661. https://doi.org/10.1371/journal.pgen.1009661

Zhou, T., Yue, Cp., Zhang, Ty. et al. Integrated ionomic and transcriptomic dissection reveals the core **transporter genes responsive to varying cadmium abundances** in allotetraploid rapeseed. BMC Plant Biol 21, 372 (2021). https://doi.org/10.1186/s12870-021-03136-w

Chen, J., Zhang, H., Tong, J. et al. Genome-wide association analysis of **root length traits** in *Brassica napus* at germination stage **under sodium carbonate stress**. Euphytica 217, 197 (2021). https://doi.org/10.1007/s10681-021-02928-3

Wang, W., Pang, J., Zhang, F., Sun, L., Yang, L., Zhao, Y., ... & Siddique, K. H. (2021). Integrated transcriptomics and metabolomics analysis to characterize **alkali stress responses** in canola (*Brassica napus L.)*. Plant Physiology and Biochemistry. https://doi.org/10.1016/j.plaphy.2021.06.021

Ibrahim, S., Li, K., Ahmad, N., Kuang, L., Sadau, S. B., Tian, Z., ... & Wang, H. (2021). Genetic Dissection of Mature **Root Characteristics** by Genome-Wide Association Studies in Rapeseed (*Brassica napus L*.). Plants, 10(12), 2569.https://doi.org/10.3390/plants10122569

Jin, Q., Yin, S., Li, G., Guo, T., Wan, M., Li, H., ... & Zhou, G. (2021). Functional homoeologous alleles of **CONSTANS** contribute to seasonal crop type in rapeseed. Theoretical and Applied Genetics, 134(10), 3287-3303. https://doi.org/10.1007/s00122-021-03896-x

Gill, K. (2021). Evaluation of oilseed *Brassica napus* germplasm for **days to flowering** under a short-day condition and QTL mapping of the trait. https://doi.org/10.7939/r3-3pdv-0e80

Huang, L., Min, Y., Schiessl, S., Xiong, X., Jan, H. U., He, X., Qian W., Guan C., Snowdon R., Hua W. & Qian, L. (2021). Integrative analysis of GWAS and transcriptome to reveal novel loci regulation **flowering time** in semi-winter rapeseed. Plant Science, 110980. https://doi.org/10.1016/j.plantsci.2021.110980

Ahmar, S., Zhai, Y., Huang, H., Yu, K., Khan, M. H. U., Shahid, M., ... & Zhou, Y. (2021). Development of mutants with varying **flowering times** by targeted editing of multiple SVP gene copies in *Brassica napus L. The* Crop Journal. https://doi.org/10.1016/j.cj.2021.03.023

Helal, M. M. U., Gill, R. A., Tang, M., Yang, L., Hu, M., Yang, L., ... & Liu, S. (2021). SNP-and Haplotype-Based GWAS of **Flowering-Related Traits** in *Brassica napus*. Plants, 10(11), 2475. https://doi.org/10.3390/plants10112475

Chai, L., Zhang, J., Li, H., Cui, C., Jiang, J., Zheng, B., ... & Jiang, L. (2021). Investigation of thermomorphogenesis-related genes for a multi-silique trait in *Brassica napus* by comparative transcriptome analysis. Frontiers in genetics, 12, 1239. https://doi.org/10.3389/fgene.2021.678804

Zhang, X., Huang, Q., Wang, P. et al. A 24,482-bp deletion is associated with **increased seed weight** in *Brassica napus L.*. Theor Appl Genet 134, 2653–2669 (2021). https://doi.org/10.1007/s00122-021-03850-x

Zhao, J., Jin, C., Geng, R., Xue, Y., Tang, M., Zhu, K., ... & Tan, X. (2021). Development and application of molecular markers for TSW **(thousand-seed weight) related gene** BnaGRF7. C02 in Brassica napus. Oil Crop Science, 6(3), 145-150. https://doi.org/10.1016/j.ocsci.2021.07.003

Xin, S., Dong, H., Yang, L., Huang, D., Zheng, F., Cui, Y., ... & Qian, W. (2021). Both overlapping and independent loci underlie **seed number per pod and seed weight** in *Brassica napus* by comparative quantitative trait loci analysis. Molecular Breeding, 41(7), 1-13. https://doi.org/10.1007/s11032-021-01232-1

ZHU, M. C., Ran, H. U., ZHAO, H. Y., TANG, Y. S., SHI, X. T., JIANG, H. Y., ... & QU, C. M. (2021). Identification of quantitative trait loci and candidate genes controlling **seed pigments** of rapeseed. Journal of Integrative Agriculture, 20(11), 2862-2879. https://doi.org/10.1016/S2095-3119(20)63377-9

Fan, Y., Mao, L., Qu, C., Lu, K., Li, J., & Liu, L. (2021). Expression Profile And Genome-Wide Association Analyze of **Silique Length** In *Brassica Napus L*. https://doi.org/10.21203/rs.3.rs-877275/v1

Zhou, X., Zhang, H., Wang, P., Liu, Y., Zhang, X., Song, Y., ... & Hong, D. (2021). BnaC7. ROT3, the causal gene of **cqSL-C7**, mediates **silique length** by affecting cell elongation in *Brassica napus.* Journal of Experimental Botany. https://doi.org/10.1093/jxb/erab407

Wang, J., Fan, Y., Mao, L. et al. Genome-wide association study and transcriptome analysis dissect the genetic control of **silique length** in *Brassica napus* L.. Biotechnol Biofuels 14, 214 (2021). https://doi.org/10.1186

Afridi, M., Ahmad, K., Malik, S. S., Rehman, N., Yasin, M., Yasin, M. T., ... & Khan, M. R. (2021). Genome Wide Identification, Phylogeny and Expression Profiling Analysis of **Shattering genes** in Rapeseed and Mustard Plants. https://doi.org/10.21203/rs.3.rs-631553/v1

Chu, W., Liu, J., Cheng, H., Li, C., Fu, L., Wang, W., ... & Hu, Q. (2021). A lignified-layer bridge controlled by a single recessive gene is associated with **high pod-shatter resistance** *in Brassica napus* L. The Crop Journal. https://doi.org/10.1016/j.cj.2021.09.005

Xia, J., Wang, D., Peng, Y., Wang, W., Wang, Q., Xu, Y., ... & Xu, X. (2021). Genome-Wide Analysis of the **YABBY Transcription Factor Family** in Rapeseed (*Brassica napus L.).* Genes, 12(7), 981. https://doi.org/10.3390/genes12070981

Widiarsih, S., Nagel, M., Börner, A., Feussner, K., Feussner, I., & Möllers, C. (2021). Inheritance of **seed quality and seed germination** in two doubled haploid populations of oilseed rape segregating for acid detergent lignin (ADL) content. Euphytica, 217(8), 1-16. https://doi.org/10.1007/s10681-021-02891-z

Yu, K., He, Y., Li, Y., Li, Z., Zhang, J., Wang, X., & Tian, E. (2021). Quantitative Trait Locus Mapping Combined with RNA Sequencing Reveals the Molecular Basis of **Seed Germination** in Oilseed Rape. Biomolecules, 11(12), 1780. https://doi.org/10.3390/biom11121780

Yang, Q., Wang, S., Chen, H., You, L., Liu, F., & Liu, Z. (2021). Genome-wide identification and expression profiling of the COBRA-like genes reveal likely roles in **stem strength** in rapeseed *(Brassica napus L.).* PloS one, 16(11), e0260268. https://doi.org/10.1371/journal.pone.0260268

Fan, S., Zhang, L., Tang, M., Cai, Y., Liu, J., Liu, H., ... & Zheng, M. (2021). CRISPR/Cas9-targeted mutagenesis of the BnaA03. BP gene confers **semi-dwarf and compact architecture** to rapeseed *(Brassica napus L.).* Plant Biotechnology Journal. https://doi.org/10.1111/pbi.13703

Das, G.G., Malek, M.A., Shamsuddin, A.K.M. et al. Development of high yielding early matured and shattering tolerant *Brassica napus* L. through **interspecific hybridization** between *B. rapa L.* and *B. oleracea L.*. Genet Resour Crop Evol (2021). https://doi.org/10.1007/s10722-021-01277-3

Xu, P., Zhu, Y., Zhang, Y., Jiang, J., Yang, L., Mu, J., ... & He, Y. (2021). Global Analysis of the Genetic Variations in **miRNA-Targeted Sites and Their Correlations With Agronomic Traits** in Rapeseed. Frontiers in genetics, 12. https://dx.doi.org/10.3389%2Ffgene.2021.741858

Raboanatahiry, N., Chao, H., He, J., Li, H., & Li, M. (2021). Construction of a **Quantitative Genomic Map** Gives Insight on Rapeseed Genetic Characteristics and Direction for Future Breeding. https://doi.org/10.21203/rs.3.rs-729050/v1

Zhang, H., Li, X., Yang, Y., Hu, K., Zhou, X., Wen, J., ... & Tu, J. (2021). BnaA02. YTG1, encoding a tetratricopeptide repeat protein, is required for early chloroplast biogenesis in *Brassica napus*. The Crop Journal. https://doi.org/10.1016/j.cj.2021.06.010

Khan, S.U.; Saeed, S.; Khan, M.H.U.; Fan, C.; Ahmar, S.; Arriagada, O.; Shahzad, R.; Branca, F.; Mora-Poblete, F. Advances and Challenges for QTL Analysis and GWAS in the **Plant-Breeding of High-Yielding:** A Focus on Rapeseed. Biomolecules 2021, 11, 1516. https://doi.org/10.3390/biom11101516

Yin, N., Li, B., Liu, X., Liang, Y., Lian, J., Xue, Y., ... & Chai, Y. (2021). Two types of cinnamoyl-CoA reductase function divergently in accumulation of **lignins, flavonoids and glucosinolates** and enhance **lodging resistance** in *Brassica napus*. The Crop Journal. https://doi.org/10.1016/j.cj.2021.10.002

Urban, M. O., Planchon, S., Hoštičková, I., Vankova, R., Dobrev, P., Renaut, J., ... & Vítámvás, P. (2021). The resistance of oilseed rape **microspore-derived embryos** to **osmotic stress** is associated with the accumulation of energy metabolism proteins, redox homeostasis and higher abscisic acid and cytokinin contents. Frontiers in plant science, 12, 1161. https://doi.org/10.3389/fpls.2021.628167

Zhang, X., Lian, J., Dai, C., Wang, X., Zhang, M., Su, X., ... & Yu, C. (2021). Genetic segregation analysis of **unsaturated fatty acids content** in the filial generations of high-linolenic-acid rapeseed (*Brassica napus*). Oil Crop Science. https://doi.org/10.1016/j.ocsci.2021.10.001

Yan, G., Yu, P., Tian, X., Guo, L., Tu, J., Shen, J., ... & Dai, C. (2021). DELLA Proteins BnaA6. RGA and BnaC7. RGA negatively regulate **fatty acid biosynthesis** by interacting with BnaLEC1s in *Brassica napus.* Plant Biotechnology Journal. https://doi.org/10.1111/pbi.13628Ding, Y., Yu, S., Wang, J. et al. Comparative transcriptomic analysis of seed coats with high and low lignin contents reveals **lignin and flavonoid biosynthesis** in *Brassica napus.* BMC Plant Biol 21, 246 (2021). https://doi.org/10.1186/s12870-021-03030-5

Su, W., Raza, A., Zeng, L., Gao, A., Lv, Y., Ding, X., ... & Zou, X. (2021). Genome-wide analysis and expression patterns of **lipid phospholipid phospholipase gene family** in *Brassica napus L.* BMC genomics, 22(1), 1-15. https://doi.org/10.1186/s12864-021-07862-1

Wu, X., Chen, F., Zhao, X., Pang, C., Shi, R., Liu, C., ... & Zhang, J. (2021). QTL Mapping and GWAS Reveal the Genetic Mechanism Controlling **Soluble Solids Content** in *Brassica napus* Shoots. Foods, 10(10), 2400. https://doi.org/10.3390/foods10102400

Rahman, M., Guo, Q., Baten, A., Mauleon, R., Khatun, A., Liu, L., & Barkla, B. J. (2021). Shotgun **proteomics of *Brassica rapa* seed proteins** identifies **vicilin** as a major seed storage protein in the mature seed. PloS one, 16(7), e0253384. https://doi.org/10.1371/journal.pone.0253384

Gacek, K., Bayer, P. E., Anderson, R., Severn-Ellis, A. A., Wolko, J., Łopatyńska, A., ... & Batley, J. (2021). QTL Genetic Mapping Study for Traits Affecting **Meal Quality** in Winter Oilseed Rape (*Brassica Napus L*.). Genes, 12(8), 1235. https://doi.org/10.3390/genes12081235

Kang, Y., Liu, W., Guan, C., Guan, M., & He, X. (2021). Evolution and functional diversity of **lipoxygenase (LOX) genes** in allotetraploid rapeseed (*Brassica napus L.).* International Journal of Biological Macromolecules, 188, 844-854. https://doi.org/10.1016/j.ijbiomac.2021.08.082

Cui, X., Zhao, P., Li, Y., Xie, L., Li, Q., Yan, J., ... & Jiang, Y. Q. (2021). Rapeseed NAC46 positively regulates **hypersensitive response**-like cell death and chlorophyll degradation. Environmental and Experimental Botany, 104536. https://doi.org/10.1016/j.envexpbot.2021.104536

Zhang, X., Cheng, J., Lin, Y., Fu, Y., Xie, J., Li, B., ... & Jiang, D. (2021). Editing **homologous copies** of an essential gene affords **crop resistance** against two cosmopolitan necrotrophic pathogens. Plant biotechnology journal, 19(11), 2349. https://dx.doi.org/10.1111%2Fpbi.13667

Zhongwei Zou, Fei Liu, Shuanglong Huang, W.G.D. Fernando. 2020. Genome Wide Identification and Analysis of VQ Motif-containing Family in *Brassica napus* and Functional Characterization of BnMKS1 in Response to ***Leptosphaeria maculans***. Phytopathology. https://doi.org/10.1094/PHYTO-04-20-0134-R

Mansouripour, S., Oladzad, A., Shahoveisi, F. et al. Identification of genomic regions associated with **resistance to blackleg** (*Leptosphaeria maculans*) in canola using genome wide association study. Eur J Plant Pathol 161, 693–707 (2021). https://doi.org/10.1007/s10658-021-02354-0

Degrave, A., Wagner, M., George, P., Coudard, L., Pinochet, X., Ermel, M., ... & Balesdent, M. H. (2021). A new avirulence gene of ***Leptosphaeria maculans*,** AvrLm14, identifies a resistance source in American broccoli (*Brassica oleracea*) genotypes. Molecular Plant Pathology, 22(12), 1599-1612. https://doi.org/10.1111/mpp.13131

Dandena, H. B. (2021). Genetic and genomic studies towards understanding **quantitative resistance to blackleg** infection in canola. http://hdl.handle.net/1993/36006

Roy, J., Shaikh, T. M., Luis, E., Hosain, S., Chapara, V., & Rahman, M. (2021). Genome-Wide Association Mapping and Genomic Prediction for Adult Stage **Sclerotinia Stem Rot Resistance** in *Brassica Napus (L)* Under Field Environments. https://doi.org/10.21203/rs.3.rs-589440/v1

Khan, M. A., Cowling, W., Banga, S. S., You, M. P., Tyagi, V., Bharti, B., & Barbetti, M. J. (2021). Quantitative inheritance of **Sclerotinia stem rot resistance** in *Brassica napus* and relationship to cotyledon and leaf resistances. Plant Disease, (ja). https://doi.org/10.1094/PDIS-04-21-0885-RE

Kawasaki, M., Ohara, T., Ishida, M., Takahata, Y., & Hatakeyama, K. (2021). Development of novel **clubroot resistant** rapeseed lines *(Brassica napus L.)* effective against Japanese field isolates by marker assisted selection. Breeding Science, 21014. https://doi.org/10.1270/jsbbs.21014

Hasan, J., Shaikh, R., Megha, S., Herrmann, D. T., Kebede, B., & Rahman, H. (2021). Mapping of flowering time, seed quality and **clubroot resistance** in rutabaga× spring canola populations and their association. Euphytica, 217(8), 1-21. https://doi.org/10.1007/s10681-021-02889-7

Hasan, M. J., Shaikh, R., Basu, U., & Rahman, H. (2021). Mapping **clubroot resistance** of *Brassica rapa* introgressed into *Brassica napus* and development of molecular markers for the resistance. Crop Science, 61(6), 4112-4127. https://doi.org/10.1002/csc2.20626

Yu, H., Zhou, Q., Hwang, S. F., Ho, A., Chang, K. F., Strelkov, S. E., ... & Harding, M. (2021). Pathogenicity, anastomosis groups, host range and genetic diversity of **Rhizoctonia** species isolated from soybean, pea and other crops in Alberta and Manitoba, Canada. Canadian Journal of Plant Science, (ja). https://doi.org/10.1139/CJPS-2021-0039

Serdyuk, O. A., Trubina, V. S., & Gorlova, L. A. (2021, November). The breeding of spring rapeseed and brown mustard for **resistance to Fusarium blight.** In IOP Conference Series: Earth and Environmental Science (Vol. 845, No. 1, p. 012027). IOP Publishing. https://iopscience.iop.org/article/10.1088/1755-1315/845/1/012027/meta

Agrawal, N., Gupta, M., Atri, C. et al. Anchoring alien chromosome segment substitutions bearing gene(s) for **resistance to mustard aphid** in *Brassica juncea-B. fruticulosa* introgression lines and their possible disruption through gamma irradiation. Theor Appl Genet 134, 3209–3224 (2021). https://doi.org/10.1007/s00122-021-03886-z

Palial, S., Kumar, S., Atri, C. et al. Antixenosis and antibiosis mechanisms of resistance to **turnip aphid,** *Lipaphis erysimi (Kaltenbach)* in *Brassica juncea-fruticulosa* introgression lines. J Pest Sci (2021). https://doi.org/10.1007/s10340-021-01418-8

Guo, Y., Liu, C., Long, W., Gao, J., Zhang, J., Chen, S., ... & Hu, M. (2021). Development and molecular analysis of a novel acetohydroxyacid synthase rapeseed mutant with high **resistance to sulfonylurea herbicides**. The Crop Journal. https://doi.org/10.1016/j.cj.2021.05.006

Roeintan, A., Safavi, S.M. & Kahrizi, D. Rapeseed Transformation with aroA Bacterial Gene Containing P101S Mutation Confers **Glyphosate Resistance**. Biochem Genet (2021). https://doi.org/10.1007/s10528-021-10136-w

Zhu, J., Zhang, J., Jiang, M., Wang, W., Jiang, J., Li, Y., ... & Zhou, X. (2021). Development of genome-wide SSR markers in rapeseed by **next generation sequencing**. Gene, 798, 145798. https://doi.org/10.1016/j.gene.2021.145798

Corral-Martínez P., Camacho-Fernández C., Mir R., Seguí-Simarro J.M. (2021) Doubled Haploid Production in High- and Low-Response Genotypes of Rapeseed (*Brassica napus*) Through Isolated **Microspore Culture**. In: Segui-Simarro J.M. (eds) Doubled Haploid Technology. Methods in Molecular Biology, vol 2288. Humana, New York, NY. https://doi.org/10.1007/978-1-0716-1335-1_8

Karunarathna, N. L., Patiranage, D. S., Harloff, H. J., Sashidhar, N., & Jung, C. (2021). Genomic background selection to reduce the mutation load after **random mutagenesis.** Scientific reports, 11(1), 1-8. https://doi.org/10.1038/s41598-021-98934-5

Wang, Q., Yan, T., Long, Z., Huang, L. Y., Zhu, Y., Xu, Y., ... & Jiang, L. (2021). **Prediction of heterosis** in the recent rapeseed (*Brassica napus*) polyploid by pairing parental nucleotide sequences. PLoS genetics, 17(11), e1009879. https://doi.org/10.1371/journal.pgen.1009879

Wang, T., Li, B., Guo, Y., Zhang, Y., Liu, X., Fan, L., ... & Li, M. (2021). Development of SSR Markers Associated with **Polima CMS Fertility Restorer** in *Brassica napus L.* and Its Application. Molecular Plant Breeding, 12. https://doi.org/10.5376/mpb.2021.12.0017

Lobos-Sujo, V., & Duncan, R. W. (2021). Development of *Brassica Napus L.* **Ogu-INRA CMS Restorers** Using Recurrent Full-Sib Selection. https://doi.org/10.21203/rs.3.rs-1011114/v1

Sidorov, V., Wang, D., Nagy, E.D. et al. Heritable DNA-free genome editing of canola (*Brassica napus L.)* using **PEG-mediated transfection of isolated protoplasts**. In Vitro Cell.Dev.Biol.-Plant (2021). https://doi.org/10.1007/s11627-021-10236-7

Strelnikov, E. A., Bochkarova, E. B., Gorlova, L. A., & Serdyuk, V. V. (2021). Estimation of adaptability of the maternal lines of the winter rapeseed hybrids bred at the VS Pustovoit All-Russian Research Institute of oil crops in the central zone of the krasnodar region, Russia. Caspian Journal of Environmental Sciences, 19(4), 765-769. https://dx.doi.org/10.22124/cjes.2021.5157

SHISHLOVA-SOKOLOVSKAYA, A. M., & EFIMENKO, S. BIOCHEMICAL COMPOSITION OF SEEDS OF **TRANSGENIC** SPRING RAPESEED PLANTS CARRYING THE **MAMMALI**A CYP11A1 GENE. https://doi.org/10.15407/frg2020.06.483

Stamm, M., Aiken, R., Angadi, S., Damicone, J., Dooley, S., Holman, J., ... & Santra, D. (2021). Registration of **'KS4719'winter canola**. Journal of Plant Registrations. https://doi.org/10.1002/plr2.20177

Yin, L., Zhu, Z., Huang, L., Luo, X., Li, Y., Xiao, C., ... & Fu, S. (2021). DNA repair-and nucleotide metabolism-related genes exhibit differential CHG **methylation patterns** in natural and synthetic polyploids (*Brassica napus L.).* Horticulture research, 8(1), 1-17. https://doi.org/10.1038/s41438-021-00576-1

CROP PROTECTION

Justine Cornelsen , Zhongwei Zou, Shuanglong Huang, Paula Parks, Ralph Lange, Gary Peng and W. G. Dilantha Fernando. 2021. Validating the Strategic Deployment of **Blackleg Resistance Gene Group**s in Commercial Canola Fields on the **Canadian Prairies**. Frontiers in Plant Science. https://doi.org/10.3389/fpls.2021.669997

Liang Chai, Jinfang Zhang, Wannakuwattewaduge Gerard Dilantha Fernando, Haojie Li, Xiaoqin Huang, Cheng Cui, Jun Jiang, Benchuan Zheng, Yong Liu, and Liangcai Jiang. Detection of **Blackleg Resistance** Gene Rlm1 in Double-Low Rapeseed Accessions from **Sichuan** Province, by Kompetitive Allele-Specific PCR. Plant Pathol. J. 37(2) : 194-199 (2021) https://doi.org/10.5423/PPJ.OA.10.2020.0204.

Fei Liu, Zhongwei Zou, Gary Peng, and W. G. Dilantha Fernando. 2021. ***Leptosphaeria** maculans* Isolates Reveal Their Allele Frequency in **Western Canada**. Plant Disease. 0:1-9 • https://doi.org/10.1094/PDIS-08-20-1838-RE

Cunchun Yang, W. G. Dilantha Fernando. 2021. Hormonal Responses to Susceptible, Intermediate, and Resistant Interactions in the *Brassica napus*–***Leptosphaeria maculans*** Pathosystem. International Journal of Molecular Sciences. 22, 4714. https://doi.org/10.3390/ijms22094714

Cunchun Yang, Zhongwei Zou, W. G. Dilantha Fernando. 2021. The Effect of Temperature on the Hypersensitive Response (HR) in the *Brassica napus*–***Leptosphaeria maculans*** Pathosystem. Plants. 10, 843. https://doi.org/10.3390/plants10050843

Cunchun Yang, W. G. Dilantha Fernando. Analysis of the Oxidative Burst and Its Relevant Signaling Pathways in ***Leptosphaeria maculans***—*Brassica napus* Pathosystem International Journal of Molecular Sciences. 22, 4812. https://doi.org/10.3390/ijms22094812

Rashid, M. H., Liban, S., Zhang, X., Parks, P., Borhan, H., Fernando, W. G. D. 2021. Impact of *Brassica napus*–***Leptosphaeria maculans*** interaction on the emergence of virulent isolates of L. maculans, causal agent of blackleg disease in canola. Plant Pathology. 70(2): 459-474. https://doi.org/10.1111/ppa.13293

Lipková, N., Medo, J., Artimová, R., Maková, J., Petrová, J., Javoreková, S., & Michalko, J. (2021). Growth Promotion of Rapeseed *(Brassica napus L.)* and **Blackleg Disease** *(Leptosphaeria maculans)* Suppression Mediated by Endophytic Bacteria. Agronomy, 11(10), 1966. https://doi.org/10.3390/agronomy11101966

Van de Wouw, A. P., Scanlan, J. L., Marcroft, S. J., Smith, A. J., Sheedy, E. M., Perndt, N. W., ... & Huyghe, C. (2021). Fungicide sensitivity and resistance in the blackleg fungus, ***Leptosphaeria maculans,*** across canola growing regions in Australia. Crop and Pasture Science. https://doi.org/10.1071/CP21369

Zamanmirabadi, A., Hemmati, R., Dolatabadian, A., & Batley, J. (2021). Current progress in studying **blackleg disease** (*Leptosphaeria maculans and L. biglobosa)* of canola in Iran: Where do we stand now?. Plant Pathology. https://doi.org/10.1111/ppa.13501

Chen, Q., Peng, G., Kutcher, R., & Yu, F. (2021). Genetic diversity and population structure of ***Leptosphaeria maculans* isolates** in Western Canada. Journal of Genetics and Genomics. https://doi.org/10.1016/j.jgg.2021.06.019

Amas, J., Anderson, R., Edwards, D., Cowling, W. and J. Batley. 2021. Status and advances in mining for blackleg (***Leptosphaeria maculans***) quantitative resistance (QR) in oilseed rape (Brassica napus). Theoretical and Applied Genetics 134:3123-3145. https://doi.org/10.1007/s00122-021-03877-0

Khan, M. A., Cowling, W., Banga, S. S., You, M. P., Tyagi, V., Bharti, B., & Barbetti, M. J. (2021). Quantitative inheritance of **Sclerotinia stem rot resistance** in Brassica napus and relationship to cotyledon and leaf resistances. Plant Disease, (ja). https://doi.org/10.1094/PDIS-04-21-0885-RE

Alves Ribeiro, I. D., Bach, E., da Silva Moreira, F., Müller, A. R., Rangel, C. P., Wilhelm, C. M., ... & Passaglia, L. M. P. (2021). Antifungal potential against ***Sclerotinia sclerotiorum (Lib.)*** de Bary and plant growth promoting abilities of Bacillus isolates from canola (Brassica napus L.) roots. https://doi.org/10.1016/j.micres.2021.126754

Tóthová, M., Máčajová, P., & Tóth, P. (2021). MYCELIAL INCOMPATIBILITY OF ***SCLEROTINIA SCLEROTIORUM*** ISOLATES FROM A SINGLE RAPESEED FIELD IN **SLOVAKIA**. Journal of microbiology, biotechnology and food sciences, 11(2), e3369-e3369. https://doi.org/10.15414/jmbfs.3369

Wytinck, N., Ziegler, D. J., Walker, P. L., Sullivan, D. S., Biggar, K. T., Khan, D., ... & Belmonte, M. F. (2021). Host Induced Gene Silencing of the ***Sclerotinia sclerotiorum*** ABHYDROLASE-3 gene reduces disease severity in *Brassica napus*. bioRxiv. https://doi.org/10.1101/2021.11.26.470135

Motlagh, M. R. S., & Abolghasemi, M. (2021). The effect of *Trichoderma spp*. isolates on some morphological traits of canola inoculated with ***Sclerotinia*** *sclerotiorum* and evaluation of their efficacy in **biological control** of pathogen. Journal of the Saudi Society of Agricultural Sciences. https://doi.org/10.1016/j.jssas.2021.08.004

Safi, A., Mehrabi-Koushki, M., & Farokhinejad, R. (2021). ***Plenodomus dezfulensis*** sp. nov. causing leaf spot of Rapeseed in Iran. Phytotaxa, 523(2), 141-154. https://doi.org/10.11646/phytotaxa.523.2.2

Murtza, T., You, M. P., & Barbetti, M. J. (2021). Temperature and relative humidity shape white leaf spot (***Neopseudocercosporella capsellae***) epidemic development in rapeseed (*Brassica napus*). Plant Pathology, 70(8), 1936-1944. https://doi.org/10.1111/ppa.13437

SINGH, H. K., Kumar, P., & Singh, S. K. (2021). Yield loss assessment due to **Alternaria blight** disease in rapeseed and mustard: Yield loss due to alternaria Blight in rapeseed and mustard. Journal of AgriSearch, 8(3), 241-248. https://jsure.org.in/journal/index.php/jas/article/view/865

Murtza, T., You, M. P., & Barbetti, M. J. (2021). **Synergistic/antagonistic interaction**s between *Neopseudocercosporella, Alternaria, Leptosphaeria and Hyaloperonospora* determine aggregate **foliar disease severity** in rapeseed. Plant Pathology. https://doi.org/10.1111/ppa.13506

Botero-Ramírez, A., Hwang, S. F., & Strelkov, S. E. (2021). Effect of **clubroot** (*Plasmodiophora brassicae)* on yield of canola (Brassica napus). Canadian Journal of Plant Pathology, 1-14. https://doi.org/10.1080/07060661.2021.1989801

Holtz, M. D., Hwang, S. F., Manolii, V. P., & Strelkov, S. E. (2021). Molecular evaluation of ***Plasmodiophora brassicae*** collections for the presence of divergent genetic pathogen populations before and after the release of clubroot resistant canola. Canadian Journal of Plant Pathology, 1-9. https://doi.org/10.1080/07060661.2021.1950320

Muirhead, K., & Pérez-López, E. (2021). ***Plasmodiophora brassicae*** CBM18 proteins bind chitin and suppress chitin-triggered immunity. PhytoFrontiers, (ja). https://doi.org/10.1094/PHYTOFR-04-21-0032-R

Fredua-Agyeman, R., Hwang, SF., Zhang, H. et al. **Clubroot resistance** derived from the European Brassica napus cv. 'Tosca' is not effective against virulent *Plasmodiophora brassicae* isolates from **Alberta**, Canada. Sci Rep 11, 14472 (2021). https://doi.org/10.1038/s41598-021-93327-0

Tso, H. H., Galindo-González, L., & Strelkov, S. E. (2021). Current and Future Pathotyping Platforms for ***Plasmodiophora brassicae*** in Canada. Plants, 10(7), 1446. https://doi.org/10.3390/plants10071446

Hill, T. B., Daniels, G. C., Feng, J., & Harding, M. W. (2021). Hard to kill: Inactivation ***of Plasmodiophora brassicae*** resting spores using chemical disinfectants. Plant Disease, (ja). https://doi.org/10.1094/PDIS-05-21-1055-RE

Idnurm, A., Beard, C., Smith, A., Hills, A. L., & Chambers, K. R. (2021). Emergence of ***Cladosporium macrocarpum*** disease in canola (Brassica napus). Australasian Plant Pathology, 1-8. https://doi.org/10.1007/s13313-021-00819-8

Dolatabadian, A. R. I. A., Cornelsen, J., Huang, S. H. U. A. N. G. L. O. N. G., Zou, Z., & Fernando, W. D. (2021). Sustainability on the farm: **breeding for resistance** and management of major canola diseases in Canada contributing towards an **IPM approach**. Canadian Journal of Plant Pathology, 1-34. https://doi.org/10.1080/07060661.2021.1991480

Song, Z. X., Seo, E. Y., Hu, W. X., Jeong, J. H., Moon, J. S., Kim, K. H., ... & Lim, H. S. (2021). Construction of Full-length Infectious cDNA Clones of Two Korean Isolates of **Turnip Mosaic Virus** Breaking Resistance in *Brassica Napus*. https://doi.org/10.21203/rs.3.rs-803814/v1

Palial Shivani, Kumar Sarwan, Atri Chhaya, Sharma Sanjula and Banga Surinder (2021) Antixenosis and antibiosis mechanisms of resistance to **turnip aphid**, ***Lipaphis erysimi*** *(Kaltenbach) in Brassica juncea-fruticulosa* introgression lines. Journal of Pest Science https://doi.org/10.1007/s10340-021-01418-8

Soni, S., & Kumar, S. (2021). Efficacy of the **parasitoid, *Diaeretiella rapae*** (McIntosh) (Hymenoptera: Braconidae) against ***Myzus persicae*** (Sulzer) (Hemiptera: Aphididae) infesting rapeseed-mustard. Journal of Asia-Pacific Entomology, 24(3), 912-917. https://doi.org/10.1016/j.aspen.2021.07.019

Soni, S., Kumar, S., Singh, R., Badiyala, A., & Chandel, R. S. (2022). **Aphid parasitoid**, *Diaeretiella* rapae (McIntosh) (Hymenoptera: Braconidae): opportunities for its use in integrated management of aphids infesting rapeseed-mustard in north-western Indian Himalayas. Crop Protection, 151, 105819. https://doi.org/10.1016/j.cropro.2021.105819

DANIEL, R. A., & ION, M. (2021). ***PLUTELLAXYLOSTELLA*-**A NEW CHALLENGE FOR RAPESEED CULTURE. Annals of the University of Craiova-Agriculture, Montanology, Cadastre Series, 50(1), 325-330. http://anale.agro-craiova.ro/index.php/aamc/article/view/1077

Mansouri, S. M., Mehni, N., Mehrparvar, M., Lashkari, M., & Naseri, B. (2021). The effect of different amounts of nitrogen applied on rapeseed cultivars on nutrient reaction and protein metabolism of ***Helicoverpa armigera***. Applied Entomology and Phytopathology, 89(1), 65-74. https://dx.doi.org/10.22092/jaep.2021.343314.1352

Suleimanov, S., Safiollin, R., Loginov, N., & Vafina, L. (2021). **Biological systems for the protection** of spring rapeseed **from pests** as a promising direction for a production increase of environmentally friendly and competitive oilseeds in the Republic of **Tatarstan**. In BIO Web of Conferences (Vol. 37, p. 00177). EDP Sciences. https://doi.org/10.1051/bioconf/20213700177

SARAN, C., & Hanife, G. E. N. Ç. Age-Stage, Two-Sex Life Table of The **Diamondback Moth**, *Plutella xylostella (Linnaeus, 1758) (Lepidoptera: Plutellidae)* on Different Brassicaeous Plants. Türk Tarım ve Doğa Bilimleri Dergisi, 8(3), 615-628. https://doi.org/10.30910/turkjans.928115

Cock, C., Mason, P. G., Haye, T., & Cappuccino, N. (2021). Determining the host range of *Diadromus collaris (Gravenhorst) (Hymenoptera: Ichneumonidae),* a candidate **biological control agent for diamondback moth** *Plutella xylostella linnaeus (Lepidoptera: Plutellidae)* in Canada. Biological Control, 161, 104705. https://doi.org/10.1016/j.biocontrol.2021.104705

Haye, T., Dancau, T., Bennett, A. M., & Mason, P. G. (2021). The impact of **parasitoids on diamondback moth** in Europe: a life table approach. The Canadian Entomologist, 153(6), 741-756. https://doi.org/10.4039/tce.2021.43

Moirangthem, T. T., Macana, R., & Baik, O. D. (2021). Apparent thermal death kinetics of adult **red flour beetle** (Tribolium castaneum) in stored canola (*Brassica napus L.)* seeds using a pilot-scale 50-Ω radio frequency (RF) heating system. LWT, 150, 112009. https://doi.org/10.1016/j.lwt.2021.112009

Mirzazadeh, A., Azizi, A., Abbaspour-Gilandeh, Y., Hernández-Hernández, J. L., Hernández-Hernández, M., & Gallardo-Bernal, I. (2021). A Novel Technique for Classifying **Bird Damage** to Rapeseed Plants Based on a Deep Learning Algorithm. Agronomy, 11(11), 2364. https://doi.org/10.3390/agronomy11112364

Iesa, M. A. FORAGING BEHAVIOUR OF **APIDAE BEES** ON RAPESEED FLOWERS BRASSICA NAPUS UNDER OPEN CONDITIONS. https://doi.org/10.17605/OSF.IO/VBQZE

Ucero, A., & Torres, F. Management *Osmia bicornis* and study of other **bee communities** associated to rape crops. REFERENCE

Van der Meersch, V., Billaud, O., San Cristobal, M. et al. Landscape floral resources provided by rapeseed correlate with next-year reproduction of **cavity-nesting pollinators** in a national participatory monitoring program. Landscape Ecol (2021). https://doi.org/10.1007/s10980-021-01353-0

AGRONOMY & CROP MANAGEMENT

Allies, A., Roumiguié, A., Dejoux, J. F., Fieuzal, R., Jacquin, A., Veloso, A., ... & Baup, F. (2021). Evaluation of **Multiorbital SAR and Multisensor Optical Data** for Empirical Estimation of Rapeseed Biophysical Parameters. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 14, 7268-7283. https://doi.org/10.1109/JSTARS.2021.3095537

Allies, A., Roumiguié, A., Dejoux, J. F., Fieuzal, R., Champolivier, L., & Baup, F. (2021, July). Potential and **Complementarity of Dense SAR and Optical Data for Rapeseed Crops Monitoring**. In 2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS (pp. 6757-6760). IEEE. https://doi.org/10.1109/IGARSS47720.2021.9553318

Fan, H., Liu, S., Li, J., Li, L., Dang, L., Ren, T., & Lu, J. (2021). Early **prediction of the seed yield** in winter oilseed rape based on the **near-infrared reflectance** of vegetation (NIRv). Computers and Electronics in Agriculture, 186, 106166. https://doi.org/10.1016/j.compag.2021.106166

Mercier, A., Betbeder, J., Denize, J., Roger, J. L., Spicher, F., Lacoux, J., ... & Hubert-Moy, L. (2021). **Estimating crop parameters using Sentinel-1 and 2** datasets and geospatial field data. Data in brief, 38, 107408. https://doi.org/10.1016/j.dib.2021.107408

Nguyen, L., Robinson, S., & Galpern, P. (2021). Medium-resolution **multispectral satellite** imagery in precision agri-culture: **mapping precision canola** (*Brassica napus L*.) **yield** using **Sentinel-2** time series. Earth and Space Science Open Archive ESSOAr. https://doi.org/10.1002/essoar.10507479.1

Li, L., Qiao, J., Yao, J., Li, J., & Li, L. (2021). Automatic **Freezing-Tolerant** Rapeseed Material Recognition **Using UAV Images** and Deep Learning. https://doi.org/10.21203/rs.3.rs-929591/v1

Sun, B., Wang, C., Yang, C., Xu, B., Zhou, G., Li, X., ... & Zhang, J. (2021). Retrieval of rapeseed **leaf area index using the PROSAIL model** with canopy coverage derived from UAV images as a correction parameter. International Journal of Applied Earth Observation and Geoinformation, 102, 102373. https://doi.org/10.1016/j.jag.2021.102373

Xu, M., Wang, C., Ling, L., Batchelor, W. D., Zhang, J., & Kuai, J. (2021). Sensitivity analysis of the **CROPGRO-Canola model in China**: A case study for rapeseed. Plos one, 16(11), e0259929. https://doi.org/10.1371/journal.pone.0259929

Zhao, Y., Wu, W., Zhou, Y., Zhu, B., Yang, T., Yao, Z., ... & Liu, T. (2021). A backlight and deep learning based **method** for calculating the number of **seeds per silique**. Biosystems Engineering. https://doi.org/10.1016/j.biosystemseng.2021.11.014

Xiang, W., Wu, M., Lyu, J., Ma, L., Liu, J., & Zhou, W. (2021). **Optimal design** and experiment of multi-row rolling-style planting-hole punch **for rapeseed plant seedlings**. International Journal of Industrial and Systems Engineering, 38(2), 143-166.

Asghar, W., Kataoka, R. Effect of co-application of *Trichoderma spp*. with organic composts on **plant growth** enhancement, soil enzymes and **fungal community in soil**. Arch Microbiol 203, 4281–4291 (2021). https://doi.org/10.1007/s00203-021-02413-4

Nemati, A., & Sedghi, M. (2022). Evaluation of yield and yield components of some rapeseed cultivars with **endophyte** *P. indica* and *A. siccitolerans* under **drought stress.** Journal of Crop Production, 13(4), 87-110. (English abstract, Persian) https://dx.doi.org/10.22069/ejcp.2021.18408.2364

Nicolás, Carlos and Calvo-Polanco, Mónica and Poveda, Jorge and Alonso-Ramírez, Ana and Arbona, Vicent and Hermosa, Rosa and Monte, Enrique, Rapeseed Overexpressing the Trichoderma Thkel1 Gene Can Be Colonized by **Arbuscular Mycorrhizal Fungi** With Increases in Seed Yield and Oil Quality. Available at SSRN: https://ssrn.com/abstract=3931626 or http://dx.doi.org/10.2139/ssrn.3931626

Gao, J., Li, M. M., & Zhao, G. (2021). Thiocyanate increases the **nitrous oxide** formation process through modifying the **soil bacterial community**. Journal of the Science of Food and Agriculture. https://doi.org/10.1002/jsfa.11570

Floc'h, JB., Hamel, C., Laterrière, M. et al. Inter-Kingdom Networks of Canola Microbiome Reveal **Bradyrhizobium** as Keystone Species and Underline the Importance of Bulk Soil in **Microbial Studies** to Enhance Canola Production. Microb Ecol (2021). https://doi.org/10.1007/s00248-021-01905-6

Abis, L., Kalalian, C., Lunardelli, B., Wang, T., Zhang, L., Chen, J., Perrier, S., Loubet, B., Ciuraru, R., and George, C.: Measurement report: **Biogenic volatile organic compound emission** profiles of rapeseed leaf litter and its secondary organic aerosol formation potential, Atmos. Chem. Phys., 21, 12613–12629, https://doi.org/10.5194/acp-21-12613-2021 , 2021

Li, S., Zhang, H., Wang, S., Shi, L., Xu, F., Wang, C., ... & Ding, G. (2021). The rapeseed genotypes with **contrasting NUE response** discrepantly to varied provision of ammonium and nitrate by regulating photosynthesis, root morphology, nutritional status, and oxidative stress response. Plant Physiology and Biochemistry. https://doi.org/10.1016/j.plaphy.2021.06.001

CG, C., & Schipanski, M. E. (2021). **Nitrogen Uptake** by Rapeseed Varieties From **Organic Matter** and Inorganic Fertilizer Sources. https://doi.org/10.21203/rs.3.rs-632804/v1

Shrestha, G., Baral, B. R., & Chaudhary, R. D. (2021). **Rapeseed Yield in a Maize–Rapeseed** Cropping Pattern over a Long-Term **Nutrient Management** Experiment. Journal of Nepal Agricultural Research Council, 7, 30-43. https://doi.org/10.3126/jnarc.v7i1.36917

Ejack, L., Gurung, B., Seguin, P., Ma, B. L., & Whalen, J. K. (2021). **Soil nitrogen dynamics** in canola agroecosystems of eastern **Canada**. Canadian Journal of Soil Science, 1-5. https://doi.org/10.1139/cjss-2021-0078

Ding, W., Lei, H., Zhang, J., Wang, L., Zhang, J., Ju, X., ... & Li, G. One-time **N fertilization** reduces greenhouse emissions and N leaching while maintaining high yields in a rape-rice rotation system. Agronomy Journal. https://doi.org/10.1002/agj2.20947

Gu, C., Huang, W., Li, Y., Li, Y., Yu, C., Dai, J., ... & Qin, L. (2021**). Green Manure** Amendment Can Reduce **Nitrogen Fertilizer** Application Rates for Oilseed Rape in Maize–Oilseed Rape Rotation. Plants, 10(12), 2640. https://doi.org/10.3390/plants10122640

Crous, I. R., Labuschagne, J., & Swanepoel, P. A. (2021). **Nitrogen source effects** on canola (*Brassica napus L.)* grown under conservation agriculture in **South Africa**. Crop Science, 61(6), 4352-4364. https://doi.org/10.1002/csc2.20599

Zangani, E., Afsahi, K., Shekari, F., Mac Sweeney, E., & Mastinu, A. (2021). **Nitrogen and Phosphorus** Addition to Soil Improves Seed Yield, Foliar Stomatal Conductance, and the Photosynthetic Response of Rapeseed (Brassica napus L.). Agriculture, 11(6), 483. https://doi.org/10.3390/agriculture11060483

Sikorska, A., Gugała, M. & Zarzecka, K. The response of different kinds of rapeseed cultivars to foliar application of **nitrogen, sulphur and boron**. Sci Rep 11, 21102 (2021). https://doi.org/10.1038/s41598-021-00639-2

Rosca, M., Cozma, P., Minut, M., Hlihor, R. M., Bețianu, C., Diaconu, M., & Gavrilescu, M. (2021). New Evidence of Model Crop *Brassica napus L.* in Soil Clean-Up: Comparison of Tolerance and Accumulation of **Lead and Cadmium**. Plants, 10(10), 2051. https://doi.org/10.3390/plants10102051

Tian, X., Wang, D., Li, Z. et al. Influence of nitrogen forms, pH, and water levels on **cadmium** speciation and characteristics of cadmium uptake by rapeseed. Environ Sci Pollut Res (2021). https://doi.org/10.1007/s11356-021-16671-8

Alizadeh, B., Rezaizad, A., Hamedani, M.Y. et al. **Genotype × Environment Interactions** and Simultaneous Selection for High Seed Yield and Stability in Winter Rapeseed (*Brassica napus)* Multi-Environment Trials. Agric Res (2021). https://doi.org/10.1007/s40003-021-00565-9

Khalipsky, A. N., Oleynikova, E. N., & Grishina, I. I. (2021, September). Biological efficiency of cultivation of new hybrids of spring rapeseed in **Eastern Siberia**. In IOP Conference Series: Earth and Environmental Science (Vol. 848, No. 1, p. 012217). IOP Publishing. https://iopscience.iop.org/article/10.1088/1755-1315/848/1/012217/meta

Butkevičienė, L. M., Kriaučiūnienė, Z., Pupalienė, R., Velička, R., Kosteckienė, S., Kosteckas, R., & Klimas, E. (2021). Influence of Sowing Time on Yield and Yield Components of Spring Rapeseed in **Lithuania.** Agronomy, 11(11), 2170. https://doi.org/10.3390/agronomy11112170

Acharya M, Amgain LP, Khanal S, Mishra SR, Shrestha A. Assessments of **Climate Change Adaptation** Measures on Agro-climatic Indices and Productivity of Late Planted Rapeseed in **Nepalese Mid-Hills**. Plant Biol Crop Res. 2021; 4(2): 1037. REFERENCE

Huang, J., Huang, G., Xin, X., Halstead, D., Gaetz, K., Benmerrouche, L., ... & Zhang, J. (2021). Characterization of canola growth and in-vivo element fate in **Canadian prairie** under the interferences of tillage and residue treatment. Journal of Cleaner Production, 320, 128707. https://doi.org/10.1016/j.jclepro.2021.128707

Davami, P., Fazel, M. A., Lak, S., Habibi, D., & Mozaffari, A. (2021). EFFECT OF IRRIGATION CUT-OFF AND PLANTING DATE ON YIELD AND YIELD COMPONENTS OF RAPESEED CULTIVARS. International Journal of Modern Agriculture, 10(2), 4364-4374.chttp://modern-journals.com/index.php/ijma/article/view/1358

Radić, V., Balalić, I., Krstić, M., & Marjanović-Jeromela, A. (2021). Correlation and path analysis of yield and **yield components** in winter rapeseed. Genetika, 53(1), 157-166. https://doi.org/10.2298/GENSR2101157R

DİNÇ, S., & ÜNAY, A. (2021). The Effect of Sowing Date, Cultivar and Seed Rate on Yield and Quality Characteristics in Rapeseed (*Brassica napus L.).* Journal of Adnan Menderes University, Agricultural Faculty, 18(1). https://doi.org/10.25308/aduziraat.829064

Agha Mohammad Reza, M., Paknejad, F., Shirani Rad, A. H., Ardakani, M. R., & Kashani, A. (2021). Change in plant densities combined with zinc application affects rapeseed seed oil and fatty acid composition. Journal of Plant Nutrition, 1-11. https://doi.org/10.1080/01904167.2021.1943676

Golub, G., Chuba, V., Lutak, V., Yarosh, Y., & Kukharets, S. (2021). Researching of indicators of **agroecosystem without external energy supply**. Journal of Central European Agriculture, 22(2), 397-407. https://doi.org/10.5513/JCEA01/22.2.3076

El-Badri, A. M., Batool, M., Mohamed, I. A., Khatab, A., Sherif, A., Wang, Z. K., ... & Zhou, G. (2021). Modulation of **salinity impact** on early seedling stage via **nano-priming** application of Zinc oxide on rapeseed (*Brassica napus, L.).* Plant Physiology and Biochemistry. https://doi.org/10.1016/j.plaphy.2021.05.040

Ahmad, M., Waraich, E.A., Hussain, S. et al. Improving **Heat Stress Tolerance** in *Camelina sativa* and *Brassica napus* Through **Thiourea Seed Priming**. J Plant Growth Regul (2021). https://doi.org/10.1007/s00344-021-10482-4

Kolomeichuk, L.V., Danilova, E.D., Khripach, V.A. et al. Ability of Lactone- and Ketone-Containing Brassinosteroids to Induce **Priming** in Rapeseed Plants to **Salt Stress**. Russ J Plant Physiol 68, 499–509 (2021). https://doi.org/10.1134/S1021443721020084

El-Badri, A.M.; Batool, M.; A. A. Mohamed, I.; Wang, Z.; Khatab, A.; Sherif, A.; Ahmad, H.; Khan, M.N.; Hassan, H.M.; Elrewainy, I.M.; Kuai, J.; Zhou, G.; Wang, B. Antioxidative and Metabolic Contribution to **Salinity Stress Responses** in Two Rapeseed Cultivars during the Early Seedling Stage. Antioxidants 2021, 10, 1227. https://doi.org/10.3390/antiox10081227

Liu, L., Chen, C., Xiong, J., Ma, N., & Li, J. (2021). Resilience of oilseed rape plants to **drought stress** after exogenous application of AM1, an ABA-mimicking ligand. Oil Crop Science, 6(3), 151-157. https://doi.org/10.1016/j.ocsci.2021.07.007

Savchuk, M. V., Lisovyy, M. M., Taran, O. P., Voitsekhivska, O. V., Belava, V. N., Panyuta, O. O., ... & Klymchuk, I. M. (2021). Impact of **SiO2, Al2O3, and ZnO nanomaterials** on the **physiological** parameters of winter rape. Ukrainian Journal of Ecology, 11(3), 305-311. REFERENCE

Zhu, Z. H., Sami, A., Xu, Q. Q., Wu, L. L., Zheng, W. Y., Chen, Z. P., ... & Zhou, K. J. (2021). Effects of **seed priming** treatments on the germination and development of two rapeseed (*Brassica na-*

pus L.) varieties under the co-influence of low temperature and drought. Plos one, 16(9), e0257236. https://doi.org/10.1371/journal.pone.0257236

Wittig, P. R., Ambros, S., Müller, J. T., Bammer, B., Álvarez-Cansino, L., Konnerup, D., ... & Mustroph, A. (2021). Two *Brassica napus* cultivars differ in gene expression, but not in their **response to submergence**. Physiologia Plantarum, 171(3), 400-415. https://doi.org/10.1111/ppl.13251

Semenov, A., Sakhno, T., & Semenova, K. (2021). Influence of **UV Radiation** on Physical and Biological Properties of Rapeseed in Pre-Sowing Treatment. http://dspace.puet.edu.ua/handle/123456789/10794

Li, S., Yan, L., Riaz, M., White, P. J., Yi, C., Wang, S., ... & Ding, G. (2021). Integrated transcriptome and metabolome analysis reveals the physiological and molecular **responses** of allotetraploid rapeseed **to ammonium toxicity**. Environmental and Experimental Botany, 189, 104550. https://doi.org/10.1016/j.envexpbot.2021.104550

Zhou, T., Hua, Y., Yue, C., Huang, J., & Zhang, Z. (2021). Physiologic, metabolomic, and genomic investigations reveal distinct glutamine and mannose metabolism responses to **ammonium toxicity** in allotetraploid rapeseed genotypes. Plant Science, 110963. https://doi.org/10.1016/j.plantsci.2021.110963

Leitão, I., Sales, J., Martins, L.L. et al. Response to stress induced by different potentially **toxic elements (As, Cd, Cu and Na)** in rapeseed leaves. Plant Physiol. Rep. 26, 478–490 (2021). https://doi.org/10.1007/s40502-021-00601-4

Wu, X., Tian, H., Li, L., & Wang, X. (2021). Polyaspartic acid alleviates **cadmium toxicity** in rapeseed leaves by affecting cadmium translocation and cell wall fixation of cadmium. Ecotoxicology and Environmental Safety, 224, 112685. https://doi.org/10.1016/j.ecoenv.2021.112685

Dong, R., Liu, R., Xu, Y., Liu, W., Wang, L., Liang, X., ... & Sun, Y. (2021). Single and joint **toxicity of polymethyl methacrylate microplastics and A**s (V) on rapeseed (*Brassia campestris L.*). Chemosphere, 133066. https://doi.org/10.1016/j.chemosphere.2021.133066

Hölzl, G., & Dörmann, P. (2021). Alterations of flower fertility, plant size, seed weight, and seed oil content in transgenic ***Camelina sativa*** plants overexpressing CYP78A. Industrial Crops and Products, 170, 113794. https://doi.org/10.1016/j.indcrop.2021.113794

Rostami Ahmadvandi, H., Zeinodini, A., Ghobadi, R., & Gore, M. (2021). Benefits of Adding **Camelina** to Rainfed Crop **Rotation** in Iran: A Crop with High Drought Tolerance. Agrotechniques in Industrial Crops, 1(2), 91-96. https://atic.razi.ac.ir/article_1824.html

Kuai, J., Li, X., Ji, J., Li, Z., Xie, Y., Wang, B., & Zhou, G. (2021). The physiological and proteomic characteristics of oilseed rape stem affect **seed yield and lodging resistance** under different planting densities and row spacing. Journal of Agronomy and Crop Science, 207(5), 840-856. https://doi.org/10.1111/jac.12544

PHYSIOLOGY

Maruyama-Nakashita, A., Ishibashi, Y., Yamamoto, K., Zhang, L., Morikawa-Ichinose, T., Kim, S. J., & Hayashi, N. (2021). Oxygen plasma modulates **glucosinolate levels** without affecting lipid contents and composition in *Brassica napus* seeds. Bioscience, Biotechnology, and Biochemistry, 85(12), 2434-2441. https://doi.org/10.1093/bbb/zbab157

Kuai, J., Li, X., Ji, J., Li, Z., Xie, Y., Wang, B., & Zhou, G. (2021). Response of **leaf carbon metabolism and dry matter accumulation** to density and row spacing in two rapeseed (*Brassica napus L.)* genotypes with differing plant architectures. The Crop Journal. https://doi.org/10.1016/j.cj.2021.10.006

Lohani, N. (2021). Molecular basis of the **high-temperature** susceptibility of reproductive development in Canola, *Brassica napus* (Doctoral dissertation) http://hdl.handle.net/11343/290151

Lohani, N., Singh, M. B., & Bhalla, P. L. Short-term **heat stress** during flowering results in a decline in Canola seed productivity. Journal of Agronomy and Crop Science. https://doi.org/10.1111/jac.12534

Chen, S., Stefanova, K., Siddique, K.H.M. and W.A. Cowling. 2021. Transient daily **heat stress** during the **early reproductive phase** disrupts pod and seed development in *Brassica napus L.* Food and Energy Security 10:e262 https://doi.org/10.1002/fes3.262

Chen, S., Saradadevi, R., Vidotti, M.S., Roberto Fritsche-Neto, R., Crossa, J., Siddique, K.H.M. and W.A. Cowling. 2021. Female reproductive organs of *Brassica napus* are more sensitive than male to transient **heat stress**. Euphytica 217:117. https://doi.org/10.1007/s10681-021-02859-z

Wei, J., Zheng, G., Dong, X., Li, H., Liu, S., Wang, Y., & Liu, Z. (2021). Integration of transcriptome and proteome analysis reveals the mechanism of **freezing tolerance in winter rapeseed**. Plant Growth Regulation, 1-16. https://doi.org/10.1007/s10725-021-00763-z

QUALITY & PRODUCTS

Ivashchuk, O., Hlukhaniuk, A., Semenyshyn, Y., Chyzhovych, R., Kuzminchuk, T., & Khomyak, S. (2021). Influence of **extraction** conditions on qualitative composition of vegetable **oils.** Chemistry & Chemical Technology, 15(2), 233-238. https://doi.org/10.23939/chcht15.02.233

Yu, J., Wang, M., Zhang, M., Liu, Y., & Li, J. (2021). Effect of **infrared ray roasting** on oxidation stability and flavor of virgin rapeseed oils. Journal of Food Science. https://doi.org/10.1111/1750-3841.15792

Russo, M., Yan, F., Stier, A., Klasen, L., & Honermeier, B. (2021). **Erucic acid** concentration of rapeseed (*Brassica napus L.)* oils on the German food retail market. Food Science & Nutrition. https://doi.org/10.1002/fsn3.2327

Martin, A., Naumann, S., Osen, R., Karbstein, H. P., & Emin, M. A. (2021). **Extrusion** Processing of Rapeseed Press Cake-Starch Blends: Effect of Starch Type and Treatment Temperature on **Protein, Fiber and Starch Solubility**. Foods, 10(6), 1160 https://doi.org/10.3390/foods10061160

Nandasiri, H. M. A. R. (2021). Structural characterization of **phenolic compounds** in canola meal: impact of high pressure and temperature. http://hdl.handle.net/1993/36003

Moggré, G. J., Alayon Marichal, M., Sowersby, T., Grosvenor, A., Gathercole, J., & Moreno, T. (2021). **Protein Recovery** from New Zealand Oil Rapeseed *(Brassica napus)* Cake. Waste and Biomass Valorization, 1-7. https://doi.org/10.1007/s12649-021-01534-7

Sousa, D., Salgado, J. M., Cambra-López, M., Dias, A. C., & Belo, I. (2021). Degradation of lignocellulosic matrix of oilseed cakes by **solid-state fermentation**: fungi screening for enzymes production and antioxidants release. Journal of the Science of Food and Agriculture. https://doi.org/10.1002/jsfa.11490

Cisneros-Yupanqui, M., Chalova, V.I., Kalaydzhiev, H.R. et al. Preliminary Characterisation of **Wastes** Generated from the Rapeseed and Sunflower **Protein Isolation Process** and Their Valorisation in Delaying Oil Oxidation. Food Bioprocess Technol 14, 1962–1971 (2021). https://doi.org/10.1007/s11947-021-02695-y

Georgiev, R., Kalaydzhiev, H., Slavov, A., Ivanova, P., Uzunova, G., & Chalova, V. I. (2021). **Residual Waste After Protein Isolation** From Ethanol-Treated Rapeseed Meal has Physico-Chemical Properties for Functional Food Systems Formulation. Waste and Biomass Valorization, 1-10. https://doi.org/10.1007/s12649-021-01567-y

Siebert, M., Krings, U., Günther, T., Fragalas, A., & Berger, R. G. (2021). Enzymatic hydrolysis of kaempferol 3-O-(2‴-O-sinapoyl-β-sophoroside), the key **bitter compound** of rapeseed (*Brassica napus L.*) **protein isolate**. Journal of the Science of Food and Agriculture. https://doi.org/10.1002/jsfa.11547

Rahman, M., Khatun, A., Liu, L., & Barkla, B. (2021). Identification of Allergenic Epitopes in the Sequences of Rapeseed Seed **Proteins.** *(communication abstract)* https://sciforum.net/paper/view/10220

Li, Y., Zhang, Z., Ren, W., Wang, Y., Mintah, B. K., Dabbour, M., ... & Ma, H. (2021). Inhibition effect of ultrasound on the formation of lysinoalanine in **rapeseed protein isolates** during pH shift treatment. Journal of Agricultural and Food Chemistry, 69(30), 8536-8545. https://doi.org/10.1021/acs.jafc.1c02422

Albe-Slabi, S., Defaix, C., Beaubier, S., Galet, O., & Kapel, R. (2022). **Selective extraction of napins**: process optimization and impact on structural and functional properties. Food Hydrocolloids, 122, 107105. https://doi.org/10.1016/j.foodhyd.2021.107105

Fu, Z., Su, G., Yang, H., Sun, Q., Zhong, T., & Wang, Z. (2021). Effects of Dietary **Rapeseed Meal** on Growth Performance, Carcass Traits, Serum Parameters, and Intestinal Development of **Geese**. Animals, 11(6), 1488. https://doi.org/10.3390/ani11061488

Zhu, L., Wang, J., Ding, X., Bai, S., Zeng, Q., Xuan, Y., ... & Zhang, K. (2021). Serum trimethylamine-N-oxide and gut microbiome alterations are associated with cholesterol deposition in the liver of **laying hens** fed with rapeseed meal. Animal Nutrition. https://doi.org/10.1016/j.aninu.2021.02.008

Watts, E. S., Rose, S. P., Mackenzie, A. M., & Pirgozliev, V. R. (2021). Investigations into the chemical composition and nutritional value of **single-cultivar rapeseed meals** for **broiler** chickens. Archives of Animal Nutrition, 1-13.https://doi.org/10.1080/1745039X.2021.1930455

Skvortsova L., Osepchuk D., Nepshekueva T. (2022) Efficiency of Using Rapeseed-Processing Wastes in Mixed Feed for **Broiler Chickens**. In: Muratov A., Ignateva S. (eds) Fundamental and Applied Scientific Research in the Development of Agriculture in the Far East (AFE-2021). AFE 2021.

Lecture Notes in Networks and Systems, vol 354. Springer, Cham. https://doi.org/10.1007/978-3-030-91405-9_27

Skvortsova L., Osepchuk D., Nepshekueva T. (2022) Influence of Rapeseed Processing Waste on the Development of Muscle Tissue in **Broiler Chickens**. In: Muratov A., Ignateva S. (eds) Fundamental and Applied Scientific Research in the Development of Agriculture in the Far East (AFE-2021). AFE 2021. Lecture Notes in Networks and Systems, vol 354. Springer, Cham. https://doi.org/10.1007/978-3-030-91405-9_1

Wu, Z., Chen, J., Pirzado, S. A., Haile, T. H., Cai, H., & Liu, G. The effect of fermented and raw rapeseed meal on the growth performance, immune status and intestinal morphology of **broiler chickens.** Journal of animal physiology and animal nutrition. https://doi.org/10.1111/jpn.13593

Yadav, S., Teng, P. Y., Choi, J., Singh, A. K., Vaddu, S., Thippareddi, H., & Kim, W. K. (2021). Influence of rapeseed, canola meal and glucosinolate metabolite (AITC) as potential antimicrobials: Effects on growth performance, and gut health in *Salmonella Typhimurium* challenged **broiler chickens**. Poultry Science, 101551.https://doi.org/10.1016/j.psj.2021.101551

Boroojeni, F. G., Männer, K., Boros, D., Wiśniewska, M., Kühnel, S., Beckmann, K., ... & Zentek, J. (2021). Spontaneous and enzymatic fermentation of rapeseed cake for **broiler nutrition**. Animal Feed Science and Technology, 115135. https://doi.org/10.1016/j.anifeedsci.2021.115135

Yadav, S., Teng, P. Y., Singh, A. K., Choi, J., & Kim, W. K. (2021). Influence of *Brassica spp.* rapeseed and canola meal, and supplementation of bioactive compound (AITC) on growth performance, intestinal-permeability, oocyst shedding, lesion score, histomorphology, and gene expression of **broilers** challenged with *E. maxima*. Poultry Science, 101583. https://doi.org/10.1016/j.psj.2021.101583

Olukomaiya, O. O. (2021). Utilization of solid-state fermented canola meal, camelina meal and lupin as potential protein sources in the diets of **broiler** chickens. REFERENCE

Czech, A., Stępniowska, A., & Kiesz, M. Effect of fermented rapeseed meal as a feed component on the redox and immune system of **pregnant sows** and their offspring. Annals of Animal Science. https://doi.org/10.2478/aoas-2021-0034

Czech, A., Sembratowicz, I., & Kiesz, M. (2021). The Effects of a Fermented Rapeseed or/and Soybean Meal Additive on Antioxidant Parameters in the Blood and Tissues **of Piglets.** Animals, 11(6), 1646. https://doi.org/10.3390/ani11061646

Czech, A., Grela, E. R., Nowakowicz-Dębek, B., & Wlazło, Ł. (2021). The effects of a fermented rapeseed meal or/and soybean meal additive on the blood lipid profile and immune parameters of **piglets** and on minerals in their blood and bone. Plos one, 16(6), e0253744. https://doi.org/10.1371/journal.pone.0253744

Zhu, X., Wang, L., Zhang, Z., Ding, L., & Hang, S. (2021). Combination of fiber-degrading enzymatic hydrolysis and lactobacilli fermentation enhances utilization of fiber and protein in rapeseed meal as revealed in simulated **pig** digestion and fermentation in vitro. Animal Feed Science and Technology, 115001. https://doi.org/10.1016/j.anifeedsci.2021.115001

Ingerslev, A. K., Rasmussen, L., Zhou, P., Nørgaard, J. V., Theil, P. K., Jensen, S. K., & Lærke, H. N. (2021). Effects of dairy and plant protein on growth and growth biomarkers in a **piglet** model. Food & Function, 12(22), 11625-11640. https://doi.org/10.1039/D1FO02092G

Hong, J., Ariyibi, S., Antony, L., Scaria, J., Dilberger-Lawson, S., Francis, D., & Woyengo, T. A. (2021). Growth performance and gut health of *Escherichia coli*-challenged **weaned pigs** fed canola meal-containing diet. Journal of Animal Science. https://doi.org/10.1093/jas/skab196

Lee, J., & Nyachoti, C. M. (2021). **Heat processing** increased the digestibility of phosphorus in soybean expeller, canola meal, and **canola expeller** fed to growing **pigs.** Journal of Animal Science, 99(10), skab276. https://doi.org/10.1093/jas/skab276

Nowakowicz-Dębek, B., Wlazło, Ł., Czech, A., Kowalska, D., Bielański, P., Ryszkowska-Siwko, M., ... & Florek, M. (2021). Effects of fermented rapeseed meal on gastrointestinal morphometry and meat quality of **rabbits** (*Oryctolagus cuniculus*). Livestock Science, 251, 104663. https://doi.org/10.1016/j.livsci.2021.104663

Bakker, C. E., Hite, L. M., Wright, C. L., Brake, D. W., Smart, A. J., Blair, A. D., ... & Underwood, K. R. (2021). Impact of feeding cover crop forage containing brassicas to **steers** during backgrounding on live animal performance, carcass characteristics, and meat color1. Translational Animal Science, 5(3), txab124. https://doi.org/10.1093/tas/txab124

Gao, J., Cheng, B., Sun, Y., Zhao, Y., & Zhao, G. (2021). Effects of dietary inclusion with rapeseed cake containing high glucosinolates on nitrogen metabolism and urine nitrous oxide emissions in **steers**. Animal Nutrition. https://doi.org/10.1016/j.aninu.2021.05.006

Chagas, J. C., Ramin, M., Exposito, R. G., Smidt, H., & Krizsan, S. J. (2021). Effect of a Low-Methane Diet on Performance and Microbiome in **Lactating Dairy Cows** Accounting for Individual Pre-Trial Methane Emissions. Animals, 11(9), 2597. https://www.mdpi.com/2076-2615/11/9/2597#

Haese, E., Titze, N., & Rodehutscord, M. (2021). In situ ruminal disappearance of crude protein and phytate from differently processed rapeseed meals in **dairy cows.** Journal of the Science of Food and Agriculture.https://doi.org/10.1002/jsfa.11621

Bayat, A. R., Vilkki, J., Razzaghi, A., Leskinen, H., Kettunen, H., Khurana, R., ... & Ahvenjärvi, S. (2021). Evaluating the effects of high-oil rapeseed cake or natural additives on methane emissions and performance of **dairy cows**. Journal of Dairy Science. https://doi.org/10.3168/jds.2021-20537

Benchaar, C., Hassanat, F., Beauchemin, K. A., Gislon, G., & Ouellet, D. R. (2021). Diet supplementation with canola meal improves milk production, reduces enteric methane emissions, and shifts nitrogen excretion from urine to feces in **dairy cows**. Journal of Dairy Science, 104(9), 9645-9663. https://doi.org/10.3168/jds.2020-20053

Sajedkhanian, A., Mohseni, M., & Norouzi, M. (2021). Effects of dietary fish oil replacement by canola oil on some functional and growth parameters in juveniles of ***Salmo caspius***. Iranian Journal of Fisheries Sciences, 20(4), 1219-1233. http://jifro.ir/browse.php?a_id=3932&slc_lang=fa&sid=1&printcase=1&hbnr=1&hmb=1

Kaiser, F., Harloff, H. J., Tressel, R. P., Kock, T., & Schulz, C. (2021). Effects of highly purified **rapeseed protein isolate** as fishmeal alternative on nutrient digestibility and growth performance in diets fed **to rainbow trout** (*Oncorhynchus mykiss*). Aquaculture Nutrition, 27(5), 1352-1362. https://doi.org/10.1111/anu.13273

Sallam, E.A., Matter, A.F., Mohammed, L.S. et al. **Replacing fish meal with rapeseed meal**: potential impact on the growth performance, profitability measures, serum biomarkers, antioxidant status, intestinal morphometric analysis, and water quality of *Oreochromis niloticus* and *Sarotherodon galilaeus* fingerlings. Vet Res Commun 45, 223–241 (2021). https://doi.org/10.1007/s11259-021-09803-5

Ebrahimnezhadarabi, M. R., Changizi, R., Hoseinifard, S. M., Vatandoust, S., & Ghobadi, S. (2021). Effects of canola protein hydrolysate (CPH) on growth performance, blood biochemistry, immunity, and gastrointestinal microbiota of **beluga** (*Huso huso*) **juveniles**. Iranian Journal of Fisheries Sciences, 20(4), 1165-1178. https://jifro.ir/browse.php?a_id=4571&slc_lang=en&sid=1&printcase=1&hbnr=1&hmb=1

Berge, G. M., Krogdahl, Å., Hillestad, M., Holm, H., Holm, J., & Ruyter, B. (2021). Comparison of EPA and DHA utilization in **Atlantic salmon** (Salmo salar) and **rainbow trout** (Oncorhynchus mykiss) fed two diets with different content of **fish oil and rapeseed oil**. Journal of Applied Aquaculture, 1-19. https://doi.org/10.1080/10454438.2021.1955804

Yang, J., Waardenburg, L. C., Berton-Carabin, C. C., Nikiforidis, C. V., van der Linden, E., & Sagis, L. M. (2021). Air-water interfacial behaviour of whey protein and rapeseed oleosome mixtures. Journal of Colloid and Interface Science, 602, 207-221. https://doi.org/10.1016/j.jcis.2021.05.172

Monié, A., Franceschi, S., Balayssac, S., Malet-Martino, M., Delample, M., Perez, E., & Garrigues, J. C. (2022). Study of **rapeseed oil gelation** induced by commercial monoglycerides using a chemometric approach. Food Chemistry, 369, 130870. https://doi.org/10.1016/j.foodchem.2021.130870

Gao, Y., Li, M., Zhang, L., Wang, Z., Yu, Q., & Han, L. (2021). Preparation of rapeseed oil **oleogels** based on beeswax and its application in beef heart patties to replace animal fat. LWT, 111986. https://doi.org/10.1016/j.lwt.2021.111986

Iguchi, A., Ogawa, S., Yamamoto, Y., & Hara, S. (2021). Facile Preparation of Purified Sinapate Ethyl Ester from **Rapeseed Meal Extracts** Using Cation-exchange Resin in Dual Role as Adsorber and Catalyst. Journal of Oleo Science, ess21036. https://doi.org/10.5650/jos.ess21036

Tymczewska, A., Szydłowska-Czerniak, A., & Nowaczyk, J. (2021). **Bioactive packaging** based on gelatin incorporated with rapeseed meal for prolonging shelf life of rapeseed. Food Packaging and Shelf Life, 29, 100728. https://doi.org/10.1016/j.fpsl.2021.100728

Ammar, W., Delbecq, F., Vroman, I., & Mhemdi, H. (2021). **Novel One-Step Process** for the Production of **Bioplastic** from Rapeseed Press Cake. Processes, 9(9), 1498. https://doi.org/10.3390/pr9091498

Škarpa, P.; Mikušová, D.; Antošovský, J.; Kučera, M.; Ryant, P. Oil-Based Polymer **Coatings on CAN Fertilizer** in Oilseed Rape (*Brassica napus L.)* Nutrition. Plants 2021, 10, 1605. https://doi.org/10.3390/plants10081605

Parvin, A., Rahman, M., & Cattani, D. J. (2021). Observation of a Chemical Softener's Effects on Stem-Specific **Lignocellulosic *Brassica napus*** (Type: Canola)(Cultivar: HYHEAR 3) Fiber Quality. Journal of Textile Science and Technology, 9(3), 112-130. https://doi.org/10.4236/jtst.2021.73010

Southern, D., Hellier, P., Talibi, M., Leonard, M. O., & Ladommatos, N. (2021). Re-assessing the **toxicity of particles from biodiesel combustion**: A quantitative analysis of in vitro studies. Atmospheric Environment, 261, 118570. https://doi.org/10.1016/j.atmosenv.2021.118570

Jia, W., Curubeto, N., Rodríguez-Alonso, E., Keppler, J. K., & van der Goot, A. J. (2021). **Rapeseed protein** concentrate as a potential ingredient for **meat analogues**. Innovative Food Science & Emerging Technologies, 72, 102758. https://doi.org/10.1016/j.ifset.2021.102758

Ntone, E., Kornet, R., Venema, P., Meinders, M. B., van der Linden, E., Bitter, J. H., ... & Nikiforidis, C. V. (2021). Napins and cruciferins in rapeseed **protein extracts** have complementary roles in structuring emulsion-filled gels. Food Hydrocolloids, 107400. https://doi.org/10.1016/j.foodhyd.2021.107400

Zahari, I., Ferawati, F., Purhagen, J. K., Rayner, M., Ahlström, C., Helstad, A., & Östbring, K. (2021). Development and characterization of **extrudates** based on rapeseed and pea protein blends using **high-moisture extrusion cooking.** Foods, 10(10), 2397. https://doi.org/10.3390/foods10102397

Ntone, E., Qu, Q., Gani, K. P., Meinders, M. B., Sagis, L. M., Bitter, J. H., & Nikiforidis, C. V. (2021). Sinapic acid impacts the **emulsifying properties of rapeseed proteins** at acidic pH. Food Hydrocolloids, 107423. https://doi.org/10.1016/j.foodhyd.2021.107423

Xiong, Z., Fu, Y., Yao, J., Zhang, N., He, R., Ju, X., & Wang, Z. (2021). Removal of **anti-nutritional factors** of rapeseed protein isolate (RPI) and toxicity assessment of RPI. Food & Function. https://pubs.rsc.org/en/content/articlelanding/2021/fo/d1fo03217h/unauth

Tang, Y. R., & Ghosh, S. (2021). Canola protein thermal denaturation improved emulsion-templated oleogelation and its **cake-baking application**. Rsc Advances, 11(41), 25141-25157. https://doi.org/10.1039/D1RA02250D

Grenov, B., Larnkjær, A., Ritz, C., Michaelsen, K. F., Damsgaard, C. T., & Mølgaard, C. (2021). The effect of **milk and rapeseed protein on growth** factors in 7–8 year-old healthy **children**–A randomized controlled trial. Growth Hormone & IGF Research, 60, 101418. https://doi.org/10.1016/j.ghir.2021.101418

Kersting, M., Kalhoff, H., Honermeier, B., Sinningen, K., & Lücke, T. (2021). **Erucic acid exposure** during the first year of life—Scenarios with precise food-based dietary guidelines. Food Science & Nutrition. https://doi.org/10.1002/fsn3.2652

Murillo, G., Horn, T., Johnson, W. D., & MacIntosh, S. (2021). 28-Day oral (gavage) and 13-week (dietary) **toxicity studies of DHA canola oil** and DHA canola meal in rats. Regulatory Toxicology and Pharmacology, 127, 105050. https://doi.org/10.1016/j.yrtph.2021.105050

Miklavčič Višnjevec, A., Tamayo Tenorio, A., Steenkjær Hastrup, A. C., Hansen, N. M. L., Peeters, K., & Schwarzkopf, M. (2021). Glucosinolates and Isothiocyantes in Processed Rapeseed Determined by HPLC-DAD-qTOF. Plants, 10(11), 2548. https://doi.org/10.3390/plants10112548

Park, J. E., Lee, D. G., Kim, H. R., Kim, M. J., Kim, H. Y., & Kim, H. J. (2021). Development of **ultrafast PCR assays** for the event-specific detection of eleven approved **genetically modified** canola events in South Korea. Food Chemistry, 131419. https://doi.org/10.1016/j.foodchem.2021.131419

Wan, X., Liao, Y., Yuan, J., Yang, J., & Liao, Q. (2021). Numerical analysis of cyclone separator with different structural parameters for rapeseed **combine harvester** based on CFD. In 2021 ASABE Annual International Virtual Meeting (p. 1). American Society of Agricultural and Biological Engineers. https://elibrary.asabe.org/abstract.asp?aid=52320

ECONOMY and MARKETS

Destiarni, R. P., & Jamil, A. S. (2021). Price Integration Analysis of Crude Oil and Vegetable Oils. Habitat, 32(2), 82-92. https://doi.org/10.21776/ub.habitat.2021.032.2.10

Bajželj, B., Laguzzi, F., & Röös, E. (2021). The role of fats in the transition to sustainable diets. The Lancet Planetary Health, 5(9), e644-e653. https://doi.org/10.1016/S2542-5196(21)00194-7

Rozhkova, A. V. (2021, September). Rapeseed production as a promising direction for the agricultural complex development of the Krasnoyarsk Region. In IOP Conference Series: Earth and Environmental Science (Vol. 839, No. 2, p. 022091). IOP Publishing. https://iopscience.iop.org/article/10.1088/1755-1315/839/2/022091/meta

McCollum, C. J., Ramsey, S. M., Bergtold, J. S., & Andrango, G. (2021). Estimating the supply of oilseed acreage for sustainable **aviation fuel production**: taking account of farmers' willingness to adopt. Energy, Sustainability and Society, 11(1), 1-22. https://doi.org/10.1186/s13705-021-00308-2

Stanica-Ezeanu, D., & Paunescu, L. M. (2021). **Sustainability of Biodiesel Production** and Usage: The Case of Romania. https://www.researchsquare.com/article/rs-898504/latest.pdf

Pilorgé, E., Kezeya, B., Stauss, W., Muel, F., & Mergenthaler, M. (2021). Pea and rapeseed **acreage and land use for plant-based meat alternatives** in the EU. OCL, 28, 54. https://doi.org/10.1051/ocl/2021037

Schaefer, K. A., Myers, R. J., Johnson, S. R., Helmar, M. D., & Radich, T. (2021). How Have **Oilseed Relative Price** Relationships Changed Over Time?. AgBioForum, 23(1), 72-83. https://www.agbioforum.info/index.php/agb/article/view/43/30

MUSTARD and Other Brassicae

Nanjundan, J., Aravind, J., Radhamani, J. et al. Development of **Indian mustard** [*Brassica juncea (L.)* Czern.] **core collection** based on agro-morphological traits. Genet Resour Crop Evol (2021). https://doi.org/10.1007/s10722-021-01211-7

Yadav, P., Yadav, S., Mishra, A., Chaudhary, R., Kumar, A., Meena, H. S., & Rai, P. K. (2021). Genetic Diversity And Population Structure of Indian Mustard (*Brassica Juncea*) Based On Morphological and Molecular Markers. https://doi.org/10.21203/rs.3.rs-904639/v1

Borisovna, B. E., Anatolievna, G. L., Vladimirovich, S. V., Aleksandrovich, S. E., & Nikolaevna, K. G. (2021). Breeding of spring turnip rape, *Brassica rapa* L. var. subsp. campestris (L.) AR Clapham at All-Russian Research Institute of Oil Crops. Caspian Journal of Environmental Sciences, 19(4), 709-714. https://dx.doi.org/10.22124/cjes.2021.5144

Mehta, N. Epidemiology and prediction models for the management of rapeseed–mustard diseases: current status and future needs. Indian Phytopathology 74, 437–452 (2021). https://doi.org/10.1007/s42360-021-00353-z

Miscellaneous

Salomé, M., Fouillet, H., Nicaud, M. C., Dussiot, A., Kesse-Guyot, E., Maillard, M. N., ... & Mariotti, F. (2021). Optimizing the Nutritional Composition of a Meat Substitute Intended to Replace Meat in Observed Diet Results in Marked Improvement of the Diet Quality of French Adults. Current Developments in Nutrition, 5(Supplement_2), 1089-1089. https://doi.org/10.1093/cdn/nzab053_082

Marjanović-Jeromela, A., & Prodanović, S. (2021). Good agricultural practices and technologies to mitigate the impacts of natural disasters in oilseed rape production in Serbia. http://fiver.ifvcns.rs/handle/123456789/2273

Upcoming International and national events

May 1-4, 2022, AOCS Annual Meeting, Atlanta, USA / live and online
https://annualmeeting.aocs.org/

Live+Online

2022 AOCS Annual Meeting & Expo

May 1-4, 2022, Atlanta, Georgia, USA

June 26-29, 2022, 15th International Conference on Precision Agriculture Minneapolis, USA
https://www.ispag.org/icpa

August 29 – September 2, 2022, European Society o Agronomy Congress; Potsdam, Germany
https://esa-congress-potsdam2022.de/frontend/index.php?folder_id=4191&page_id=

September 24-27, 2023, 16th International Rapeseed Congress, Sydney, Australia
For further info go to www.irc2023sydney.com

We invite you to share information with the rapeseed/canola community: let us know the scientific projects, events organized in your country, crop performances or any information of interest in rapeseed/canola R&D.

Contact GCIRC News:

Etienne Pilorgé, GCIRC Secretary-Treasurer: e.pilorge@terresinovia.fr

Contact GCIRC: contact@gcirc.org