The International Rapeseed Congress in Saskatoon attracted experts from around the world to provide updates on canola and rapeseed advancement. Here are some highlights.

By Jay Whetter

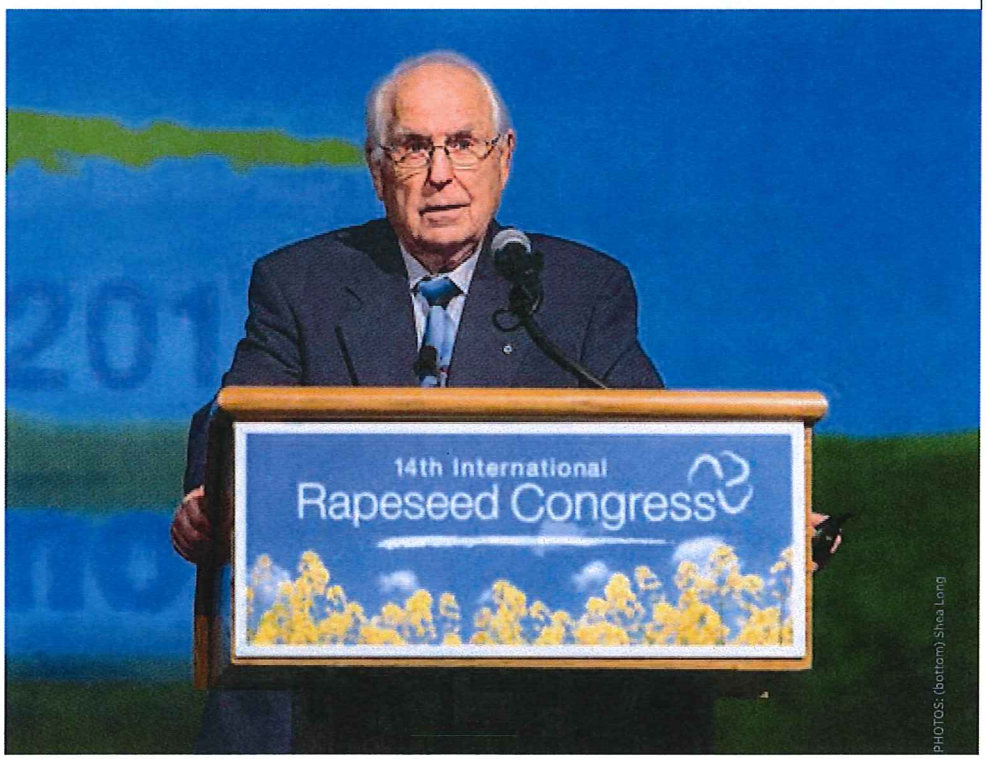
Global effort for a common cause: Canola

There is something comforting when you see public and private researchers from around the world meet to share knowledge and collectively advance canola and rapeseed production. You think, "This is a crop that matters."

That is what happened this past July when Saskatoon hosted over 850 delegates from 33 countries for the GCIRC's International Rapeseed Congress, a high level global gathering of canola and rapeseed scientists.

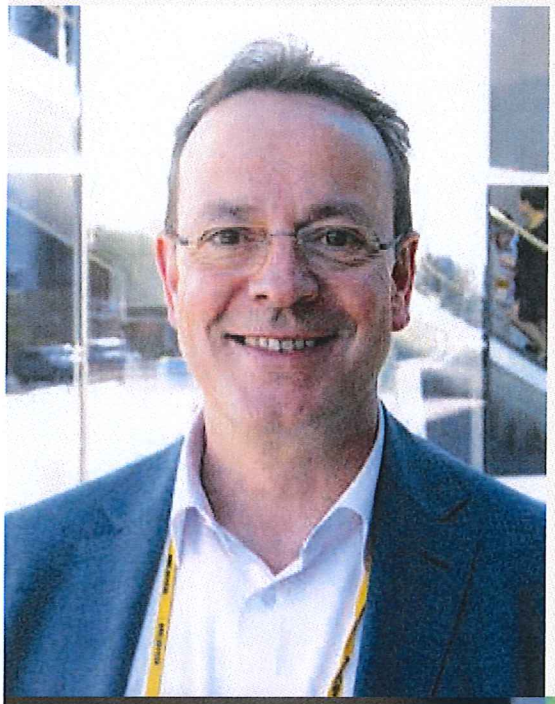
GCIRC, an abbreviation for a French title that translates as the International Consultative Group for Research on Rapeseed, was established in 1972 to facilitate and promote the scientific development of canola and rapeseed. This was its 14th International Rapeseed Congress (IRC), which is held every four years in different cities. The Canola Council of Canada (CCC) and AgWestBio co-hosted IRC 2015.

Keith Downey, one of the lead researchers who developed canola, presented the opening address. He says, "The congress is one of the few places where all the researchers in canola



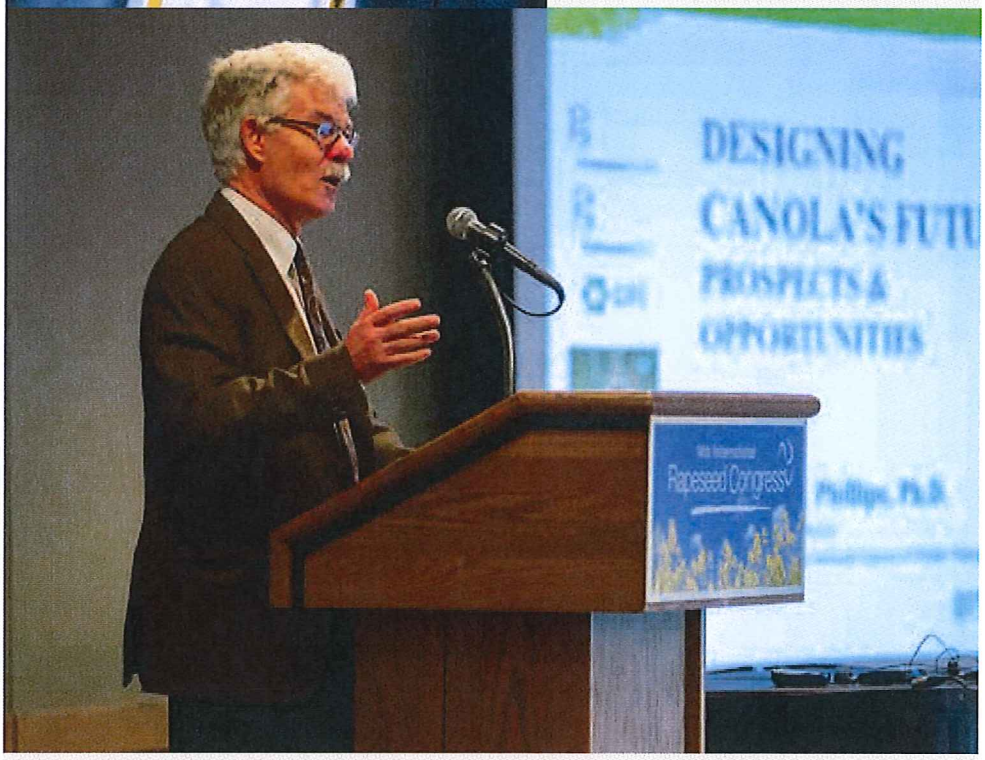
PHOTOS: (bottom) Shea Long

Keith Downey, one of the lead researchers who developed canola in the 1960s, says the International Rapeseed Congress is one of the few places where all the researchers in canola come together for scientific exchange of information.



14th International Rapeseed Congress
SASKATOON 2015

Folkhard Isermeyer, president of Germany's Thünen Institute, says the fact Canada is the only major exporter of canola has both benefits and risks.



Peter Phillips, professor at the University of Saskatchewan, says Canada's increased market share of global canola/rapeseed production is driven largely by Canada's acceptance of seed technology.

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The adopters win

The GCIRC board has made a conscious effort to broaden the scope of the congress, which was historically production focused, to include more sessions on topics related to quality, processing, utilization and market trends.

Peter Phillips, distinguished professor at the University of Saskatchewan's Johnson-Shoyama Graduate School of Public Policy, and Folkhard Isermeyer, president of Germany's Thünen Institute, made back-to-back presentations looking at opportunities and challenges for canola and rapeseed.

Phillips showed that Canada had 25 percent share of global canola/rapeseed production in 2013-14 (and a five-year average of 23 percent), up from 19 percent two decades ago. He says this increased share is driven largely by Canada's acceptance of seed technology. "The adopters win," he says.

"When we export 90 percent of what we grow and process, market acceptance is key to a healthy, profitable industry."

—Patti Miller

But Canada is the major exporter of canola or rapeseed. The other large producing regions — Europe, China and India — use theirs domestically. The benefit, Isermeyer says, is that Canada has made strong trade relationships, giving it a significant competitive advantage over any other exporters entering the market. The risk, he adds, is that Canada relies on other countries' technology and trade policies to maintain its export business.

"This emphasizes the importance of the Canola Council of Canada's efforts in trade and market access," says Patti Miller, president of the Canola Council of

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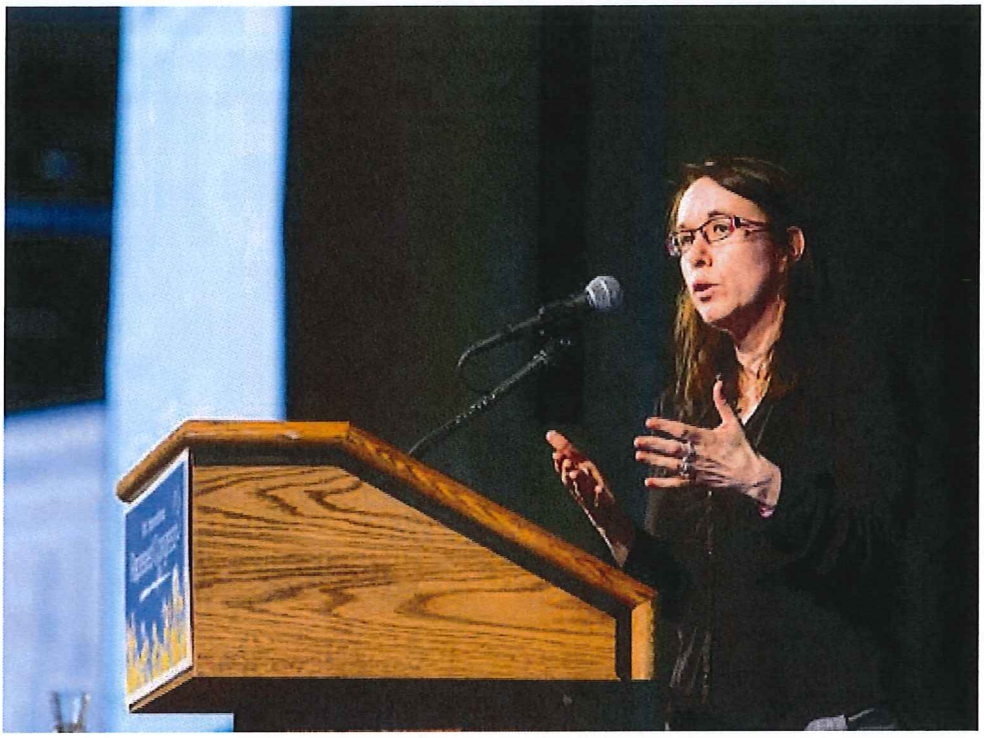

AAFC research scientist Isobel Parkin says the complexity and liquidity of Brassica genomes gives canola an advantage over other oil crops when it comes to potential genetic advancement.

PHOTO: Shea Long

Canada and co-chair of the IRC event in Saskatoon. "When we export 90 percent of what we grow and process, market acceptance is key to a healthy, profitable industry. It also emphasizes the need for everyone in the industry, especially scientists, to help educate consumers and governments about the technology we use and its contribution to sustainable, safe food production."

New specialty canola oils

James Petrie, a canola genetics specialist with Australia's Commonwealth Scientific and Industrial Research Organisation, presented his latest work on developing a transgenic approach to modify canola oil to include eicosapentaenoic acid (EPA) and up to 12 percent docosahexaenoic acid (DHA) in the seed oil — two healthy omega 3 fatty acids humans get from eating wild fish. Given the stress on natural populations of wild fish and the health benefits of these oils, there could be significant demand for this canola — as long as it gets regulatory approval.

Petrie has successfully introduced a suite of genes from microalgae, the primary producers of these specialized fatty acids, into *Brassica napus*, and is currently working with the licensee Nuseed on field trials. "One hectare of 12 percent DHA canola equals the DHA from 10,000 fish," he says. "This makes an extremely strong sustainability argument."

Exploiting genetic diversity

The global canola and rapeseed effort is looking for lots of genetic solutions — including higher yield, disease resistance, drought tolerance and nitrogen use efficiency — and with advanced genetic mapping technology and genome sequencing, many solutions will continue to come through selective breeding.

Isobel Parkin, research scientist and canola geneticist with Agriculture and Agri-Food Canada in Saskatoon, presented on the complexity of the Brassica genomes and the benefits this complexity provides for canola.

"One hectare of 12 percent DHA canola equals the DHA from 10,000 fish. This makes an extremely strong sustainability argument."

—James Petrie

The *B. napus* genome map, with around 100,000 genes, was first released in 2014 through an international collaboration led by Boulos Chalhoub, research director at French National Institute for Agricultural Research. In the short time since that work was completed, tools have come along that can map a genome in about 14 minutes.

With these tools, geneticists can explore the complexity of *Brassica* genomes to look for target genes. The six major Brassica oilseed species — *napus, rapa, juncea, carinata, nigra* and *oleracea* — have three major genomes. The enhanced tools scan genomes quickly, so geneticists can use the brassicas' genetic fluidity to find desired traits and further develop other Brassica species as oil crops, Parkin says.

For example, geneticists can compare the genomes for canola lines with better drought tolerance to the genome of canola with low drought tolerance and observe the differences in gene expression. "This should give us a clean association for desired genes," Parkin says. "We can use this to shorten the breeding process for traits of interest."

Chalhoub, who collaborates with Parkin and 80 other scientists from around the world on this work, says *B. napus* has more than 2,000 genes responsible for oil production and biosynthesis, which is double the number of oil genes in soybeans and more than double the number in palm. With this edge in genetic diversity, canola breeders will be able to more quickly and broadly improve oil content and quality as well as other traits, Chalhoub says.

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Sclerotinia stem rot resistance: The challenge of phenotyping

While genetic sequencing has advanced rapidly, scientists still have a long way to go in identifying multi-gene traits and phenotypes. A phenotype is how a genome interacts with its environment.

The quest for true sclerotinia stem rot resistance demonstrates this challenge. Martin Barbetti, professor in plant biology at the University of Western Australia, leads a study in India, China and Australia to find sclerotinia resistance in oilseed brassicas. To be marketable, a resistance trait must relate to stem infection resistance, the most costly infection, and it must be repeatable, he says.

In his presentation, Barbetti used extreme close-up images to show how brassica plants with sclerotinia resistance will build up a wall of woody lignan cells around a stem infection, blocking it from getting into vascular tissue where it spreads. His team has found this "excellent resistance" to the prevailing sclerotinia biotypes among brassica crops in India.

What's interesting is that resistance traits are often temperature dependent. Barbetti says that while some of the more promising resistance traits seem to work well at cool temperatures, the disease pathotypes seem to overcome the resistance at high temperatures.

Igor Falak, who has worked to develop Pioneer Hi-Bred canola with improved sclerotinia tolerance, says it could be 10 more years before we have sclerotinia resistance strong enough to eliminate the need for fungicide. Sclerotinia resistance is not a single gene like clubroot resistance, he says. With sclerotinia resistance, it will likely be quantitative with lots of genes working together. With so much "noise" in the environment, finding the genes responsible is difficult, especially since genes seem to express so differently depending on the environment, Falak says. "You have to respect the pathogen when you work with sclerotinia," he says. "If you are not humble, you get smacked in the face."

In the 130 or so presentations at IRC, the sharing and collaboration in all aspects of canola and rapeseed became clear.

"Fewer and fewer crops get significant attention from international private breeding companies. Canola remains one of them," says CCC president Miller. "With palm and soybeans the dominant two vegetable oil crops globally, canola needs the international collaboration that GCIRC strives for — especially for Canada, where canola is such a large part of the agriculture economy."

Downey spoke about the value of having Canadian public and private researchers participate in the Congress and in ongoing collaborative research. "Canada used to be the leader in rapeseed and canola science in just about every aspect. We look around the world now, and China and Germany I think are well ahead of us and moving very fast," he says. "Canola is a very important aspect of our diet and it's very important for our income from foreign exports. Everything has to come together to make advances."

The next IRC is in Berlin in 2019. For more on GCIRC, visit **www.gcirc.org**. For more on IRC 2015, go to **https://event-wizard.com/irc2015/0/welcome/**.

Jay Whetter is the editor of Canola Digest.

The major canola/rapeseed producers

	SHARE OF GLOBAL PRODUCTION (2014-15)*	DOMINANT CANOLA/RAPESEED SPECIES	GM PRODUCTION ALLOWED
EUROPE (28 EU COUNTRIES)	34%	*B. napus* (double low glucosinolates and erucic acid)	No
CANADA	22%	*B. napus* (double low glucosinolates and erucic acid)	Yes
CHINA	20%	*B. napus*	Under review
INDIA	10%	*B. juncea* and *B. rapa*	No
AUSTRALIA	5%	*B. napus* (double low glucosinolates and erucic acid)	Yes
U.S.	1.6%	*B. napus* (double low glucosinolates and erucic acid)	Yes
OTHER	7%		

*Source: USDA

"With palm and soybeans the dominant two vegetable oil crops globally, canola needs the international collaboration that GCIRC strives for — especially for Canada, where canola is such a large part of the agriculture economy."

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