Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada



Innovation *EXPRESS*

Science News from Agriculture and Agri-Food Canada

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Allow Us to Introduce Ourselves

Welcome to the first issue of **Innovation *Express***, our quarterly round-up of what's new in science and innovation at Agriculture and Agri-Food Canada's Research Branch.

As a key player in Canada's agri-food R&D arena, we owe it to Canadians to keep our research visible and accessible. By doing so we also hope to enhance our dialogue with the sector and present opportunities for collaborative research.

Our vision is to create a better future and improve economic prosperity for the agriculture and agri-food sector in Canada through agricultural research and innovation. We provide the agri-food sector with information, research and technology that generates wealth for producers and the country, and help achieve security of the food system, health of the environment, and innovation for growth. And, as a federal department, our work supports the overarching science and innovation directions of the Government of Canada.

We have just concluded a series of sessions with stakeholders across Canada to discuss future directions in science and innovation for the agri-food sector. One of the consistent elements coming out of these sessions was the enormous appetite for more information on our science results.

We conduct research at 19 centres across Canada, where over 600 researchers among a staff of some 2300 employees take part in world-class science and innovation programs. This newsletter shows just a sample of what we do for Canada.

Inside:

Canada

New Iceberg Lettuces Look to Capture Market Share

Two new varieties from the Horticulture Research and Development Centre in Saint-Jean-sur-Richelieu, Quebec, are ready to take part in Canada's $43-million-a-year lettuce industry. Consumers, producers and processors all stand to benefit from the result of 10 years' worth of collaborative research that led to the new varieties. The two new iceberg lettuces each show resistance to heat-related stresses that can cause rib discolouration and bolting, both of which can seriously limit marketability.

One of the new entries, dubbed Hochelaga, shows promise as a fresh-market variety. The other, known as Estival, is suitable for the processing industry and for export, in particular to the lucrative American market. Estival was also a finalist in the Canadian Seed Industry (SeCan) 2008 Seed of the Year award. The research was conducted in collaboration with the Fédération des producteurs maraîchers du Québec, the Coopérative de producteurs Multiveg, the Coop Uniforce, and several processing companies.

Canadian Barley Takes U.S. by Storm

A malting barley variety developed by Agriculture and Agri-Food Canada that dominates the Canadian prairies has now achieved similar results in the United States. Figures released by the United States Department of Agriculture, show that Canada's most popular variety, AC Metcalfe, has surged to over 30 per cent of the seeded acreage for two-row malting barley, tops for this class.

AC Metcalfe is named for the late Dick Metcalfe, who made the initial cross and performed some of the early selection work back in the 1980s. Subsequent efforts by Bill Legge led to the registration of the new variety in 1997. The work took place at the Winnipeg and Brandon research centres.

Once released, AC Metcalfe quickly became the darling of barley growers, ultimately eclipsing the benchmark variety Harrington by 2002. Its popularity among producers and processors stemmed from its improved disease resistance and superior yields, combined with its excellent malting characteristics.

Currently, AC Metcalfe makes up almost 60 per cent of the two-row malting barley acreage in Canada. Since about half of all malting barley planted on the Prairies is two-row (as opposed to six-row malting types and feed varieties), this translates to over 25 per cent of the total barley acreage.

Canada's success in producing such a competitive barley variety is likely to continue as new germplasm becomes available for breeding programs to meet the needs of producers, maltsters and brewers.

Coordinated Effort Aims to Tackle Food Allergies

As anyone who's ever had first-hand experience with an epi-pen can attest, food allergies can pose a serious threat to those who suffer from them. And so, the Government of Canada is marshalling its expertise in a bid to address the issue. Specifically, Health Canada and the Canadian Food Inspection Agency are teaming up with Agriculture and Agri-Food Canada to develop allergy intervention and control strategies and help coordinate Canadian research activities on the international stage.

This concerted effort to target food allergies grew from informal research linkages among government labs. The network will build upon the individual efforts of the participating players that are currently under way.

Dairy Industry Benefits from Long-term Collaborative Research

The last 10 years may be a blink of an eye in the world of science, but for Canada's dairy industry it's been a golden age of discovery, thanks to the Novalait project. The project has united researchers from government, university and industry labs to focus on dairy production and products. In the earlier stages of the collaboration, researchers looked at the impact of genetics and nutrition, and the results of these studies are still being used in the production of cheese and yogourt. More recent research has examined the health benefits of conjugated linoleic acid, a component of milk that has been touted as having anti-cancer properties.

Scientists are also assessing the antibacterial and antifungal properties of whey, which could further enhance the reputation of dairy products as important components of a healthy diet and boost the dairy industry. Over the course of the Novalait project, Agriculture and Agri-Food Canada has invested about $9 million and 16 departmental researchers have participated in 28 dairy-related studies.

Flax Gets GRAS

Canada's flax industry has good reason to celebrate as flaxseed has earned the United States Food and Drug Administration (FDA)'s Generally Recognized as Safe (GRAS) designation in January 2009 (Formal recognition will occur in June when the FDA issues a 'letter of no objection'). GRAS recognition for flax was the culmination of a concerted effort from a number of research institutions including Agriculture and Agri-Food Canada (AAFC), the Canadian Grain Commission, and universities in Canada and the U.S.

Although flaxseed and flaxseed oil have been recognized as safe by other U.S. government agencies, the GRAS designation by FDA remains the most important criterion for its incorporation in food products, not only in the U.S. but all around the world. A great deal of safety and toxicological data and human clinical research results are required to demonstrate that the ingredient is safe for human consumption before the FDA gives its assent.

There has been ongoing research within AAFC on flax since the 1960s. Over the years, its plant breeders have been able to develop new varieties, including those that have now been recognized as safe, and its agronomists and plant pathologists have developed beneficial management practices for flax production in Canada.

Flax Canada 2015 (FC2015), a not-for-profit corporation owned and operated by the Flax Council of Canada (FCC), vigorously pursued its goal to get the GRAS determination for flax. Major five-year funding and support from AAFC was key to the success. The corporation is also funded by the FCC, the Saskatchewan Flax Development Commission, the provinces of Alberta, Saskatchewan and Manitoba, and through the flax industry.

Canada is the world's leader in the production and export of flax – a position it has held since 1994. In 2005, Canadian flax production totalled over 1 million tonnes, according to the FCC. Besides its use for human nutrition, flax is added to animal diets to improve the quality of products. Canada currently ships 60 per cent of its flax exports to the European Union, 30 per cent to the United States, and four per cent to Japan.

The GRAS designation will open the door to new markets for flaxseed and flaxseed oil, as major food companies are expected to include more of these ingredients in their formulations. Flax is a good source of omega-3 fatty acid, making it a big draw to consumers interested in its health benefits. Once the FDA has declared a food ingredient GRAS, it may then consider health claims for it. Such a declaration further expands the marketing potential, paving the way for increased marketing advantages.

Soybean Growers Reap Windfall Benefit, Say Researchers

Years of selecting for desirable agronomic traits have resulted in an unintended – yet welcome – health benefit in current soybean varieties, say researchers at Agriculture and Agri-Food Canada. Breeders there have determined that the short-season varieties they have been improving over the past six decades have shown a one- to two-per cent increase per year of beneficial compounds known as isoflavones.

Isoflavones are sometimes referred to as phytoestrogens, owing to their resemblance to estrogen. The potential health benefits of this naturally occurring substance include reduced menopause symptoms, lowered risk of heart attack, prostate protection, improved bone protection and reduced cancer risk. Isoflavones are found in many foods, but the best source is soybeans.

Canadian researchers began breeding soybeans for short season conditions in the 1930s. One of the key areas for improvement was yield, and scientists believe this is how the bonus benefits came about.

Soybeans are legumes that can fix their own nitrogen through nodules in their roots. The roots are also where the isoflavones are produced. The working theory is that in the cool soils of the short-season region, varieties that have more isoflavones can fix more nitrogen, making for stronger, more disease-resistant plants, ultimately leading to increased seed yield. Thus selecting for seed yield would produce a corresponding increase in isoflavones. Testing is currently under way to determine the validity of this theory.

Researchers have also determined that isoflavones content is moderately heritable, which means that it is a trait relatively easy to breed for. High-isoflavone varieties can thus be further refined to satisfy the functional food markets, just as low-isoflavone varieties can be developed to meet consumer demand.

Research Agreements Reached in Poultry and Plant Breeding

A pair of recently signed research agreements between Agriculture and Agri-Food Canada (AAFC), the University of Guelph and industry representatives provides a blueprint for collaborative research efforts in the years to come. The key feature of these agreements is co-location, meaning that researchers can focus their efforts in true team fashion using existing facilities, rather than working in quasi-isolation across a number of disparate locales. The idea is that these arrangements get maximum leverage from research dollars while smoothing the road to more rapid industry uptake of research results.

One of these agreements is the Alignment of Research Capacity in Poultry Welfare, and signing on with AAFC and Guelph are the Canadian Poultry Research Council (CPRC) and the Poultry Industry Council (PIC). Each of the signatories brings a key piece to the table. AAFC has expertise in national poultry welfare research. Guelph has educational expertise and infrastructure. The CPRC makes linkages between the poultry sector and its research needs. And the PIC finances research and education for the benefit of the industry.

Together, the parties aim to pool their scientific, financial and infrastructural resources to establish a poultry welfare research cluster at the university. AAFC's contribution, specifically, will be a researcher who will be located at Guelph. The university will provide the researcher with office and lab space and academic privileges. The two industry organizations will provide financial support, including the funding of a research chair in poultry welfare.

The parties will also set up an advisory committee to offer technical advice and open the door to industry collaboration in poultry welfare research.

Meanwhile, on another front, an agreement between AAFC, Guelph and the Ontario bean industry will also feature the co-location of an AAFC researcher on the university campus, where the university operates a number of bean research programs. The result will be a rich research capacity able to better serve the needs of Ontario's bean industry.

The other players in the agreement are the Ontario Coloured Bean Growers' Association and the Ontario White Bean Producers' Marketing Board, who bring an industry perspective to the research programming. The parties will concentrate on active collaboration to advance bean breeding, as well as commercializing and sharing in the proceeds of intellectual property arising from the collaborative research.

Marshalling Forces in Bioproducts Innovation

Canada's best minds in bioproducts research and development are pooling their expertise in an effort to develop new products from Canadian agricultural sources. A number of research networks are coming together under our Agricultural Bioproducts Innovation Program, or ABIP. The program is designed to integrate Canada's talent from universities, industry and government, including scientists from AAFC, in order to stimulate creativity, leverage resources, reduce costs and accelerate progress towards commercialization of bioproducts and bioprocesses. ABIP's net benefits are expected to include more market options for Canada's farmers, jobs and growth for rural communities, new products for consumers and greener technologies for a healthy environment.

One of the networks created under ABIP is the Industrial Oil Seed Network. The aim of this network is to develop new oilseeds to produce a biodegradable and renewable substitute for petroleum products. Researchers will study the potential for applications in heavy equipment and marine towing operations, hydraulic fluids, the construction industry, for city buses and even the lobster fishery. There are even plans to examine how bio-based oils can lessen the environmental impact of urban community housing. Besides boosting the value of oilseeds, the work is expected to offer a number of economic development opportunities for rural economies, such as blending, packaging and distribution businesses stemming from the increased use of bio-based products. The research network received $3 million in Government of Canada funding under ABIP.

Another research network now up and running is the Feed Opportunities from the Biofuels Industry. This group is using a $6 million investment from ABIP to develop and harness new market opportunities in the ethanol and livestock sectors. More precisely, the network is examining the integration of livestock production and wheat-based ethanol production, and focus on creating novel co-products as well and new markets for existing co-products. The studies will include wheat breeding, fermentation processing technologies, and animal nutrition studies.

Biomass is the focus of the Cellulosic Biofuel Network, which aims to capitalize on this renewable resource to produce ethanol. The potential for ethanol production from biomass is enormous, but has been constrained by high economic and environmental costs. Working with a contribution from the Government of Canada of almost $20 million, the network is exploring the conversion of agricultural wastes to ethanol, as well as assessing the use of byproducts in feedlots and the reduction of greenhouse gasses. The work promises to pave the way to new crop varieties specifically designed for the energy market, thereby creating new economic opportunities for Canadian producers.

Tell Us What You Think

Innovation *Express* is the Research Branch of Agriculture and Agri-Food Canada's quarterly newsletter to promote research partnerships and technology transfer to organizations interested in agri-food research and development.

We welcome your comments and suggestions.

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