Preparing Pulse Ingredients for the World Stage

November, 2021

By Noelle Chorney

A team of researchers have been working closely to shift Canada's reputation as a pulse exporter to a specialty ingredient supplier. Their goal is to increase the overall demand for pulses as well as to develop a new pulse ingredient industry on the Prairies.

While various technologies, such as milling, have long been available for processing grains, application of those technologies to peas, lentils, faba beans, and chickpeas has been an area of development. Constance Chiremba, SPG's Pulse Science Cluster Program Manager says, "Researchers specializing in nutrition and protein quality are working together with the Canadian International Grains Institute and the Pulse Science Cluster at Cereals Canada to develop processing strategies that create commercial-ready pulse ingredients such as pulse flours that can be used to make pasta, pan breads, meat alternatives, dips, and sauces."

Cereals Canada is applying the expertise they've developed in pulse milling as well as their relationships throughout the cereal, pulse, and agriculture value chains. "There is great potential to increase demand for Canadian pulses and bring benefits to pulse growers by developing value added ingredients," says Elaine Sopiwnyk, Vice President Technical Services at Canadian International Grains Institute (CIGI). "We're hoping to connect the pulse ingredients to businesses ready to pilot a product, as we did previously with Warburtons, to develop a higher protein bread using pulse flour."

Mike Nickerson, Saskatchewan Ministry of Agriculture Research Chair in Protein Quality and Utilization, has been working on testing various pulse processing methods. "We are modifying proteins to create different functionality and to make the ingredients more digestible, with the goal of creating ingredient lines with different nutritional and functional qualities to compete against soy in the marketplace," he says. "We are working with InfraReady Products, Ltd. to test infrared heating, as well as other heating processes such as roasting and extrusion, and bioprocesses such as fermentation, enzyme treatments, and sprouting."

Nickerson's team is using clean label techniques – extracting proteins without the use of solvents required for higher oil content legumes like soy – then testing their functionality of the processed pulses, including their ability to hold water and oil (useful in meat alternatives and for use as binding agents), emulsification (for beverages, salad dressings, and baking), foaming (baked goods, desserts), and gelation (to control food structure).

Nickerson identifies four challenges to pulse ingredients entering the marketplace:

- **Functionality:** they can be less functional than animal proteins.
- **Protein qualities:** they can be deficient in sulfur amino acids and tryptophan, and may need to be blended with cereals to create a complete protein.
- **Flavour compounds:** they can taste 'bean-y'.
- **Supply:** to replace soy products, they need to be scalable and reliable, so food manufacturers can count on a steady supply.

Dr. James D. House, Professor in the Department of Food and Nutritional Sciences at the University of Manitoba, is working on the protein quality challenge, testing pulse ingredients to ensure they meet regulatory requirements for nutrition. "If you want to say a food product is a good source of protein, you need data to substantiate the protein claim. There is not a lot of data on these newer ingredients. We are testing whether it meets the required amino acid composition, and testing whether it is digestible. We are asking, 'How does processing impact protein quality in pulse ingredients?'"

"Some processing can improve digestibility, but too much can change it again. Amino acids stay fairly stable during processing, but they can be negatively impacted by high thermal processing techniques. We need to measure the changes to know the true impact."

The ultimate goal, says Lindsay Boyd, a technologist in the Pulse Science Cluster at Cereals Canada, is to provide "a wider variety and more consistent ingredients supplied to the food industry. More availability and applications will increase the variety of foods that pulses can be used in and raise demand for pulses. Blending pulse flours with wheat flour gives us a familiar product with an added nutritional boost in protein and fibre from the pulses. We have had great results with bread and pasta."

The potential of many pulses is still untapped. Faba beans, which can be used to create a 65% protein concentrate, have great potential in meat analogs. Lentil and chickpeas have shown excellent functional and nutrition attributes. The opportunities, once supply is steady and processes are fine-tuned, are endless.

This research and development work is funded under the *Processing Strategies for Commercially Ready Pulse Ingredients* project. SPG is proud to fund $413,625 of the $2,866,150 total project budget. This five year project is expected to conclude in 2023.

This work is related to the Canadian pulse industry's market development strategy to create new uses and new markets for 25% of Canadian pulse production by 2025. Once complete, outcomes of this project will drive new uses to increase demand for pulse ingredients in the food industry.

Published November 2022