CANOLA PLANT PROTEIN OPPORTUNITY

There is a significant opportunity for the Australian canola industry to tap into the burgeoning plant protein market and complement animal protein sources to meet human requirements[1].

Growing affluence in developing and emerging nations is making animal protein affordable for more people. In response, global animal protein production has increased significantly in the last two decades, climbing 44% to 337 million tonnes in 2019 compared with 2000[2].

The demand for protein will inevitably increase as the population grows from 7.6 billion today to almost 10 billion by 2050[3]. Population pressures, ecological considerations and resource constraints restrict the ability to meet the growing demand for animal-based protein.

One emerging source of plant protein for human consumption is derived from canola meal, a protein-rich by-product of the canola oil extraction process (Figure 1).

Currently, canola meal is typically used as a protein supplement in poultry, cattle, pig, and fish diets, but it has the potential to be further processed to produce a concentrated product called 'protein isolate'. Canola protein isolate as a food ingredient has potential to satisfy the growing appetite for plant protein in Australia and overseas.

After several decades of research and the development of processing technologies, commercial canola protein isolates are now becoming available, such as CanolaPRO®, produced by global ingredient manufacturer DSM Nutritional Products.

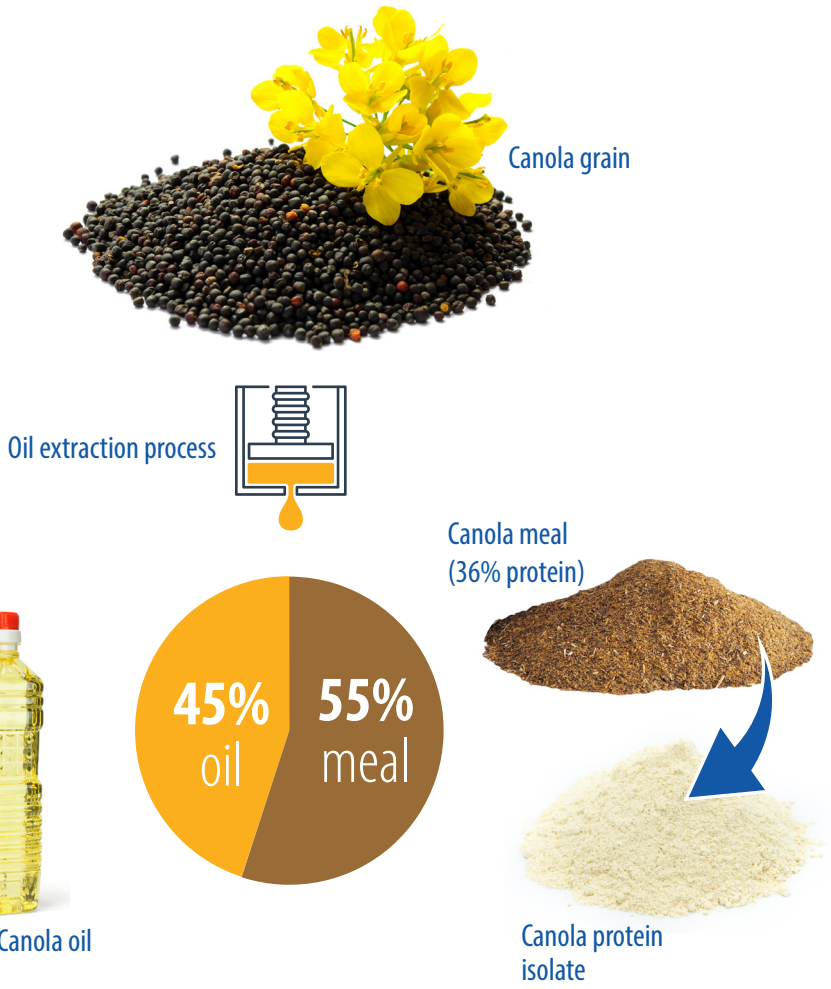

Figure 1: Typical oil and meal composition of whole canola seed.

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OPPORTUNITIES

Nutritional profile

Canola protein isolate contains high-quality protein with a well-balanced amino acid profile. Amino acids are compounds or 'building blocks' that combine to form proteins. Canola protein isolate manufacturers such as DSM extract amino acids from canola seed crushed at low temperature to preserve protein quality.

Canola protein has a high level of sulfur-containing amino acids, methionine and cysteine (40-49 mg/g protein), compared to other plant proteins, including pulses[1]. Sulfur enables the body to build and repair DNA and protect cells from damage, which helps reduce the risk of disease[4].

There are two recognised methods to score protein quality:

- Protein Digestibility-Corrected Amino Acid Score (PDCAAS)
- Digestible Indispensable Amino Acid Score (DIAAS).

Both methods rank DSM CanolaPro® in the 'excellent quality' protein category according to the UN Food and Agriculture Organisation's classification system[5].

Emerging Australian plant protein market

Australia is the third-fastest growing market in the world for plant-based foods. Sales grew 32% in FY2020 to $185 million, while production grew 70% over the same period[6]. There are now more than 200 plant-based protein products available on grocery shelves. Consumer preferences for healthy and affordable substitutes to animal protein sources have contributed to the rise in sales[7].

In line with increasing consumer demand, the number of companies in Australia working in the plant-based foods sector grew from 11 in 2019 to 22 in 2020. According to Deloitte Access Economics, manufacturing of plant-based foods will be a $1.1b industry by 2030, while product sales will reach almost $3b[8].

There is a significant opportunity for canola protein to complement pulses, wholegrains and nuts as major plant protein sources in processed food products.

$185m

FY2020 plant-based food sales

32%

Year to FY2020 sales increase

$3b

Forecast industry value by 2030

Domestic manufacturing opportunity

Around 50% of the products marketed in Australia as containing plant-based protein are manufactured overseas. Australia has the key ingredients for a domestic manufacturing sector, including:

- significant food engineering research expertise across the CSIRO, universities, state governments and private research organisations,
- experience in canola processing and an international reputation for food innovation,
- industry facilities and hubs in major canola growing regions that provide commercial support for manufacturing operations, including NSW's Special Activation Precincts[9], Qld's Food Pilot Plant[10], Victoria's Morwell Food Manufacturing Precinct[11] and Western Australia's Food Innovation Precinct[12].

CHALLENGES

Companies seeking to commercialise canola-based protein face various technical and economic challenges, including:

Processing. Heat can damage canola proteins during the oil extraction process, especially in the desolventiser/toaster stage[13]. This step removes the solvent used to extract any remaining oil from the canola solids. As well as damaging amino acids, heat can affect the protein's solubility, flavour and colour.

Canola processing in Australia is typically focused on extracting high-quality oil for food rather than preserving the quality of protein contained in the meal by-product. Recognising the opportunity to improve the value of canola protein as a source of protein isolates for human consumption will require processors to review their crushing methods to optimise quality and value across oil and protein markets.

Economic viability. Although low temperature or cold press crushing techniques can help preserve protein quality, canola meal produced this way typically contains a higher residual oil content[14]. The value of this residual oil cannot be recovered adequately when meal is sold to the animal feed market.

A challenge for the Australian canola industry is to establish whether canola plant protein extraction can be incorporated within existing canola crushing operations or whether separate, low temperature processing for oil and protein is required.

Functional properties. Functionality refers to how suitable the protein is for use in various food products or applications and how enjoyable it is to eat.

A key property is emulsification, which is the ability to combine protein with another liquid without separation. Canola protein isolates generally have limited emulsifying ability compared to soy, a common source of plant protein.

Temperature, pH and protein composition can affect the solubility of canola protein. Further processing is therefore required to achieve functional qualities that make canola protein isolates suitable for a broad range of food and beverage applications.

CURRENT RESEARCH AND DEVELOPMENT

In light of the increasingly recognised potential for canola to help satisfy the world's growing protein requirements, private and public organisations in Australia and overseas have invested in research, processing and manufacturing capabilities.

Australia

GrainCorp, CSIRO and v2food have partnered on a $4.4m research project to boost processing and manufacturing expertise related to plant protein. The project will focus on extracting protein from oilseeds, including canola and soy, and pulses, such as faba beans

and chickpeas. GrainCorp is seeking to build domestic manufacturing and supply chains for plant-based protein ingredients as a major exporter[15].

Globally

DSM Nutritional Products has developed a solvent-free processing technique to preserve the solubility, quality and functionality of canola protein. The company's protein isolate, CanolaPRO®, has functionality close to egg and soy protein with good solubility, foaming and emulsification capabilities. CanolaPRO® is best used in combination with other proteins in food and beverage products.

DSM is manufacturing CanolaPRO® in a new facility in Dieppe, France[16]. The company has also obtained FSANZ approval as a novel ingredient for use in food in Australia and New Zealand.

Figure 2: Merit Functional Food's new plant-based protein production complex in Winnipeg, Manitoba, Canada.

Burcon NutraScience from Canada, through its Merit Functional Foods business, has developed Puratein®, a high-purity canola protein isolate with at least 90% protein content. Functional benefits include superior whipping and foaming, light colour and good solubility. Commercial manufacturing commenced in 2021 using a water-based hexane-free extraction process[17].

CONCLUSION

There is a promising opportunity for canola protein to assist in satisfying the growing protein requirement for human consumption through the production of canola protein isolate. Continued investment in research, processing, manufacturing and supply chains will unlock significant value-adding opportunities for the Australian oilseeds sector.

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