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MUSTARD PROTEINS: ALTERNATIVE SOURCE FOR FILLING THE PROTEIN DEMAND

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Introduction

Among the Brassicaceae, Indian brown mustard (*Brassica juncea*), rapeseed (*B. rapa* and *B. napus*), black mustard (*B. nigra*), and yellow mustard (*Sinapis alba*) are the major oilseed crops that are valued as condiments and as sources of oil and protein worldwide. The two species together account for 20–35% of seed dry weight. During seed development, proteins are produced as precursors, modified, and sent to storage organelles where they accumulate to form a huge proportion of seed biomass. Defatted mustard seed meal forms a very high-quality protein source. The 12S globulin-type cruciferins, 2S albumin-type napins, oil-body oleosins, and most recently 7S vicilins make up 80–90% of the seed protein and they have a wide range of roles. The amino acid profile is well balanced, especially methionine rich. Because of this composition and its antimicrobial and antioxidant potential, mustard meal has long been used in feed for cattle, poultry, swine, and fish but hasn't yet become a fundamental part of human nutrition, so further research on its architecture, biological properties, and potential uses is valuable for further development.

Mustard Proteins

Nearly 80-90% of seed protein in the embryo is stored as storage protein which serves as a nitrogen reserve during germination and early growth and has become a prominent dietary protein source. The two major protein families are 12S globulin-type cruciferins (300–350 kDa) and 2S albumin-type napins (14–15 kDa), oil-body proteins like oleosins (15-26 kDa), caleosins

and the newly introduced vicilins. Mustard seed also contains anti-nutritional factors, phytates, glucosinolates and their isothiocyanate derivatives that bind nutrients, hinder absorption, can be toxic at high levels and darken protein extracts.

Functionality of Mustard Protein

Mustard protein is rich in lysine and has a balanced ratio of sulfur-containing amino acids. The production of mustard protein isolate (MPI) is technologically challenging, and no isolate is currently available commercially, in part because anti-nutritional ingredients must be removed from the protein before it can be used in food or feed. Extraction is usually done in alkaline pH, carbon treatment, precipitation, and washing, and the exact composition of MPI is summarized in Table 1. As plant proteins are getting more popular for their functional attributes, commercially available products may differ from laboratory-purified protein due to the processing methods. Production and purification are improving and plant protein is also becoming more available.

Table 1: Proximate Analysis of MPI

Total solids	Total protein	Total lipids	Total carbs	Ash	Total phenolics
97.9%	51.4%	8.2%	26.6%	11.7%	4.6–6.4%

One of the most important functional properties of mustard protein is their liquid retention which is largely determined by the ratio of polar and non-polar amino acids; mustard protein is water-holding and oil-holding.

● Gelling: Gives two-dimensional gel networks to sausage proteins and mustard protein has been shown to enhance sausage gelling properties.

● Emulsification: The mixture of hydrophobic and hydrophilic residues helps oil and water to be adsorbed onto each other to reduce surface tension and to stabilize droplets.

● Creaming: It prevents phase separation in oil-in-water emulsions.

● Color: Colors are really important (and color is one of the first things consumers look for and taste) for food products.

Applications in the Food Industry & Challenges

As concerns about animal welfare and nutrition grow, demand for plant-based proteins is growing, with soy, wheat, pea, and mustard all on the list. Mustard has a good, sulfur-rich amino acid profile and is well placed to compete for plant protein market share. Defatted seed meal is extracted and purified before being integrated into food (Table 2). Adding mustard flour into food products has been shown to increase essential amino acid and protein content without compromising acceptability, and higher MPI content has been linked to reduced cooking loss, protein loss, and stickiness.

Table 2: Products Based on Mustard Protein

Product	Type of Protein	Protein Content
Bread	Wheat + mustard flour	10%
Pasta	Mustard protein isolate	2.5–10%
Biscuits & cookies	Mustard flour / seed meal	2.5–20%
Soft drinks	Calcium-soluble protein isolate	0.2–5%
Processed meats	Protein concentrates/isolates	2%
Snack bars, soups, supplements	Protein concentrates/isolates	~1%

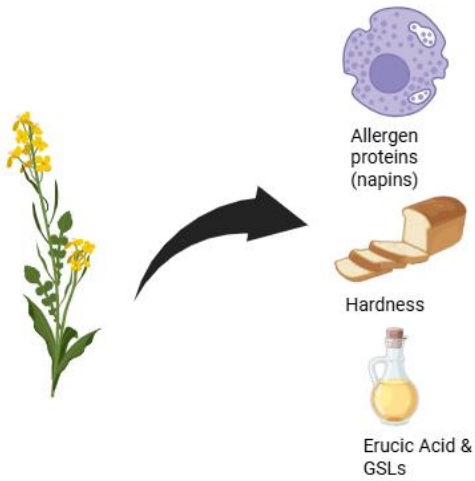

Fig 1: Challenges with Mustard Protein & Isolates

Conclusion & Future Prospects

Mustard meal is a real protein source and has a very good amino acid profile in addition to good protein content in the world market in order to meet the increasing demand and supply. But its anti-nutritional factors limit protein bioavailability and digestibility, so the research currently is trying to reduce those compounds without compromising the quality or quantity of protein, as well leading to the application of mustard protein to the food industry.

References

Bopitiya, D., Hearn, M. T. W., Zhang, J., & Bennett, L. E. (2022). Demonstration of anti-oxidant properties of mustard seed (Brassica juncea) protein isolate in orange juice. Food Chem. 396, 133648.

Marnoch, R., & Diosady, L. L. (2006). Production of mustard protein isolates from oriental mustard seed (Brassica juncea L.). J. Am. Oil Chem. Soc. 83(1), 65–69.

Paucean, A., Man, S., Muste, S., Pop, A., Chiș, S., & Cotișel, D. (2018). Physico-chemical and sensory properties of wheat bread supplemented with mustard flour. Bull UASVM Food Sci. Technol. 75(1), 82–85.