

Towards fully digestible soy protein extracts

Production of germinated protein extract and soy protein isolate with improved digestibility profile from high-protein soybeans

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This work looks into beneficial biochemical changes induced by Germination as a pretreatment to high-protein soybeans. It contributes to increasing the body of knowledge and guiding the industrial application of healthier protein ingredients from an Australian soybean variety.

Introduction

Soy has higher protein quality compared with other plant-based proteins along with high protein content. However, compared with animal proteins the digestibility of soy proteins is limited by inherently different physiochemical properties of the storage proteins characterised by large and compact structures. The co-presence of antinutritional factors such as trypsin inhibitors, phytates and tannins also reduces digestion leading to poor bioavailability of peptides and amino acids. Less digested protein in the upper gastrointestinal tract means increased amounts of intact proteins reaching colon which may cause increased colonic fermentation of proteins and related health issues due to production of toxic metabolites.

Why germination?

Natural programming of the seeds to come out of dormancy and germinate during germination under suitable conditions leads to microstructural changes including degradation of protein. For example, Zahir et al (2020) have shown that pre-treatment with germination increased the degree of duodenal hydrolysis in-vitro (Fig 1). Germination is also capable of reducing selected antinutritional and off-flavour factors in a variety-specific manner.

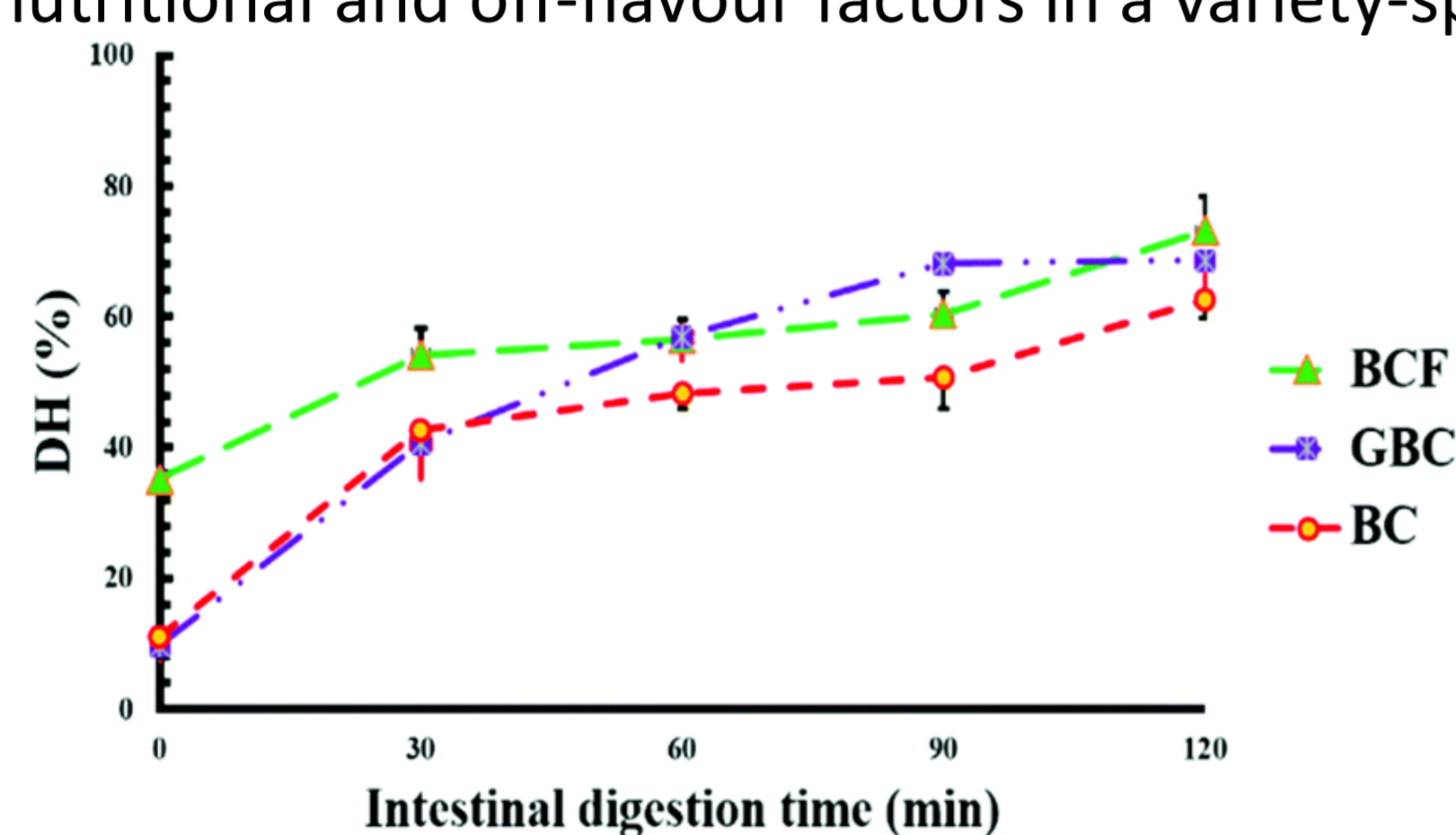


Figure 1: Degree of protein hydrolysis (DH%) of isolated soybean cells during duodenal digestion BC: boiled cotyledon cells, BCF: fermentation boiled cotyledon cells; GBC: cells of germinated and boiled cotyledons.¹



Figure 2: Schematic of experiments to prepare protein extracts and perform in vitro digestion experiments.



Figure 3: High-protein soybeans germinated in incubator at 25°C under dark in our lab.

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FOR FURTHER INFORMATION

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Key Findings

- Experimental product, germinated protein extract (SBG) had a 1.25-times higher degree of hydrolysis per gram of protein than in house prepared soy protein isolate (SPI) after in vitro digestion using INFOGEST protocol.
- The soluble protein (mg/g dry mass) available for digestion was found to be 1.6-times in SBG as compared to SPI.
- Phytates were in negligible amounts in SBG compared to SPI.

Future Directions

- ✓ After digestion and complete antinutritional factor profiling, colonic fermentation profile of experimental control and test products will be performed.
- ✓ The digests will be subjected to peptidomic analysis and basis will be provided for evidence collection on healthy peptides generation.

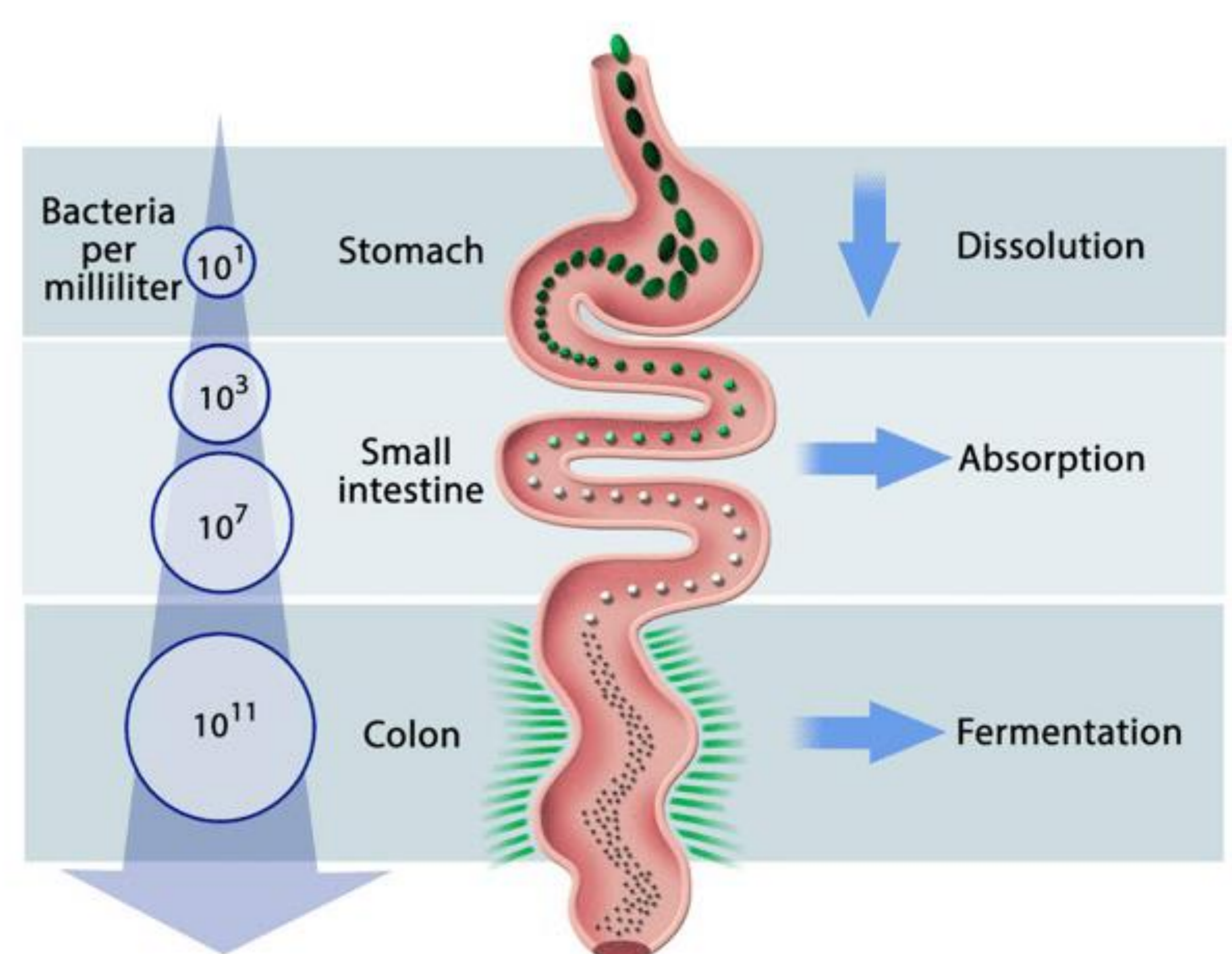


Figure 4: Different physiological processes involved in protein metabolism through out the journey in gastrointestinal tract.²