Faba Bean as a Promising Emulsifying and Gelling Alternative to Soy

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For several years, consumer demand has been increasing for minimally processed foods with a lower environmental impact and free from artificial chemical ingredients [1]. One potential solution to this challenge is the use of plant proteins, known for their stabilizing and gelling properties [2]. However, the complexity of these systems makes them difficult to control and remains a major barrier to their integration into food formulations.
Among the protein-rich plants, soy is the most extensively studied. Its good water solubility, along with its emulsifying and gelling properties, makes it an attractive candidate for use in the food industry. However, its high content of isoflavones, classified as endocrine disruptors, poses a risk with excessive consumption [3]. Although less studied, the faba bean shows a great potential. It can be cultivated in many regions of the world, including China, European countries, Australia and Ethiopia, and its tolerance towards cold climate enables local production while reducing environmental impact. Moreover, it offers valuable nutritional benefits that contribute to a healthy diet [4]. Despite being underappreciated, its physicochemical properties make it a highly promising candidate for innovative food applications.
The objective of this project is to understand the emulsifying and gelling properties of plant-based proteins and to relate them to their composition, their production process, and their physico-chemical environment in simple systems. The ultimate goal is to apply this knowledge to more complex systems, such as dairy-like food models. Faba bean protein isolate and soy protein isolate with equivalent protein contents were studied. Although both are capable of forming stable and well-structured emulsions and gels, their levels of water-soluble proteins differ. Soy protein isolate, which contains a higher proportion of soluble proteins, appears to be mainly stabilized by this soluble phase. In contrast, faba bean protein isolate seems to be stabilized by both the soluble and insoluble fractions in a more balanced way. The gelation mechanism also appears to be influenced by the relative contributions of the soluble and insoluble fractions. To investigate this, particular attention was paid to the roles of these two fractions. The solubility of the isolates in water was analyzed, along with the ability of the different plant protein fractions to reduce interfacial tension and form stable emulsions. The gelling ability and mechanism were further examined through rheological measurements.

Keywords:
Emulsion, Faba bean, Gel, Lipids, Proteins, Soy

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