

Isolation and functionalisation of plant proteins

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Why are plant-based proteins an ever increasing trend?

- Healthy reasons
- Dietary preferences
- Food intolerances
- Ethical motivations

What are the positive aspects of their use?

Environmental aspects

Potential low life cycle environmental impact.

Healthy aspects

- Role in glycaemic control in combination with standard therapy
- Potential antioxidant power

What are the negative aspects of their production?

Typical industrial processes for plant-based protein extraction from different sources involve a first basic extraction step followed by isoelectric precipitation at low pHs, followed by neutralisation and drying. During precipitation denatured proteins aggregate through physical and non-specific bonds, and heating application lead to negative changes in the surface properties, reducing their solubility and making food use difficult.

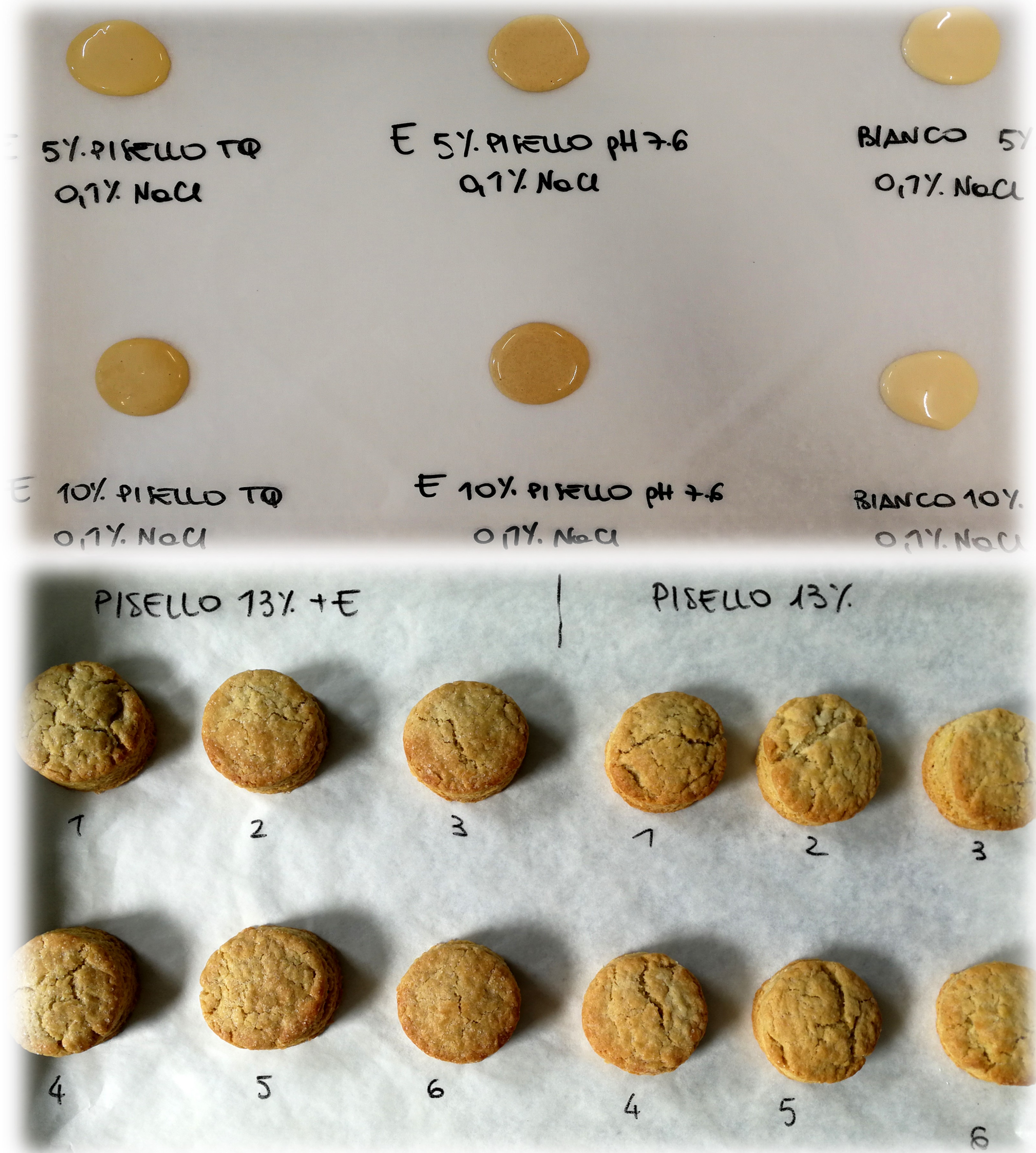
Are there alternative greener extraction techniques?

Hadnadev et al. (2017) claim that *ultrasound assisted extraction* showed increased extraction efficiency more than two times and *enzymatic (protease) assisted extraction* has increased the yield from 27,8% to 66,2%.

Are there any post-extraction treatments?

Different physical/chemical post-extraction methods are also evaluated in the literature in an effort to improve the functional characteristics of the extracted proteins. For example, the functional properties of soy proteins could be improved through the *conjugation with phenolic substances* (Djuardi et al., 2020). Even, hydrolysis of a protein is a simple and potentially green method to convert protein into free amino acids and short chain polypeptides. Such products are far more soluble in water than the original protein, yet their amino acid composition remains essentially unchanged but the process requires careful optimisation.

Activity	Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A1) <i>Bibliographic research</i>																									
A2) <i>Acquisition of knowledge</i>																									
A3) <i>Plant proteins use in food formulations</i>																									
A4) <i>Innovative extraction processes</i>																									
1) PEF (Pulsed Electric Field)																									
2) Enzymatic assisted extraction																									
A5) <i>Functionalisation techniques</i>																									
1) Hydrolytic enzymes																									
2) Conjugation with natural antioxidant extracts																									
A6) <i>Definition of extraction process variables</i>																									
A7) <i>Evaluation of food application</i>																									
A8) <i>Thesis and Paper Preparation</i>																									



Expected results

- ◆ Evaluation of the impact (either positive or negative) of conventional and alternative process extraction parameters (e.g. pH, temperature, time, stirring level) on the extraction yield of plant proteins;
- ◆ Evaluation of the impact of the extraction technique and of physical/chemical post-extraction treatments on functional and technological properties (i.e. solubility, emulsifying and gelling capacity) of extracted proteins;
- ◆ Identification of best-exploitation “recipes” of the obtained proteins in different food applications based on their functional and technological properties.

Djuardi AUP, Yuliana ND, Ogawa M, Akazawa T, Suhartono MT (2020) Emulsifying properties and antioxidant activity of soy protein isolate conjugated with tea polyphenol extracts.J Food Sci Technol **57**(10): 3591-3600.

Hadnadev MS, Dapčević Hadnadev TR, Pojić MM, Šarić BM, Mišan AČ, Jovanov PT, Sakač MB (2017) Progress in vegetable proteins isolation techniques: A review. *Food Feed Res* **44**(1): 11-21.