

# GreenNutriFood

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# BOOK OF ABSTRACTS

1ST INTERNATIONAL CONGRESS ON  
SUSTAINABLE FOOD, GREEN CHEMISTRY  
AND HUMAN NUTRITION

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**University of Zagreb, Faculty of Food Technology and Biotechnology**

**Universitat De València, Faculty of Pharmacy and Food Sciences**

**1st International Congress on Sustainable Food, Green Chemistry and Human  
Nutrition**

**GREENNUTRIFOOD2025**

# **Book of Abstracts**

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# FIBRE-RICH INGREDIENTS OBTAINED AFTER RAPESEED PROTEIN ISOLATE PRODUCTION VIA ALKALI AND DES EXTRACTION

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## Abstract

Rapeseed is primarily grown for oil production, but its high-protein cake is also suitable for protein isolate production. The conventional method for protein extraction involves alkaline extraction followed by acid precipitation. However, deep eutectic solvents (DESs) are emerging as promising alternatives. After protein isolate production, residual by-products are generated, and to align with circular economy principles, valorizing these fibre-rich by-products is essential.

Fibre-rich ingredients obtained from cold-pressed rapeseed meal after protein isolate production were compared using three extraction systems: 1) alkali extraction at pH 12 with ethanol (84%) pretreatment, 2) DES extraction with choline chloride:urea (ChCl:urea), and 3) betaine: citric acid. The ingredients were analyzed for their chemical profile, mineral content, amino acid profile, antinutrient content, and colour.

In all the ingredients, dietary fibers dominated ( $46.9 \pm 2.36\%$ – $63.0 \pm 1.44\%$ ), but they still contained a significant amount of proteins ( $22.5 \pm 0.24\%$ – $35.5 \pm 0.66\%$ ). The ingredients were rich in minerals, especially potassium, magnesium, zinc, manganese, and iron. Choline chloride:urea extraction resulted in the highest lysine and methionine content compared to the other ingredients, with methionine being present only in DES-based ingredients.

Glucosinolates were not detected in any of the ingredients. Alkali extraction was the most effective at minimizing total phenolic content ( $0.01 \pm 0.0003$  g GAE/100 g) and tannins due to the pretreatment for polyphenol removal. DES extraction resulted in fibre-rich ingredients containing  $0.13 \pm 0.04$  g GAE/100 g (ChCl:urea) and  $0.14 \pm 0.04$  g GAE/100 g (betaine: citric acid). The lowest phytic acid content was achieved with betaine: citric acid extraction ( $1.05 \pm 0.06$  mg/100 g), while ChCl:urea resulted in the highest phytic acid content ( $2.24 \pm 0.07$  mg/100 g).

Both DESs outperformed alkali extraction in terms of ingredient colour parameters. The  $L^*$  value of the alkali extraction-based ingredient was  $44.1 \pm 0.02$ , compared to  $51.1 \pm 0.05$  for ChCl:urea-based ingredient and  $56.9 \pm 0.08$  for betaine: citric acid-based ingredient.

These results suggest that further investigation into DES systems for rapeseed protein isolate production is warranted, considering not only the proteins but also the valorization of fibre-rich by-products, which seem to be potential ingredients for food-grade systems.

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**Keywords:** rapeseed protein isolate, fibre-rich ingredients, alkali extraction, DESs, characterisation