Summary

By-products of the oil industry, including rapeseed, sunflower and milk thistle meals, represent a valuable yet still underutilized source of plant protein for human nutrition. In parallel, recent years have witnessed an intensive development of research on plant-derived bioactive peptides, including those obtained from oilseed crops. The aim of this study was to develop and optimize a process for producing peptides from proteins of selected press cakes with potential antioxidant and antihypertensive properties, and to assess the feasibility of transferring the developed technology to industrial conditions.

In the experimental part, the oilseed meals were characterized in terms of chemical composition, and a protein isolation procedure was developed consisting of alkaline extraction, isoelectric precipitation, and purification of the protein curd. The resulting concentrates exhibited high protein content on a dry-matter basis. Bioactivity potential was first assessed *in silico* using the BIOPEP-UWM database and subsequently verified experimentally after enzymatic hydrolysis of the proteins with plant proteases: papain, bromelain and ficin. Antioxidant activity was determined using ABTS, DPPH and FRAP assays, whereas antihypertensive activity was evaluated based on angiotensin-converting enzyme (ACE) inhibition, expressed as percentage inhibition and IC_{50} value.

The obtained hydrolysates exhibited significant antioxidant activity and ACE-inhibitory capacity in all tested variants. At the same time, the bioactivity profile depended on the type of raw material, the enzyme used, and the analytical method applied, indicating the need to select the raw material–enzyme pair according to the desired biological effect. The developed process was successfully scaled up to industrial level, yielding hydrolysates with comparable composition and preserved bioactivity relative to the laboratory scale.

Keywords: antioxidant activity; antihypertensive properties; protein hydrolysates.