

Physicochemical Properties of Cold-Pressed Pumpkin Seed Oil and Press Cakes: A Path Toward Sustainable Valorization

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The increasing acknowledgment of cold-pressed oils and their by-products, such as press cakes, as sources of health benefits, environmentally sustainable products, and potential applications in the food industry presents a notable challenge. However, there is a critical need for a deeper understanding of their physicochemical properties, the efficiency of oil extraction processes, and the potential for valorizing press cakes. The study examined the yield, fatty acid composition, oxidative stability, and nutritional properties of cold-pressed pumpkin seed oil and its press cakes. The residual press cakes were evaluated for their protein, dietary fibre, and amino acid profiles in order to assess their functionality and potential applications. The oil derived from pumpkin seeds exhibited a moderate oil content (41.56%) and a relatively low extraction efficiency (16.95%), which was attributed to suboptimal moisture levels (2.01–4.41%). The oil was found to be rich in unsaturated fatty acids, primarily linoleic acid (52.95%), with a moderate oxidative stability (induction period: 13.78 hours). The press cakes retained a significant proportion of residual oil (34.69%), high protein content (44.50%), and dietary fibre (24.46%). The essential amino acid analysis revealed a high leucine and arginine content, indicating a high nutritional value. These findings are in accordance with the growing interest in cold-pressed oils, which are known to retain bioactive compounds such as essential fatty acids, phenolics, and tocopherols. The study highlights the dual value of pumpkin seed oil and its press cakes as health-promoting and functional ingredients. The bioactive properties and moderate stability of pumpkin seed oil make it suitable for use in nutritional applications. The nutrient-rich press cakes present opportunities for use in functional foods, supplements, and dietary formulations. This aligns with the principles of the circular economy, contributing to economic and environmental sustainability in oilseed processing. [2, 4] Future studies should focus on optimising extraction methods and exploring diverse applications for these by-products.

Biography

Ivett Jakab is a distinguished scholar in the field of food science, currently pursuing her doctoral studies at the Hungarian University of Agriculture and Life Sciences. Her academic credentials include a Master's degree in Food Safety and Quality Engineering and a Bachelor's degree in Food Engineering. Her expertise encompasses alternative proteins, and cereal-based innovations. In her role as assistant lecturer, Ivett provides active mentorship to students and contributes to the advancement of food science education. Her research is centered on the development of sustainable food production methods, with a particular focus on the integration of pressed cakes into food products. Ivett's work is reflected in 12 scientific publications, which demonstrate her commitment to innovative and practical food science solutions. Notable projects include the development of automated smart devices for the baking industry and the exploration of the use of apple pomace in gluten-free biscuits.

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