10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Unconventional Yeast in the Bakery Industry

Authors:
Cristian Mititiuc, Ionut Avramia

INTRODUCTION

The bakery industry plays a significant role in the food sector and continues to evolve to meet consumer expectations for healthier, artisanal, and innovative products. While Saccharomyces cerevisiae remains the primary yeast used in breadmaking because of its strong leavening power and consistent results, recent interest has shifted toward unconventional yeasts such as Torulaspora delbrueckii, Candida milleri, Pichia anomala, and Yarrowia lipolytica. These strains show potential in enhancing flavor complexity, nutritional quality, and stress tolerance, although they are generally less efficient in leavening and present challenges for industrial applications.

MATERIALS AND METHODS

This review collected and analyzed information from existing scientific studies focusing on the use of unconventional yeasts in bakery products. The approach included:

- Assessing the advantages of non-*Saccharomyces* strains in terms of aroma development, nutritional enhancement, and stress resistance.
- Comparing their technological properties with those of *S. cerevisiae*.
- Summarizing the main yeast genera and species of interest for bakery fermentation.
- Highlighting hybrid fermentation strategies that combine conventional and unconventional yeasts to optimize both sensory and technological performance.

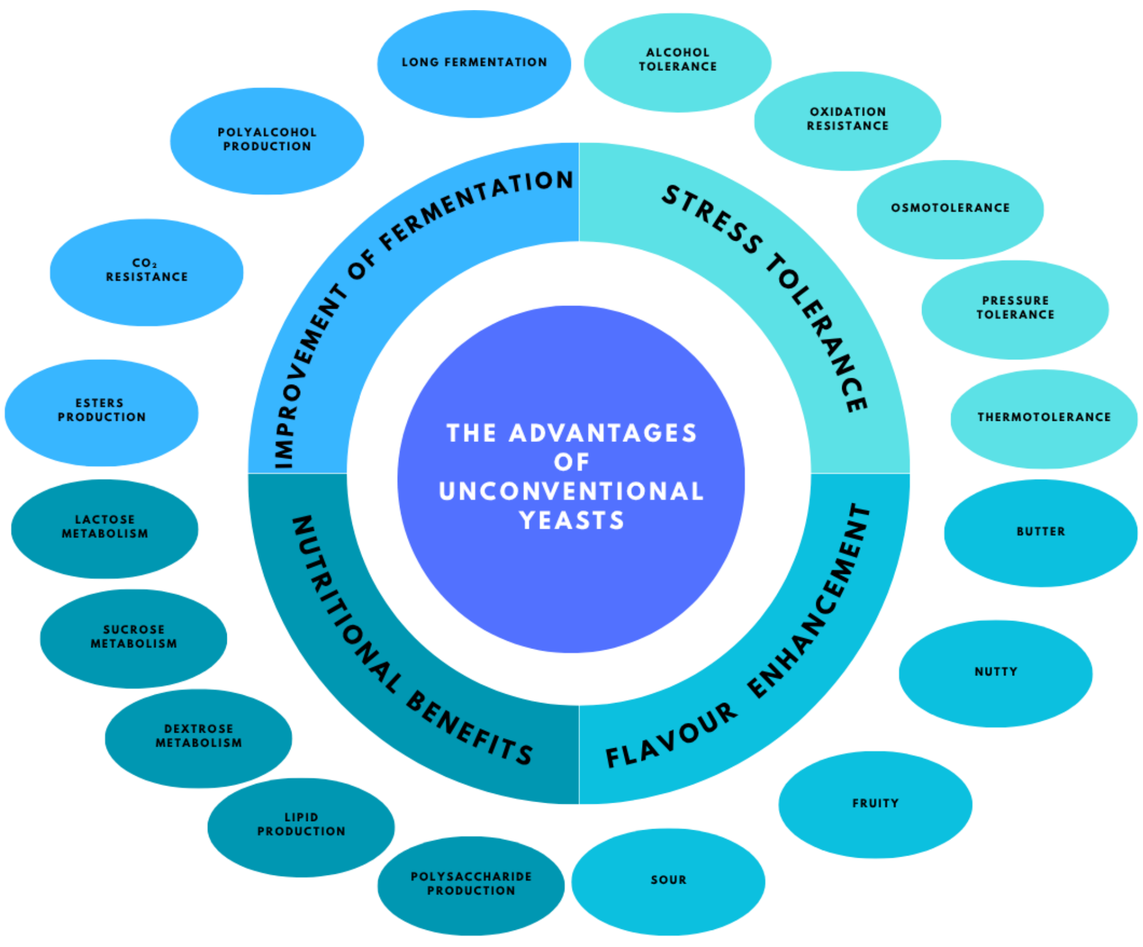
Tables and comparative summaries were used to organize the information regarding flavor compounds, dough performance, stress tolerance, and nutritional outcomes.

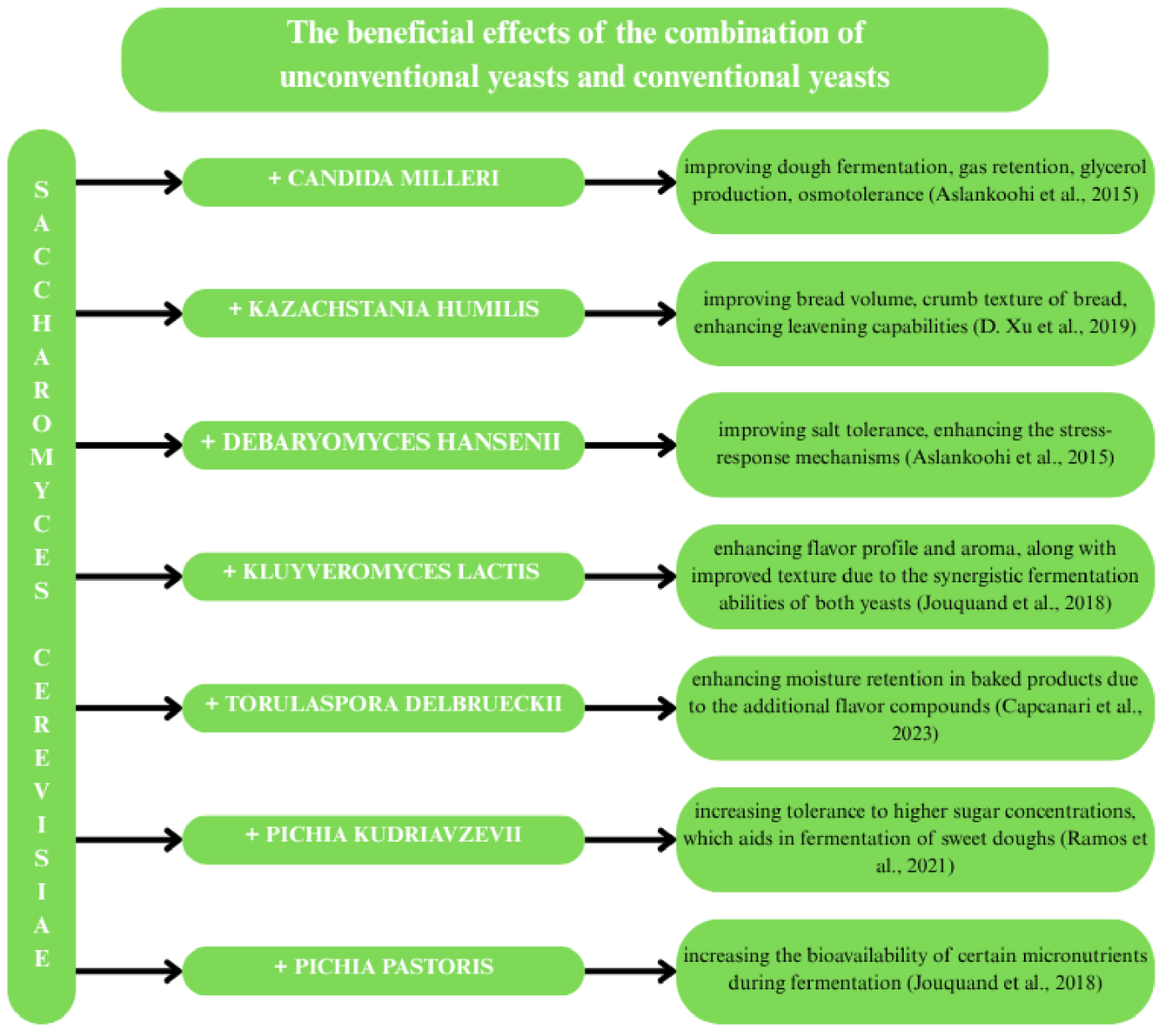
RESULTS AND DISCUSSION

Unconventional yeasts demonstrated several advantages for bakery applications. They contribute to improved sensory qualities by producing a diverse range of volatile compounds, including esters, higher alcohols, and organic acids, which add complexity to bread flavor. In addition, certain species enhance nutritional value by synthesizing vitamins, releasing minerals through phytate degradation, and increasing overall bioavailability of micronutrients.

Another important feature is their resilience under stress conditions such as osmotic pressure, temperature fluctuations, and oxidative environments, making them suitable for specific fermentation processes. However, these benefits are balanced by limitations, including weaker leavening power, variability in fermentation kinetics, sensitivity to drying or freezing, and loss of volatile compounds during baking.

Another important feature is their resilience under stress conditions such as osmotic pressure, temperature fluctuations, and oxidative environments, making them suitable for specific fermentation processes. However, these benefits are balanced by limitations, including weaker leavening power, variability in fermentation kinetics, sensitivity to drying or freezing, and loss of volatile compounds during baking.





CONCLUSIONS

Unconventional yeasts represent a valuable resource for the future of the bakery industry. They provide opportunities to diversify flavors, enhance nutritional profiles, and improve fermentation resilience. Despite their weaker leavening performance and challenges in industrial use, their integration through hybrid fermentations with S. cerevisiae offers a viable solution. The adoption of these yeasts aligns with current consumer trends and opens new possibilities for innovation, supporting the development of healthier, more flavorful, and sustainable bakery products.

Acknowledgements

The authors thank the scientific community for their valuable contributions to research on unconventional yeasts in bakery applications.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

The cryoprotective effect of waxy wheat flour on baker's yeast in frozen dough

Ioana ISACHE

INTRODUCTION

Freezing of leavened dough is a valuable technology in bakery processing; however, yeast viability is reduced due to osmotic stress and the formation of ice crystals. Waxy wheat flour, characterized by an amylose content below 5% and an amylopectin content above 95%, exhibits functional properties that recommend it as a cryoprotective agent. Due to its high amylopectin content and enhanced water retention capacity, waxy flour contributes to mitigating cellular damage induced by ice crystal formation during freezing.

MATERIALS AND METHODS

In the present study, supplementations of 10%, 15%, and 20% waxy wheat flour were tested in the formulation of frozen mini-baguettes stored at −18 °C. The analysis of CO_2 release by yeast was conducted to assess its fermentative activity. Samples containing waxy flour were compared with a control sample that did not receive supplementation. Fermentative activity was correlated with texture and specific volume of the mini baguettes to determine the protective role of waxy flour on yeast cells.

RESULTS AND DISCUSSION

The analysis of CO_2 release by yeast demonstrated that samples containing waxy flour exhibited higher values compared to the control sample, even after 56 days of frozen storage. Fermentative activity was positively correlated with texture and specific volume of the mini-baguettes, confirming the protective role of waxy flour on yeast cells. The incorporation of waxy wheat flour into frozen mini-baguette dough enhanced yeast resistance to thermal stress, maintained cellular viability, and ensured superior sensory attributes of the final product.

Supplementation of frozen mini-baguette dough with waxy wheat flour improves the viability of Saccharomyces cerevisiae during storage at −18 °C. Due to its high amylopectin content and superior water retention capacity, waxy flour reduces cellular damage caused by ice crystal formation during freezing. The addition of 10–20% waxy flour maintains yeast fermentative activity and enhances the quality of the final baked products, even after 56 days of frozen storage. Fermentative activity showed a positive correlation with the texture and specific volume of the mini-baguettes, confirming the protective role of waxy flour on yeast cells. Waxy wheat flour can be effectively employed as a natural cryoprotective ingredient in modern bakery production, contributing to superior quality in frozen baked goods.

CONCLUSIONS: Waxy wheat flour improves yeast viability and fermentative performance in frozen dough. Its use enhances product quality and serves as an effective natural cryoprotective agent for bakery applications.

ACKNOWLEDGEMENTS: The author gratefully acknowledges the support of the Faculty of Food Engineering, Ștefan cel Mare University of Suceava, Romania, for providing the facilities and resources necessary to conduct this research.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Hazelnut-Based Alternative to Dairy in Functional Ice Cream Formulations for Lactose-Free Consumers

Ionela-Cristina Iacoban[1], Adriana Dabija

INTRODUCTION

The increasing prevalence of **lactose intolerance** and the rising consumer preference for **plant-based and sustainable foods** have driven significant innovation in dairy-free product development. Ice cream, one of the most popular frozen desserts worldwide, presents particular challenges when reformulated without milk, as its **texture, creaminess, and stability** depend strongly on the interactions between milk proteins and fats.

Hazelnuts (Corylus avellana L.) represent a valuable plant-based alternative due to their **high content of unsaturated fatty acids (≈67%)**, **plant proteins (≈18%)**, and **bioactive compounds** such as tocopherols and phenolic antioxidants. These properties contribute not only to improved nutritional balance but also to enhanced oxidative stability and sensory quality in functional formulations.

The development of **hazelnut-based lactose-free ice cream** aligns with global trends in **functional and health-oriented foods**, offering benefits such as lower saturated fat, absence of cholesterol, and suitability for lactose-intolerant and vegan consumers.

This research investigates the **technological feasibility, nutritional composition, rheological behavior, and sensory performance** of hazelnut beverage and hazelnut cream as **dairy substitutes** in functional ice cream formulations.

MATERIALS AND METHODS

Base ingredients:

Hazelnut based ice cream- Hazelnut beverage (3.5% fat) and hazelnut cream (30% fat) prepared from Metro Chef hazelnuts (67.5 g fat, 17.8 g protein /100 g).Carob powder and sugar.

Milk based ice cream- milk (3.5% fat), cream (30% fat), carob powder and sugar.

Processing steps:

- High-speed homogenization
- Maturation for 12 h at 2–5 °C
- Turbine aeration and freezing at −18 °C

Comparative samples: 9 hazelnut-based formulations vs. 9 dairy control (milk + cream).

Analyses:

- Nutritional content (energy, fat, protein)
- Physico-chemical (pH, acidity, °Brix, FT-IR, fat content, protein content, ash content)
- Rheological properties (viscosity, G′, G″, texture)
- Sensorial characteristics (color, aroma, consistency, sweetness, acceptability;)

RESULTS AND DISCUSSION

1. Nutritional Content

Hazelnut-based formulations displayed a favorable nutritional profile compared with dairy ice cream.

- **Energy:** 98–318 kcal/100 g (hazelnut) vs. 187–301 kcal/100 g (dairy)
- **Fat:** 2.8–24.0 g/100 g, primarily unsaturated fatty acids, contributing to a healthier lipid profile.
- **Protein:** 1.0–6.6 g/100 g (vs. 2.5–12.4 g/100 g in dairy samples).

Overall, the hazelnut formulations were lactose-free, lower in saturated fat, and richer in antioxidants, aligning with the principles of functional food development.

2. Physico-Chemical Properties

All hazelnut ice cream samples exhibited stable emulsions and homogeneous structures.

- The **pH** and **°Brix** values were comparable to those of dairy formulations, indicating consistent solubility and sugar concentration.
- **Ash content:** slightly lower in hazelnut-based samples, reflecting lower mineral contribution compared to milk.
- **Ash** and **solid content** correlated with the ratio of hazelnut beverage to cream.
- **FT-IR spectra** indicated lipid–protein interactions comparable to those in milk emulsions, demonstrating functional equivalence in the ice cream matrix.
- The incorporation of hazelnut components maintained good freeze–thaw stability and colloidal consistency, confirming technological feasibility in lactose-free formulations.

3. Rheological Properties

Rheological testing confirmed that hazelnut-based ice creams exhibited pseudoplastic (shear-thinning) behavior, typical of ice cream systems.

- Viscosity increased proportionally with the amount of hazelnut cream, leading to enhanced creaminess and body.
- The elastic (G′) and viscous (G″) moduli showed balanced viscoelastic behavior, ensuring desirable structural integrity.

T**exture profile analysis (TPA)** demonstrated that:

- Hazelnut formulations had **slightly lower hardness** but **higher cohesiveness and adhesiveness**, resulting in a smoother perception.
- The improved **elasticity and creaminess** correlated with the increased unsaturated fat content and reduced ice crystal formation.

4. Sensorial Characteristics

Sensory evaluation confirmed high consumer acceptance.

- Increasing hazelnut cream enhanced flavor intensity, creaminess, and overall acceptability.
- No off-flavors, waxy sensation, or textural defects were perceived.

Hazelnut-based ice creams demonstrated comparable texture, rheology, and sensory performance to conventional dairy ice cream. Their improved nutritional profile, functional value, and absence of lactose make them a promising alternative for health-conscious and lactose-intolerant consumers.

Figure 1. Etalon (milk-based) and Hazelnut (plant-based) ice cream samples P1–P9 used for comparative analysis.

Figure 2. Hazelnut-based ice cream during the freezing process at −12 °C, showing smooth texture and stable emulsion structure obtained with hazelnut beverage and cream formulations.

CONCLUSIONS

This study demonstrates that **hazelnut beverage and hazelnut cream** can successfully replace dairy ingredients in the formulation of **functional, lactose-free ice cream** without compromising product quality.

The hazelnut-based formulations exhibited **stable emulsions**, **balanced rheological and textural properties**, and **high sensory acceptability**, comparable to conventional dairy ice cream. Their **improved nutritional profile**—characterized by reduced saturated fat, the absence of lactose, and enhanced antioxidant potential—supports the development of healthier frozen desserts. These findings confirm the **technological feasibility and functional potential** of hazelnut matrices as sustainable dairy alternatives in modern food innovation.

Acknowledgements

The author expresses sincere gratitude to **Prof. univ. ec. dr. ing. Adriana DABIJA** for her valuable scientific guidance and continuous support throughout this research. Appreciation is also extended to the **Faculty of Food Engineering, Ștefan cel Mare University of Suceava**, for providing laboratory facilities and technical assistance during the experimental work.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Application of differential scanning calorimetry (DSC) in identifying adulteration of cold- pressed walnut oil with refined sunflower oil

Georgiana Fediuc, Mircea Oroian

INTRODUCTION

Walnut is the oldest and most widely cultivated oilseed crop worldwide (FAO, 2013). Due to the high nut yield, walnut oil (WO) is recognized as a high-value vegetable oil. Walnut oil is rich in unsaturated fatty acids (FA, >90%), especially the omega-6 essential linoleic acid (50-70%) and omega-3 linolenic acid, as well as a variety of bioactive compounds, such as squalene, phytosterols, tocopherols, etc.

(Zhang et al., 2023). The DSC technique works by subjecting an oil sample to a controlled temperature program, during which its response is recorded as a distinct thermal profile, driven by the oil's intrinsic physical and chemical properties.

MATERIALS AND METHODS

Materials

In 2023, sixteen samples of walnut oils were obtained by cold pressing from different sources. The raw material, the walnut kernel, was subjected to mechanical pressing in a screw press. The samples were kept in glass bottles and stored at 8ºC. For the adulteration of walnut oil, binary mixtures of walnut and sunflower oil were prepared at different concentrations (5%, 10%, 20%, 30%, 40%, 50%). A total of 23 samples were analyzed.

Methods

Calorimetric analyses were performed using a TA4000 differential scanning calorimeter (Mettler-Toledo). Heat flow calibration was performed using. Temperature calibration was performed using hexane (mp -93.5°C), water (mp 0.0°C) and indium (mp 156.6°C).

Each oil composition exhibited distinct thermal profiles, which were identified through DSC analysis. Walnut oil showed a crystallization onset temperature (Tonset) of –41.53 °C and an enthalpy of 21.61 J/g, indicating a high content of saturated and monounsaturated fatty acids specific to walnut oil. In comparison, sunflower oil displayed a significantly lower crystallization enthalpy (5.22 J/g) and a higher Tonset (–40.52 °C), suggesting a different lipid profile characterized by a higher content of polyunsaturated fatty acids. With the progressive increase in sunflower oil content within the mixtures, a gradual variation in thermal parameters was detected. Samples containing 40% and 50% of sunflower oil exhibited reduced crystallization enthalpy values (5.43 J/g and 6.06 J/g, respectively), displaying thermal behavior characteristic of sunflower oil, thus highlighting its predominant influence at higher levels of substitution.

CONCLUSIONS

This observation demonstrates that thermal parameters represent reliable and sensitive markers for assessing the authenticity of walnut oils and for accurately identifying adulteration with other oil types.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Effects of germinated buckwheat flour addition on dough rheological properties during extension and fermentation

Olivia ATUDOREI, Georgiana Gabriela CODINĂ

INTRODUCTION

Bread represents a staple food product in the human diet, being consumed on a daily basis across the globe. Consequently, scientific research has increasingly focused on identifying innovative approaches to improve conventional bread formulations, either by adapting them for individuals affected by celiac disease or by enriching their nutritional properties. The present study explores the potential applications of germinated buckwheats in bread production and investigates their influence on the rheological properties of dough through alveographic and reofermetographic tests.

MATERIALS AND METHODS

The dough was prepared using wheat flour without additives, yeast, salt, and water, with the incorporation of buckwheat germ flour (BGF) at different substitution levels (5%, 10%, 15%, and 20%). To evaluate the effect of BGF addition on dough properties alveographic and reofermentometric analyses were performed.



RESULTS AND DISCUSSION

The alveographic analysis revealed that the addition of small percentages of BGF is most suitable for obtaining dough samples with optimal characteristics. This test also showed that as the proportion of BGF increased, the values of key parameters such as P (tenacity), L (extensibility), and W (baking strength) decreased. This reduction is primarily due to the partial replacement of wheat gluten in the dough matrix, which directly affects its structural and viscoelastic properties.

Sample	P (mm)	L (mm)	G (mm)	W (10^{-4} J)	P/L
Control sample	98.00 ± 1.00	57.00 ± 1.00	16.67 ± 0.32	184.00 ± 1.00	1.72 ± 0.01
Day 2_2.5%	94.00 ± 3.00	71.00 ± 2.65	18.63 ± 0.25	225.00 ± 5.00	1.32 ± 0.02
Day 2_5.0%	82.67 ± 3.06	62.33 ± 2.52	17.53 ± 0.35	175.00 ± 3.00	1.32 ± 0.01
Day 2_7.5%	74.00 ± 4.00	56.67 ± 3.51	16.77 ± 0.25	147.67 ± 4.51	1.31 ± 0.01
Day 4_2.5%	77.67 ± 2.52	71.67 ± 3.51	18.77 ± 0.25	186.67 ± 3.06	1.08 ± 0.02

The rheofermentometric evaluation provided further insights into the fermentation performance of the dough. When 2.5% BGF was incorporated, there was an observable increase in the values of the H'm (maximum height), VT (total volume of gas produced), and VR (retention of gas) parameters. These improvements suggest that low level of BGF addition can enhance the fermentation process, likely by positively influencing yeast activity and gas retention capacity. However, at higher addition levels of 5% and 7.5%, a gradual decline in these parameters was observed. This decrease can be attributed to the weakening of the gluten network, which occurs when a larger portion of wheat flour is replaced by BGF, reducing the dough's ability to trap and hold gases effectively during fermentation.

Sample	H'm (mm)	VT (mL)	VR (mL)	CR (%)
Control sample	75.7 ± 1.01	1522 ± 0.98	1175 ± 2.11	77.2 ± 1.02
Day 2_2.5%	77.5 ± 3.02	1715 ± 0.52	1280 ± 0.34	74.6 ± 0.95
Day 2_5.0%	76.7 ± 0.28	1708 ± 2.56	1271 ± 0.76	74.4 ± 0.82
Day 2_7.5%	76.4 ± 1.26	1698 ± 3.26	1268 ± 0.90	74.7 ± 1.29
Day 4_2.5%	77.4 ± 2.11	1720 ± 0.43	1255 ± 1.70	72.9 ± 1.98

CONCLUSIONS

Overall, the results indicate that while BGF has the potential to improve certain functional properties of dough at low inclusion levels, excessive substitution may compromise its structural integrity. Consequently, from both alveographic and rheofermentometric perspectives, it can be concluded that the addition of germinated buckwheat flour is most beneficial at low percentages. This suggests that careful optimization of BGF levels is necessary to balance the nutritional benefits of buckwheat with the technological requirements of wheat dough, ensuring that both dough quality and baking performance are maintained.

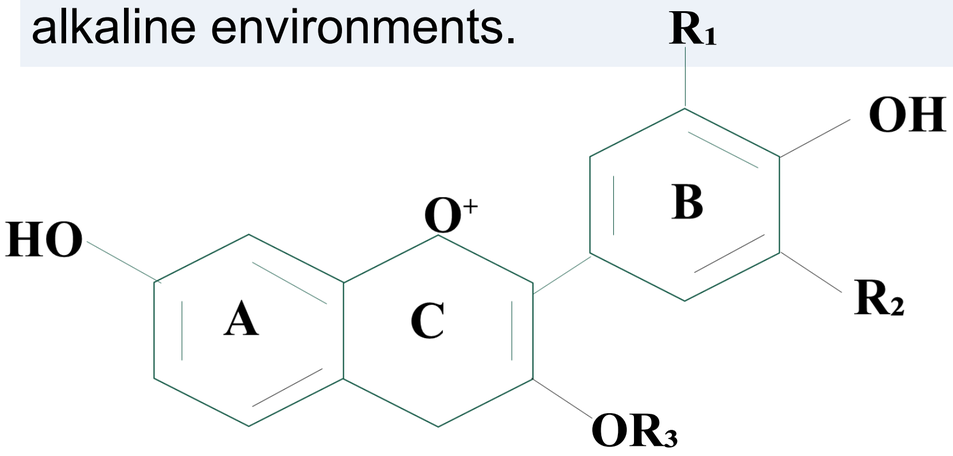
10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Development Of Intelligent Meat Packaging Using Polyphenolic Compounds From *Aronia Melanocarpa* And *Sambucus Nigra*

[1]Loredana – Mariana HUȚUȚUI, [2]Sonia AMARIEI

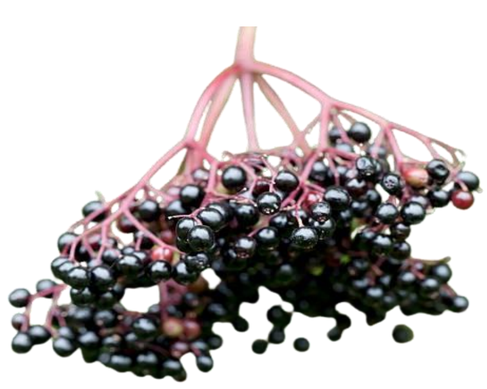
INTRODUCTION

Meat is a food with a short shelf life (1–5 days at 0–4 °C) and high annual per-capita consumption (60–70 kg in Romania; 70–80 kg in Europe). Microbiological, chemical, and physical factors cause changes in color and texture, the formation of NH_3 and H_2S, and an increase in pH. Elderberry and chokeberry are valuable sources of polyphenols, especially anthocyanins, which have a remarkable ability to change color depending on the pH of the environment, from red in acidic conditions to blue or yellow in alkaline environments.



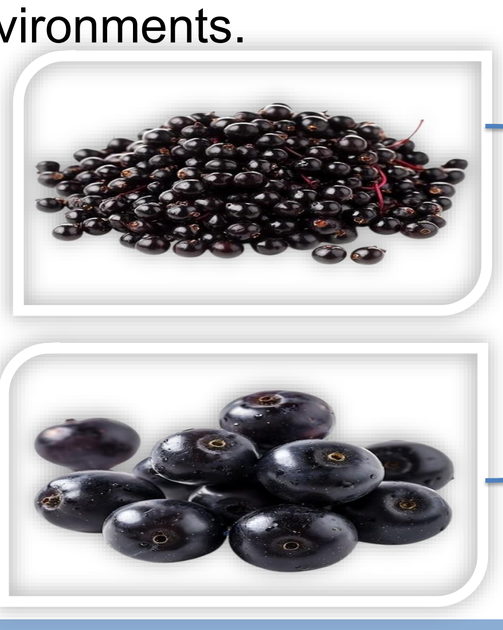
MATERIALS AND METHODS

Fresh chokeberry *(Aronia melanocarpa)* and elderberry *(Sambucus nigra)* were homogenized as purees to obtain uniform matrices. Extractions were performed with 50% (v/v) ethanol–water by ultrasound (US). A Design-Expert plan generated 17 runs, varying time (10, 15, 20 min), temperature (30, 40, 50 °C), and amplitude (30, 50, 70%) at constant solid-to-solvent ratio. Color was measured using a Konica Minolta CM-700 chroma meter (Konica Minolta, Tokyo, Japan) according to the CIEL laboratory method. Three measurements per sample were recorded for the parameters L*, a*, and b*.



RESULTS AND DISCUSSION

Fresh fruits and the resulting extracts were subjected to a series of physicochemical analyses, determining moisture, ash, total phenolic content (TPC), total flavonoid content (TFC), and DPPH antioxidant activity. Color was evaluated in the CIEL*a*b* system as a function of pH on a 1–11 scale, adjusted with 0.1 N HCl and 0.1 N NH_3. The color shifted from red under acidic conditions to violet, and then to blue or yellow in alkaline environments.



CONCLUSIONS

Elderberry and chokeberry fruits are rich sources of anthocyanins with a remarkable ability to change color depending on pH, making them suitable for integration into smart packaging as spoilage indicators. Ultrasound-assisted extraction (US) has proven to be efficient (fast, at moderate temperatures, with high yield), providing extracts that are color-stable in acidic environments and useful as functional natural colorants.

Bibliography:

1. Huțuțui, L., & Amarei, S. (2025, May 30–31), *Development of intelligent packaging systems for real-time detection of meat spoilage.* Paper presented at the 4th Sivas International Conference on Scientific and Innovation Research, Sivas University of Science and Technology, Sivas, Turkey.
2. Huțuțui, L., & Amarei, S. (2025, June 18–21), *Current state of research on the development of intelligent packaging*. Poster presented at the "Doctoral Students' Days" Workshop, Ștefan cel Mare University of Suceava, Faculty of Food Engineering, Suceava, Romania.
3. Huțuțui, L., & Amarei, S. (2025, August 30–31), *Monitoring meat freshness in smart packaging using anthocyanins from fresh blackberries*. Paper presented at the 4th International Gaziantep Scientific Research Congress, Gaziantep, Turkey.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Evaluation of the Antioxidant Potential and Phytochemical Profile of Horseradish (*Armoracia rusticana*) Leaves and Roots

Bianca Șuian, Sonia Amariiei, Ancuța Petraru

INTRODUCTION

Horseradish (*Armoracia rusticana*) is traditionally used as a culinary plant, but both its roots and leaves are valuable sources of bioactive compounds, including vitamin C, polyphenols, and isothiocyanates, which contribute to its notable antioxidant activity. Exploring the full potential of the plant—especially the often underutilized leaves—can support the development of natural products with potential applications in the food and nutraceuticals.

MATERIALS AND METHODS

roots

HORSERADISH

leaves

LYOPHILIZATION

EXTRACTION OF BIOACTIVE COMPOUNDS

RESULTS AND DISCUSSION

DPPH

96.93%
methanol:water
1:1

76.90%
deionized water
extract

Vitamin C

105.32 mg/100 g
dry matter

299.78 mg/100 g
dry matter

methanol:water
1:1

Polyphenolic profile

Procatechuic acid

Common polyphenols

- Caffeic acid
- Chlorogenic acid
- *p*-coumaric acid
- Vanillic acid
- Rosmarinic acid
- *p*-hydroxybenzoic acid

Myricetin
Kaempferol
Quercitin

Chlorophyll + carotenoids

- Chlorophyll a
  360.7 mg/100 g
  dry matter
- Chlorophyll b
  110.03 mg/100 g
  dry matter

Total carotenoids
72.35 mg/100 g
dry matter

CONCLUSIONS

Therefore, both horseradish roots and leaves have demonstrated significant antioxidant activity, confirming their value as bioactive sources for practical applications in nutraceutical formulations and active food packaging systems.

Bibliography

1. Șuian, B., & Amariei, S. (2025). Extraction and Characterization of Bioactive Compounds in Horseradish (Armoracia rusticana): Focus on Polyphenols, Vitamin C, and Fatty Acids. *Applied Sciences*, *15*(12), 6534.
2. Șuian, B., Amariei, S., & Petraru, A. (2025). Comprehensive Characterization of Armoracia rusticana Roots and Leaves: Physicochemical Properties, Functional Potential, and Nutritional Composition. *International Journal of Molecular Sciences*, *26*(19), 9462. 1. Șuian Bianca, Amariei Sonia, *Research on New Biodegradable Packaging for Food Industry*, International World Energy Conference-III, **Turkey**, 4-5 December 2023.
3. Șuian Bianca, Amariei Sonia, *Bibliometric Study On Biodegradable Active Food Packaging: Trends, Challenges And Future Directions*, 91^{th} International scientific conference of young scientists and students *"Youth scientific achievements to the 21st century nutrition problem solution"*, **Ukraine**, 7-11 April 2025.
4. Șuian Bianca, Amariei Sonia, Petraru Ancuța, Avrămia Ionuț, *Evaluation Of Bioactive Compounds From Horseradish Root (Armoracia Rusticana) And Their Antioxidant Potential,* 8^{th} *International Food, Agriculture and Veterinary Sciences Congress*, **Turkey**, 29-31 May 2025.
5. Șuian Bianca, Amariei Sonia, *Development of Bioactive Food Packaging Materials with Antiallergenic Potential, Workshop – Doctoral Days, Ștefan cel Mare University of Suceava*, **Romania**, 17-22 June 2025.
6. Șuian Bianca, Amariei Sonia, Petraru Ancuța, *The Potentıal Antı-Allergenıc Effect Of Horseradısh In The Development Of Bıoactıve Packagıng,* 7^{th} *International Cappadocia Scientific Research Congress*, **Turkey**, 2-4 August 2025.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

The impact of heavy metal contamination on casein in cow's milk

Maria-Natalia CHIRA, Sonia AMARIEI

INTRODUCTION

-Milk is a complex biological matrix with high nutritional and economic importance, representing a key component of the human diet worldwide.

-It provides essential macronutrients such as proteins, lipids, and carbohydrates, and contains approximately 38 minerals and trace elements.

-In regions affected by environmental pollution or inadequate quality control, milk can become a vector for toxic heavy metals such as Pb, Cd, Hg, and As.

-Their accumulation disrupts enzymatic systems, induces oxidative stress, and poses significant health risks.

-Continuous monitoring of heavy metal content in milk using advanced analytical techniques, such as ICP-MS and AAS, is essential to ensure food safety and protect public health.

- Commission Regulation (EU) 2023/915 of 25 April 2023 on maximum levels for certain contaminants in foodstuffs and repealing Regulation (EC) No 1881/2006

MATERIALS AND METHODS

-Cow milk samples were collected from three different areas of Romania (central, north-eastern and southern) from farms representative of various geographical and agro-industrial areas.

-The samples were initially analyzed in terms of physical and chemical parameters to determine fat content (%), density (g/ml), and total protein (%).

-Sample preparation for quantitative determination of heavy metals consists of mineralization by calcination in an oven in an oxidizing atmosphere (air) at 450–550 °C until a mineral residue (ash) is obtained, which contains metals in the form of oxides or stable inorganic salts.

-The content of heavy metals was analyzed using atomic absorption spectrophotometry (AAS).

-The results obtained were statistically interpreted using ANOVA ($p<0.05$).

RESULTS AND DISCUSSION

-Contamination under laboratory conditions also revealed certain organoleptic changes in the samples, observed during the analysis process. At a contamination level equal to the maximum permissible limit, the coagulum has a slightly yellowish color, with a fine texture and a slightly metallic, almost imperceptible taste. However, as contamination increases, a change in color is observed, becoming bluish-green, the coagulum has a pronounced metallic, even rancid taste, and a rough texture in most samples.

-Pb, at the maximum limit (LM), was predominantly retained in casein for both coagulation methods, exceeding 80% of the total Pb content

-At the 10×LM contamination level, the type of coagulation significantly influenced Pb retention, with enzymatic coagulation showing a slightly higher proportion of Pb in casein (mean: 83.03%) compared to acid coagulation (mean: 82.56%)

-At LM, Cd was highly concentrated in the casein fraction (>93%) for both coagulation methods

-At 10×LM, Cd retention in casein decreased by approximately 9–11% compared to LM, but the effect of coagulation type remained non-significant

-Cu was also preferentially associated with casein across all contamination levels. At LM, casein retained around 90–92% of total Cu, with no significant differences between enzymatic and acid coagulation

-At 10×LM, casein-bound Cu showed a slight reduction (~4–6%) relative to LM, with values remaining above 85% in both coagulation systems; the differences between coagulation types were not statistically significant

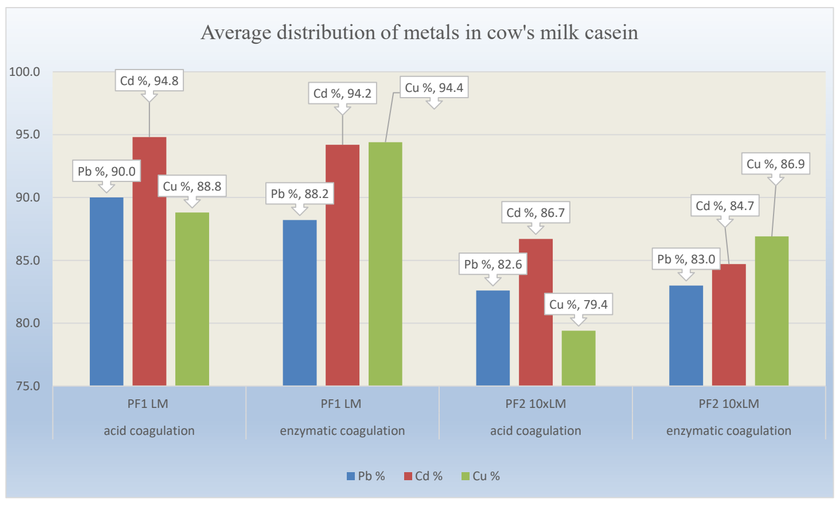


Figure 1. Average distribution of heavy metals through two types of coagulation in bovine milk casein (PF1-LM – sample contaminated at the maximum limit, PF2-10LM – sample contaminated at 10x the maximum limit)

Figure 2. Organoleptic appearance of curd samples obtained by enzymatic and acid coagulation of experimentally contaminated milk at different metal concentrations.

CONCLUSIONS

This study demonstrated that both the level of contamination and the type of coagulation significantly influence the metal content of the casein fraction, showing that, at a high level of contamination, above the maximum permissible limit, enzymatic coagulation significantly favors the retention of Pb and Cu in casein, while acid coagulation slightly favors Cd binding, which highlights the critical role of the coagulation mechanism in metal-protein interactions and the separation of contaminants in the casein matrix. highlights the need to use casein-associated metal levels as sensitive indicators of milk safety and potential toxicological risk in dairy products.

10th International Conference
BITECHNOLOGIES, PRESENT AND PERSPECTIVES

ASSESSMENT OF THE INFLUENCE OF THE ADDITION OF FRUIT FLOURS ON THE FUNCTIONAL- TECHNOLOGICAL PROPERTIES OF WHEAT FLOUR

Mariana Slavic, Ancuța Petraru, Adriana Dabija, Amelia Buculei
Stefan cel Mare University of Suceava, Romania
October 17, 2025

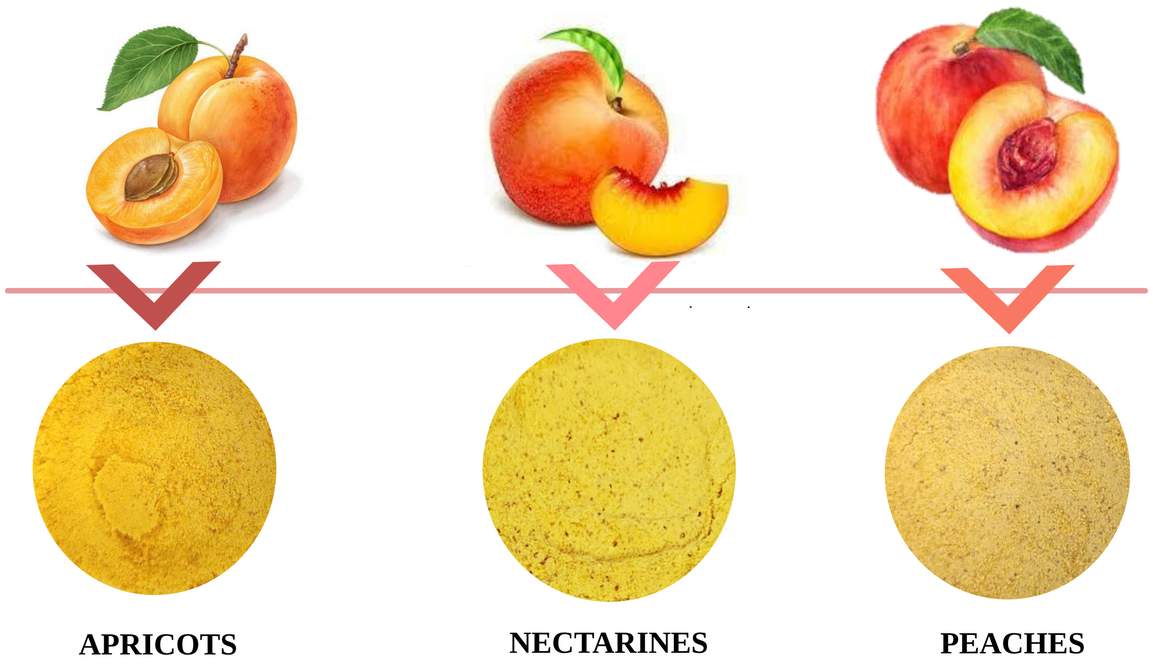
ABSTRACT

The increasing demand for nutritious and sustainable foods has driven interest in fruit flours as functional ingredients in bakery products. This study evaluated the impact of lyophilized apricot, peach, and nectarine flours (5–15%) on dough properties. Results showed improved nutritional value (fibers), enhanced color and better rheological behavior. Overall, fruit flours offer a promising approach to improving both the health value and sensory appeal of bakery items.

INTRODUCTION

The rising demand for nutritious and sustainable foods has sparked interest in unconventional ingredients like fruit flour, which offers a nutrient-rich alternative to traditional flours by enhancing bakery products with fiber, antioxidants, vitamins, and bioactive compounds, while improving flavor and texture.

In the face of growing populations and limited resources, incorporating fruit flour helps diversify food sources, reduce reliance on conventional crops, and promote healthier diets through its high fiber content and beneficial phytochemicals.



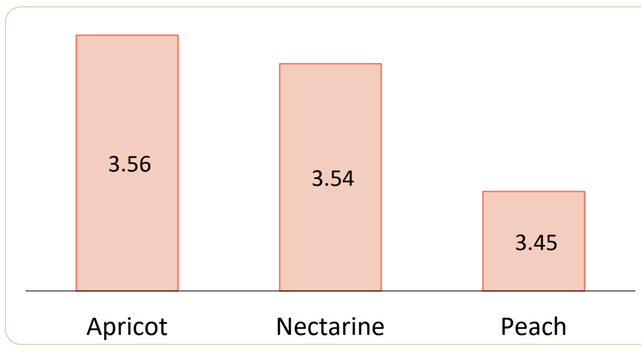
MATERIALS AND METHODS

Three fruit samples from the Prunus genus (apricot, peach and nectarine) were lyophilized using a Biobase BK-FD12S freeze dryer and finely chopped with a Thermomix TM6 to obtain the flour.

The effects of incorporating these flours at levels of 5%, 10%, 12.5%, and 15% were evaluated based on dough properties, including sensory characteristics, rheological behavior, color, and texture.

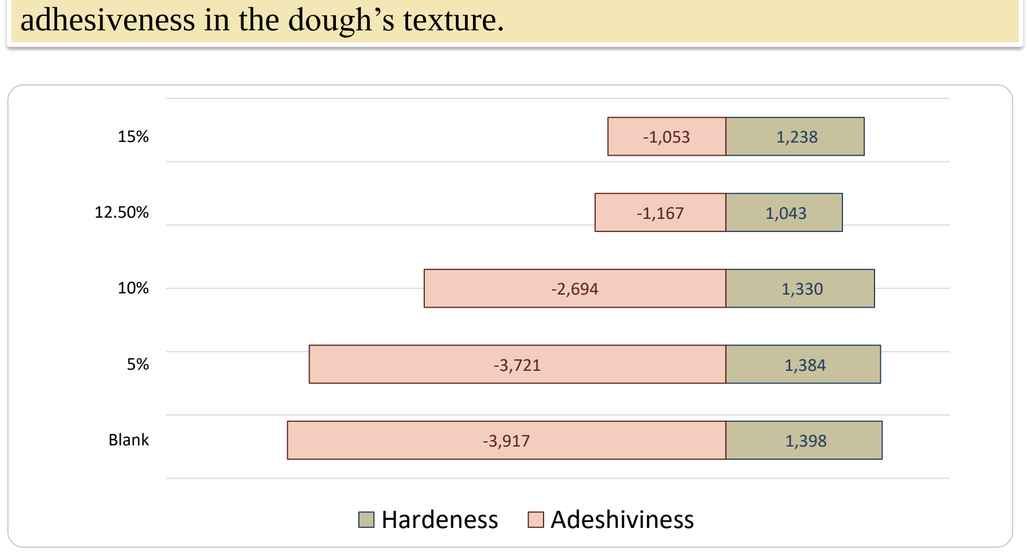
As fruit flour is added, the dough becomes darker, with intensified yellow and red tones.
The doughs with the addition of peach flour presented the most reddish tone while the doughs with apricot flour the most yellowish tone

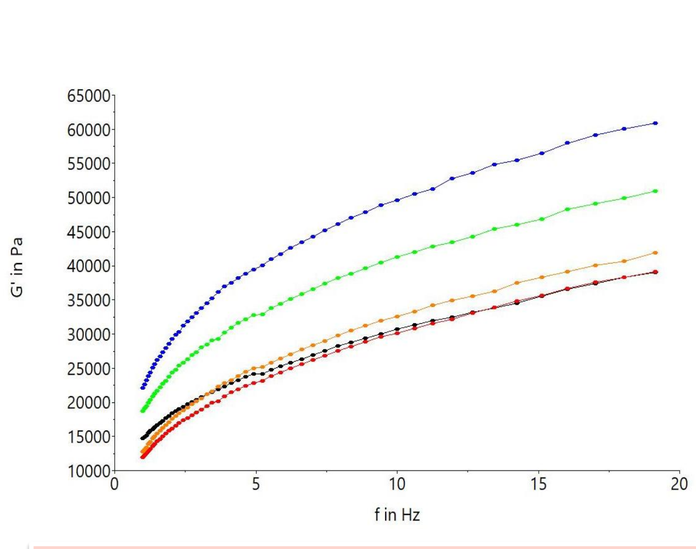
RESULTS AND DISCUSSION

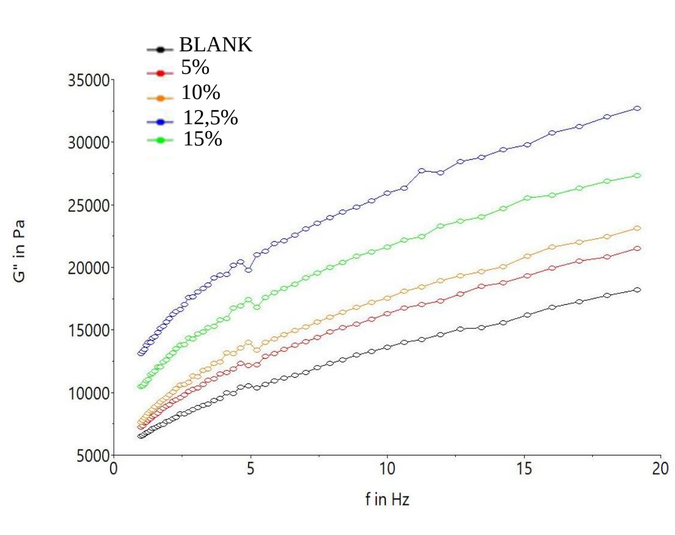


Based on fiber content, the samples ranked in the following order: apricot, nectarine, and peach. With growing consumer interest in healthy lifestyles and nutrient-rich diets, the inclusion of high-fiber ingredients in everyday bakery products is increasingly recommended to enhance their nutritional profile.

Increased levels of fruit flour result in reduced hardness and adhesiveness in the dough's texture.







Rheological properties such as viscosity and elasticity improve with higher fruit flour incorporation. These proprieties were highest in the sample with addition of 12,5% of fruit flour.

Sensory analysis revealed that while the addition of lyophilized fruit enhanced color and flavor, incorporating more than 15% resulted in a noticeably sour taste that was not well accepted by consumers.

CONCLUSIONS

This study highlights that innovative foods incorporating lyophilized fruit species offer promising nutritional benefits and appealing sensory qualities, such as intense color, making them especially suitable for sour-sweet bakery products and enhancing their market potential.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Functional extrudates from carrot by-products: a sustainable approach to food waste reduction

Diana-Raluca Creciunescu (Bouriaud), Silvia Mironeasa
Faculty of Food Engineering, Stefan cel Mare University of Suceava, Romania

INTRODUCTION

The increasing interest in healthy eating has boosted fruit and vegetable consumption in juice and puree forms. Pomace, a byproduct of this production, is often discarded as waste. Although it constitutes about 20% of raw materials, global pomace production reaches around 630,000 tonnes annually. Research reveals that pomace is rich in valuable nutrients (Łusiak et al., 2023).

Because fruits and vegetables spoil quickly, converting surplus produce into shelf-stable powders is important. These powders retain nutrients and also enhance food texture, color, and sensory qualities. Both whole and pomace-derived powders can be used as functional ingredients in healthy food products (Ying et al., 2021). Through extrusion, a thermo-mechanical process where a mixture of ingredients is forced through a die under high temperature and pressure, we can produce snacks, breakfast cereals, protein bars, and more.

MATERIALS AND METHODS

1. Preparation: Dry by-products (hot air or freeze-drying) to under 10% moisture, then grind into flour. **2. Formulation:** Mix with base flours (corn, rice, wheat, pea) at 5–30%, depending on product type, texture, expansion, and flavor. **3. Extrusion:** Process at 120–180°C, with controlled screw speed and moisture to enhance product functionality. **Addition rate depends on:** *product type* (snacks need lower, bars can have higher addition); *desired texture* (high fiber toughens texture, suitable for bars, not airy snacks); *expansion and flavor* (fiber reduces expansion; leafy powders may add bitterness, so addition rates vary by flavor tolerance). Optimal levels require product-specific testing.

Researchers examined how various drying techniques, such as freeze-drying, vacuum drying, microwave-assisted infrared, and conventional oven drying, affected the nutritional and functional qualities of the material.

RESULTS AND DISCUSSION

Carrots are rich in β-carotene, B vitamins, minerals, and calcium pectate, which helps lower cholesterol. Regular consumption may reduce risks of hypertension, stroke, heart disease, and some cancers. They are eaten raw, juiced, cooked, or in desserts. Carrot juice is especially high in pro-vitamin A and minerals. Juice extraction yields only 60–70%, leaving up to 80% of β-carotene in the pomace, which still contains valuable nutrients and fiber but is largely underused (Kumar & Kumar, 2011).

Carrot pomace is composed of about 55% dietary fiber, which significantly enhances its ability to retain water, ranging from 17.9 to 23.3 grams of water per gram of fiber. This dietary fiber also has the capacity to bind fat, contributing important functional benefits in food systems. Both fat-binding capacity and water-holding capacity are crucial attributes that help improve product quality by enhancing characteristics like juiciness, flavor, and overall mouthfeel (Richards et al., 2024). Carrot pomace characteristics depend on carrot variety (Luca et al., 2024) and can be successfully used as a functional ingredient to enhance staple food nutritional value. According to the results presented in the literature, the drying methods used to avoid the rapid microbial contamination of the carrot pomace influenced its functionality by changing its chemical composition. The components left after drying are directly proportional with the time, temperature and the thickness of the carrot pomace layer (Luca et al., 2021).

The potential of carrot leaves (*Daucus carota L.*) was investigated by Bardakçı et al. (2024) as a valuable source of bioactive compounds, particularly due to their high levels of ascorbic acid, phenolic compounds, and associated antioxidant activity. Researchers examined how various drying techniques, such as freeze-drying, vacuum drying, microwave-assisted infrared, and conventional oven drying affected the nutritional and functional qualities of the leaves. They found that carrot leaves stored under refrigeration conditions preserved significantly higher concentrations of bioactive compounds than those subjected to ambient temperature drying.

CONCLUSIONS

The valorization of carrot pomace and leaves in extruded products offers significant competitive advantages in a context where sustainability, food innovation, and health are priorities. However, effective management of technological risks and consumer perception is essential.

This approach offers multiple benefits from nutritional, economic, and environmental perspectives. Carrot pomace and leaves are rich in fiber, antioxidants, natural pigments, and bioactive compounds, which can transform a conventional product into a functional food with added value. Moreover, the use of these by-products helps reduce food waste and raw material costs, making the proposed research topic attractive to the food industry, which is increasingly focused on efficiency and sustainability.

A strategic approach is essential, combining technological development (recipe testing, extrusion process optimization) with market research and consumer education campaigns focused on the nutritional and environmental benefits of the products.

References

Kumar, N., & Kumar, K. (2011). Development of carrot pomace and wheat flour based cookies. Journal of Pure and Applied Science and Technology, 1(1), 5-11.

Łusiak, P., Mazur, J., Sobczak, P., Zawiślak, K., & Panasiewicz, M. (2023). The use of carrot and apple pomace in the production of healthy snack bars. Agricultural Engineering, 27.

Luca, M. I., Ungureanu-Iuga, M., & Mironeasa, S. (2024). Nutritional and bioactive composition of different carrot pomace varieties. Ukrainian Journal of Food Science, 12(2).

Bardakçi, M. S., Özçelik, A., & Karacabey, E. (2024). Does Daucus carota L. leaf provide a high potential as a source of bioactive constituents: A case study about the influences of process/storage conditions. Food Science & Nutrition, 12(8), 5882-5889.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Research on the use of deproteinised whey in beer production

Ancuța Chetrariu, Ramona-Elena Huber, Lavinia-Vasilica Dornescu, Eusebiu Drăgoi, Adriana Dabija

ABSTRACT

Whey is usually produced when curds or cheese are made. However, only half of the whey produced is used, despite the fact that a significant amount is produced. Furthermore, the environment is negatively impacted when whey is disposed of improperly. The application using whey in beverage manufacturing is a novel strategy that could increase the range of uses for this food industry by-product. Obtaining whey beverages represents a viable solution for valorisation that can be used by cheese producers in our country. The paper proposed the valorisation of deproteinized whey in the manufacture of whey beer.

INTRODUCTION

Preventing waste generation is the top priority of the New Waste Framework Directive (Directive 2008/98/EC), which then places the least emphasis on disposal and more on processing for reuse (valorisation), recycling, and recovery. In a similar vein, the European Union's bio-economy policy needs to be implemented in order to enhance biological resource management, create new markets for food and biobased goods, and protect the environment. Dairy processors must therefore create efficient and lucrative methods of managing whey waste, especially given the exorbitant prices of the waste treatments used today. The consumers, business, and scientific community are becoming more interested in the recycling and reuse of food and agricultural industry by-products. Deriving added value from otherwise lost food production outputs is a key principle of the circular bioeconomy, even though there is still disagreement over a common definition of this notion. Whey is produced in large quantities as a useful by-product of the dairy industry's constant expansion in output. Whey must therefore be processed properly because its composition poses a risk to the environment if improperly disposed of. If whey is disposed of improperly, it could change the soil's physicochemical properties and reduce crop output. The whey, used intelligently, adds freshness, balance and at the same time contributes to the sustainable recovery of a by-product from the dairy industry. Fir buds bring freshness, a fresh, slightly resinous aroma, tonic effects, vitamin C and essential oils. High quality malt offers not only taste and color, but also natural antioxidants that contribute to a stable and healthy drink.

MATERIALS AND METHODS

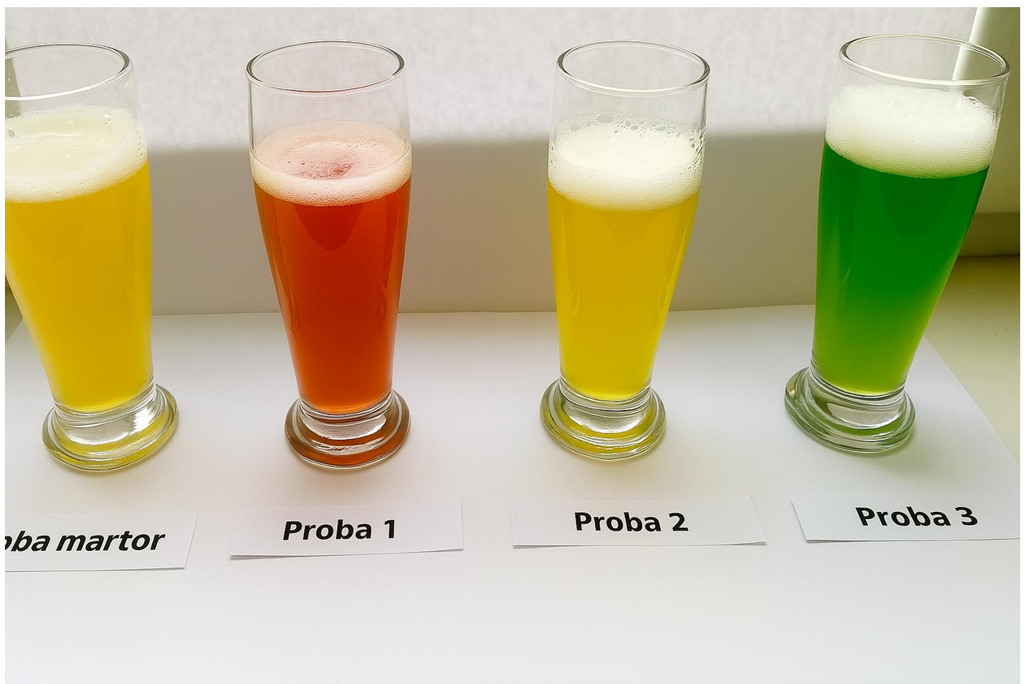
Whey beer was obtained according to a conventional method of obtaining beer with following main operations: mashing, filtration, boiling, cooling, fermentation, maturation, pasteurization and bottling. In the manufacturing recipe, 30% of the water was replaced with deproteinized whey resulting from obtaining the Romanian dairy product “urda”. For sensory improvement, the following types of syrup were introduced into the hopped wort, before the technological operation of primary fermentation, in a proportion of 5%: raspberries (S1), elderflowers (S2) and fir buds (S3). For fermentation is used of bottom-fermenting yeast of *Saccharomyces carlsbergensis* species. The fermentation temperature was maintained at 10°C for 6 days. Then, after cooling down to 2°C, the yeast was discharged from the bottom of the vessel. The maturation lasted for 20 days. At the end of maturation, the beer was analysed from the sensorial and physicochemical point of view in accordance with EBC-methods: real extract, apparent extract, alcohol content, density, colour, pH,, content in CO2, and bitter value. For the analysis of beer - finished product was used the equipement Anton Paar.

RESULTS AND DISCUSSIONS

The variants of the finished product have been developed to optimize sensory and physical-chemical characteristics. The whey beers obtained by the three variants differed from the control sample in terms of real extract, apparent extract, alcohol content, carbon dioxide content, while insignificant differences were observed in color, pH, bitterness value. A very important distinguishing parameter is ethyl alcohol, the content of which was affected by the use of whey and added syrups.The variant that met from the point of view of sensory analysis the highest score was variant 3, whey beer with fir bud syrup. Whey beer presents distinct sensory, functional and ecological characteristics, located at the intersection of food innovation, the valorization of renewable resources and the circular economy. With an original recipe, it presents special sensory characteristics, a unique flavor, a bittersweet taste, with citrus nuances and unmistakable freshness.

Physicochemical characteristics of whey beer—finished product

Characteristic	Sample			
	Control sample	1	2	3
Real extract, % m/m	5.81±0.4	9.54±0.05	10.04±0.04	10.56±0.05
Apparent extract, % m/m	3.77±0.02	7.73±0.07	7.95±0.06	7.98±0.06
Alcohol content, % v/v	5.20±0.06	4.90±0.09	4.80±0.05	4.70±0.04
Alcohol content, % m/m	4.08±0.05	3.74±0.08	3.68±0.05	3.58±0.04
Density, g/cm^3	1.0136±0.01	1.0288±0.03	1.0379±0.02	1.0437±0.02
Turbidity, EBC	0.86±0.02	3.19±0.04	3.03±0.03	1.98±0.01
pH	4.65±0.03	4.63±0.09	4.14±0.05	4.16±0.05
Color, EBC	9±0.10	11.77±0.18	6.11±0.16	8±0.11
Bitter value, IBU	25.8±0.53	24.9±0.95	23.8±0.60	24.8±0.69
CO_2, g/L	5.12±0.07	4.42±0.03	4.42±0.01	4.36±0.01



CONCLUSIONS

Whey alcoholic beverages are suitable for a broader range of consumers, primarily due to their low lactose content and reduced allergenicity. Moreover, compared to non-alcoholic whey drinks, whey alcoholic beverages offer extended shelf life, higher levels of phenolic compounds, and enhanced antioxidant activity.Whey beer, the final result, has characteristics comparable to those of beer, including a nice, distinctive smell, a hop aroma, and a pleasant, bittersweet taste. From a sensory point of view, the absolute novelty is the taste, but also the surprising colour: the unmistakable green of fir buds. In conclusion, the project proposes obtaining a non-distilled low-alcoholic beer-type beverage that can be easily reproduced on an industrial scale, from micro-factories to large-capacity production companies, through a simple process, in accordance with the provisions of the regulations in force, under food safety conditions.

ACKNOWLEDGEMENTS: This work was supported by project number CNFIS-FDI-2025-F-0603/USV VIP 2025.

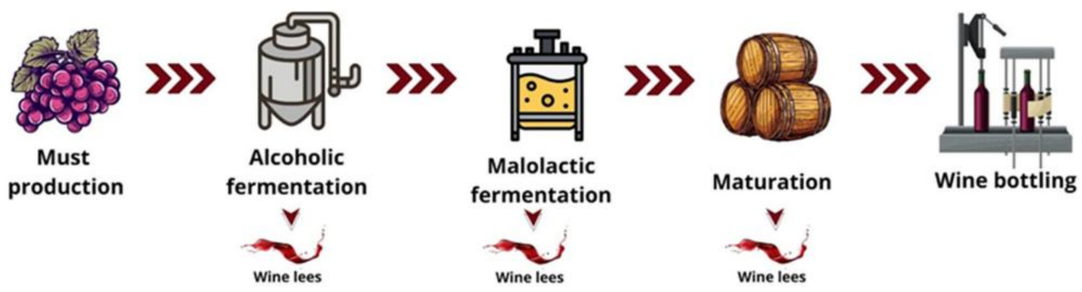
10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Nutrient-rich by-products of the fermentation industry: quality and applications

Adriana Dabija[1], Ionuț Avrămia[1], Larisa Caisîn[2], Vitalii Agapii[2], Ancuța Chetrariu[1]

INTRODUCTION

The wine industry produces by-products with a variety of useful compounds, many of which are currently poorly understood and underutilized. Despite being the second most important by-product of winemaking after grape pomace, wine lees have not gotten much attention when it comes to their potential for value addition. Wine lees from four wineries in Moldavia were used in this investigation. Their diverse composition possess a significant obstacle to their industrial use, even if they are abundant in bioactive components like β-glucans. Dietary fibbers or polysaccharides known as β-glucans are well-known for their many bioactive qualities, which include anti-inflammatory, anticancer, immunomodulatory, antioxidant, glycemic and cholesterol-lowering actions. By examining the rheological characteristics of β-glucan suspensions, this work sheds light on their possible uses in a range of sectors, such as food, medicine, and cosmetics.



MATERIALS AND METHODS

In this study, winery yeast lees from four types of wines from three Moldavian wineries were used (Table 1). The yield of glucan compounds was determinated gravimetrically, as the ratio between the weight of the obtained dry extract and the initial amunt of residual yeast reported to dry matter. The Fourier Transform Infrared Spectroscopy measurements of raw, undried samples of β-glucans were performed in reflective absorbance mode.

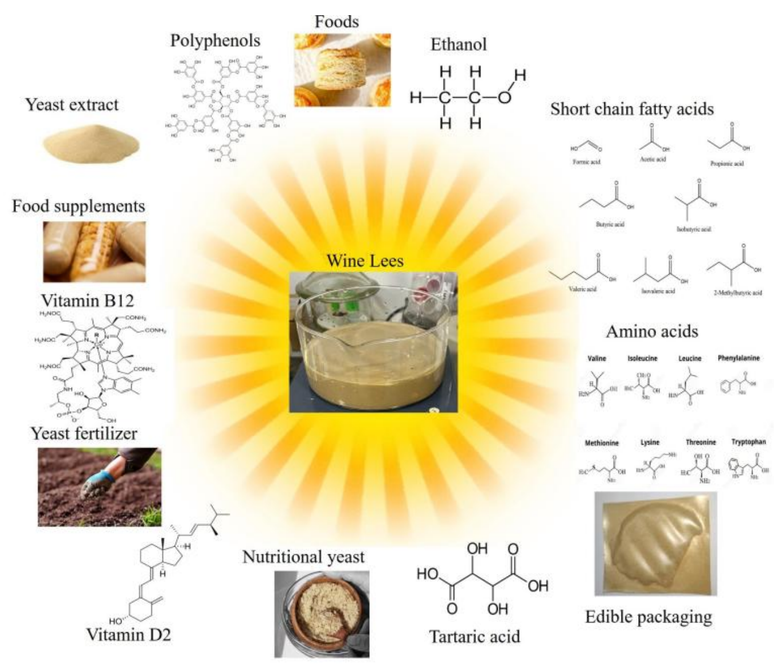
Table 1. Winery yeast lees and their provenance

Winery yeast lees	Abbreviation	Grape variety	Harvest year	Manufacturer	Recovery stage
Semi-dry white wine	SVAM	Muscat	2023	Chateau Vartely winery	Collected after the wine was stored
Dry red wine	SVRS	Shiraz	2023	Purcari winery	Collected after the wine was stored
Sweet white wine (Ice wine)	SVR	Traminer and Muscat	2023	Poiana winery	Collected after fermentation
White sparkling wine	SVS	Chardonnay, Pinot Blanc and Pinot Noir	2022	Purcari winery	Collected after disgorging the sparkling wine

RESULTS AND DISCUSSION

The ultrasound frequency used did not influence the extraction yield in the case of both methods (e.g., for sweet white wine using the acid–base method, at 25 kHz the yield was between 5.99 ± 0.16% and 9.99 ± 0.30%, and at the frequency of 45 kHz, between 5.17 ± 0.19% and 6.70 ± 0.10%). The type of yeast used has the greatest influence on the yield of extracted β-glucans. The highest β-glucan yield using autolysis was observed in sparkling white wine (41.34 ± 0.31% without ultrasound), indicating that certain wine residues may respond more effectively to enzymatic degradation.

The peaks near 995, 1040 and 1025 cm^{-1} are typical for β-glucans (the peaks in 1025 cm^{-1} is characteristic for β-1,4 glucans). Another peak that can be found in practically all samples is 1042, 1041 cm^{-1} indicating the presence of β-1,3-glucan. Infrared Fourier Transform Spectroscopy reveals that the examined samples contain a variety of glucan and polysaccharide types, and the diversity of glucan molecules is shown by the distinct existence of β-1,4, β-1,3, and β-1,6 glucans, as shown by the various spectral peaks (particularly at 1000-1150 cm^{-1}).



CONCLUSIONS

The massive amounts of solid-liquid waste that are thrown away each year without specific uses make wine lees a significant by-product of the wine industry, and reprezent a significant environmental concern. Wine lees are a by-product that has the potential to be used in a variety of industries, including food, winemaking, biotech, and pharmaceutical sectors. The β-glucan yields from the autolysis approach were greater (18.95 ± 0.49% to 39.36 ± 0.19%) than those from the acid–base method (3.47 ± 0.66% to 19.76 ± 0.58%). According to FTIR spectroscopy, the β-glucan extracts contain a range of glucan and polysaccharide types, with particular absorption peaks identifying the three different β-glucans (β-1,4, β-1,3, and β-1,6 glucans. The wine industry's waste valorization, sustainability initiatives, and β-glucan extraction process optimization all depend on these knowledge. An effective way to extract β-glucans from natural sources, such as wine lees, presents a viable route to their commercial use as useful functional compounds. Further studies on different types of yeast lees are necessary to improve the efficiency of utilizing these extraction methods.

Acknowledgments: This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS-UEFISCDI, project number PN-IV-P8-8.3-ROMD-2023-0121, within PNCDI.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Biowaste valorization strategies for *Cornus mas L.* by-products

Alina BOIȘTEAN; Aurica CHIRSANOVA; Aliona GHENDOV-MOȘANU

INTRODUCTION

Sustainable resource management and circular bioeconomy concepts have encouraged the valorization of agri-food by-products as alternative sources of functional ingredients. *Cornus mas L*. (*Cornelian cherry*) fruits are highly valued for their richness in polyphenols, anthocyanins, and organic acids, offering strong antioxidant and antimicrobial properties. However, during liqueur production, large amounts of processed fruits remain as residues containing residual ethanol, which limits their direct use in food or feed.

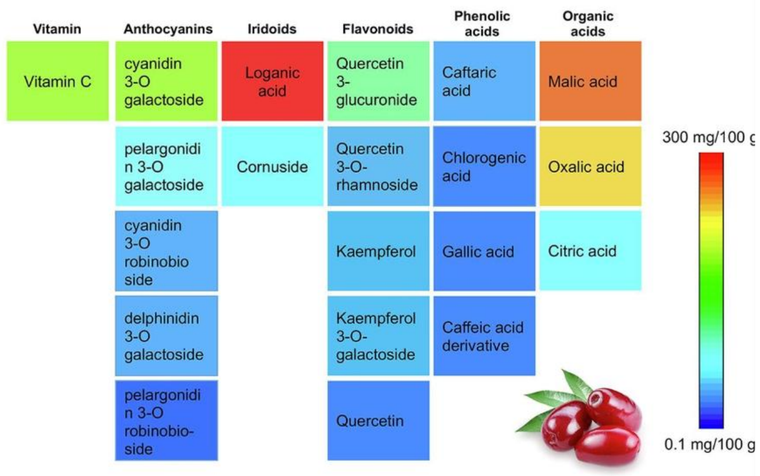


Figure 1. Quantitative profile of anthocyanins, iridoids, organic acids, etc. in *Cornus mas L.* fruits.
[Martinović A. et al. Food Chemistry (2020)]

MATERIALS AND METHODS

Figure 2. Liquor obtained from *Cornus mas L.* fruits

Figure 3. *Cornus mas L.* By-Products

Figure 4. *Cornus mas L.* vinegar

- ✓ Determination of acidity
- ✓ Determination of dry matter
- ✓ Determination of density
- ✓ Determination of color (CIE Lab*)
- ✓ Determination of polyphenols
- ✓ Determination of antioxidant activity

RESULTS AND DISCUSSION

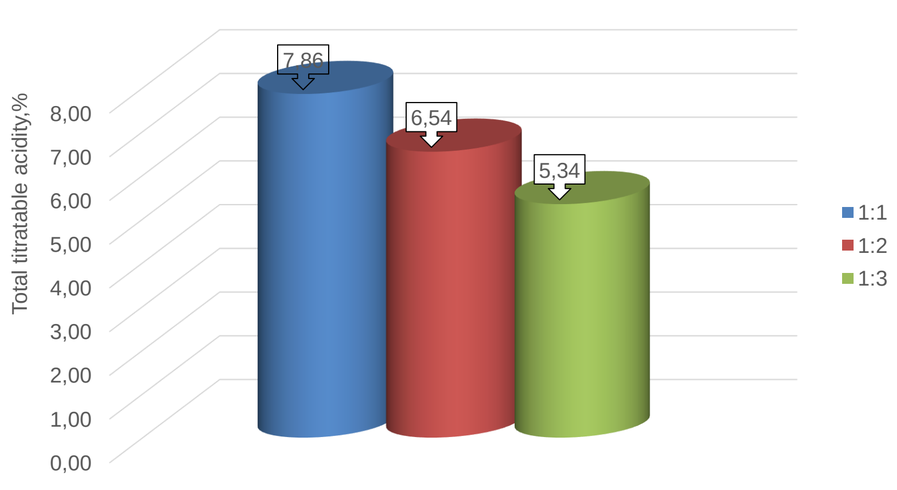


Fig. 5. Titratable acidity of the obtained vinegar

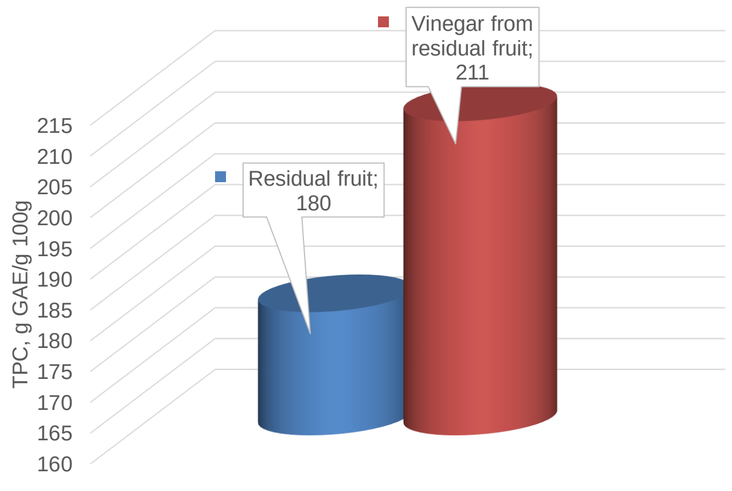


Fig. 6. Total polyphenol content

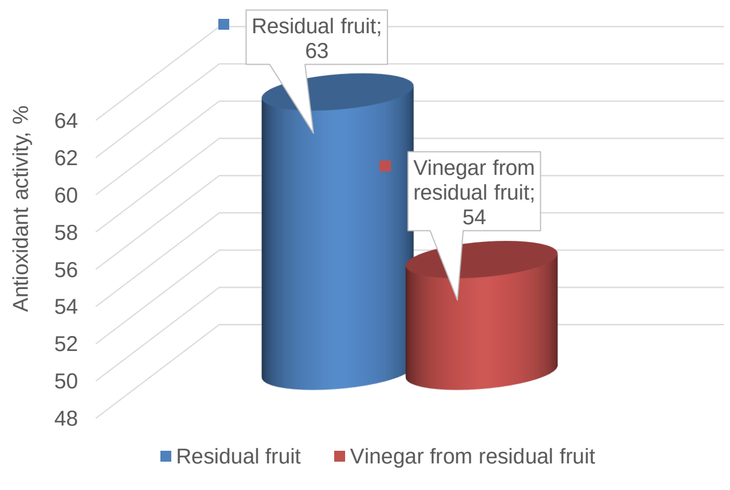


Fig. 7. Antioxidant activity in residual fruit and vinegar

1:1 - 1,040 g/cm³; 1:2 1,026 g/cm³; 1:3 - 1,021 g/cm³

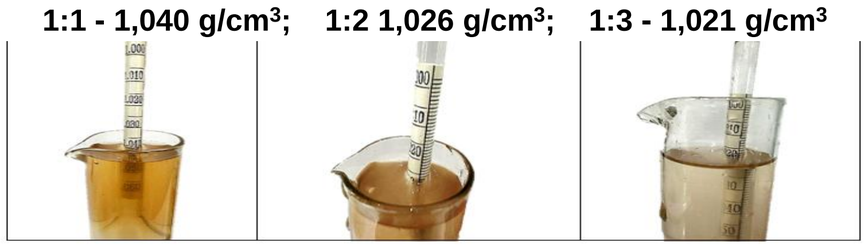
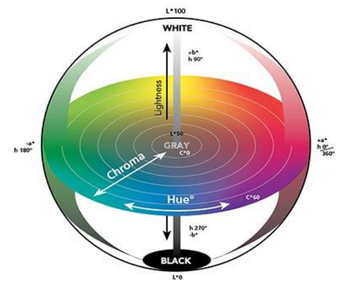


Fig. 8. Density of 3 vinegar samples with different concentrations

Table 1. CIELAB color coordinates and color difference (ΔE) of the samples

Sampel	L*	a*	b*	ΔE
H_2O	99,09±0,17	0,06±0,12	-0,55±0,15	-
1:1	43,63±6,39	43,72±1,58	54,33±5,45	89,41
1:2	54,12±6,78	13,62±2,85	30,01±6,72	56,04
1:3	65,08±6,85	5,59±0,76	23,31±3,12	41,91



CONCLUSIONS. Residual *Cornus mas L*. represent a valuable raw material due to their sufficient alcohol content obtained after fermentation. This ethanol concentration is adequate to support effective acetic fermentation. Therefore, Cornelian cherry residues can be successfully utilized for the production of natural vinegar, thus transforming secondary by-products into a valuable and beneficial natural product.

Acknowledgment: The research was supported by Institutional Project, subprogram 020405 "*Optimizing food processing technologies in the context of the circular bioeconomy and climate change*", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

Food and Nutrition Department, TUM
Tel: (+373) 69 081 217, email: alina.boistean@toap.utm.md

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Antioxidant performance of liposomal carotenoids under simulated *in Vitro* digestion

Popovici Violina, Covaliov Eugenia, Capcanari Tatiana, Radu Oxana, Cojocari Alexandrina

INTRODUCTION

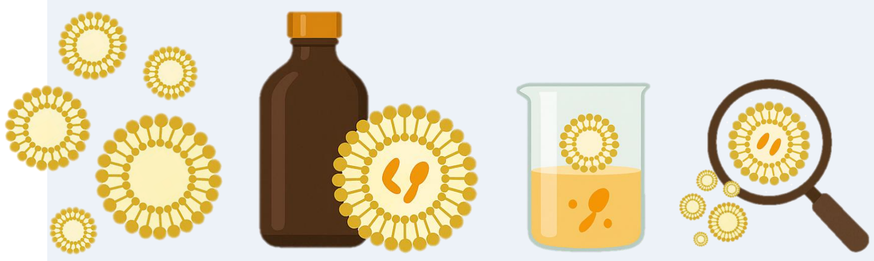
Carotenoids are naturally occurring pigments with potent antioxidant properties that play a crucial role in maintaining human health and preventing oxidative stress–related diseases such as cardiovascular disorders, diabetes, and certain types of cancer. These lipophilic compounds can neutralize reactive oxygen species and thus contribute to the reduction of cellular oxidative damage. However, despite their remarkable bioactive potential, carotenoids exhibit low chemical stability and poor bioavailability due to their sensitivity to environmental factors and degradation during gastrointestinal digestion. These limitations significantly hinder their effective utilization in food and nutraceutical formulations. Liposomal encapsulation has emerged as an efficient strategy to overcome these challenges, offering enhanced stability, protection against oxidative degradation, and controlled release of carotenoids throughout digestion. This approach represents a promising direction for developing functional food systems with improved delivery and absorption of lipophilic bioactives.

MATERIALS AND METHODS

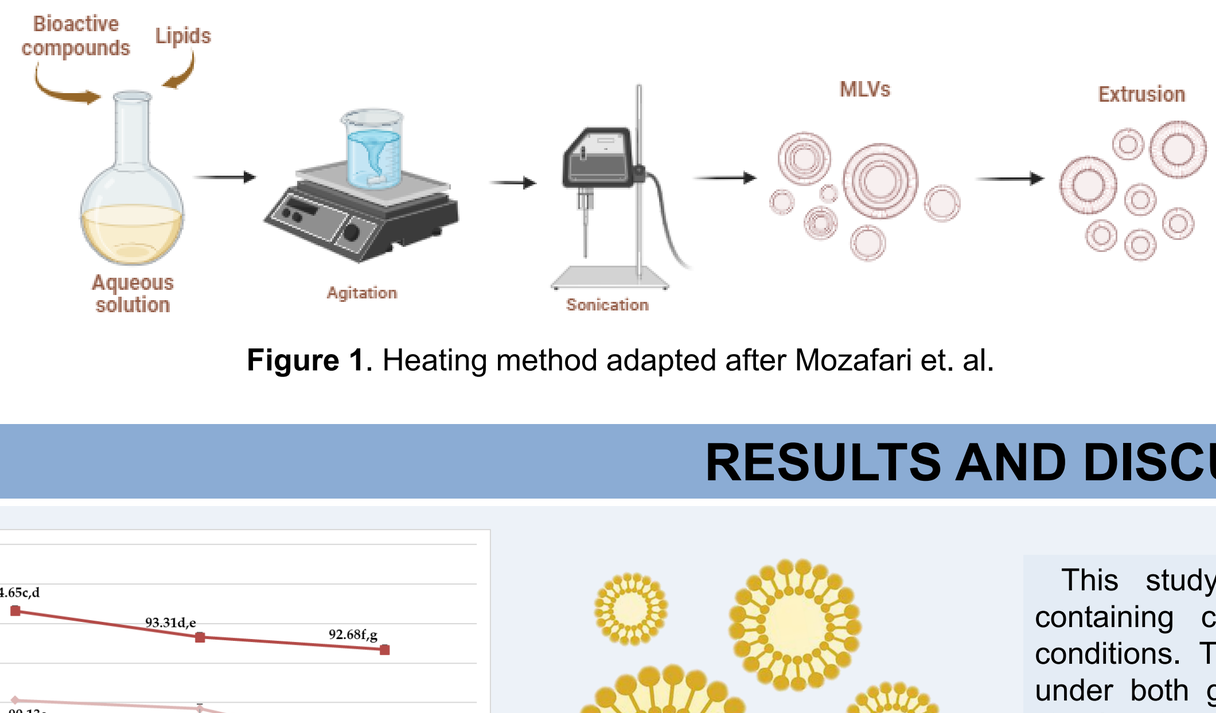
Carotenoids were extracted from *Hippophae rhamnoides* (sea buckthorn) berries using a solvent extraction method optimized for lipophilic bioactive compounds.

The obtained carotenoid-rich extract was subsequently incorporated into liposomal formulations by the thin-film hydration technique.

Phosphatidylcholine was used as the main lipid component to ensure membrane stability and efficient encapsulation.



Extraction of bioactive compounds



Encapsulation Parameters:
Heating/stirring: 1h, 36°C;
Sonication: 30 cycles
Extrusion: 0.8; 0.4; 0.2 μm

Figure 1. Heating method adapted after Mozafari et. al.

RESULTS AND DISCUSSION

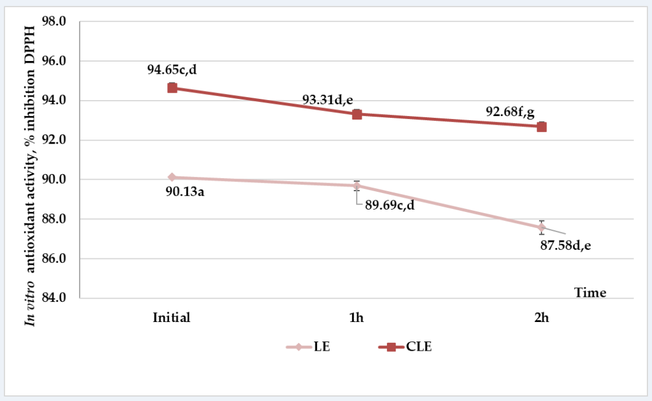
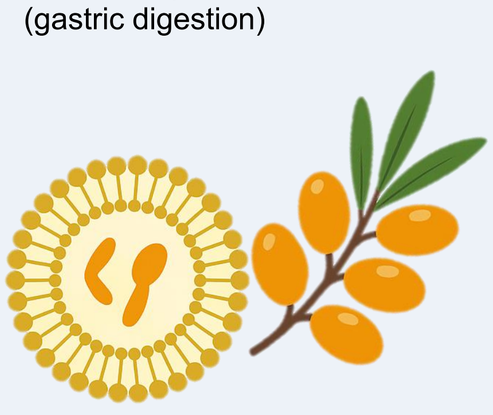


Figure 2. Antioxidant activity *in vitro* of liposomal formulations (gastric digestion)



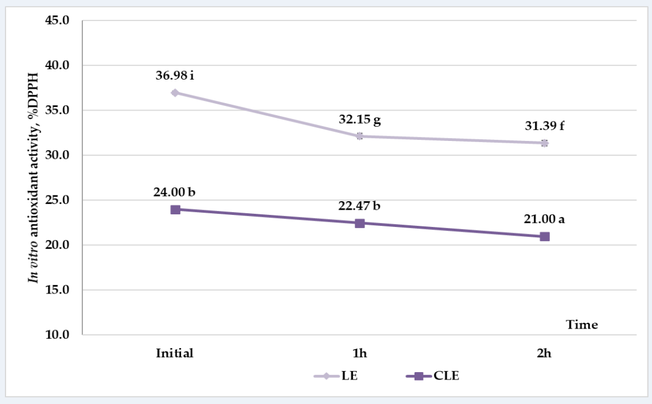


Figure 2. Antioxidant activity *in vitro* of liposomal formulations (intestinal digestion)

This study investigated the antioxidant performance of liposomal formulations containing carotenoid-rich sea buckthorn extract under simulated gastrointestinal conditions. The antioxidant activity was monitored during two-hour digestion periods under both gastric (pH 1.8 ± 0.1) and intestinal (pH 8.2 ± 0.1) environments.Under simulated gastric conditions, liposomal carotenoids demonstrated significantly higher antioxidant stability compared to the non-encapsulated extract.

The encapsulated lipophilic extract (CLE) exhibited an initial antioxidant activity of 92.68 ± 0.89%, which slightly increased to 94.65 ± 1.15% after two hours of digestion. In contrast, the free extract (LE) displayed lower values, ranging from 87.58 ± 1.35% at the beginning to 90.13 ± 0.65% after two hours. These results confirm that liposomal encapsulation provides an effective protective barrier against the acidic gastric environment, minimizing oxidative degradation and preserving the functional integrity of carotenoids.

However, during the intestinal phase, a marked reduction in antioxidant activity was observed for all samples. The CLE sample showed a decrease from 24% to 21% after two hours, while the non-encapsulated extract (LE) declined from 37% to 31%. This reduction can be attributed to the destabilization of liposomal membranes and the potential release and degradation of carotenoids in the alkaline environment. Overall, these findings highlight that liposomal encapsulation effectively enhances carotenoid stability under gastric conditions but requires further optimization—such as lipid composition adjustment or incorporation of stabilizing agents—to improve performance under intestinal conditions.

CONCLUSIONS

Liposomal encapsulation proved to be an effective strategy for protecting carotenoids during simulated gastric digestion, ensuring higher antioxidant activity and improved stability compared to non-encapsulated extracts. The protective phospholipid bilayer of liposomes prevented oxidative degradation and supported the controlled release of carotenoids in acidic environments, thereby enhancing their potential bioavailability.

The reduced antioxidant performance observed under intestinal conditions indicates that liposomal integrity is compromised in alkaline media. Therefore, further optimization of liposomal formulations—such as the modification of lipid composition or incorporation of stabilizing agents—is necessary to improve their resistance and functional performance throughout gastrointestinal transit. The development of more robust liposomal systems could facilitate the application of carotenoid-enriched formulations in functional foods, dietary supplements, and nutraceutical products.

Acknowledgements

The research was supported by the State Project for Young Researchers **25.80012.5107.10TC** *"Stabilization of Plant-derived Bioactive Compounds by Liposomal Encapsulation"*, running within Technical University of Moldova.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

A review on hazelnut by-products: a valuable source of bioactive compounds

Liliana Bolohan-Luca, Daniela Pauliuc

INTRODUCTION

The processing of hazelnuts generates a large number of by-products such as the woody shell, the skin/tegument, and leaves. Most often, these by-products end up being treated as waste, which generates an ecological imbalance. This study provides an overview of the current scientific data regarding hazelnut by-products and their valorization for optimizing population health.

MATERIALS AND METHODS

This paper presents an analysis of the specialized literature from electronic databases, specifically PubMed, Google Scholar, and Cochrane Library, covering the period from January 2015 to September 2025. The search strategy combined medical subject headings and free-text terms related to hazelnuts and relevant molecular or metabolic mechanisms.

Studies were considered eligible if they met the following criteria:

✓Involvement in human *in vitro*, *in vivo*, or observational models relevant to health;

✓Evaluated the effects of compounds derived from hazelnuts (including oils, pellicles, or fermented extracts);

✓Were original research articles published in full text in the English language.

Exclusion criteria included the following:

✓Narrative reviews, conference papers, editorials, or letters;

✓Studies focused on the general consumption of "nuts" without specific data on hazelnut by-products;

✓Articles that did not contain health-relevant outcomes or mechanistic evaluation criteria.

RESULTS AND DISCUSSION

Table 1.Properties and most relevant biological effects of hazelnut and by-products.

Property	Part	components	Subject	Effects	References
Antioxidant	**Skin**	Polyphenols		Inhibited BSA-AGEs	Spagnuolo, et al., 2021
Antitumor	**Shell**	Paclitaxel	SK-Mes-1, A375 cells, SK-MEL-28 and HeLa cells	Inhibitsed cell growth; transition rate from mid to late stage↓	Ottaggio et al., 2008, Esposito et al., 2017
	Leaf	Extracts	HeLa, HepG2 and MCF-7 cells	Inhibited the cellular activity	Gallego et al., 2017
	Husk	Extracts	T47D-Kbluc and A549 cells	Cytotoxic effect; ROS↓	Rusu, et al., 2019
Antimicrobial	**Shell**	Caffeic acid and epigallocatechin gallate		Bacillus subtilis↓; Staphylococcus aureus↓; Bacillus cereus↓	Di Michele et al., 2021, Oliveira et al., 2007
	Skin	Proanthocyanidin		Candida albicans SC5314↓; decreased fungal cells	Piccinelli, et al., 2016
Prebiotics	**Kernel /shell**	Dietary fibres		Butyric acid producing bacteria↑; Lactobacillus plantarum P17630 ↑, Lactobacillus crispatus P17631↑	Tuncil, 2020, Montella et al., 2013a)
Anti-obesogenic and lipid-lowering	**Skin**	Extracts	Golden Syrian hamsters	Total cholesterol↓, low-density lipoprotein level↓, fecal bile acid content↑	Caimari, et al., 2015

Table 2. Application of hazelnut by-products.

Part	Application		Reference
Leaf, skin	Husbandry	Animal feed additive	Renna et al., 2020; Terranova et al., 2021
Kernel, skin, shell, husk	Food Industry	Bioactive packaging, bioactive films, fuel, medium density fibreboard, natural dyestuff, dye-affinity sorbent	Esposito et al., 2020, Niderkorn et al., 2020, Tutak and Benli, 2012
Shell	Chemical processing	Ethanol and other biochemical reagents, culture substrates	Puliga et al., 2022

Table 3. Bioactive components of hazelnut by-products

Hazelnut Part	Bioactive Compound Class	Specific Compounds Mentioned	Key Benefits/Notes	Authors/Citations
Skin	Phenolic Compounds (General)	Flavonoids, Flavan-3-ols.	Contains 168 to 378 times more total phenolic compounds than raw or roasted kernels.	Del Rio et al., 2011; Taş et al., 2015; Król et al., 2020
	Phenolic Acid	Gallic Acid (equivalent).		Taş et al., 2015
	Tocopherols	-tocopherol (content is twice that of the kernel).		Taş et al., 2015
	Dietary Fiber	Lignin (approx. 55%), Fibrous Polysaccharides (approx. 45%).	Total fiber content is about 69.8%, with probiotic potential.	Tuncil, 2020
Shell	Phenolic Compounds (General)	Diarylheptanes, Neolignans, Phenylpropanoids, Flavonoids.	Natural source of antioxidants.	Esposito et al., 2017; Masullo et al., 2017; Yuan et al., 2018
	Phenolic Acid	Catechin (most abundant phenolic acid); Coumaroylquinic acid.		Yuan et al., 2018
	Lignan/Diarylheptane	Giffenine V.		Masullo et al., 2017
	Hemicellulose	Xylan (a major source of nascent prebiotics).		López, Rivas, Moure, Vila, & Parajó, 2020
	Taxanes	Paclitaxel, 10-deacetylbaccatin III, baccatin III, paclitaxel C, 7-epipaclitaxel.	High potential for the industrial production of related compounds.	Ottaggio et al., 2012; Miele et al., 2012
Husk	Phenolic Acids	Chlorogenic acid, Caffeic acid, Protocatechuic acid, Ferulic acid, Caftaric acid.		Rusu et al., 2019
	Flavonoids/Flavones	Apigenin, Flavonols, Flavones (lignan-7-O-rutinoside).		Rusu et al., 2019; Cabo et al., 2020
	Sterols	-sitosterol (highest content), Campesterol, Stigmasterol.		Rusu et al., 2019
	Other Compounds	Ellagic acid, Benzoic acid, Baccatin III (a precursor to paclitaxel synthesis).		Cabo et al., 2020; Hoffman & Shahidi, 2019
Leaf	Phenolic Compounds (General)	Diarylheptanes, Flavonol Glycosides.	Used in folk medicine to treat hemorrhoids, varicose veins, phlebitis, and other diseases.	Alberti et al., 2016; Oliveira et al., 2007
	Specific Compounds	Prunetin-3-O-rhamnoside (main phenolic compound); Caffeoyl tartaric acid, p-Coumaroyl tartaric acid, Populinoid rhamnoside.		Amaral, et al., 2015; Oliveira, et al., 2017
	Taxanes	Paclitaxel, 10-deacetyl baccatin III, Cephalomannine.	A natural source of paclitaxel.	Hoffman & Shahidi, 2019

CONCLUSIONS

This article summarizes the research on the nutrition, bioactive components, extraction methods, biological functions, and applications of different by-products (shell, skin, husk, and leaf) over the last decade. Its bioactive components are mainly polyphenols, dietary fiber, proteins, polysaccharides, paclitaxel, etc. Most notably, the shells, husks, and leaves of the hazelnut tree contain taxanes such as paclitaxel, which have a certain cytotoxicity, can inhibit the proliferation of cancer cells, and can reduce the transformation rate of cells in the middle and late stages. Hazelnut by-products represent an excellent source of nutrients and bioactive compounds, which possess good functional and health-promoting properties and can have valuable applications in the food, pharmaceutical, and other industries.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Evaluation of the nutritional quality of breakfast cereals available on the Romanian market

Ancuța Elena PRISACARU, Cristina GHINEA, Marian Cătălin PRISACARU

INTRODUCTION

Breakfast is recognized as a key meal that provides essential nutrients after fasting, with regular consumption supporting cognitive and physical performance while its omission is linked to deficiencies and unhealthy dietary patterns. Dietary guidelines recommend that breakfast supply 15–25% of daily energy and include at least three core food groups, with whole-grain cereals highlighted for their nutrient density and potential role in disease prevention. Ready-to-eat cereals, while convenient, vary greatly in nutritional quality depending on composition and processing, underscoring the importance of evaluating their contribution to overall diet quality.

MATERIALS AND METHODS

A total of 119 breakfast cereals were collected from major Romanian supermarket websites between October 2021 and May 2022, with inclusion limited to products providing complete nutritional data and clear labelling. Nutritional information—including energy, macronutrients, fiber, salt, and gluten content—was extracted and products were classified into six categories (cereal bars, muesli, flakes, bran, puffed cereals, and filled/honey varieties) to allow structured comparison. Data were processed in Excel, and descriptive statistics were calculated to evaluate nutritional composition against WHO recommendations, enabling assessment of their contribution to daily intake and identification of potential dietary imbalances.

RESULTS AND DISCUSSION

The analyzed breakfast cereals showed considerable variation in energy content, with bran cereals being the least energy-dense and filled or glazed varieties the most, while gluten-free products had slightly lower average energy than gluten-containing ones. Although typical servings generally provide a moderate contribution to daily energy intake, consumption of energy-dense cereals may substantially increase total caloric intake, highlighting the potential for excessive energy consumption.

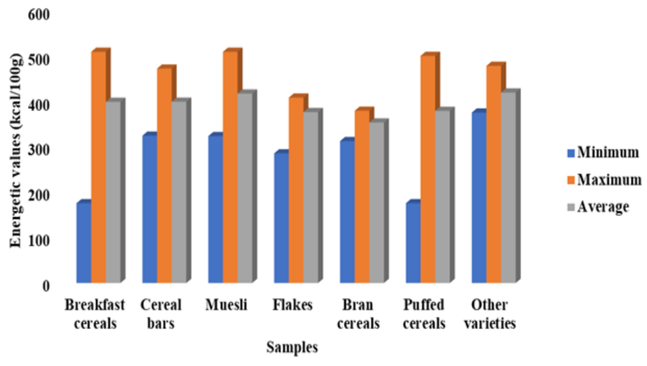


Fig. Energetic value of analyzed samples (kcal/100g)

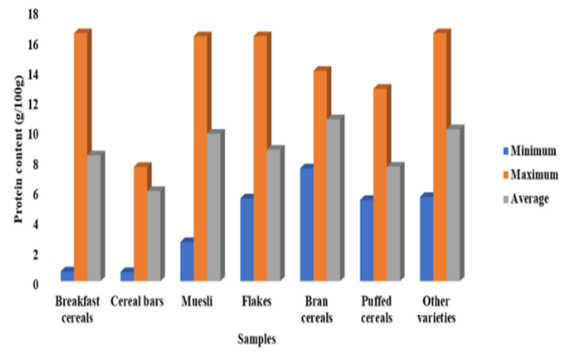


Fig. Protein content of analyzed samples (g/100g)

Protein content in the cereals ranged from very low in cereal bars to high in filled and bran varieties, with gluten-free products showing slightly higher averages than gluten-containing ones. While most cereals provide a moderate contribution to daily protein intake according to WHO recommendations, additional protein sources are needed to meet total daily requirements.

Fat content in the analyzed cereals varied widely, with muesli showing the highest levels and bran cereals the lowest, while gluten-containing products had slightly more fat on average than gluten-free ones. Although most cereals remain below WHO recommended fat intake, high-fat varieties can substantially increase total dietary fat if consumed in large portions, emphasizing the need for careful product selection.

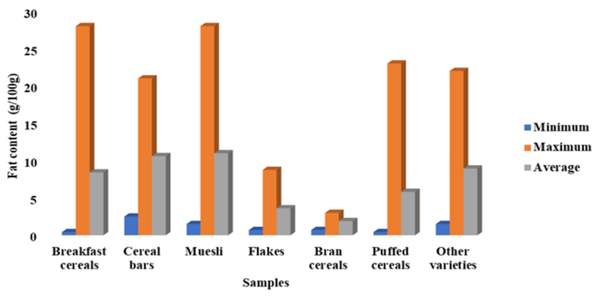


Fig. Fat content of analyzed samples (g/100g)

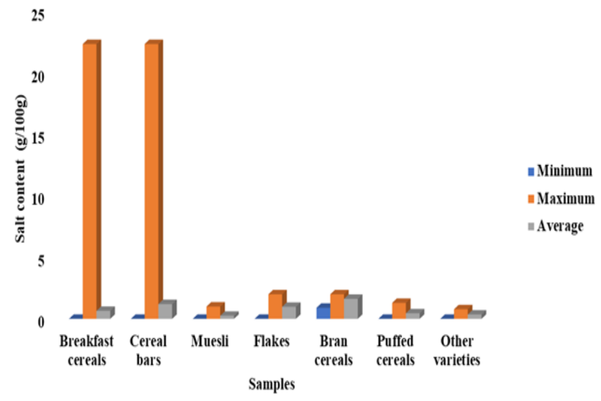


Fig. Salt content of analyzed samples (g/100g)

Salt content varied among the cereals, with cereal bars having the highest levels and gluten-containing products slightly exceeding gluten-free ones on average. Most cereals contributed minimally to daily salt intake relative to WHO recommendations, though frequent consumption of high-salt bars could significantly increase overall sodium intake.

Carbohydrate content among the cereals ranged widely, with filled or glazed varieties being the highest and puffed cereals the lowest, while gluten-containing and gluten-free products showed similar average values. Breakfast cereals provide a substantial source of carbohydrates relative to WHO recommendations, but those with very high carbohydrate levels may contribute to excessive intake if not balanced with sufficient protein and fiber.

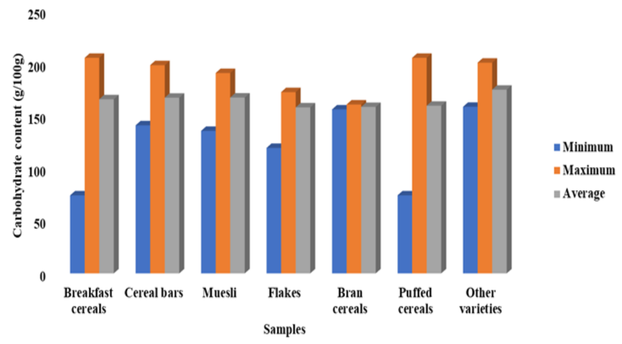


Fig. Carbohydrate content of analyzed samples (g/100g)

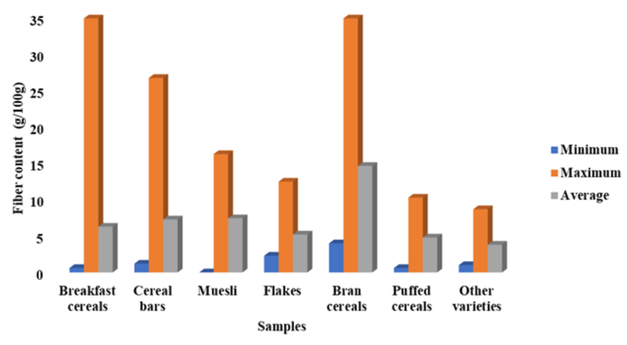


Fig. Salt content of analyzed samples (g/100g)

Dietary fiber content varied widely, with bran cereals having the highest levels and filled or glazed varieties the lowest, while gluten-containing products averaged slightly more fiber than gluten-free ones. Fiber-rich cereals, especially bran types, can substantially support WHO dietary recommendations, promoting gastrointestinal health and reducing chronic disease risk.

Sugar content varied widely among the analyzed cereals, with flakes showing the highest levels and muesli the lowest, while gluten-free products contained slightly more sugar than gluten-containing ones. Several cereals, particularly flakes and filled or glazed varieties, may contribute substantially to sugar intake relative to WHO recommendations, highlighting the need for careful selection, especially for children or those monitoring sugar consumption.

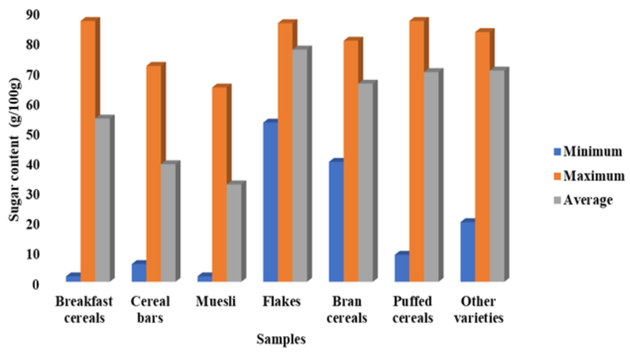


Fig. 4. Sugar content of analyzed samples (g/100g)

CONCLUSIONS

The analysis of 119 breakfast cereals on the Romanian market revealed substantial variations in energy, macronutrient, sugar, salt, and fiber content, with notable differences between gluten-free and gluten-containing products. While some cereals, particularly those high in sugar and fat, may contribute to excessive intake, bran-based varieties provide valuable fiber and protein, emphasizing the need for informed choices based on nutritional labelling and for reformulation efforts to align with international dietary recommendations.

Stefan cel Mare University of Suceava

10th International Conference BITECHNOLOGIES, PRESENT AND PERSPECTIVES

TOTAL PHOLYPHENOLIC CONTENT AND ANTIOXIDANT POTENTIAL OF WALNUT OILCAKE

Ancuța Petraru, Ionuț Avrămia, Daniela Pauliuc, Florin Ursachi, Ancuța Chetrariu, Amelia Buculei, Sonia Amariei
Stefan cel Mare University of Suceava, Romania
October 17, 2025

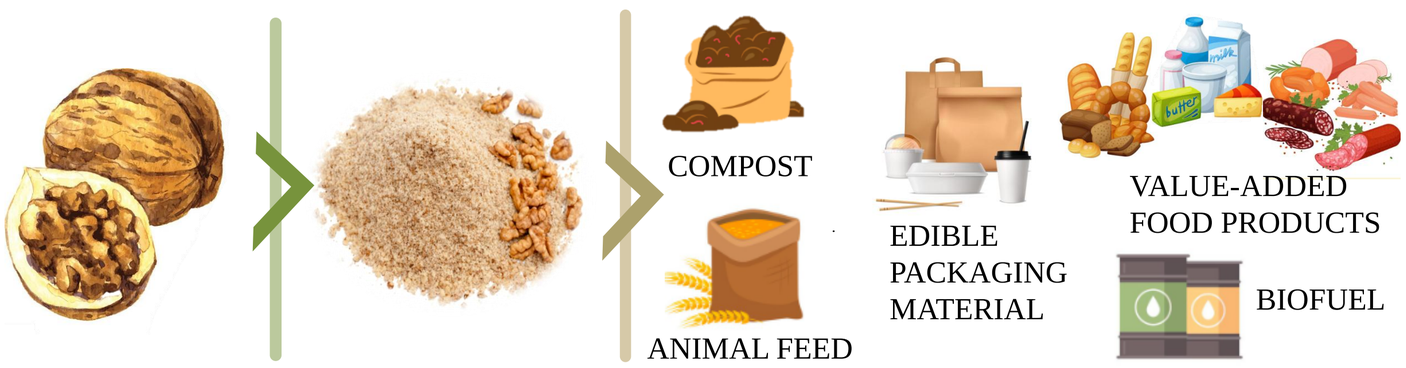
ABSTRACT

Walnut oilcake (WOC) produced as a by-product of oil extraction is considered a new product with potential use in both animal and human diets. In this study the walnut oilcake was characterized to determine its health- enhancing substances and antioxidant activity.

INTRODUCTION

Modern society faces major challenges like resource exhaustion and waste accumulation, driving up raw material costs and tightening waste regulations. In line with the EU's waste management hierarchy (prevention to disposal), agri-food by-products—especially from the oil, agriculture, and food sectors—offer promising, low-cost sources of functional compounds.

Oilcakes, rich in techno-functional properties, hold great potential for food, feed, and biodegradable material applications, yet remain underutilized. With proper processing and detoxification, these by-products could enhance sustainability, support food security, and contribute to circular economy goals.



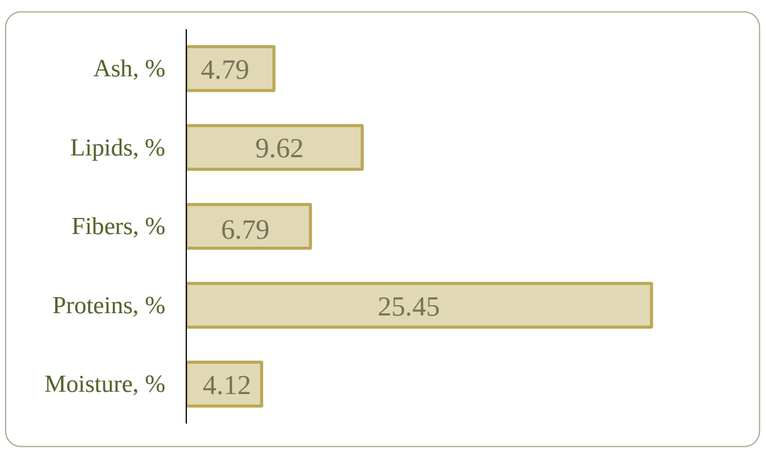
MATERIALS AND METHODS

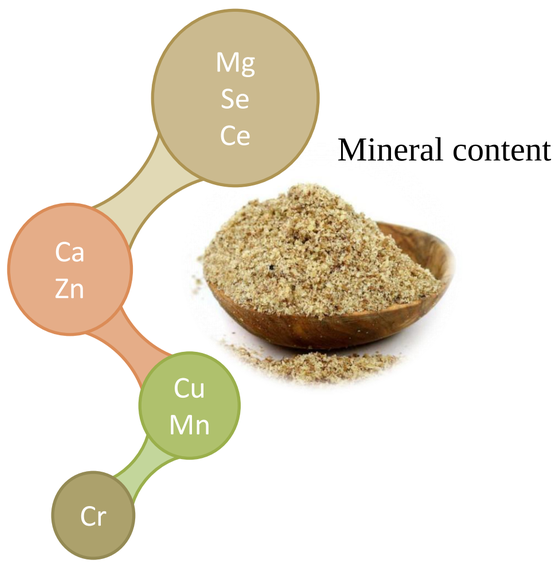
Walnut oilcake (WOC), a by-product of traditional mechanical oil pressing, was ground, defatted, and analyzed for its key physicochemical properties (proteins, minerals, ash, lipids, fibers, moisture). This characterization is essential for exploring new valorization opportunities.

The effects of different extraction conditions on total polyphenol content (TPC) and antioxidant activity were evaluated using a Box–Behnken design in Design Expert 11 (Stat-Ease Inc., trial version) . Four variables—temperature (30–50 °C), time (10–20 min), amplitude (40–100%), and solvent type (methanol, water, ethanol)—were tested. Extractions were performed via ultrasonication of a defatted walnut oilcake meal–solvent mixture (1:20) using a ultrasonic bath (Elma Transsonic TI-H15) .

TPC and radical scavenging activity were determined using a UV-VIS-NIR spectrophotometer (Shimadzu, Kyoto, Japan). TPC was assessed with the Folin–Ciocâlteu method (at 750 nm, gallic acid curve 10-500 mg/L, $R^2 = 0.997$), and antioxidant activity using DPPH (at 517 nm). The phenolic acids were determined for the extract with the highest TPC.

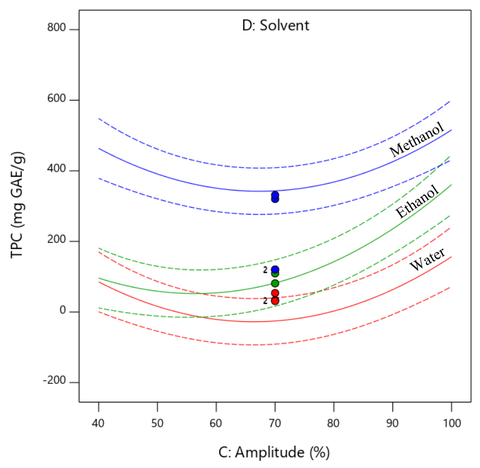
RESULTS AND DISCUSSION

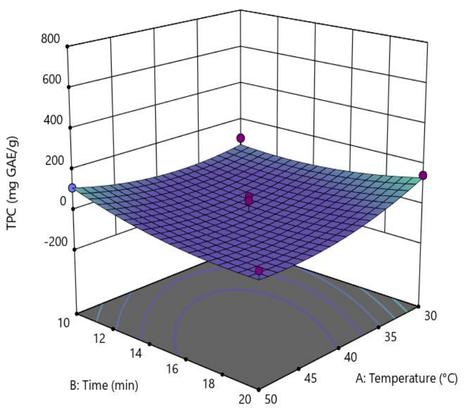




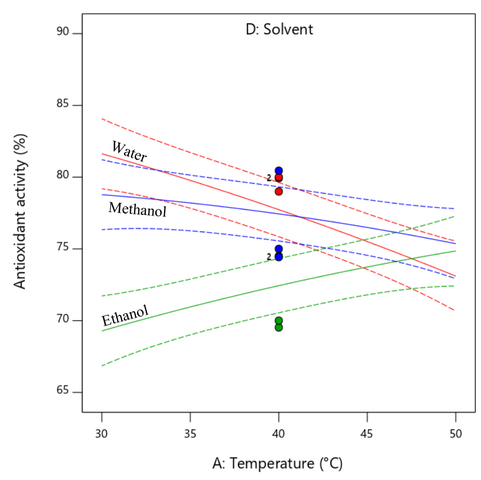
Mineral content

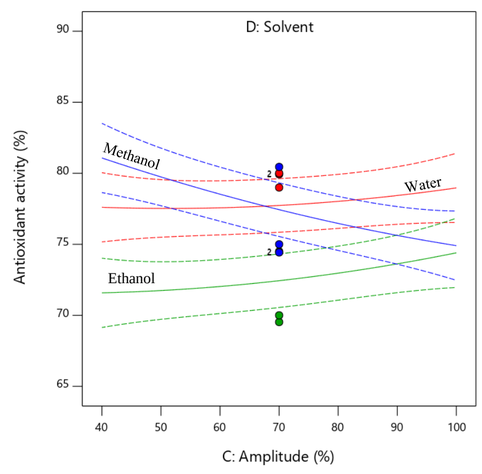
The application of various working parameters resulted in alterations in the polyphenol content and antioxidant activity. Consequently, TPC ranged from 13.87 to 699.75 mgGAE/g while antioxidant capacity from 66.25 to 85.19%





Amplitude had the most significant positive effect on TPC, while increasing temperature and extraction time, as well as decreasing amplitude, negatively impacted the TPC. The best extraction was obtained with methanol, ethanol and lastly water.





The solvent type, temperature, and amplitude significantly ($p<0.01$) influenced the antioxidant activity. In the case of methanol, increasing temperature and amplitude reduced antioxidant potential, while in the case of ethanol, higher values of these parameters enhanced it.
The best extraction was obtaine with ethanol, water and lastly methanol.

The phenolic acids identified in WOC, in descending order, were: protocatechuic acid, 4-hydroxybenzoic acid, vanillic acid, caffeic acid, myricetin, quercetin, p-coumaric acid, chlorogenic acid, luteolin, and rosmarinic acid.

CONCLUSION

Walnut oilcake is a low-cost, renewable by-product with significant potential as a co-product in the development of novel, high-value food products and dietary supplements. Additionally, future applications include the production of edible and biodegradable food packaging materials, contributing to both sustainability and innovation in food technology.

REFERENCES

1. Petraru, A.; Sonia, A. (2020) Oil press-cakes and meals valorization through circular economy approaches: A review. *Appl. Sci.*, *10*, 7432.
2. Petraru, A.; Amariei, S.; Senila, L. Flaxseed Oilcake: An Ingredient with High Nutritional Value in the Realization of Innovative Food Products. *Foods* **2025**, *14*, 1–25.
3. Chetrariu, A.; Dabija, A. Spent Grain from Malt Whisky: Assessment of the Phenolic Compounds. *Molecules* **2021**, *26*, 3236, doi:10.3390/molecules26113236.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Development and stability assessment of films based on cellulose, grape pomace pectin, and *Bursera graveolens* essential oil

Mariana Spinei[1,2*], Florina Dranca[2], Daniela Pauliuc[2], Mircea Oroian[2]

[1] Integrated Center for Research, Development and Innovation in Advanced Materials, Nanotechnologies and Distributed Systems for Fabrication and Control (MANSiD), Stefan cel Mare University of Suceava, Romania

[2] Faculty of Food Engineering, Stefan cel Mare University of Suceava, Romania

*Corresponding author: mariana.spinei@fia.usv.ro

INTRODUCTION

An **edible film** is a thin layer of edible material that, once formed, can be placed over or between food ingredients, forming an edible coating as a coating on the food. The most common materials for the formulation of edible/biodegradable films and coatings are proteins, **polysaccharides**, and lipids, and in the combination of these allows for producing blends of enhanced characteristics. Recently, **essential oils** have been widely studied as additives which have different properties (e.g., antimicrobial and antioxidant) in edible/biodegradable emulsified films and coatings.

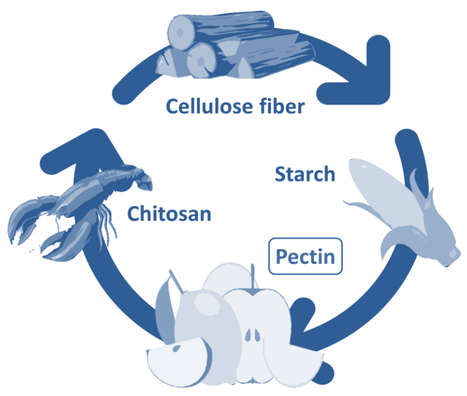


Fig. 1. Different sources of biomaterials

MATERIALS AND METHODS

This study aimed to develop composite films formulated from carboxymethyl cellulose (CMC), grape pomace pectin (GPP), and *Bursera graveolens* essential oil (BGEO), using glycerol as a plasticizer. The films were characterized in terms of thickness, mechanical properties (tensile strength and elongation at break), optical properties (opacity and color parameters), and structural features *via* FT-IR spectroscopy.

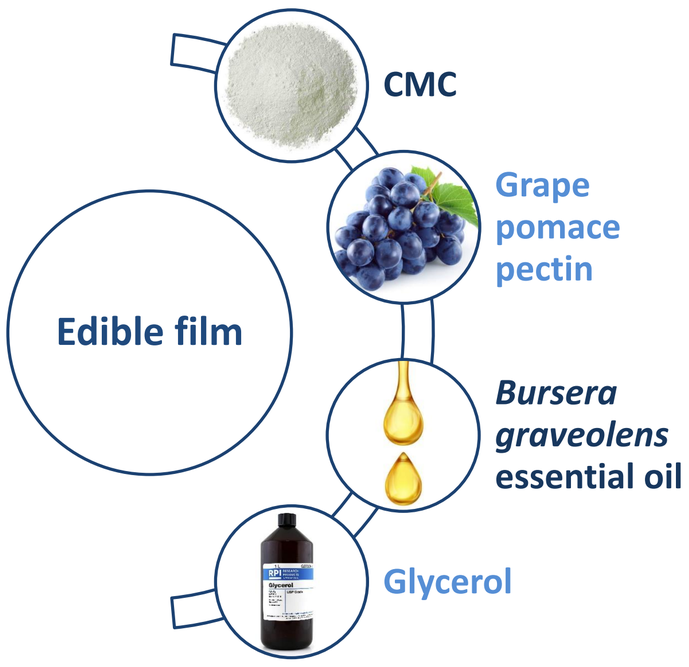


Fig. 2. Film preparation

RESULTS AND DISCUSSION

Results indicated that the incorporation of BGEO influenced the optical characteristics of the films; opacity values ranged from 8.12 to 11.10. FT-IR analysis of films containing CMC, 10% GPP, and BGEO revealed prominent absorption peak at 2910 cm^{-1}, attributed to C–H bending vibrations. These findings demonstrate that films based on CMC and GPP, enhanced with 2% BGEO, offer promising potential for application in sustainable food packaging and functional material development aimed at reducing environmental impact.

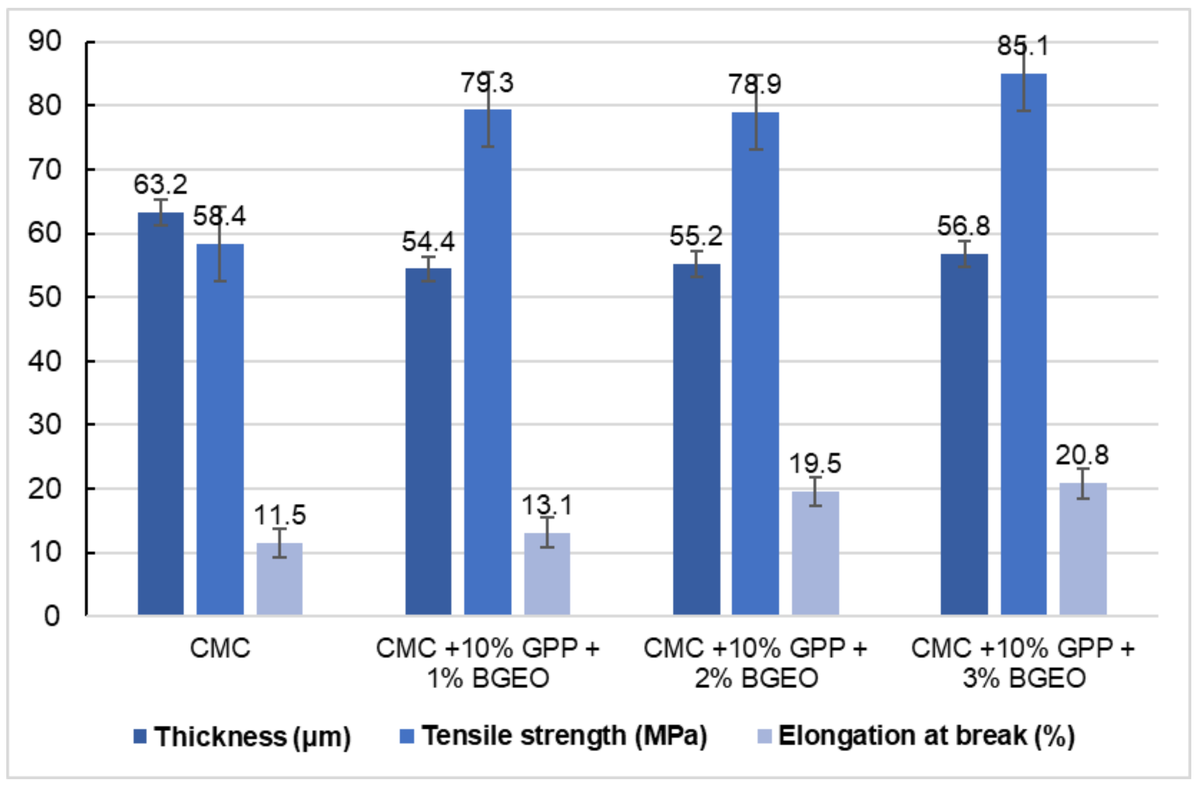


Fig. 3. Mechanical properties of edible films

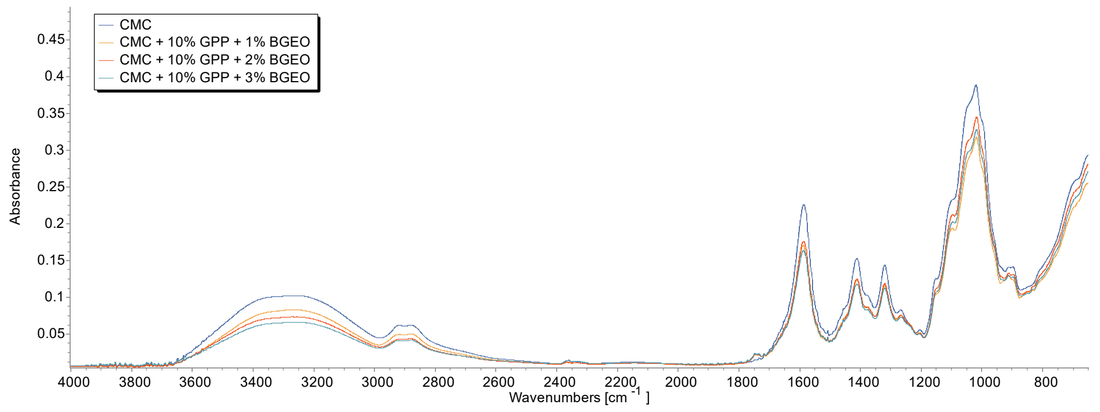


Fig. 4. FT-IR spectra of edible films

Fig. 5. Images of edible films

CONCLUSIONS

These composite films exhibit improved functional properties, such as enhanced antioxidant capacity, mechanical strength, and barrier performance, which are essential for effective food preservation. Moreover, the incorporation of GPP and BGEO not only adds value to by-product materials but also supports a circular economy approach, aligning with global efforts to minimize plastic usage and reduce environmental footprint. Therefore, this study highlights the strong potential of such bio-based films for practical application in eco-friendly food packaging systems, as well as in the development of multifunctional materials suitable for broader industrial use.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

QUALITY CHARACTERISTICS OF READY-TO-DRINK COFFEE-BASED PRODUCTS

Laura Carmen APOSTOL*, Sorina ROPCIUC, Florin URSACHI, Ionut AVRAMIA
Faculty of Food Engineering, Stefan cel Mare University of Suceava,
13 Universității Street, Suceava 720229, Romania
*email: laura.apostol@fia.usv.ro

INTRODUCTION

.

Coffee become one of the most appreciated beverages mostly due to its distinctive flavor properties. According to the World Coffee Organization (ICO), world coffee consumption has grown at an average annual rate of 1.9%, Europe touching in 2023 a consumption of 53.7 million bags (60 kg) (30% of global demand) (Barrea et al., 2023).

Coffee leads the hot beverage industry in terms of value, and this dominance is expected to continue. In this context diverse variants such as milk coffee (cappuccino, latte, mochaccino) and flavor coffee were develop. The increase in demand for specialty coffee has been accompanied by a growing interest among consumers in knowing where the coffee comes from and how it is grown (Cioba, 2025). Once a seasonal treat, cold coffee is a year-round habit and growing fast. European consumers spent more than double on cold coffee in 2023, than spent in 2016 (European Economy Institutional Papers, 2023).

The main purpose of this study was to determine the quality of types ready to go cappuccino characteristics available ready-made in Romania supermarkets.

MATERIALS AND METHODS

Five commercial samples from different manufacturers, based on coffee and especially cappuccino which are predominantly found on supermarket refrigerator shelves, were purchased and coded from A to E.

Sample A, **Iced Coffee Starbucks** is made from 100% Arabica coffee, a cold blend of espresso and creamy milk with hints of cocoa.

Sample B, **Mizzo coffe,** is a coffee-based drink originating in Hungary.

Sample C, **Meggle,** is a cappuccino originating from Croatia, served cold., from sterilized milk drink with coffee extract .

Sample D, **Caffemio**, is a cappuccino from Rauch originating in Austria, made from alpine milk and flavored coffee, adapted to a practical size of the robust PET bottle with a leak-proof screw cap presents an advantage for its use.

Sample E, **Nescafe**, a very famous coffee brand in Romania, made from carefully selected Arabica and Robusta coffee beans for an aromatic taste and resistant foam.

The analyses performed on the cappuccino samples were consumer tests, volume evaluation, pH, acidity, color and sugar determination by standard methods. Determination of caffeine in coffee products using HPLC.

RESULTS AND DISCUSSION

Organoleptic Quality Traits

Analyzing the profile data, it is observed that sample number 5 (Nescafe) has a less pronounced taste, smell and aroma than the rest of the samples. These values are due to the low milk content, being covered by the sweet taste due to the presence of sugar and water which becomes a substitute for milk in these products (Table 1).

Table 1. Quality parameters and their descriptive values

Sensory characteristics (Scoring scale 0-5)	Iced Coffee	Mizzo	Meggle	Cafemio	Nescafe
Color	5	4	3	5	5
Clarity	5	5	5	5	5
Aroma	5	4	3	3	2
Taste	5	4	4	4	2
Smell	5	4	3	3	2
Overall score	25	21	18	20	16

Proximate composition of samples

The results regarding the composition of the analyzed samples are further presented in Table 2 (volume, pH, acidity, color, ersatz and sugar content).

The standards on the pH scale for coffee indicate a ranges from 4.85 to 5.10, which makes it an acid. Coffee contains 2 types of acids: organic acids and chlorogenic acid. According to the data obtained from the analyzes performed and presented in Table 2, it was found that the products with the lowest pH are Nescafe and Meggler

Caffeine content in coffee-based products using HPLC

Three standard caffeine solution concentrations, ranging from 25 to 100 mg/L, were examined in order to adequately represent the range of coffee samples that were collected from the market. According to Table 3, it can be seen that the highest caffeine concentration is found in Nescafe Cappuccino (250 ml dose) with 41.13 mg/L, and the lowest values are found in Meggle Iced Coffee Cappuccino (tetrapack) with 21.24 mg/L.

Acknowledgements
This research was supported by the "Ștefan cel Mare" University of Suceava.

Table 2. Proximate composition resulted from laboratory analyses (n=3).

Parameter	Iced Coffee	Mizzo	Meggle	Caffemio	Nescafe
Volume, mL (displayeddetermined)	220/220	330/300	250/248	250/250	250/250
pH	6.75±0.01	6.69±0.02	6.58±0.01	6.65±0.01	6.35±0.02
Acidity, (T°)	2.40±0.20	2.63±0.12	2.90±0.10	2.53±0.12	2.20±0.20
Color, L*; a*; b*	52.73±0.03; 2.85±0.01; 19.77±0.11	60.83±0.02; 1.66±0.04; 24.73±0.02	61.21±0.01; 1.10±0.03; 25.03±0.02	49.49±0.02; 4.43±0.03; 24.71±0.01	44.69±0.01; 3.67±0.03; 21.14±0.00
Ersatz	Absent	Absent	Absent	Absent	Absent
Sugar content (°Brix)	15.27±0.12	17.93±0.12	14.47±0.12	15.93±0.12	11.97±0.06

The sugar content in cappuccino is often an important value for determining the caloric values of the analyzed products, thus the product with the highest sugar value is Mizzo cappuccino – 17.93, and the lowest values are found in Nescafe samples.

Following the determination of the ersatz in coffee-based products, in absolutely all cases a lack of it was demonstrated, which demonstrates that no falsification actions were carried out on the products.

Table 3. Caffeine concentration in the analyzed samples

Sample	RT	Area at 206 nm	Dilution factor	Caffeine concentration mg/L
Nescafe	7.341	7060060.2	10	41.13
Mizzo	7.335	3753302.6	10	21.87
Meggle	7.333	3645967.6	10	21.24
Cafemio	7.322	6548463.7	10	38.15
Iced Coffee	7.332	4115568.2	10	23.98

CONCLUSIONS

The pH parameter for each individual cappuccino sample was between 6.75 and 6.35; likewise, the titratable acidity for each sample was established to be between 2.2 T° to 2.9 T°. The total soluble solids analysis indicate the higher value for Mizzo coffee - 17.9 °Brix, and the lowest values are found in Nescafe cappuccino sample (11.97°Brix). The detection of caffeine content at the 206 nm area, showed that the Nescafe cappuccino sample at the retention time of 7.341 had the highest values of 41.13 mg/L, and the product Meggle Cappuccino with the lowest concentration of caffeine is 21.24 mg/L at a retention time of 7.333. It can be noted that the aroma, taste and smell values for cappuccino are dependent on the amount of coffee and the sugar content.

Stefan cel Mare University of Suceava

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Faculty of Food Engineering

The influence of soy lecithin on the rheological properties of dough and bread quality formulated with 650 type wheat flour

Silviu-Gabriel STROE, Andreea HAINA

Faculty of Food Engineering,
Stefan cel Mare University of Suceava, Romania

INTRODUCTION

Throughout history, breadmaking techniques have undergone significant evolution, driven by the refinement of existing methods and the development of advanced technological approaches aimed at achieving distinctive characteristics, desired quality attributes, and differentiated flavor profiles [Koukouta et al., 2017]. To effectively enhance both rheological and textural properties, bread formulations are frequently fortified through the incorporation of composite flours from alternative cereals, seeds, or specific food additives.

One such natural additive commonly employed is lecithin, a compound classified under the phospholipid group, naturally occurring in both plant and animal tissues. Lecithin is utilized within the food industry and designated by the European identifier E322. Beyond its established antioxidant, emulsifying, and stabilizing properties, lecithin serves to refine product texture, prevent ingredient phase separation, and extend the overall shelf life of the final product.

Research has unequivocally demonstrated that the incorporation of soy lecithin significantly influences the rheological characteristics of the dough and the textural attributes of the resultant bread. Specifically, the inclusion of a 1% concentration of soy lecithin has been observed to measurably improve the overall quality of the bread. Due to its elevated phospholipid content, lecithin contributes to superior gas retention within the dough matrix, thereby exerting a beneficial effect on both the porosity and specific volume of the baked good. Furthermore, the application of lecithin has been shown to reduce the initial gelatinization temperature of starch, a mechanism that may serve as a critical prerequisite for the subsequent extension of the bread's freshness, shelf life, and desirable sensory properties [Krasilnikova et al., 2023].

MATERIALS AND METHODS

In the experiment we used 650 type wheat flour for baking, powdered lecithin extracted from non-genetically modified soybeans, added in 0.5% (sample 1), 0,75% (sample 2), 1,0% (sample 3), 1,25% (sample 4), and 1.5% (sample 5) concentrations, compressed yeast (*Saccharomyces cerevisiae*), and table salt.

The quality of the raw material and the subsequent dough behavior were rigorously assessed using the following standardized methodologies:

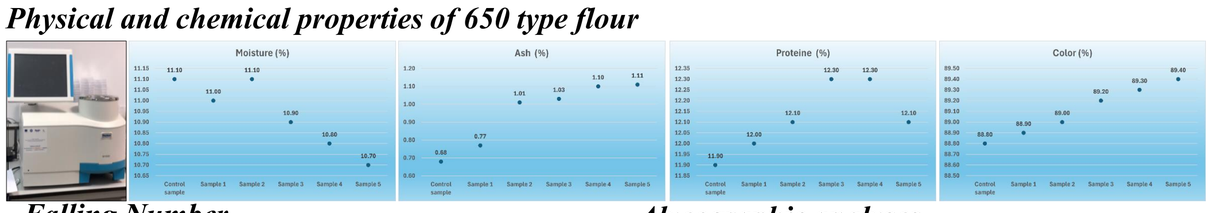
- ***Alpha-Amylase Activity*** (Falling Number);
- ***Ash and Protein Content*** (Perten Analyzer);
- ***Rheological Behavior during Thermal Cycling*** (Chopin Mixolab);
- ***Protein and starch behavior*** (evaluated using Chopin Mixolab);
- ***The rheological properties of dough stretching (alveographic method)*** (Chopin Alveograph);
- ***Viscoelastic properties*** (G′ and G″ moduli) (Thermo Scientific HAAKE MARS rheometer);

The physical attributes of the baked product were quantified using established standards:

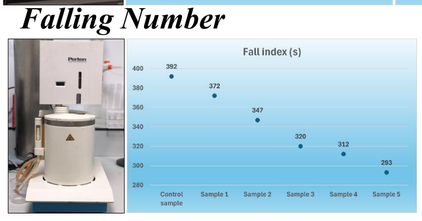
- ***Specific Volume***: using the Fornet device (SR 91:2007).
- ***Textural Profile Analysis*** (TPA) (TVT-6700 Texturometer, Perten Instruments);
- ***Crumb Porosity and elasticy***: ***Porosity*** was calculated as the percentage of total pore volume based on the measured mass of a defined cylindrical crumb sample of known volume (SR 91/2007***). Crumb elasticity*** was determined according to SR 91:2007.

RESULTS AND DISCUSSION

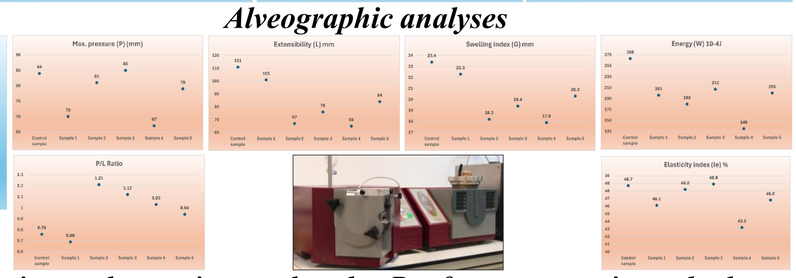
Physical and chemical properties of 650 type flour



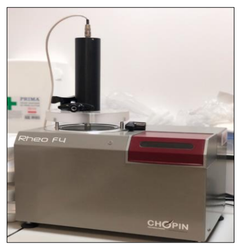
Falling Number



Alveographic analyses



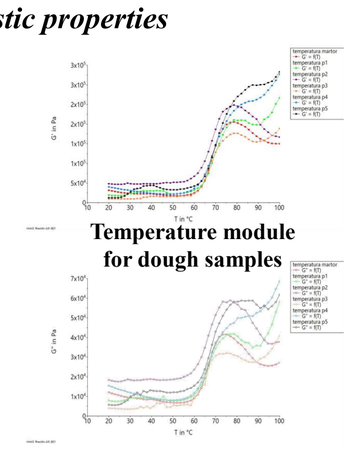
Gas formation and retention on doughs. Reofermentometric method



The analysis revealed that sample 4 achieved the highest dough development height (H'm), followed by samples 1 and 2, which also exhibited the shortest development times. This improvement is attributed to the addition of lecithin, which enhances gluten structure, water retention, and emulsion stability.

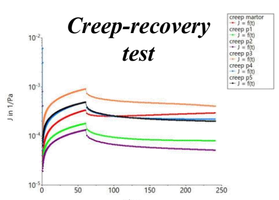
In contrast, sample 5 showed the lowest H'm, although some other parameters improved. These results indicate that a 1.5% soy lecithin concentration is excessive, negatively affecting dough development despite partial functional benefits.

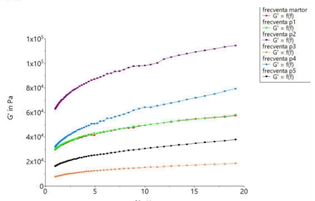
Viscoelastic properties



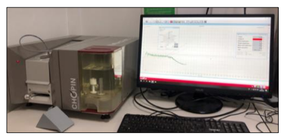
Temperature module for dough samples

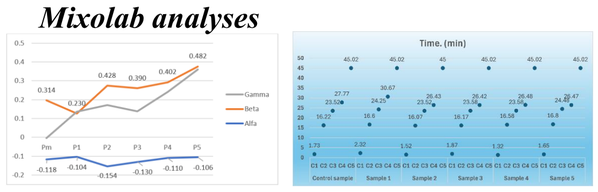
Creep-recovery test

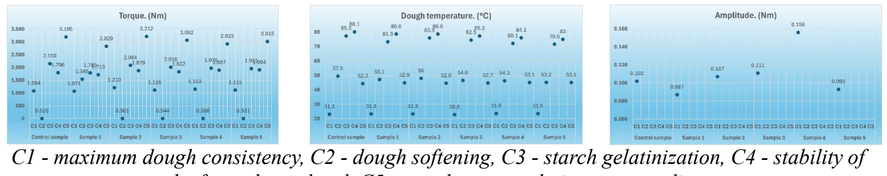




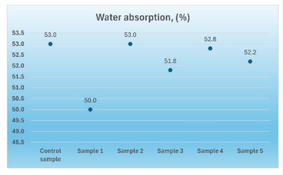
Mixolab analyses







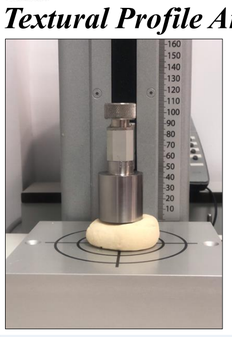
C1 - maximum dough consistency, C2 - dough softening, C3 - starch gelatinization, C4 - stability of the formed starch gel, C5 - starch retrogradation upon cooling.

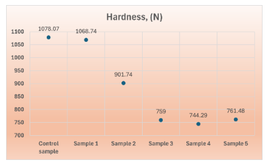


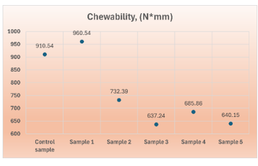
For the studied samples, a slight and statistically insignificant decrease in water absorption capacity was observed following the addition of soy lecithin, compared with the control sample. This behavior can be attributed to the amphiphilic nature of lecithin molecules, which contain both hydrophilic and hydrophobic moieties, enabling interactions with both water and dough constituents.

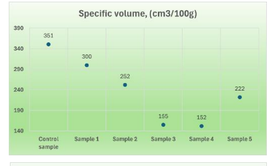
In general, flours exhibiting a higher water absorption capacity are preferred, as they contribute to greater dough yield and improved baking performance.

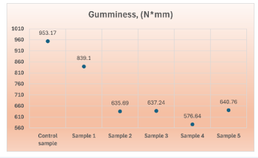
Textural Profile Analysis (TPA)

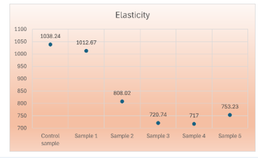












A decrease in bread crumb hardness was observed with the addition of lecithin. The control sample has the highest elasticity value, while cohesion and gumminess are lowest in sample 4. Resilience is a critical parameter in the rheological and textural characterization of bakery products, particularly for evaluating the freshness and mechanical behavior of the bread crumb. Analysis of the resilience profile revealed that samples 3 and 5 exhibited values comparable to the control, indicating an enhanced elastic recovery capacity of the crumb structure following compression.

CONCLUSIONS

The study was carried out to evaluate and compare the effects of different concentrations of soy lecithin on the rheological and technological properties of dough and bread. The findings revealed distinct variations between bread formulated with soy lecithin and the control sample without lecithin, indicating that higher lecithin concentrations positively influence overall bread quality. The experimental results were further correlated with data from previous studies employing various additives and emulsifiers to assess their impact on dough functionality and final product characteristics. The optimal concentration of soy lecithin was identified in sample 4, as this level provided the most favorable results across all analytical parameters evaluated. Based on these comparative analyses, it can be concluded that soy lecithin exhibits superior efficacy relative to other technological additives or emulsifiers.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Study on the influence of sea buckthorn pomace addition on the physico-chemical and textural characteristics of plant-based ice cream

Andreea SCHIPOR, Anca-Mihaela GÂTLAN[1], Daniela PAULIUC[1*], Ancuța PETRARU[1], Ancuța CHETRARIU[1], Ionuț AVRĂMIA[1], Vasile-Florin URSACHI[1]
[1]Faculty of Food Engineering, Ştefan cel Mare University, Romania

INTRODUCTION

The plant-based ice cream represents an alternative to dairy products, meeting the demands of health- and sustainability-conscious consumers, while also offering functional products through plant-based ingredients with high nutritional value and being suitable for individuals with lactose intolerance.

This study aimed to valorize a by-product, namely sea buckthorn pomace, by incorporating it into plant-based ice cream at 1%, 3%, and 5% levels and analyzing its influence on physico-chemical, rheological, and textural properties.

MATERIALS AND METHODS

The acidity was determined according to the STAS 6353-85 standard, while the pH value was measured following STAS 2213/9-68. A Konica Minolta CR-400/410 colorimeter was used for color measurement. The texture of the ice cream was evaluated through Texture Profile Analysis (TPA) using a Perten Texture Analyzer. The rheological properties were determined using a Haake Mars 40 rheometer. The antioxidant activity, total phenolic content (TPC), and flavonoid content were assessed using a Shimadzu UV-VIS spectrophotometer.

Fig. 1 The plant-based ice cream enriched with sea buckthorn pomace

RESULTS AND DISCUSSION

Increasing the concentration of sea buckthorn pomace led to a decrease in pH and an increase in acidity (from 33 °Th in the control sample to 69 °Th at 3% addition, exceeding the acceptable limit at 5%), negatively affecting structural stability. Compared to the control, enriched samples showed significant color changes, confirming that fruit bioactive pigments improve nutritional value and can act as natural colorants, reducing the need for synthetic additives. Pomace addition significantly increased total polyphenol content (from 19.02 mg GAE/L in the control to 20 mg GAE/L at 3% and 31 mg GAE/L at 5%), with similar trends observed for flavonoid content and antioxidant activity.

Texture and rheological analyses revealed that higher concentrations increased hardness, whereas lower concentrations (1–3%) produced softer and more flexible structures (G' 259–523 Pa, G" 80–218 Pa). The results suggest that 1–3% sea buckthorn pomace is optimal for producing plant-based ice cream with enhanced antioxidant properties, while higher levels (5%) negatively affect acidity and pH, requiring technological adjustments such as the use of stabilizers.

Table 1. Physicochemical parameters of plant-based ice cream enriched with sea buckthorn pomace

Parameter	The plant-based ice cream		
	Sea buckthorn pomace 1%	Sea buckthorn pomace 3%	Sea buckthorn pomace 5%
L*	58.15	57.12	57.55
a	4.73	4.89	5.33
b	14.79	19.16	21.98
pH	5.43	4.97	4.75
Acidity (° Th)	66.66	70	143.3
TPC (mg GAE/L)	19.68	19.82	32.96
TFC (mg quercitina/L)	269.92	296.77	383.28
DPPH (%)	89.11	90.78	95.75

CONCLUSIONS

The study results demonstrated that the addition of sea buckthorn pomace to the plant-based ice cream increases antioxidant activity, as well as the total phenolic and flavonoid content, and affects its color, rheological, and textural properties. Additions of 1% and 3% pomace powder were found to be the optimal concentrations for obtaining a product with high antioxidant properties.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17th, 2025

Fortification of set yogurt with citrus peel powder – effect on physicochemical and sensory properties

Florina Dranca*, Iustina-Georgiana Asiminei, Mariana Spinei, Ancuţa Petraru

Faculty of Food Engineering, Ştefan cel Mare University, Romania. *florina.dranca@usm.ro

INTRODUCTION

- Yogurt is a widely consumed fermented dairy product valued for its nutritional and functional properties.
- Fortifying yogurt with fiber-rich materials, such as fruit by-products, has gained attention for enhancing its health benefits and functional value.
- Citrus peel is an excellent source of dietary fiber due to its high water-soluble fraction compared to other sources.
- This study aimed to investigate the physicochemical, rheological, and sensory properties of set yogurt fortified with citrus peel powder.

MATERIALS AND METHODS

- Yogurt was prepared using fresh cow's milk with a fat content of 4.1%, by inoculation with a commercial yogurt starter and incubation at 42 °C. Prior to inoculation, lemon and lime peel powders were incorporated at concentrations of 0.25%, 0.50%, and 0.75% (w/w).
- The yogurt samples were evaluated for pH, titratable acidity, protein content, fat content, total fiber content, viscosity, syneresis, color, and sensory acceptability to assess the physicochemical, textural, and sensory effects of yogurt fortification with citrus peel powder.

RESULTS AND DISCUSSION

- Citrus peel addition significantly affected pH and titratable acidity (TA), which remained within acceptable ranges, while protein and fat contents were not influenced by fortification, indicating compositional stability.
- Yogurts containing lime peel exhibited higher total fiber (Table 1), highlighting the nutritional advantage of fortification.
- Incorporation of citrus peel powders improved viscosity and reduced syneresis, enhancing texture, and positively influenced color and appearance, especially at lower inclusion levels.
- Among the formulations, yogurt with 0.50% lemon peel achieved the highest overall sensory acceptability (Figure 1).

Table 1. Physicochemical properties of yogurt samples

Sample	pH	TA (g lactic acid/100 g)	Protein content (g/100 g)	Fat content (g/100 g)	Total fiber content, g/100 g
YControl	4.61 ± 0.01	8.74 ± 0.06	3.61 ± 0.01	3.95 ± 0.02	n.d.
YLemon-0.25	4.50 ± 0.02	9.29 ± 0.05	3.59 ± 0.01	3.93 ± 0.02	0.09 ± 0.00
YLemon-0.50	4.42 ± 0.01	9.44 ± 0.04	3.60 ± 0.01	3.93 ± 0.02	0.19 ± 0.00
YLemon-0.75	4.30 ± 0.01	10.14 ± 0.04	3.59 ± 0.01	3.93 ± 0.02	0.28 ± 0.00
YLime-0.25	4.49 ± 0.02	10.25 ± 0.06	3.61 ± 0.01	3.94 ± 0.03	0.05 ± 0.00
YLime-0.50	4.38 ± 0.02	10.67 ± 0.05	3.60 ± 0.01	3.94 ± 0.03	0.09 ± 0.00
YLime-0.75	4.25 ± 0.01	10.92 ± 0.06	3.59 ± 0.01	3.94 ± 0.03	0.15 ± 0.00

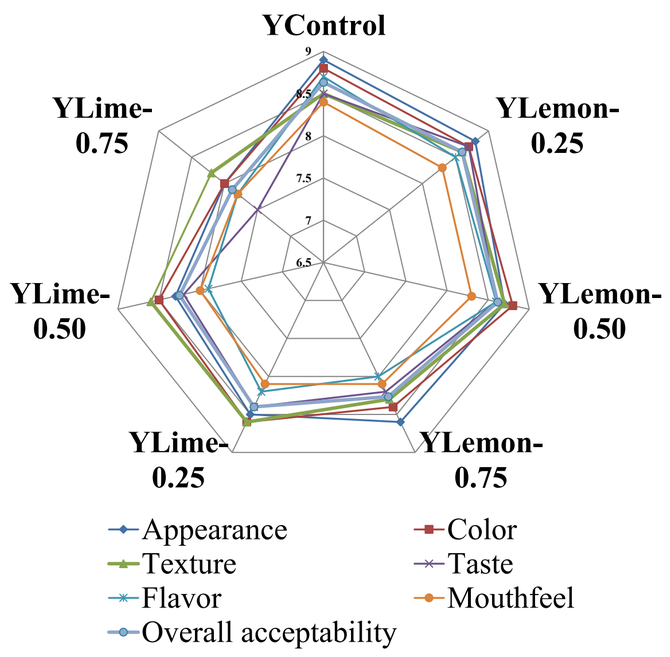
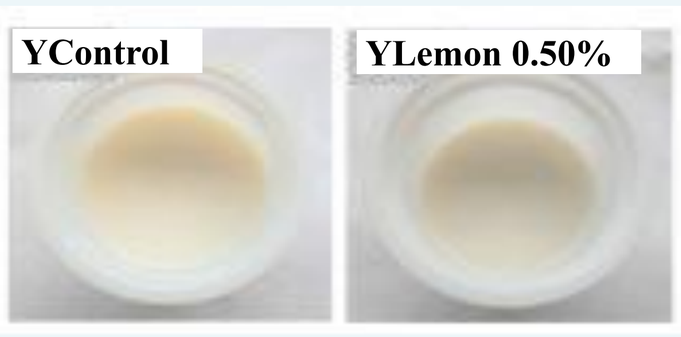


Figure 1. Sensory evaluation of yogurt samples



CONCLUSIONS

- Fortification of yogurt with citrus peel powder improved its nutritional, textural, and sensory qualities without affecting protein and fat composition, indicating its potential as an effective functional ingredient.
- Yogurt fortified with 0.50% lemon peel powder achieved the best overall balance of quality and acceptability.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17th, 2025

Thermal behavior and stability of carnauba wax–structured sunflower and pumpkin seed oil oleogels

Sorina Ropciuc[1], Florina Dranca[1*], Daniela Pauliuc[1], Georgiana Codină[1], Mircea Oroian[1], Viorica Bulgaru[2]

[1]Faculty of Food Engineering, Ştefan cel Mare University, Romania
[2]Faculty of Food Technology, Technical University of Moldova, Chişinău, Moldova
*florina.dranca@usm.ro

INTRODUCTION

- Oleogels have emerged as promising alternatives to solid fats in food applications due to their ability to structure liquid oils without the use of trans or saturated fats. Their thermal behavior plays a critical role in determining functionality, stability, and potential application.
- The present study aimed to investigate the influence of carnauba wax concentration on the thermal stability of oleogels prepared with sunflower oil and pumpkin seed oil.

MATERIALS AND METHODS

- Oleogel samples were formulated with 2, 4, 6, 8, and 10% (w/w) carnauba wax in sunflower oil or pumpkin seed oil and were characterized using differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA).
- DSC measurements were performed from −60 to 100 °C using a DSC 25 calorimeter (TA Instruments, USA), while TGA measurements were conducted from 30 to 600 °C using a TGA 2 thermal analysis system (Mettler Toledo, USA).

RESULTS AND DISCUSSION

- DSC analysis indicated that both melting and crystallization temperatures increased with increasing wax concentration, suggesting the development of more ordered crystalline structures and stronger intermolecular interactions between the wax and the oil matrix.
- TGA results demonstrated a two-step thermal degradation process, with the first stage corresponding to volatilization of the vegetable oil components and the second to decomposition of the wax.

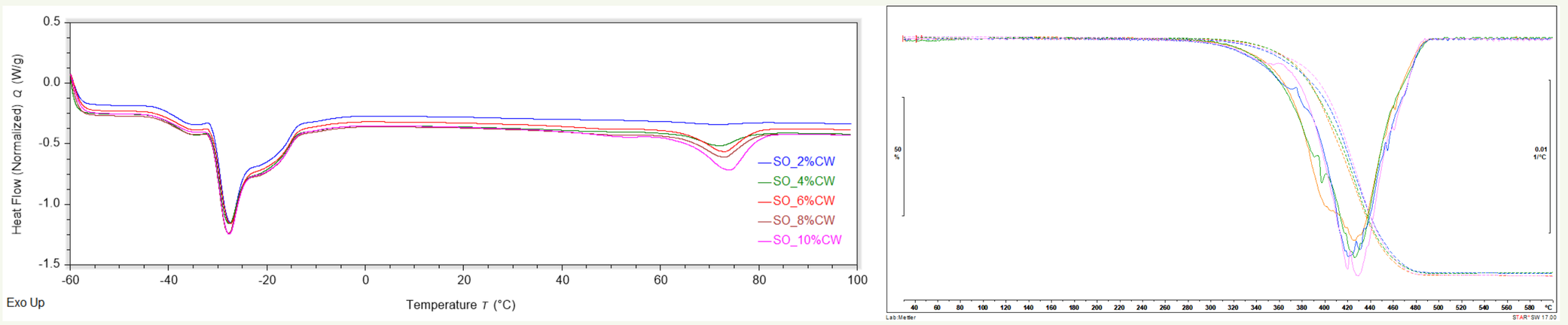


Figure 1. DSC (left) and DTG (right) curves illustrating the effect of carnauba wax concentration on the thermal properties of oleogels

CONCLUSIONS

- Increasing the concentration of carnauba wax in sunflower- and pumpkin seed oil-based oleogels improved their thermal stability, as indicated by the shift of degradation temperatures to higher values. Furthermore, higher wax content enhanced the structural integrity of the oleogels, confirming its key role in gel formation and stability.

Acknowledgement

This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS – UEFISCDI, project number PN-IV-PCB-RO-MD-2024-0173, within PNCDI IV.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

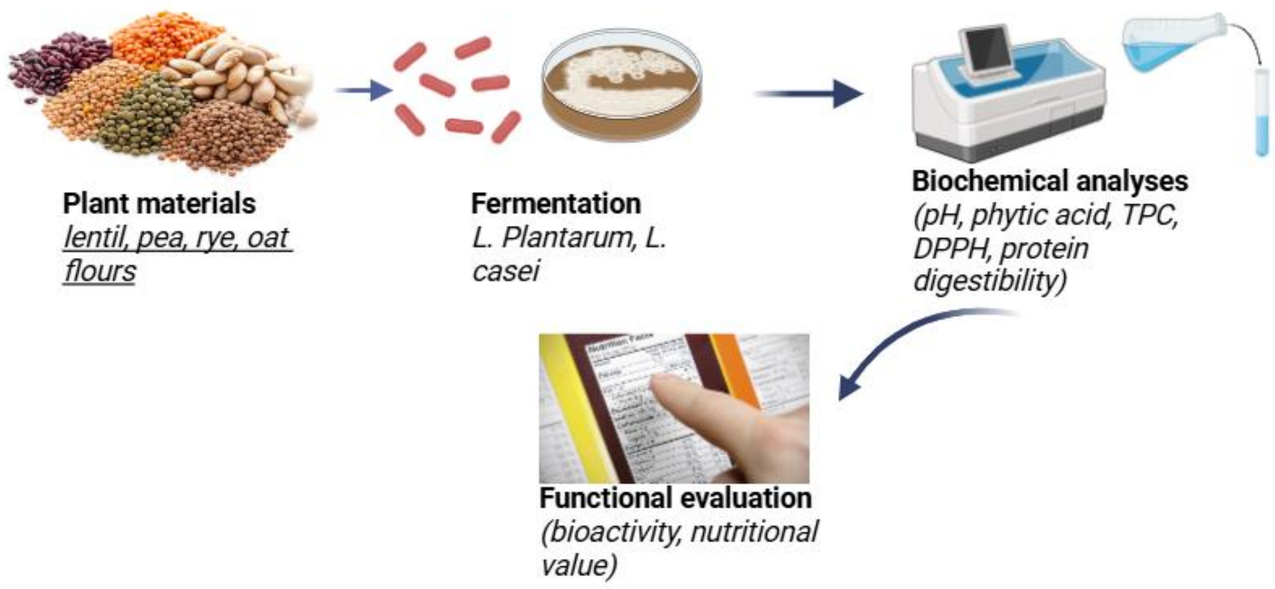
Advancing Sustainable Nutrition Through the Development of Functional Fermented Foods from Alternative Plant Materials

Covaliov, E., Popovici, V., Capcacanari, T., Radu, O., Negoita, C.

INTRODUCTION

The growing demand for sustainable and health-promoting foods has motivated the use of alternative plant sources in the formulation of functional fermented products. This study examined the influence of lactic acid fermentation on the nutritional, physicochemical, and bioactive characteristics of matrices obtained from lentil, pea, rye, and oat flours, used both individually and in mixed systems.

MATERIALS AND METHODS

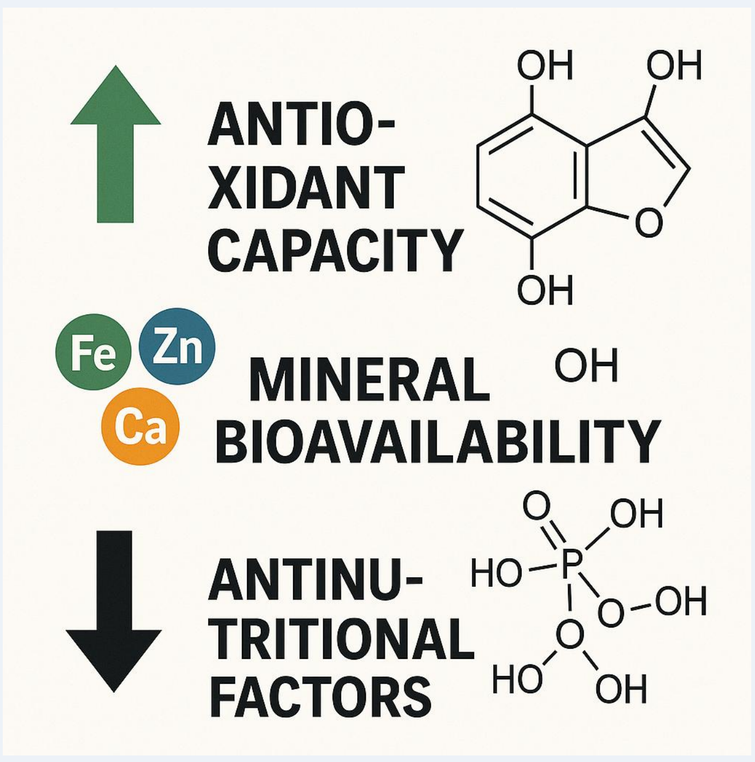


RESULTS AND DISCUSSION

Physicochemical changes
- Fermentation lowered pH from 6.2 to ~4.0, confirming active lactic metabolism and improving microbial stability and safety.

Nutritional enhancement
- Phytic acid decreased by 42–56% and tannins by 30–40%, increasing mineral bioavailability and protein digestibility.

Bioactive potential
- Total phenolic content more than doubled, and antioxidant capacity rose by ~70%, indicating polyphenol release and new bioactive compound formation..



CONCLUSIONS

Lactic acid fermentation significantly improved the nutritional and functional properties of legume–cereal matrices. The combined activity of *Lactiplantibacillus plantarum* and *Lacticaseibacillus casei* enhanced protein digestibility, mineral bioavailability, and antioxidant capacity through the reduction of antinutritional factors and the release of bioactive compounds. These results demonstrate the potential of alternative plant materials as sustainable substrates for developing functional fermented foods with high nutritional value and industrial relevance.

Acknowledgements: The research was supported by Moldovan Government within project of Young Researchers 25.80012.5107.11TC BIO-FERM - Valorization of bioactive compounds from alternative plant sources for the development of functional fermented foods, running at Technical University of Moldova.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

THE INFLUENCE OF COCOA POWDER ON THE QUALITY OF WHEAT BREAD

Anna Hryshchenko

INTRODUCTION

One of the main goals of bakery manufacturers is to develop new products that have good taste and an attractive appearance. Along with developing new flavors, the nutritional and energy value of the products should be considered for improvement. A promising approach is the use of cocoa bean byproducts, which not only have a unique flavor but also contain many beneficial substances. Numerous recipes for cookies, gingerbread, and cakes contain cocoa powder. Products with cocoa powder-containing fillings are also popular. Unfortunately, there are no bakery product recipes that directly add cocoa powder to the dough.

Cocoa powder has several advantages, including its high fiber content (up to 35-37%) and its content of trace elements such as calcium, magnesium, copper, potassium, and zinc, which is significantly higher than many other products.

MATERIALS AND METHODS

Studies were conducted to examine the effect of cocoa powder containing 10-12% fat on the quality of wheat bread. Dough was prepared using a straight-dough method based on a white wheat bread recipe, with 2, 4, and 6% cocoa powder added.

RESULTS AND DISCUSSION

It was found that adding cocoa powder reduced dough moisture by 1-3% compared to the control sample. This is likely due to the high water absorption capacity of cocoa powder. This fact should be taken into account in future studies to determine the optimal dough moisture content and kneading time. The specific volume of bread with cocoa powder decreased by 3-9% compared to the control. The diameter-to-height ratio of bread baked on a baking sheet increased, but porosity decreased and the crumb became denser. Therefore, the crumb of bread with added cocoa powder was harder to chew, especially for bread containing 6% cocoa powder. With an increased cocoa powder dosage, a slight unevenness of the surface appeared, caused by small tears in the dough on the surface of the breads during molding. This is most likely due not only to the increased water absorption capacity of the dough, but also to the effect of alkaloids and tannins on gluten.

However, a significant advantage of this bread is its pleasant cocoa flavor and aroma. The attractive brown color and its intensity depended on the amount of cocoa powder in the recipe.

CONCLUSIONS

Based on the taste characteristics of baked goods, cocoa powder has potential for use in bakery recipes. To improve crumb structure, crust surface, and volume, it's important to optimize the dough's moisture content and explore the effects of adding fats and sugar to the recipe.

Acknowledgements

.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Analysis of the nutritional context in relation to the consumption of organic food products

Oxana RADU, Tatiana CAPCANARI, Eugenia COVALIOV

Faculty of Food Technology,
Technical University of Moldova, Republic of Moldova

Aim of the Study:

To evaluate consumer awareness, attitudes, and motivations toward plant-based and organic food products, and to identify the main barriers to their consumption.

INTRODUCTION

The growing awareness of the link between diet, health, and environmental sustainability has significantly shaped consumer behaviour across Europe. This study examines the nutritional context and trends in the consumption of organic food products, highlighting factors that influence purchasing decisions and dietary preferences.

MATERIALS AND METHODS

Online survey (2025)
- Conducted via Google Forms and social media platforms

Respondents
- More than 150 participants aged 18-60+ years, representing different demographic and social groups.

Study variables
- Preferences, motivations, barriers, and price perception regarding eco-friendly and plant-based foods.

RESULTS AND DISCUSSION

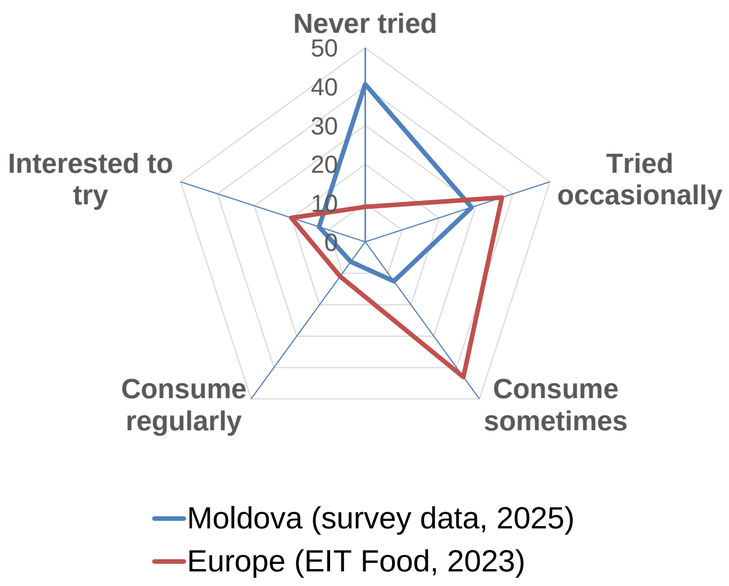


Fig.1. Consumer engagement with eco-friendly foods (%): comparison between Moldova and European averages

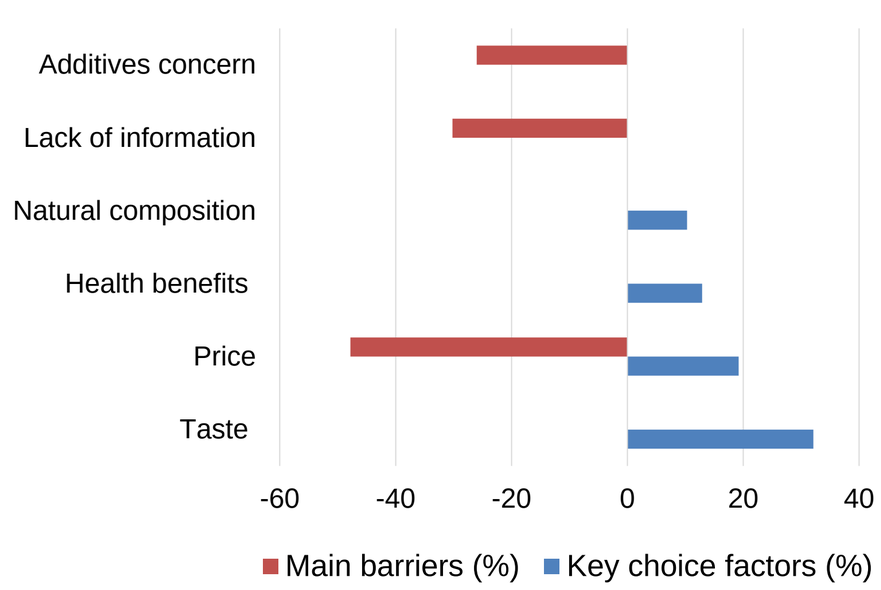


Fig.2. Drivers and barriers affecting consumer decisions on eco-friendly food purchase

- Younger consumers (18–35 years) show stronger eco-consciousness;
- High interest suggests market growth potential if affordability and labelling improve;
- Transparency and clean-label approaches can strengthen trust;
- Local organic initiatives and educational programs are crucial for market expansion.

CONCLUSIONS

Local consumers demonstrate growing but still fragmented awareness of eco-friendly foods. Targeted education, transparent labelling, and affordable prices are essential for strengthening trust and expanding the organic and plant-based market.

Acknowledgements: The research was supported by the Institutional Project, subprogram 020405 "*Optimizing food processing technologies in the context of the circular bioeconomy and climate change*", Bio-OpTehPAS, being implemented at the Technical University of Moldova

Food and Nutrition Department, TUM, email: *oxana.radu@sa.utm.md*

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

SEA BUCKTHORN POMACE – A SOURCE OF BIOACTIVE COMPOUNDS FOR FUNCTIONAL FOODS

Dianu Irina, Macari Artur, Dabija Adriana, Netreba Natalia,
Sandu Iuliana, Greta Balan, Daniela Cojocari

INTRODUCTION

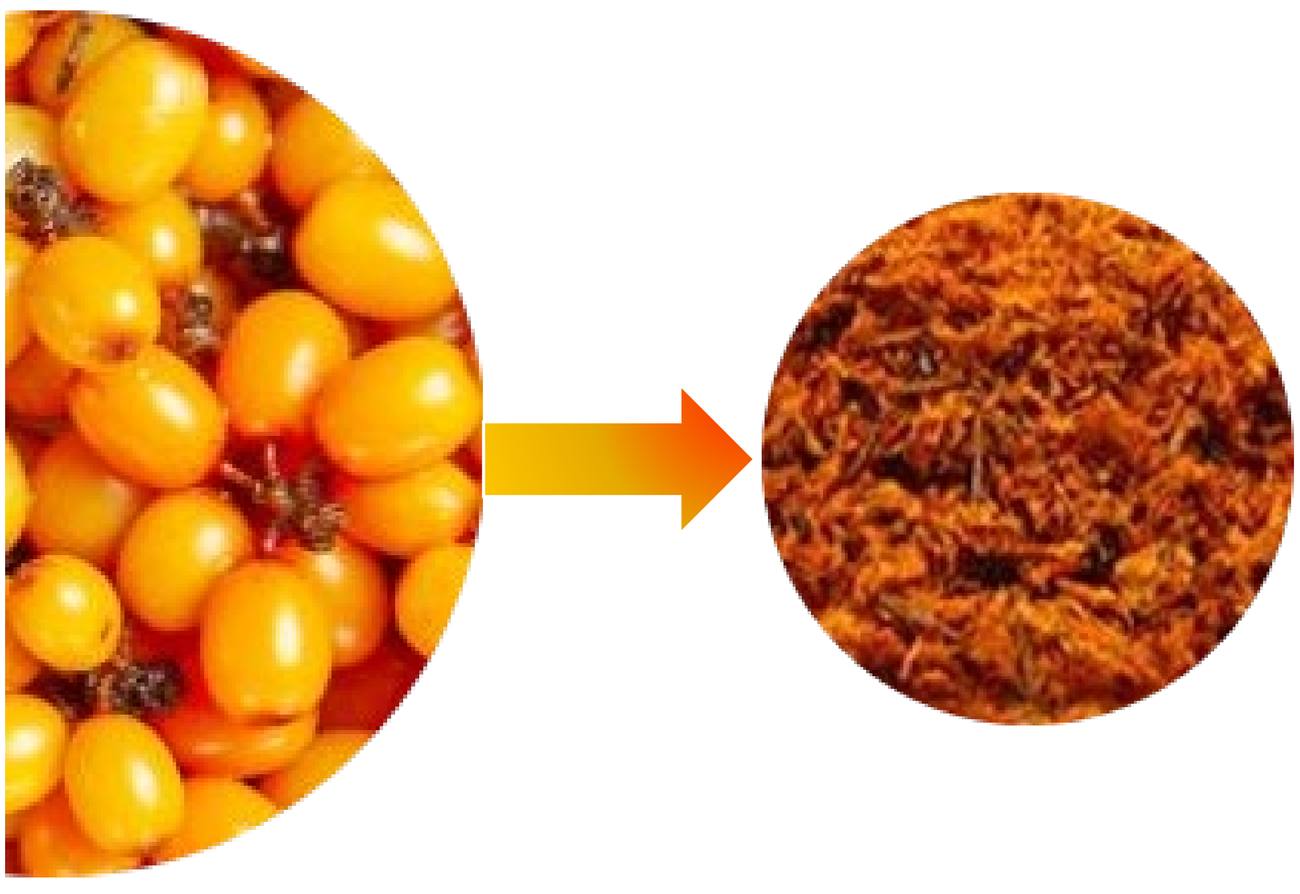
Sea buckthorn (*Hippophaë rhamnoides* L.) represents a strategic direction for the agri-food sector in the Republic of Moldova, due to it's high potential in both fruit processing and by-product valorization. The pomace resulting from juice extraction is a valuable source of bioactive compounds and plays an important role within the bio-based circular economy.

MATERIALS AND METHODS

- **Sea buckthorn pomace**
- **Physicochemical properties**
- **Nutritional composition**
- **Content of bioactive compounds**
- **Antioxidant activity**

All analyses were reported per 100 g of dry weight.

RESULTS AND DISCUSSION



The sea buckthorn pomace showed:
• moisture content: 92.95%
• pH: 3.49
• titratable acidity: 2.81%
• fats: 30.07%
• proteins: 19.92%
• ash: 3.15%
• carbohydrates: 1.26%
• water activity: a_w = 0.228

The content of bioactive compounds was notable:
• *L*-ascorbic acid: 22.98 mg/100 g
• total carotenoids: 96.4 mg/100 g
• total polyphenols: 10.94 mg TE/100 g

Antioxidant activity was confirmed by:
• DPPH: 3.36 mg TE/100 g
• ABTS: 3.57 mg TE/100 g

The active acidity and high titratable acidity contribute to the preservation of the pomace by inhibiting microbial growth, ensuring product stability. Its high content of fats and proteins makes the pomace a valuable source of nutrients and a functional ingredient in the food industry. The presence of bioactive compounds such as vitamin C, carotenoids, and polyphenols imparts antioxidant properties, as confirmed by DPPH and ABTS assays, supporting its application in functional foods with immunostimulatory effects.

CONCLUSIONS

Sea buckthorn pomace proves to be a valuable by-product with real potential for valorization in the food industry, in line with the principles of the circular economy. Its rich composition in bioactive compounds and antioxidant properties supports its use in the development of functional foods.

Acknowledgements *The research was supported by Project PN-IV-PCB-RO-MD-2024-0214 "Integral valorisation of sea buckthorn fruits through the development of new functional food products"*

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

The influence of stabilisers on plant-based fermented beverages

PhD Candidate: Artem BARALIUK,
Supervisor: Associate Professor Tetiana OSMAK

INTRODUCTION

The global demand for plant-based dairy alternatives is continuing to rise, reflecting a steady shift in consumer preferences and eating habits.

One of the key technological challenges in developing these products is achieving a texture and consistency comparable to that of conventional dairy. The challenge is especially highlighted by fermented beverages, where maintaining texture stability and a pleasant mouthfeel is complex during processing and storage.

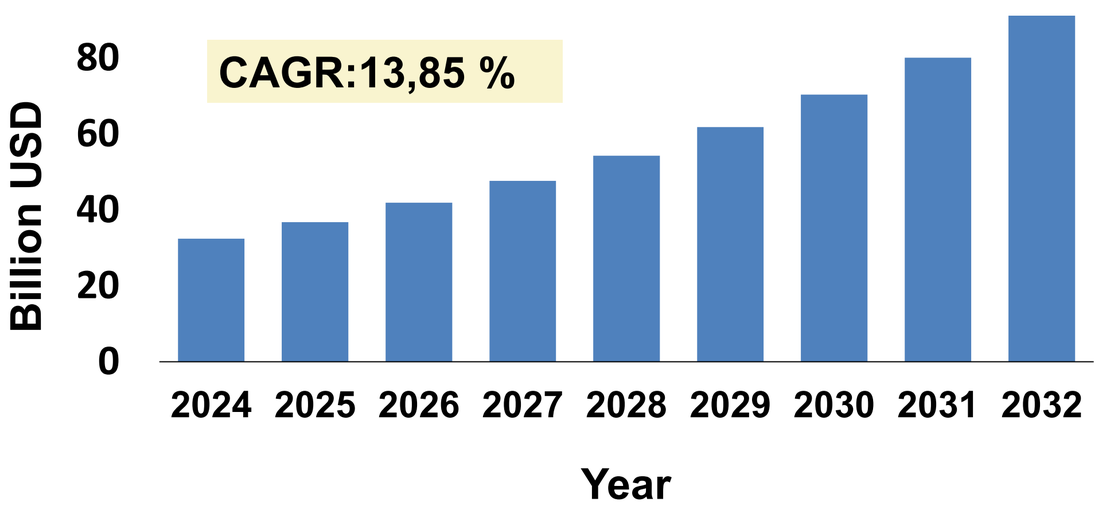


Figure 1. Global dairy alternatives market forecast, 2024–2032 (Fortune Business Insights, 2024)

MATERIALS AND METHODS

This study combines a literature review with experimental observations focusing on stabilisation strategies for plant-based fermented beverages. Particular attention was paid to the functional behaviour of starches and hydrocolloids from different botanical sources under controlled processing conditions.

The findings obtained were compared with published data to identify similarities, differences, and potential gaps in current research related to stabiliser performance and product stability.

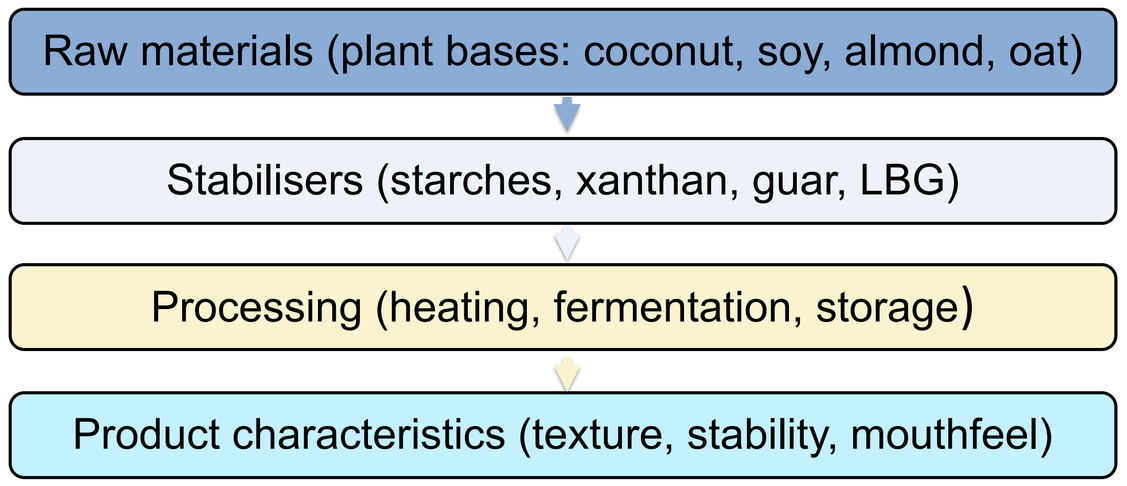


Figure 2. Conceptual diagram illustrating the stabilisation approach in plant-based fermented beverages

RESULTS AND DISCUSSION

To address this issue, various stabilisers, such as starches, xanthan gum, guar gum, and locust bean gum, are commonly used; however, systematic studies comparing these stabilisers remain limited. This lack of knowledge is due to several factors, among which is the use of different starch varieties, often without specifying their botanical origin. The diversity of raw materials used to produce plant-based alternatives, for example, coconut, soy, almond, rice, and oat, remains a persistent challenge to systematically cross-correlate the existing data. Another bottleneck is the application of varied processing conditions, which are difficult to reproduce in research laboratory settings and compare as is. All of these underpin the need for systematic research under unified and carefully controlled conditions to provide a more consistent understanding of the plant-based fermented beverages manufacturing.

CONCLUSIONS

This work addresses this issue, with an emphasis on the use of stabilisers of differing origin and quality.

Acknowledgements: The author expresses sincere gratitude to Associate Professor Tetiana Osmak (National University of Food Technologies, Ukraine) for her supervision and valuable guidance.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Improvement of fermented milk desserts using secondary dairy raw materials

Anton OSMAK,
Uliana BANDURA, Oksana BASS

INTRODUCTION

The need to create functional dessert products with the introduction of secondary resources is relevant. First, the original formulations for dairy desserts are rarely used. The production of non-traditional types of desserts, such as multi-component dessert products, has no analogs on the market yet. Second, the use of whey as a raw material is relevant due to the current shortage of milk worldwide.

MATERIALS AND METHODS

Research works, articles, conference materials, and technologies for improving dairy desserts were analyzed.

RESULTS AND DISCUSSION

Whey is a by-product in the production of protein dairy products. The main component of whey is lactose, about 70 % by weight of all solids. Whey contains a significant amount of biologically valuable whey proteins, free amino acids, and minerals. The content of whey proteins in whey reaches 0.5…1.5 %. The main ones are β-lactoglobulin (7…12 % of the total amount of milk proteins), α-lactalbumin (2…5 %), whey albumin, immunoglobulins, and components of the protease-peptone fraction.

Whey proteins (albumins and globulins) have valuable biological properties that contain the optimal set of vital amino acids. There is a small amount of fat in whey (0.05…0.4 %) but its value is that it is dispersed into balls with a diameter of less than 2 μm.

The main macronutrients of whey are calcium, phosphorus, magnesium, potassium, sodium, chlorine, and sulfur (found in proteins). Whey proteins contain the following trace elements: iron, copper, zinc, manganese, aluminum, selenium, iodine, and others.

CONCLUSIONS

Therefore, the development and improvement of sour milk desserts using secondary milk raw materials is a promising area of research.

Acknowledgements: The results were obtained within the scope of the state-funded research work at the Problem Research Laboratory, NUFT: "Development of technology for the reuse of secondary dairy resources for the production of new products and the reduction of food waste generation" (state registration number 0124U000965)

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Potential of oilseed cakes as sources of high-value protein isolates for functional foods

Oxana RADU, Alina BOIȘTEAN
Faculty of Food Technology,
Technical University of Moldova, Republic of Moldova

Aim of the Study:

The study aims to valorize oilseed by-products from the oil and fat industry by comparing three protein extraction methods and evaluating the functional potential of the obtained concentrates for use in plant-based foods.

INTRODUCTION

Oilseed cakes – the solid residues remaining after cold-press oil extraction – are often treated as agro-industrial waste. However, they are rich in proteins (35–60%), dietary fibers, and bioactive compounds, making them promising raw materials for plant-based protein ingredients. Their valorization supports circular economy goals by reducing waste and promoting sustainable protein sources.

RESULTS

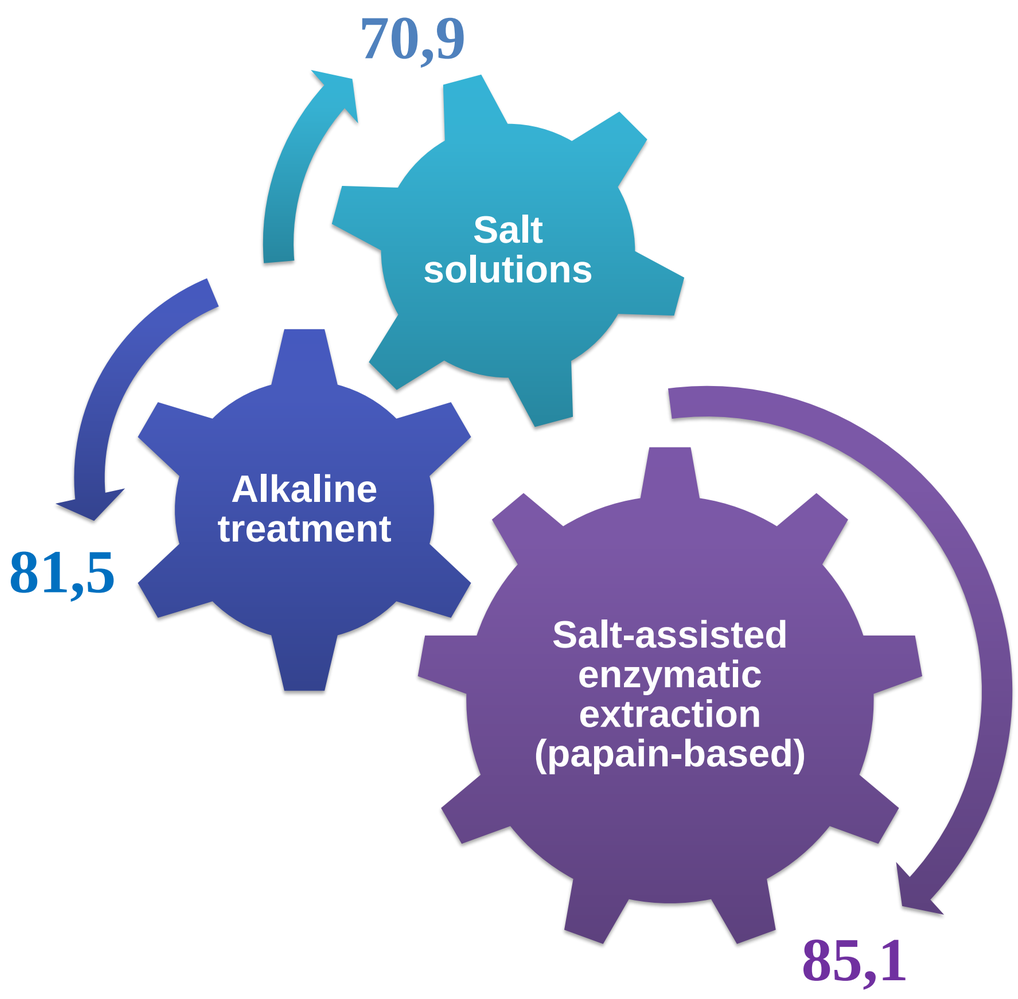


Figure 1. Total protein content (% d.m.) in protein concentrates obtained by different extraction methods

MATERIALS AND METHODS

Oilseed cakes from

3 strategies for protein extraction (Fig.1)

Obtaining protein extracts and testing their properties:

- ✓ protein yield
- ✓ functional properties (absorption capacity, solubility, emulsifying activity, thermal stability, etc.)

DISCUSSION

Simple salt extraction resulted in a lower yield but preserved protein integrity and functionality. The **alkaline method** ensured efficient solubilization of bound proteins, whereas the **enzymatic-salt method** achieved the ***highest protein recovery*** and produced concentrates with optimal solubility, emulsifying, and foaming properties, confirming their potential as functional ingredients for plant-based food formulations.

CONCLUSIONS

The enzymatic-salt extraction proved to be an efficient and sustainable method, yielding high-quality protein isolates suitable for the development of functional and plant-based food products.

Acknowledgements: The research was supported by the State Project for Young Researchers 23.70105.5107.06T “Valorization of vegetable proteins from secondary products of the local fat and oil industry (ProVeg)”, running within the Technical University of Moldova.

Food and Nutrition Department, TUM, email: *oxana.radu@sa.utm.md*

Stefan cel Mare University of Suceava

10th International Conference BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES

MODIFICATIONS IN SORGHUM FLOUR PROPERTIES FOLLOWING GRAIN HEAT TREATMENT

Batariuc Ana, Mădălina Ungureanu-Iuga, Silvia Mironeasa
Sanitary, Veterinary and Food Safety Directorate of Suceava, Romania
Faculty of Food Engineering, „Stefan cel Mare" University of Suceava, Romania
November 5, 2021

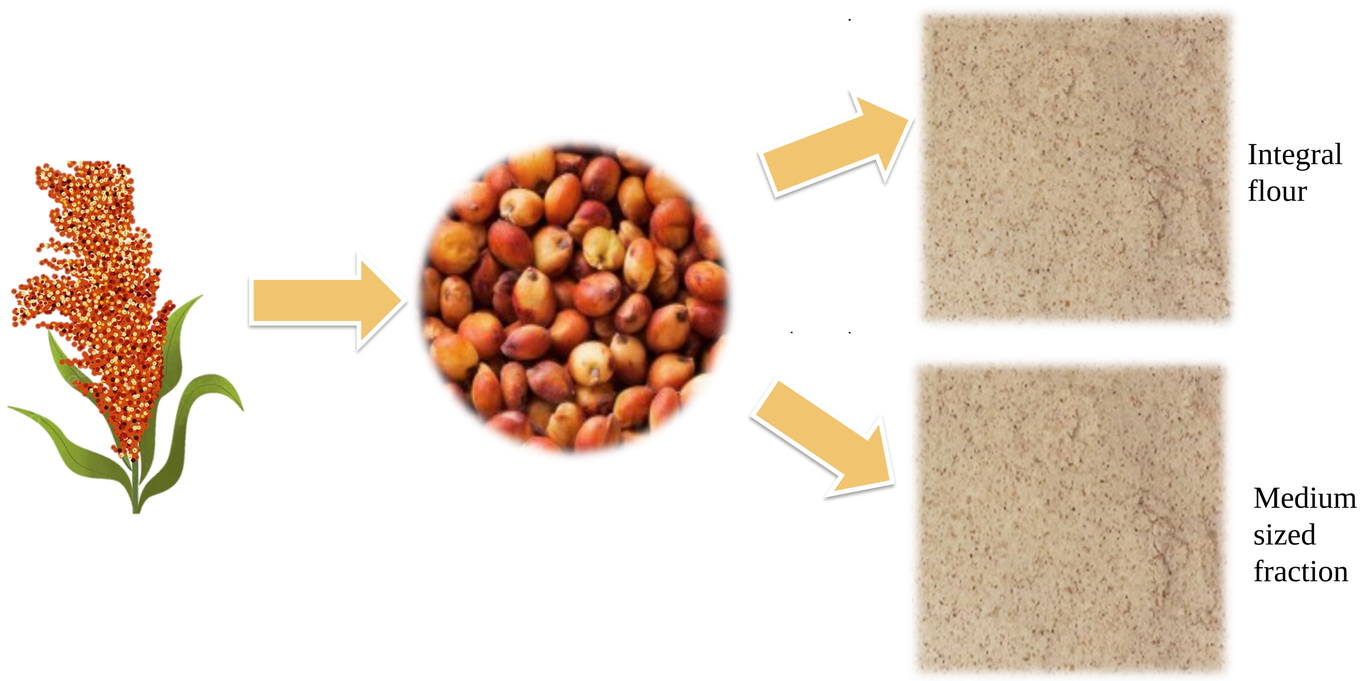
ABSTRACT

This study evaluated the nutritional and rheological properties of heat-treated and untreated red sorghum flour, focusing on the medium-sized fraction (M) and whole (integral) flour.

INTRODUCTION

Sorghum (*Sorghum bicolor L. Moench*) originates from East Africa (Sudan and Ethiopia) and is now the world's fifth most cultivated cereal due to its drought resistance, pest tolerance, high productivity, and low production costs.

Nutritionally, sorghum is rich in starch, protein, and phenolic compounds, with health benefits such as slow sugar release—useful for diabetics—and potential as a prebiotic ingredient. It is used in various food products like bread, porridge, pasta, and beverages.

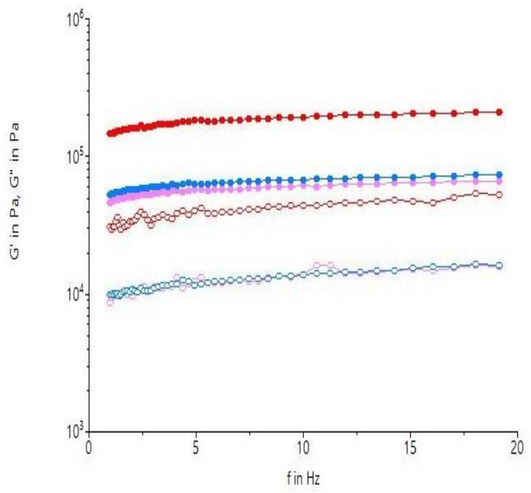


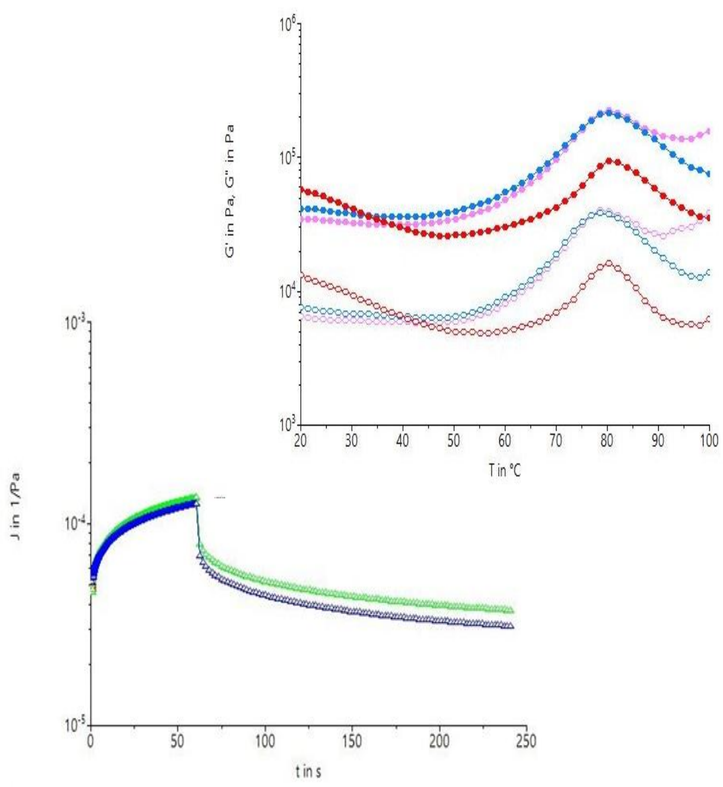
Dry heat treatment of sorghum flour reduced essential amino acids overall, but lysine content increased in the treated M fraction compared to the control. Non-essential amino acids significantly decreased after heat treatment and grinding.

Treatment at 133 °C combined with fractionation increased mono- and polyunsaturated fatty acids while decreasing saturated fatty acids in the treated M fraction.

Heat treatment reduced the volatile compound 2,4-pentadienenitrile and introduced 2,4-hexadienenitrile in the treated M fraction.

Dough made from the treated M fraction exhibited slightly higher elastic energy than dough from whole flour treated at the same temperature. The treated M fraction showed a lower maximum gelatinization temperature and greater compliance during creep and recovery tests compared to the control.





MATERIALS AND METHODS

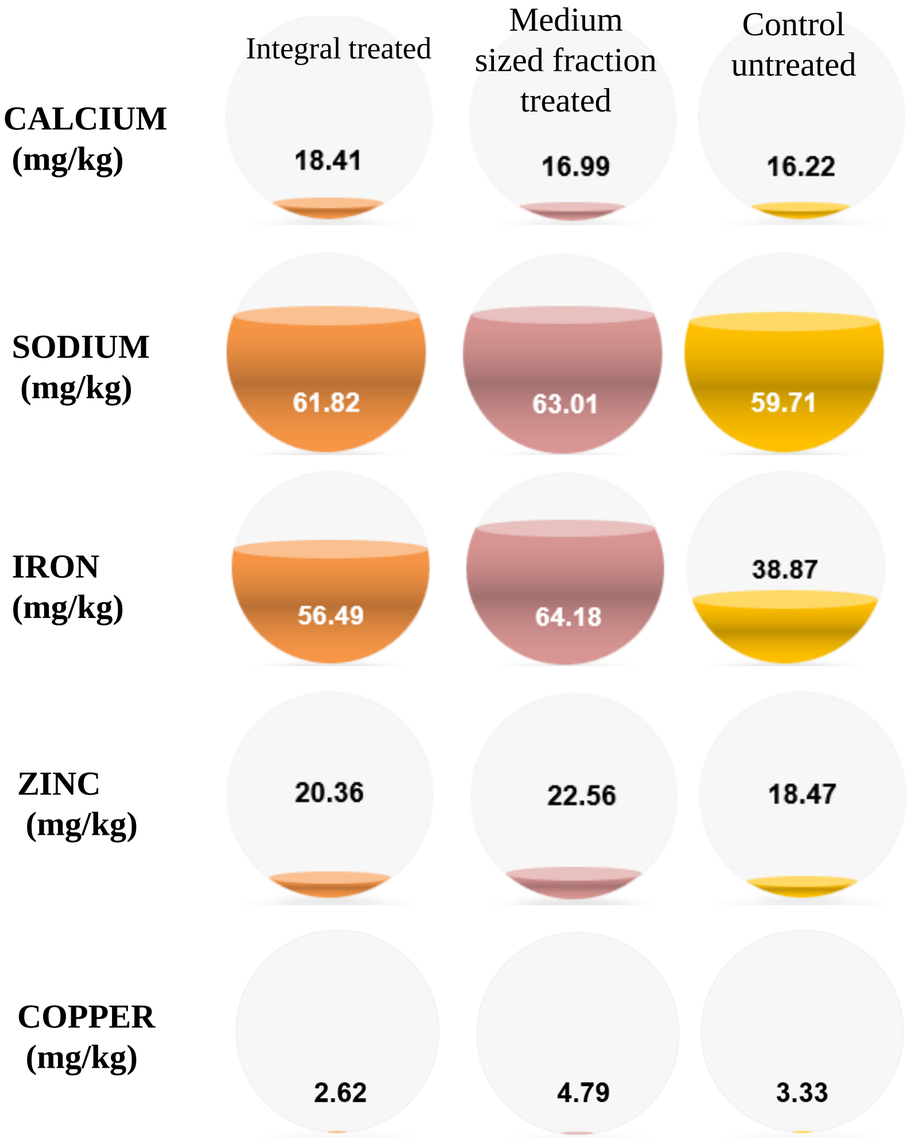
Red sorghum grains (ES Alize hybrid) from Moldova, Romania, were subjected to dry heat treatment (133°C for 15 min) and then milled. Flour was fractionated by particle size (M=200–250 μm). Three sample types were studied: integral treated (I_TOM), treated M fraction (OM), and untreated control (CM).

The evaluation of how heat treatment and particle size affect sorghum flour's nutritional and functional characteristics was conducted to support its use in gluten-free food applications

Amino acids were analyzed by high-performance liquid chromatography, fatty acids and volatiles by gas chromatography, minerals by atomic absorption spectrophotometry, and rheological properties by dynamic testing.

RESULTS AND DISCUSSIONS

Significant variations in sodium, iron, zinc, and copper were also observed.



CONCLUSIONS

Dry heat treatment and fractionation significantly altered the nutritional and rheological properties of sorghum flour. These processes enhanced the amino acid profile, increased n-3 and n-6 PUFA and mineral content, and affected dough behavior, with differences observed based on particle size and treatment. These findings support the potential use of sorghum flour in developing gluten-free baked products.

REFERENCES

1. Batariuc, A.; Ungureanu-Iuga, M.; Becze, A.; Senila, L.; Mironeasa, S. Impact of heat treatment of sorghum grains on flour properties. *Ukrainian Food Journal* **2024**, *13*, 723–736, doi:10.24263/2304-974X-2024-13-4-7.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Life cycle assessment of sweet cherry compote

Cristina Ghinea, Ana Leahu
Faculty of Food Engineering, Stefan cel Mare University of Suceava, Romania

INTRODUCTION

. Fruits are among the most consumed foods worldwide and are an integral part of a healthy and balanced diet due to the nutrients they contain, such as vitamins and minerals. However, fresh fruit production is seasonal, so they are commonly consumed after processing, mainly in the form of canned fruit. Although the fruit canning industry offers a sustainable solution for consuming nutritious foods year-round and transporting them around the world, as an industrial branch, it is associated with high energy requirements, high water consumption, and the production of a large volume of solid waste, leading to a large environmental footprint. In this study, a life cycle assessment (LCA) was conducted to evaluate the environmental impacts associated with the production of cherry compotes.

RESULTS AND DISCUSSION

The results showed that emissions from the cherry compote production process contribute most to human toxicity potential (HTP), followed by eutrophication potential (EP) and global warming potential (GWP). The treatment of wastewater resulting from the cherry compote production process is responsible for the eutrophication potential. It contributes 95% to this impact category, followed by the production stage itself with 3%, and transport and cultivation stages (each with a contribution of 1%). The results obtained using the GaBi software were normalized and are illustrated in Figure 2.

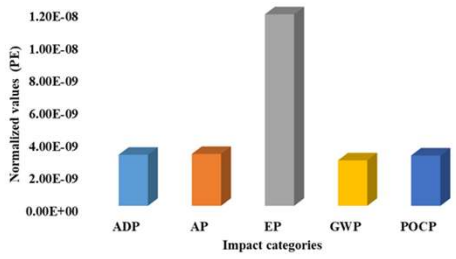


Fig. 2. Normalized environmental impacts of the life cycle of cherry compote – CML method 2001-August 2016 (PE- person equivalents)

MATERIALS AND METHODS

As a functional unit was selected 5,000 kg of cherries, from which six pallets with 2,448 jars (800 g each) of cherry compote were obtained. The system boundaries are illustrated in Fig. 1.

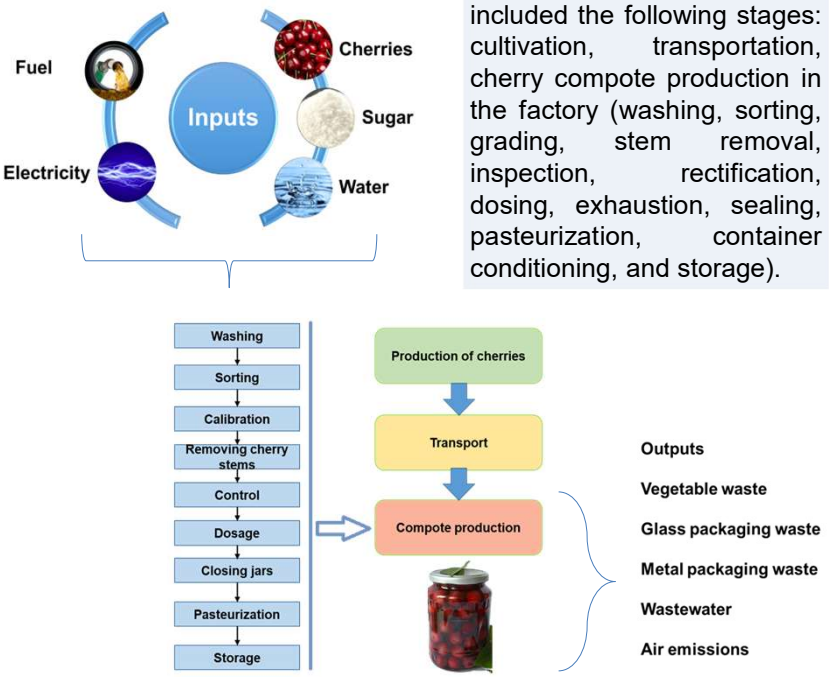


Fig. 1. System boundaries for the production of cherry compote

The system boundaries included the following stages: cultivation, transportation, cherry compote production in the factory (washing, sorting, grading, stem removal, inspection, rectification, dosing, exhaustion, sealing, pasteurization, container conditioning, and storage).

The inputs considered in this study were: raw material (cherries), water (both in the production process and for washing), sugar, electricity, and fuel, while the outputs were: the finished product (cherry compote), vegetable waste, glass packaging waste, wastewater (loaded with various pollutants, especially suspended solids and organic substances), and atmospheric emissions from both transport and combustion plant (particles, CO, SOx, NOx).

The environmental impacts included in the LCA methods and selected for this study were: Abiotic Depletion potential - ADP; Acidification Potential – AP; Eutrophication Potential – EP; Global Warming Potential – GWP; Human Toxicity Potential – HTP; Photochemical Ozone Formation potential – POCP.

CONCLUSIONS

In this study, the environmental impact categories of cherry compote production were assessed to identify the most significant impacts and to suggest ways to reduce the environmental impact related to the production system. To reduce the environmental burdens caused by emissions from the cherry compote factory, insulating the pipes, where heating or cooling is involved, could reduce steam consumption and therefore energy consumption. Improving heating systems and using renewable energy, such as solar energy, should be considered.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

OLEOGELS AS AN ALTERNATIVE TO SATURATED AND TRANS FATS

Bulgaru Viorica[1], Netreba Natalia[1], Smerea Olga[1], Paiu Sergiu[1], Mircea Adrian Oroian[2], Sorina Ropciuc[2]

[1]Technical University of Moldova, Republic of Moldova
[2]Stefan cel Mare University of Suceava, Romania

INTRODUCTION

According to the guidelines of the European Food Safety Authority and the World Health Organization, fats should represent between 20% and 35% of total energy intake. A minimum level of 20% is necessary to ensure a sufficient intake of energy and essential fatty acids, as well as to facilitate the absorption of fat-soluble vitamins. In terms of composition, trans fatty acids should not exceed 1% of total energy, and saturated fats should not contribute more than 10%. However, compliance with these recommendations is more difficult for the consumer to achieve. To overcome this problem, structured emulsions called oleogels have been designed.

RESULTS AND DISCUSSION

Oleogels can be developed using a diverse range of structuring agents, which promote distinct gelation mechanisms at the nano- and micro-scale, thereby generating specific macroscopic properties. According to their molecular weight, oleogelators are divided into groups.

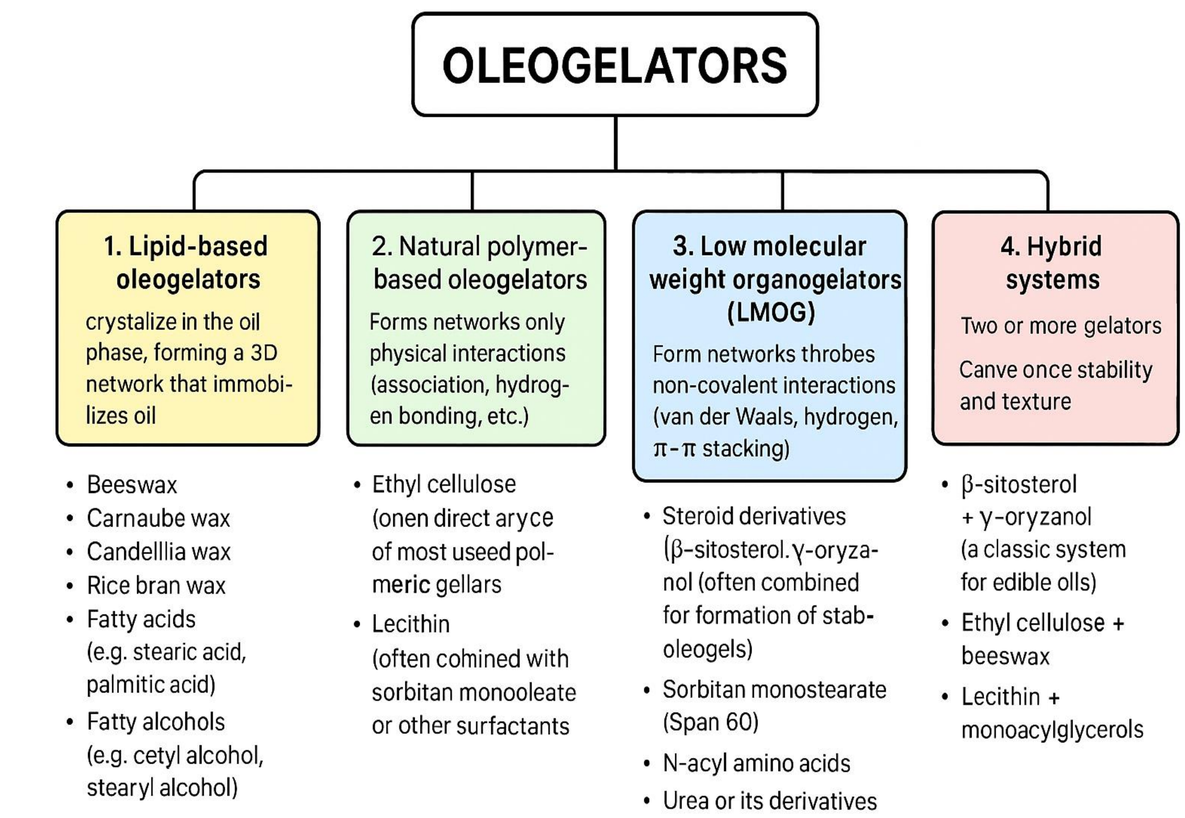


Figure 1. Classification of oleogelators used in the formation of oleogels

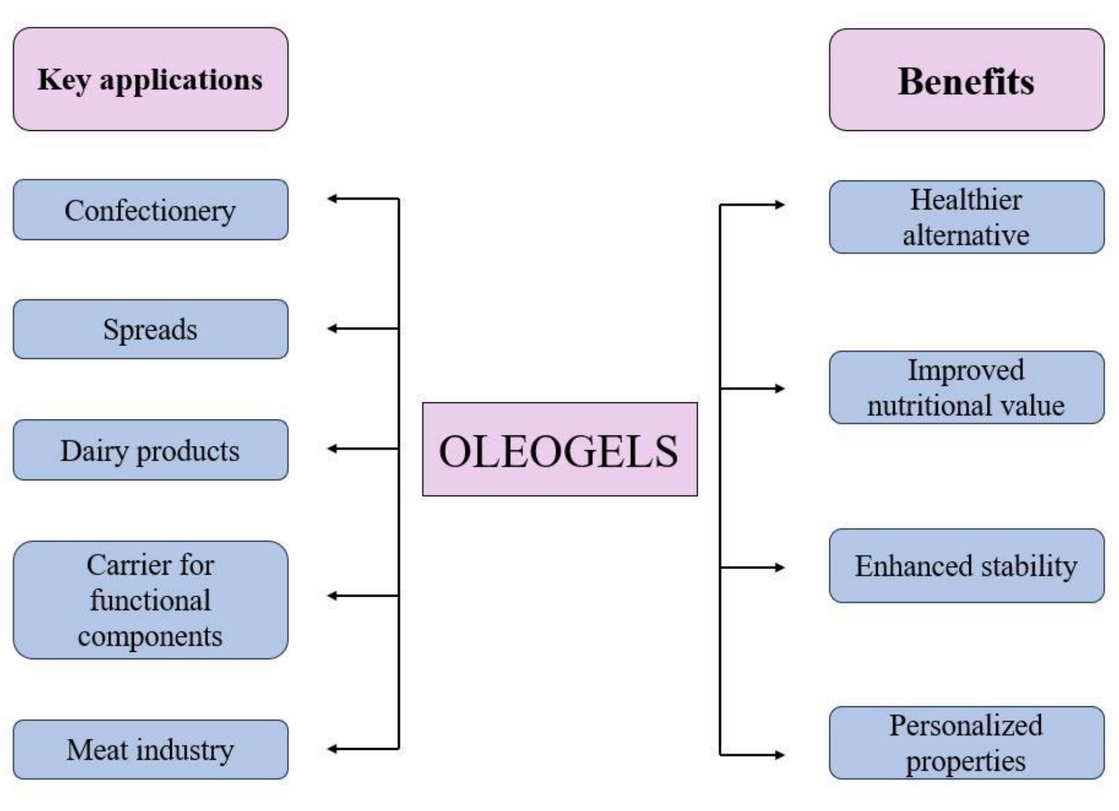


Figure 2. Applications and benefits of oleogels

CONCLUSIONS

The formulation and characterization of various oleogels, as well as their application as substitutes for conventional fats, represent a significant area of research aimed at developing innovative food products.

Acknowledgements

Bilateral Project 25.80013.5107.25ROMD Development of new food products for special medical purposes through the use of unconventional raw materials.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

Residual wine yeasts as a sustainable source of β-glucans: exploring multifunctional bio-ingredients for novel applications

Alina BOIȘTEAN; Aurica CHIRSANOVA; Rodica SIMINIUC

INTRODUCTION

Wine production generates large amounts of by-products, among which residual yeasts represent a valuable yet underexploited biomass. These microorganisms are rich in β-glucans—natural polysaccharides known for their technological and biological functions. β-Glucans exhibit thickening, stabilizing, and texturizing properties, while also providing immunomodulatory and cholesterol-lowering effects. Their recovery from winery residues offers an eco-friendly strategy consistent with circular economy principles. Exploring yeast-derived β-glucans opens new opportunities for sustainable and functional food innovation.

MATERIALS AND METHODS

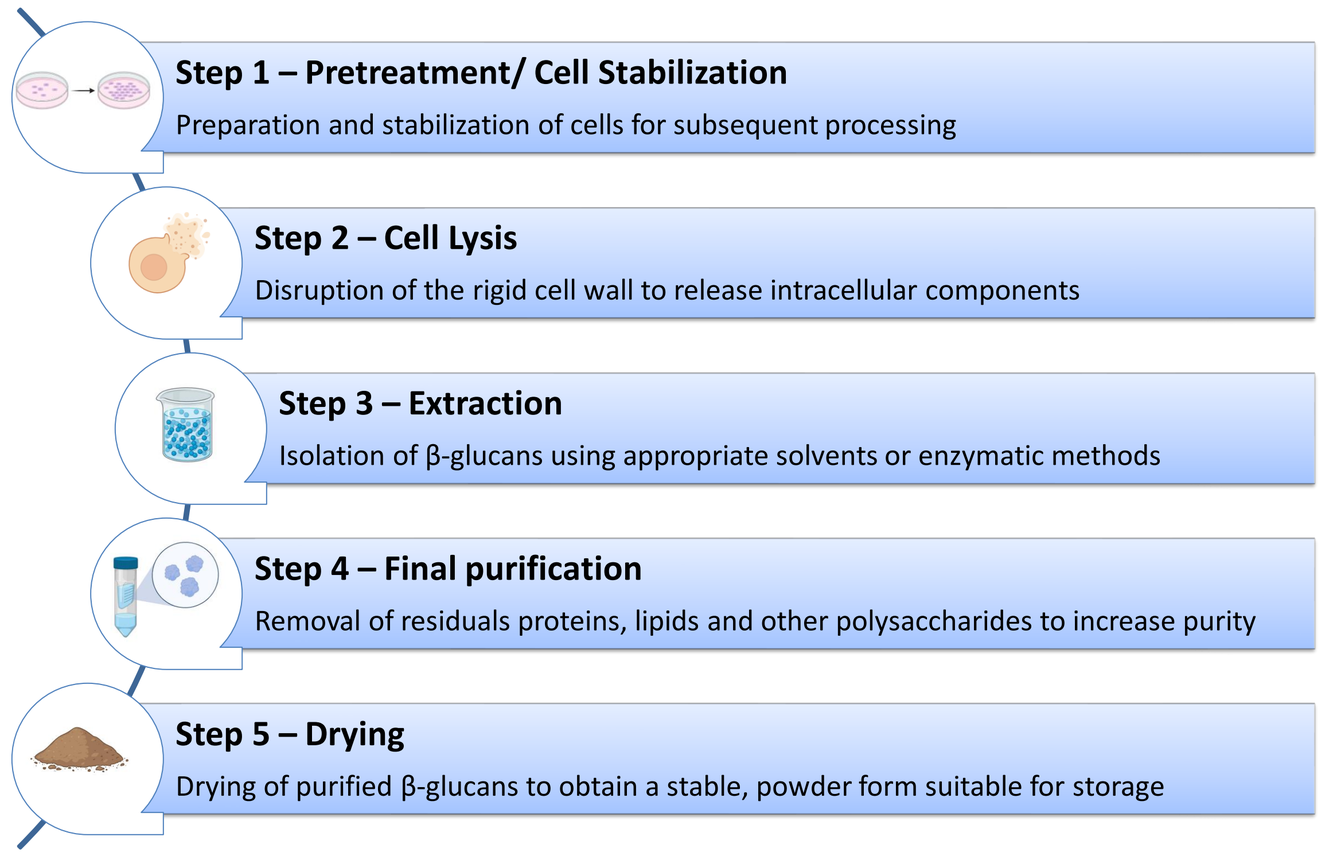
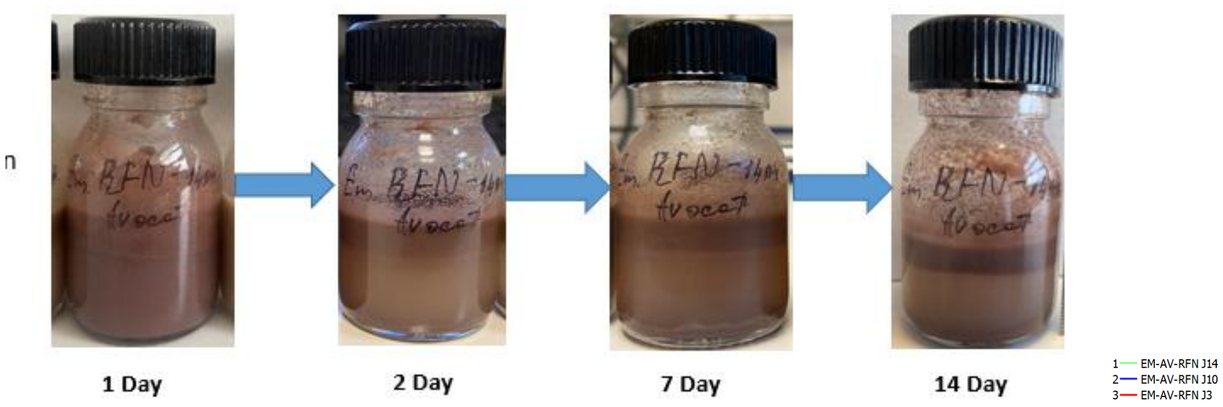


Figure 1. Schema of β-Glucan production from a yeast cells

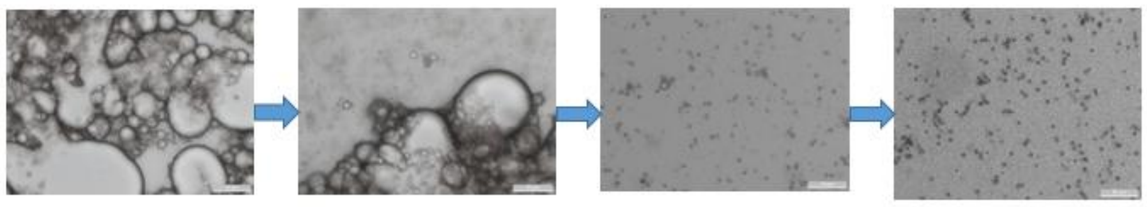
RESULTS AND DISCUSSION

An example of the stability of an emulsion containing β-glucans and avocado oil.

Figure 2. Emulsion stability results



Figures 3. Results of microscopic stability of the emulsion



Description of results: A pronounced sediment appearance can be seen which remained stable after 2 weeks with no change in color or texture. Microscopic stability analysis showed that after a few days there were no pronounced oil bubbles in the emulsion.

Analyzing the graph, we can conclude that the results obtained on days 3 and 10 are almost identical, with very similar microparticle diameters. However, the results obtained on the fourteenth day after the preparation of the emulsion show significant differences. The microparticles in the lower phase of the emulsion are much larger than those in the upper phase.

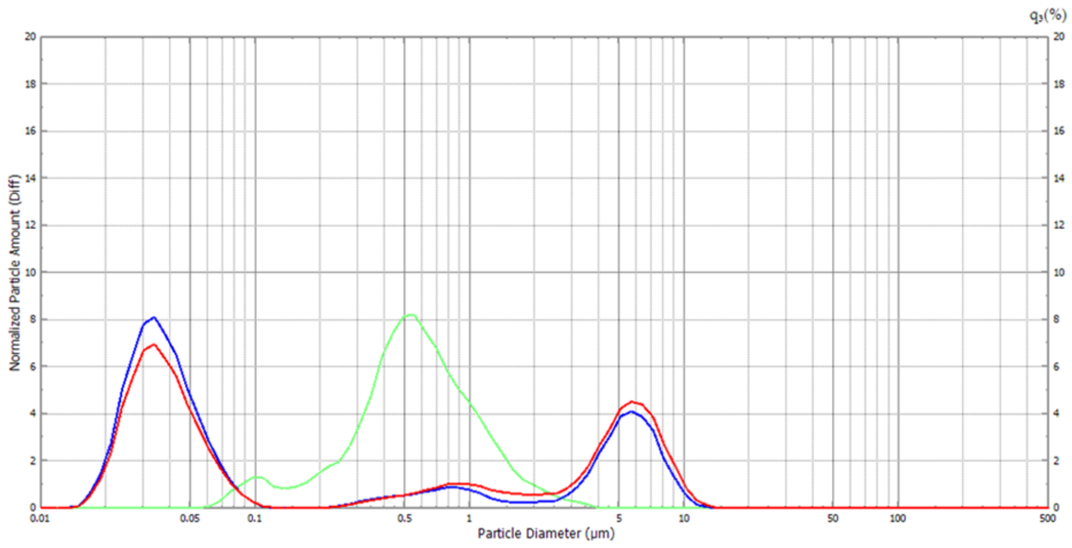


Figure 3. Particle size of emulsions with beta-glucan and avocado oil (bottom layer)

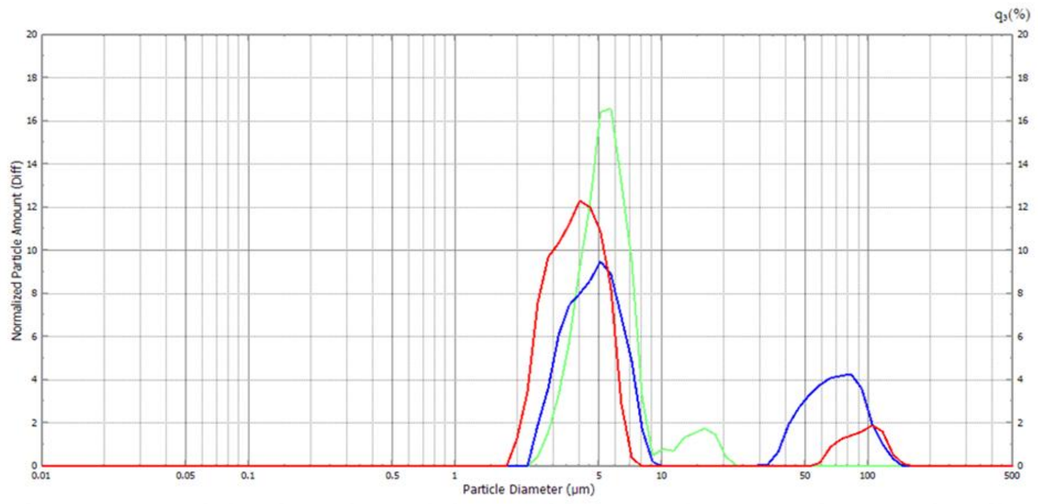


Figure 4. Particle size of emulsions with beta-glucan and avocado oil (top layer)

CONCLUSIONS

The extracted yeast β-glucans showed promising structural and functional properties, enhancing food quality and stability. Their recovery from wine residues represents an efficient valorization pathway. This sustainable approach integrates health benefits with environmental responsibility.

Acknowledgment: This work is supported by the State Project Rebrain 25.80013.5107.03RE Sustainable valorization of residual wine yeasts: exploring multifunctional bio-ingredients for innovative applications, implemented at the Technical University of Moldova.

Food and Nutrition Department, TUM
Tel: (+373) 69 081 217, email: alina.boistean@toap.utm.md

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

WINE TOURISM, THE CALLING CARD OF MOLDOVAN NATIONAL TOURISM

Alexandu NISTIRIUC, Eugenia COVALIOV

INTRODUCTION

The quality and diversity of Moldovan wines are key factors in the dynamic development of Moldovan wine tourism. The "National Wine Day" continues to attract thousands of tourists since 2022. Infrastructure development in recent years, along with the emergence of modern wineries and accommodation facilities, has strengthened the existing potential of wine tourism.
High-quality wines, landscapes, cultural heritage, and traditions throughout the year turn our country into a "welcoming host" offering top-quality tourist services. The Republic of Moldova is home to some of the largest and most spectacular underground wineries in the world (Cricova, Mileștii Mici, Castel Mimi, Purcari). Tourists visit these cellars, take part in grape picking and tasting, and can enjoy various themed wine routes. Wine tourism is harmoniously combined with local gastronomy, which provides that "unique flavor" always sought and appreciated by visitors.

MATERIALS AND METHODS

a) **Participatory observation:** We took part in several wine tours, where we studied the way wine and wine history are presented, the experiences offered (tastings, gastronomy, music, art), the guide–tourist interaction, service quality, and tourists' reactions
b) **Interviews with:** managers or administrators of wineries and tourist wine cellars, wine tour guides, and tourists.
c) **Questionnaires** for tourists, wineries, and cellars, analyzing service quality, wine-tourism experience, visited wineries; for wineries: annual number of visitors, promotion strategies, tourist types (local/international), and difficulties in developing wine tourism.
d) **Case studies:** We analyzed representative wineries (e.g., Cricova, Mileștii Mici, Castel Mimi, Purcari).

RESULTS AND DISCUSSION

Recently, wine tourism has become one of the most developed branches of tourism in the Republic of Moldova. According to the National Office of Vine and Wine, the number of visitors to wineries increased by approximately 25% annually between 2018 and 2023. About 2% of the world's vineyards are cultivated in Moldova. The country ranks among the top 20 wine-producing nations, holding the 13th position. Over 120 million liters of wine products reached foreign markets, bringing around 190 million US dollars to the national economy. 86% of tourists stated that they chose Moldova as a destination for its wines and wineries. 93% rated their wine tour experience as "very good" or "excellent." Festivals such as "National Wine Day" or "DescOPERA Moldova" are essential in strengthening this image. According to surveys and interviews, wine remains the most recognized Moldovan product abroad and the primary element through which most tourists get to know Moldova.

CONCLUSIONS

The research confirms that wine tourism is truly the "calling card" of Moldovan tourism, offering authentic experiences that combine history, culture, gastronomy, and tradition. Many wineries serve as examples of sustainability, applying eco-friendly practices. This sector is continuously developing and has significant potential to attract international tourists seeking authentic and refined experiences. With strategic promotion and innovation in infrastructure and services, it can become a regional tourism brand of reference in Eastern Europe.

Acknowledgements
Institutional Project 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova.

10th Edition of the International Conference
BIOTECHNOLOGIES, PRESENT AND PERSPECTIVES
Stefan cel Mare University of Suceava, Romania
Suceava, October 17, 2025

RURAL AGRO-PENSIONS AND TRADITIONAL CUISINE – AUTHENTIC FORMS OF MOLDAVIAN RURAL TOURISM

Alexandu NISTIRIUC, Aurica CHIRSANOVA

INTRODUCTION

Most often, rural agro-pensions offer tourists a retreat away from noisy cities, in picturesque villages, wine regions, hilly areas, or near forests and rivers. Here, tourists can take part in various agricultural activities (animal care, fruit and vegetable picking, haymaking, winemaking), hiking, craft workshops, carriage, boat, or bicycle rides.

Agro-pensions feature traditional-style accommodation with authentic elements of local architecture. Tourists staying at these guesthouses can learn interesting stories, legends, and folk tales from locals. They can enjoy traditional dishes prepared from local products — in rural areas, the taste of childhood persists in every meal: pies, stuffed cabbage rolls, stews, fish, polenta with cheese and sour cream, homemade wine, and natural compotes.

All these elements together make a stay at rural agro-pensions a satisfying experience for both local and international tourists.

MATERIALS AND METHODS

To highlight the potential of rural pensions in the Republic of Moldova, we applied the following research methods:

a) **Interviews** with: owners of rural agro-pensions, local chefs or housewives involved in gastronomic tourism, and tourists who have experienced Moldovan agritourism (from whom we obtained detailed information about motivations, experiences, difficulties, perspectives, and challenges).

b) **Analysis of promotional materials**: websites, brochures, Facebook/Instagram pages of the pensions, and menus.

c) **Questionnaires applied to tourists**: reasons for choosing an agro-pension, level of satisfaction, authenticity of culinary dishes, willingness to return or recommend the experience.

d) **Direct observation and case studies**: we selected several agro-pensions from different regions of Moldova, where we analyzed the tourist offer, community involvement, and promotion of traditional gastronomy.

RESULTS AND DISCUSSION

The main agro-tourism guesthouses in the Republic of Moldova were analyzed to determine their tourism potential and the relationships they establish with visitors.

Following the analysis of 20 agro-pensions from the districts of Ungheni, Strășeni, Orhei, Soroca, Călărași, and Hîncești, it was found that: 85% are family businesses with direct involvement of family members in cooking, accommodation, and organization of traditional activities, 69% offer traditional meals prepared on-site using local ingredients, most owners (80%) stated that tourists return year after year precisely because of the rustic atmosphere and delicious, authentic dishes, some agro-pensions organize real gastronomic workshops, where traditional cuisine becomes the key element in attracting tourists.

The questionnaire applied to 50 tourists staying in agro-pensions revealed that: 80% believed that their choice was influenced by the opportunity to taste traditional Moldovan food, 90% positively evaluated the authenticity of the recipes and the taste of the dishes offered (e.g., chicken soup with homemade noodles, cabbage rolls, pies, polenta with roast meat and cheese) most would recommend the experience of staying at an agro-pension and enjoying a traditional dinner to their friends.

CONCLUSIONS

The study results confirm that local pensions offer tourists high-quality services and delicious traditional dishes. There is a need to improve their promotion methods through creativity and innovation. Efforts should also focus on enhancing the tourism infrastructure.

Acknowledgements

Institutional Project 020405 "Optimizing food processing technologies in the context of the circular bioeconomy and climate change", Bio-OpTehPAS, being implemented at the Technical University of Moldova..