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C27 CHALLENGES AND OPPORTUNITIES RELATED TO THE WALNUT-BASED INNOVATIVE FOOD DEVELOPMENT

Cristina POPOVICI

Technical University of Moldova, Faculty of Food Technology, Department of Food and Nutrition, Chisinau, Republic of Moldova

cristina.popovici@toap.utm.md

Walnut is a crop of a high economic interest for the food industry. Walnut kernels have a lipid content of 65% of which 73% consists of polyunsaturated fatty acids, although values do vary between cultivars. Walnut kernels are consumed fresh or toasted, alone or in other edible products. With growing understanding of the relationship between diet and health has come the emergence of so-called innovations in food industry in order to design and develop healthy and nutritious foods. The idea of using food for health purposes and not merely as a source of nutrients opens up a new field in walnuts processing. In addition to traditional presentations, there a number of ways in which the walnut sector can modify the qualitative and quantitative walnut food composition and produce designer foods with specific properties (sensory, technological, hygiene, stability, etc.), nutritional value (balanced composition and bioactive substances) and their health effects. This presentation reviews a comprehensive approach for the development of walnut-based foods (Figure 1).

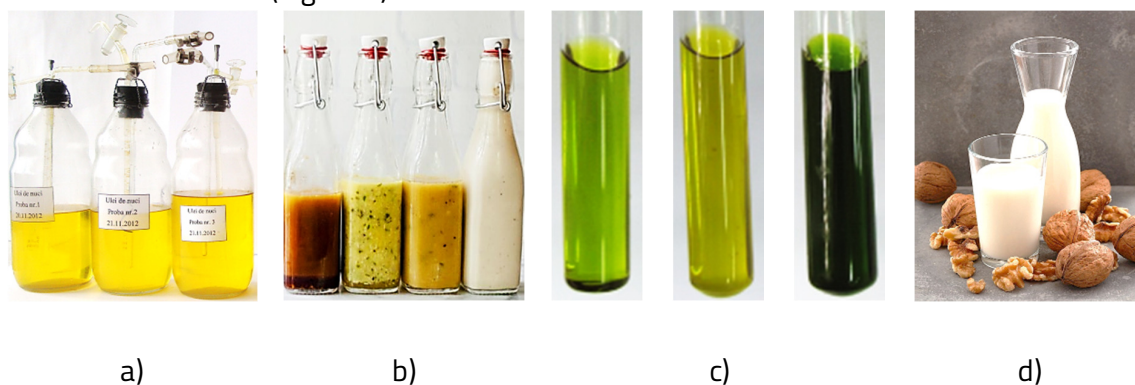


Figure 1. Samples of walnut-based food products: a) Walnut oils with high oxidative stability, b) Walnut dressings, c) Walnut by-products bioactive compounds, d) Walnut beverage emulsion

The consumption of walnut oils from different geographic origins has been reported extensively. Their major constituents are tryglicerides, in which monounsaturated (oleic acid mainly) and polyunsaturated fatty acids (linoleic and α – linolenic acids) are present in high amounts. The presence of other bioactive minor components, such as tocopherols and phytosterols, has been also documented. Walnut oil is appreciated as specialty oil also because of its characteristic flavor, aroma and health benefits.

A major goal in walnut production is to find an appropriate method to stabilize lipids from walnut kernels. The oxidative stabilization of walnut oil is imperative to determine the feasibility of bringing it into commercial production. The results of this research showed the influence of dehydration, thermal treatment and their combination as well as antioxidants efficacy on the quality properties (primary and secondary oxidation products) and antioxidant potential cold pressed walnut oil. It was demonstrated that walnut oil possess high quality after dehydration treatment and quality deteriorates after combined dehydration and heat treatment.

In the last few years, the population ratio demanding vegetable-based products is growing, either because of the increasing problems related with the intolerances to cow milk or because of changes in the food preferences. As a consequence of new consumer tendencies, food industries are currently producing new, high quality, nutritionally improved products with added value. Vegetable-based “milks” are included in these new products, which are available at any supermarket as an alternative to dairy products, with an increasing consumer acceptance. In this sense, walnuts can were used as an alternative to cow milk in lacto-intolerant people, allergic to animal proteins and vegans. This presentation describes how potentially walnuts were used to obtain vegetable milk, not only able to exert health benefits, but also as an alternative to dairy based products. Processing steps and conditions to ensure chemical composition, quality properties, microstructure and rheological behavior of walnut milk are presented. These studies showed high potential and positive view on walnut milk production, in agreement with the current demand of healthy products. These results offer new interesting expectations to continue with this research line and demand the application of advanced technologies.

Special attention is focused on the extraction of bioactive compounds from walnut by-products, using different solvents. The extraction constitutes an important step in the manufacture of phytochemical-rich products. The application of this low-cost technology to obtain molecules to be used as food additives or nutraceutical products is an appropriate strategy for the exploitation of by-products such as the walnut leaves, green husks and membrane septum. In this presentation, the extraction of phenol compounds

from walnut leaves, green husks and membrane septum was optimized by applying Soxhlet technique. This method has been proven to be desirable for phenols extraction and has many advantages such as increasing extraction yield, shortening extraction duration. Evaluation of the influence of solvent in the solid-liquid extraction process was measured by total phenol content and DPPH radical scavenging activity. Finally, the optimized conditions were validated. Solid-liquid extraction was preceded by the selection of the best solvent for obtaining phenols-enriched extracts of walnut leaves, green husks and membrane septum.

In view of the fact, that walnuts are of high health benefits and should be effectively used in the food industry and human nutrition, it is extremely important to elaborate technologies of walnut-based foods. This presentation describes how potentially walnuts were used to obtain these foods, not only able to exert health benefits, but also as an alternative to other food products. Processing steps and conditions to ensure chemical composition, quality, nutritional properties, structure and rheological behavior of walnut-based food products were analyzed. Results show high potential and positive view on walnut industrial processing, in agreement with the current demand of healthy and innovative food products.

Cristina POPOVICI

- Associate Professor of New Food Product Development and Food Technology of Public Catering at Faculty of Food Technology, Technical University of Moldova
- PhD (2009) in Engineering (Food Technology), Technical University of Moldova
- Habilitation in Food Engineering since 2021
 - 168 Stefan cel Mare Av., MD 2004 Chisinau, Republic of Moldova
 - E-mail: cristina.popovici@toap.utm.md
 - Phone: +37368241547
 - researcher ID: C-3919-2019
 - ORCID ID: 0000-0002-6985-8158
 - Scopus Author ID: 57200654499



Research Interests

Main research interests are focused on following topics: food fortification with calcium and iodine (*in vitro* and *in vivo* studies), advanced extraction methods (supercritical CO₂, solid/liquid) of bioactive compounds from agrofood sources/wastes;

antioxidant profile and quality characteristics evaluation; nut milk processing and characterization; vegetable oil processing and stabilization; development of fermented dairy products from goat milk with functional properties, consumer perception of innovative and future food.

Memberships

- Editorial Board of *Ukrainian Food Journal*, since 2013, www.ufj.ho.ua
- Consumer Perception working group within Global Harmonization Initiative, responsible for Innovative and Future Food, since 2021, <https://www.globalharmonization.net/wg-consumer-perception>
- Scientific International Conference "Youth scientific achievements to the 21st century nutrition problem solution", National University of Food Technologies, Kiev, Ukraine (Annual Editions 2014-2022).
- International Summer School "Food Safety for Healthy Living –FSHL", since 2018.

Selected Projects&Networks

- COST CA20133 „Cross-Border Transfer and Development of Sustainable Resource Recovery Strategies Towards Zero Waste (FULLRECO4US)", 2022-2025.
- INTERTOOL "Modernizing Internationalization Tools, Practices and Staff Competences to Support Student-Centered Learning in Eastern Partnership Universities", January 2019 – December 2019.
- Erasmus+ KA2 no. 573921-EPP-1-2016-1-MD- EPPKA2-CBHE-SP „ELEVATE - Elevating the Internationalisation of Higher Education in Moldova", 2016-2020.
- Project no. 16.80012.51.23A „Innovative Product from Goat Milk with High Biological Properties (InoBioProd)", January 2017- December 2018.
- CEEPUS CIII-RO-1111-07-2223 – Food Safety for Healthy Living, 2017-present.
- CEEPUS CIII-HR-1404-04-2223 - Adriatic-Pannonian-Black Sea Food Connect, 2019-present.
- Project no.15.817.02.30A "Development of Methods and Technics for Modernisation of Nuts (*Juglans regia* L.) Processing Technology Using their Biologically Active Constituents in the Functional Foods", 2015-2019.
- Project no. 318946 - FP7-PEOPLE - 2012 – IRSES „NUTritional LABELing Study in Black Sea Region Countries (NUTRILAB)", 2013- 2015.

Selected publications

- **Popovici C.** Chapter 4. Fortificarea alimentelor cu iod: abordări tehnologice, efecte nutritive și aspecte de siguranță. In: Innovative Food Products, Chișinău: Tehnica-UTM, 2021, ISBN 978-9975-45-704-0, p. 166-255 p.

- **Popovici C.** Nutrition and Diet in Cancer Prevention. The 10th International EuroAliment 2021 Symposium, 7-8 October 2021, ISBN 1843-5114, p 80.
- **Popovici C,** Tita A.M, Cartasev A, Resitca V, Bogdan N, Migalatiev O. Biochemical approaches for goat milk yogurt production. Scientific Bulletin Series F. Biotechnologies, Vol. XXIV, No. 2, Bucharest, Romania, 2020, ISSN 2285-1364, p. 49-54.
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- Saykova I, Tylkowsky B, **Popovici C.** Extraction of phenolic and flavonoid compounds from solid wastes of grape seed oil production by cold pressing. J Chem Tech and Metallurgy 2018; 2 (53): 177-190.
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- Sturza R, Deseatnicova O, **Popovici C,** Gudumac V, Nastas I. Influence of iodinated oil and margarine on the thyroid system of rats. Chemistry Journal of Moldova. General, industrial and ecological chemistry 2008; 3 (1): 77 – 84.