

Project Title

“Impact of technological processing on the stability of phenolic compounds, anthocyanins, flavonoids, and microelements in functional products based on organic and wild berry raw materials of the Carpathian region”

Research Team

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Project Concept

The project is based on an integrated scientific approach that combines a comprehensive analytical evaluation of bioactive compounds (phenolics, anthocyanins, flavonoids, microelements, and potential contaminants) in raw materials with monitoring their stability during technological processing and assessing the antioxidant potential of finished products.

The research focuses on non-traditional plant materials and wild-growing species aimed at creating products with enhanced nutritional value and health-promoting properties. The project includes the analysis of essential and toxic elements in plants, safety assessment, and evaluation of potential health risks. Significant attention is given to the development of innovative technologies for preparing functional foods, beverages, and confectionery products enriched with bioactive ingredients.

1. Key Areas of Project Implementation

I. Analytical Evaluation of the Resource Potential of Plant Raw Materials

Instead of providing a general overview, the team conducts a precise and systematic study of the chemical composition of wild and organic flora.

- **Identification of Nutrient Profiles:** Determination of vitamin, amino acid, and mineral content in accordance with national and international analytical standards.
- **Quantification of Antioxidants:** Application of the DPPH assay to determine radical-scavenging activity of berries and plant extracts.
- **Environmental Certification:** Monitoring of essential and toxic elements to ensure ecological purity and safety of the raw material base.

II. Investigation of Biochemical Markers of Antioxidant Protection

At this stage, interactions of phyto-ingredients with enzymatic antioxidant systems are analyzed at the biochemical level using model systems or plant/biomimetic tissues.

III. Development of Innovative Food Systems

The obtained analytical data are transformed into practical technological solutions for the food industry.

- **Formulation Development:** Creation of bread, confectionery (e.g., chocolate truffles), and beverages enriched with functional plant-derived ingredients.
- **Quality Prediction:** Optimization of product composition to enable forecasting of antioxidant value after thermal or mechanical processing.

2. Scientific Novelty and Development Prospects

- **Technological Control:** Transition from random use of berries to systematic development of foods with targeted bioactive properties.
- **Use of Non-Traditional Raw Materials:** Advancement toward the legalization and standardization of wild plants and organic farming products for industrial-scale food production.
- **Integrated Safety Approach:** Development of a methodology that simultaneously evaluates nutritional value, ecological purity, and antioxidant stability.

3. Expected Outcomes

The project will result in the creation of a line of innovative food products with high consumer value and a clearly defined biochemical profile that aligns with modern requirements of nutrition science and environmental safety.

List of publications on the topic

1. Krektun B., Zhylishchych Y., Antonyak H., Bomba M., Fedyna L., Pandyak I., Zhygal N. Content of biologically active compounds and antioxidant capacity of berry fruits from *ARONIA MELANOCARPA*, *PRUNUS SPINOSA*, *SAMBUCUS NIGRA* AND *RUBUS FRUTICOSUS*. *Biol. Stud.* 2026, 20(1), 65–82 doi: <https://doi.org/10.30970/sbi.2001.869> (Scopus)
2. Myroslav Y. Bomba, Tetyana S. Zazulyak, Ihor V. Zhytnetskyi, Larysa O. Fedyna The content of essential and toxic microelements in nettle dioecious in the aspect of using the plant as a food raw. *Journal of Chemistry and Technologies*, 2024. 32(2). P.417-422. <http://chemistry.dnu.dp.ua> (Scopus)
3. Bomba M., Fedyna L., Zazulyak T., Pandiak I., Bomba M.I. Snudy of the nutrient composition of Amelanchier alnifolia frutts. *Food Science and Technology*. 2025. №19(4). P.4-10. <https://doi.org/10.15673/fst.v19i4.3295> (Web of Science)