



Fund “Nauka” Project № 22011 Resume – Competition-Based Session 2022:

“Evaluation of the microbial safety, physicochemical characteristics and consumer health benefits of a farmer’s white brined cow’s milk cheese”

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This project focused on a comprehensive assessment of the microbiological safety, physicochemical characteristics, and potential health benefits of Bulgarian artisanal white brined cow's milk cheese, a traditional dairy product of considerable nutritional, cultural, and economic importance. The main objective was to generate new scientific knowledge regarding the product's quality, safety, microbial ecology, and technological characteristics, while exploring innovative approaches for improving its preservation through the application of natural antimicrobial agents. The project was implemented using an interdisciplinary approach integrating food microbiology, dairy chemistry, food technology, and statistical data analysis.

A representative collection of 111 white brined cow's milk cheese samples, including both artisanal and industrially produced products from different regions of Bulgaria, was established. All samples underwent comprehensive microbiological, physicochemical, and sensory evaluation. Microbiological safety was assessed according to internationally recognized ISO standards by examining the presence of *Staphylococcus aureus*, β -glucuronidase-positive *Escherichia coli*, *Salmonella spp.*, *Listeria monocytogenes*, yeasts, and molds. In parallel, the principal physicochemical characteristics—including moisture, fat content, sodium chloride concentration, titratable acidity, and degree of ripening—were determined, together with a detailed sensory evaluation of each cheese sample.

One of the project's major scientific achievements was the first comprehensive characterization of the yeast microbiota of Bulgarian artisanal and industrial white brined cheeses using MALDI-TOF MS technology. Nine yeast species were identified, with *Debaryomyces hansenii* being the predominant species in industrially produced cheeses, whereas *Torulaspora delbrueckii* occurred more frequently in artisanal products. The study demonstrated that salt concentration, moisture content, titratable acidity, and ripening degree are among the principal factors shaping the composition of the yeast microbiota and the microbial ecology of white brined cheese.

The project also generated new scientific data regarding the diversity of lactic acid bacteria isolated from the investigated cheeses. Several promising strains with potential application as functional starter cultures and probiotic microorganisms were identified, providing a valuable basis for future research on their technological and health-promoting properties.

Particular emphasis was placed on investigating the application of oregano (*Origanum vulgare*) and caraway (*Carum carvi L.*) essential oils as natural post-preservative agents in low-salt cheese brines. Experimental studies demonstrated pronounced antimicrobial activity against *Escherichia coli* and *Staphylococcus aureus* without adversely affecting the sensory quality of the cheese. These findings provide a scientific basis for developing healthier dairy products with reduced salt content and decreased reliance on synthetic preservatives.

In addition, comparative analyses of the physicochemical and sensory characteristics of artisanal and industrial cheeses were performed, together with an evaluation of compliance with European and Bulgarian regulations governing dairy product labeling. The results confirmed that all investigated products complied with the established quality and safety requirements, while artisanal producers demonstrated a high level of conformity with current labeling legislation.

The outcomes of the project significantly expand current knowledge of the microbial ecology, safety, and quality characteristics of Bulgarian white brined cheese. They provide a scientific foundation for the development of innovative technologies for natural preservation, optimization of dairy production processes, and enhancement of the competitiveness of traditional Bulgarian dairy products. The scientific achievements have been disseminated through publications in international peer-reviewed journals and presentations at national and international scientific conferences, thereby increasing the international visibility of the research activities of the Medical University – Varna.