



UNIVERSITY OF AGRONOMIC SCIENCES
AND VETERINARY MEDICINE OF BUCHAREST

FACULTY OF BIOTECHNOLOGIES

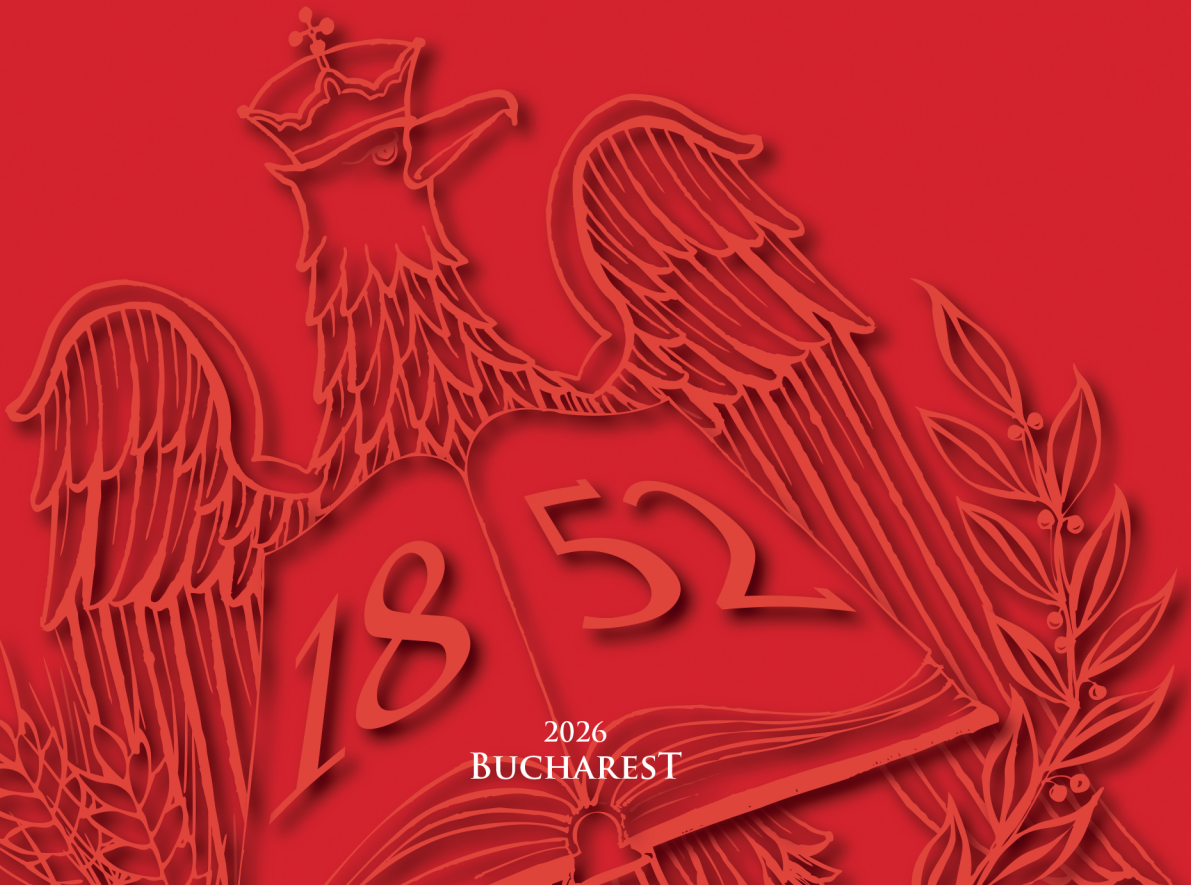


International Conference
"Agriculture for Life, Life for Agriculture"

BOOK OF ABSTRACTS

SECTION 6

BIOTECHNOLOGY



2026
BUCHAREST

UNIVERSITY OF AGRONOMIC SCIENCES
AND VETERINARY MEDICINE OF BUCHAREST

FACULTY OF BIOTECHNOLOGIES

International Conference
"Agriculture for Life, Life for Agriculture"

BOOK OF ABSTRACTS

SECTION 6

BIOTECHNOLOGY

2026
BUCHAREST

**EDITORIAL BOARD
OF THE BIOTECHNOLOGY SECTION**

General Editor: Narcisa Elena BĂBEANU

Executive Editor: Elisabeta Elena POPA

Editorial Secretary: Paul Alexandru POPESCU, Aglaia POPA

PUBLISHERS

**University of Agronomic Sciences and Veterinary Medicine of Bucharest,
Faculty of Biotechnologies, Romania**

Address: 59 Mărăști Blvd, District 1, Zip code 011464, Bucharest, Romania

Phone: + 40 21 318 25 64, Fax: +40 21 318 28 88

E-mail: biotechnologiesjournal@usamv.ro

Webpage: <http://biotechnologyjournal.usamv.ro>

CERES Publishing House

Address: 106 Izbiceni Street, District 1, Bucharest, Romania

Email: edituraceres@yahoo.com,

Webpage: www.editura-ceres.ro

Copyright 2026

To be cited: Book of Abstracts, International Conference “Agriculture for Life,
Life for Agriculture”, Section 6: Biotechnology, 2026

*The publisher is not responsible for the opinions published in this volume.
They represent the authors' point of view.*

ISSN 2343-9653 (PRINT)

ISSN-L 2343-9653

THE INTERNATIONAL CONFERENCE
“AGRICULTURE FOR LIFE, LIFE FOR AGRICULTURE”

SCIENTIFIC BOARD - SECTION 6: BIOTECHNOLOGY

- Veronika ABRAM - Biotechnical Faculty, University of Ljubljana, Slovenia
- Narcisa BĂBEANU - Faculty of Biotechnology, USAMV of Bucharest, Romania
- Gabriela BAHIRIM - Faculty of Food Science and Engineering, “Dunărea de Jos” University of Galați, Romania
- Gustavo V. BARBOSA-CANOVAS - Washington State University Pullman, State of Washington, USA
- Ingrid BAUMAN - Faculty of Food Technology and Biotechnology, Zagreb, Croatia
- Nastasia BELC - National Research & Development Institute for Food Bioresources - IBA Bucharest, Romania
- Daniela BORDA - Faculty of Food Science and Engineering, “Dunărea de Jos” University of Galați, Romania
- Monica BOSCAIU - Mediterranean Agroforestry Institute (IAM, UPV), Universitat Politècnica de València, Spain
- Dorica BOTĂU - Faculty of Agriculture, USV from Timișoara, Romania
- Nicolae CORCIONIVOSCHI - Agri-Food and Biosciences Institute, Belfast, United Kingdom
- Călina Petruța CORNEA - Faculty of Biotechnology, USAMV of Bucharest, Romania
- Florentina MATEI - Transilvania University of Brasov, Romania
- Delia DIMITRIU - Manchester Metropolitan University, United Kingdom
- Carla EMILIANI - Università degli Studi di Perugia, Italy
- Helmut GLATTES - ISEKI Food Association, Austria
- Gustavo Fidel GUTIERREZ-LOPEZ - ENCB-IPN, National School of Biological Sciences, National Polytechnic Institute, Mexico
- Florentina ISRAEL-ROMING - Faculty of Biotechnology, USAMV of Bucharest, Romania
- Huub LELIEVELD - GHI Association Netherlands, Netherlands
- Leonardo LEONARDI - Università degli Studi di Perugia, Italy
- Amalia Carmen MITELUȚ - Faculty of Biotechnology, USAMV of Bucharest, Romania
- Paola PITTIA - Dipartimento di Scienze, degli Alimenti University degli Studi di Teramo, Italy
- Mona Elena POPA - Faculty of Biotechnology, USAMV of Bucharest, Romania
- Sandrine ROUSSEAUX - University of Burgundy, Dijon, France
- Mark SHAMTSYAN - St. Petersburg State Institute of Technology, Russia

BOOK OF ABSTRACTS
SECTION 6: BIOTECHNOLOGY

- Cristina SILVA - ISEKI Food, Catholic University of Portugal, Portugal
- Ileana STOICA - University of Bucharest, Romania
- Gabriela TENEA - Universidad Técnica del Norte, Ibarra, Ecuador
- Margarida VIEIRA - Directora do Dep. De Engenharia Alimentar, Instituto Superior de Engenharia, Universidade do Algarve, Portugal
- Tatiana VASSU - University of Bucharest, Romania
- Oscar VICENTE - Universitat Politècnica de València, Spain
- Medana ZAMFIR - Institute of Biology, Romanian Academy, Romania
- Chin-Kun WANG - Chung Shan Medical University, Taiwan

ORGANIZING COMMITTEE - SECTION 6: BIOTECHNOLOGY

Section president: PhD. Narcisa Elena BĂBEANU

Section coordinator: Associate Professor PhD. Elisabeta Elena POPA and
Lecturer PhD. Paul-Alexandru POPESCU

Members:

- Associate Professor PhD. Oana-Alina BOIU-SICUIA
- Associate Professor PhD. Radu Cristian TOMA
- Lecturer PhD. Diana GROPOȘILĂ-CONSTANTINESCU
- Lecturer PhD. Mihaela GEICU-CRISTEA
- Lecturer PhD. Aglaia POPA
- Assistant Professor Ion NIȚU
- Assistant Professor Sara ROMAN
- Assistant Professor Rely TUDOR

SUMMARY

ORAL PRESENTATIONS

- O.1. CONTRIBUTION TO THE STUDY OF CONSERVATION BY THE METHOD OF LYOPHILIZATION OF FUNGI AND BACTERIA - Tamara SÎRBU, Valerina SLANINA, Cristina MOLDOVAN 10
- O.2. IMPACT OF POST-HARVEST HANDLING AND PROCESSING ON THE MICROBIAL AND PHYSICOCHEMICAL QUALITY OF CHOCHO (*LUPINUS MUTABILIS*) IN ECUADOR - Gabriela Nicoleta TENEA 11
- O.3. "NEW" CROPS TO ADAPT MEDITERRANEAN AGRICULTURE TO THE CURRENT CLIMATE EMERGENCY - Oscar VICENTE, Monica BOSCAIU 12
- O.4. IMMUNOLOGICAL ASPECTS REGARDING THE EVALUATION OF CELLULAR INDICES IN CATTLE - Rita GOLBAN 13
- O.5. EFFECT OF DIETARY FIBRE OF DIFFERENT BOTANICAL ORIGIN ON THE MOLECULAR DYNAMICS OF THE LIPID FRACTION AND PHYSICAL PROPERTIES OF CHOCOLATE - Hanna Maria BARANOWSKA, Weronika KWIATKOWSKA, Przemysław SIEJAK, Przemysław Łukasz KOWALCZEWSKI 14
- O.6. MODERNIZATION OF THE CONTROL SYSTEM OF CONVECTIVE-TYPE CABINET DEHYDRATORS AND PROVIDING LABORATORY RESEARCH ON FOOD DRYING - Marko PETKOVIĆ, Alexander LUKYANOV, Vasilii DOLGOV, Nemanja MILETIĆ 15
- O.7. SENSORY CHARACTERISTICS AND QUALITY PARAMETERS OF CHERRY LIQUEURS PRODUCED USING DIFFERENT TECHNOLOGICAL METHODS - Nemanja MILETIĆ, Bojana LAZAREVIĆ, Matija MUNJIĆ, Alexander LUKYANOV, Marko PETKOVIĆ, Branko POPOVIĆ, Vladimir FILIPOVIĆ 16
- O.8. UTILIZATION OF SNAIL-BASED PRODUCTS IN CIRCULAR BIOECONOMY - Dana COPOLOVICI, Cristian MOISA, Andreea LUPITU, Flavia BORTES, Lucian COPOLOVICI 17
- O.9. PILOT EVALUATION OF MECHANICAL PARAMETERS INFLUENCING GRAPE SEED OIL YIELD IN SMALL AGRICULTURAL PRESSES - Carmen BĂLȚATU, Sorin Ștefan BIRIȘ, Ana-Maria TĂBĂRAȘU, Dragoș Nicolae DUMITRU, Eugen MARIN..... 18
- O.10. DEVELOPMENT AND CHARACTERIZATION OF POLYVINYL ALCOHOL BASED POLYMERIC SYSTEMS FOR BIOMEDICAL AND AGRICULTURAL APPLICATIONS - Eduard-Gabriel CONSTANTIN, Mihaela Violeta GHICA, Cristina Elena DINU-PÎRVU, Ioana LUCA, Irina-Alexandra DUMITRESCU, Durmuş Alpaslan KAYA, Lăcrămioara POPA, Valentina ANUȚA, Mădălina Georgiana ALBU KAYA, Iuliana Diana BĂRBULESCU, Răzvan Mihai PRISADA 19

BOOK OF ABSTRACTS
SECTION 6: BIOTECHNOLOGY

POSTER PRESENTATIONS

SUBSECTION I: AGRICULTURAL BIOTECHNOLOGY

P.I.1. RESULTS OBTAINED FROM THE USE OF THE BACTERIUM <i>AZOTOBACTER CHROOCOCCUM</i> IN MAIZE CULTIVATION - Paul Alexandru PARDEK, Nicu Cornel SABAU, Cristina Maria MAERESCU, Ioana Maria BORZA, Radu Petru BREJEA	22
P.I.2. ELECTRON-BEAM CROSSLINKING OF ALGINATE/ACRYLIC ACID HYDROGELS: SWELLING BEHAVIOR, RELEASE KINETICS, AND MIGRATION EFFECTS - Ion NIȚU, Elisabeta Elena POPA, Amalia Carmen MITELUȚ	23
P.I.3. RECOVERY OF BIOACTIVE COMPOUNDS FROM SELECTED INDUSTRIAL PLANT WASTES AND BY-PRODUCTS-CASE STUDIES ON: TOMATO PROCESSING RESIDUES, OLIVE WASHING WATERS AND SEA BUCKTHORN BY-PRODUCTS - Adina NICHITA, Ioana Loredana STANCIU, Mihaela GEICU-CRISTEA, Mona Elena POPA	24
P.I.4. MYCOTOXINS DEACTIVATOR BASED ON SPENT BREWER'S YEAST CELL WALLS AND DIATOMACEOUS EARTH - Simona-Laura ROTARU, Carmen LUPU, Malina DESLIU-AVRAM, Florin OANCEA	25
P.I.5. MYCOTOXIN OCCURRENCE IN FEED AND FEED RAW MATERIALS IN SOUTHERN ROMANIA IN 2024 - Simona-Laura ROTARU, Veronica TUDORICA, Carmen LUPU, Florin OANCEA	26

SUBSECTION II: FOOD BIOTECHNOLOGY

P.II.1. INVESTIGATIONS ON THE USE OF EGG PROTEIN DERIVATIVES AND HYDROLYSATES FOR PUDDING FORTIFICATION - Mihaela BRUMĂ (CĂLIN), Ina VASILEAN, Iuliana BANU, Nicoleta STĂNCIUC, Gabriela RÂPEANU, Iuliana APRODU	27
P.II.2. IMPROVING THE QUALITY OF ALTERNATIVE VEGAN BURGER PRODUCTS THROUGH THE USE OF ENZYMATIC TREATMENT - Krzysztof SMARZYŃSKI, Millena RUSZKOWSKA, Hanna Maria BARANOWSKA, Przemysław Łukasz KOWALCZEWSKI	28
P.II.3. QUALITY ASSESSMENT OF CORN EXTRUDATES ENRICHED WITH SPIRULINA AND CHLORELLA AS FUNCTIONAL SNACK PRODUCTS - Millena RUSZKOWSKA, rzysztof SMARZYŃSKI, Martyna WRÓBEL, Hanna Maria BARANOWSKA, Przemysław Łukasz KOWALCZEWSKI	29
P.II.4. FOOD SAFETY RISK ANALYSIS BASED ON AN IMPROVED HACCP METHODOLOGY: AN APPLIED STUDY - Maria POPA, Mirel GLEVITZKY, Gabriela-Alina DUMITREL, Dorin-Victor POPA, Doriana Maria POPA, Ana VÎRSTA	30

THE INTERNATIONAL CONFERENCE
“AGRICULTURE FOR LIFE, LIFE FOR AGRICULTURE”

P.II.5. POTATO PROTEIN-BASED VEGAN BURGERS AS MODULATORS OF GUT MICROBIOTA AND INTESTINAL BIOACTIVITY AFTER <i>IN VITRO</i> DIGESTION - Przemysław Łukasz KOWALCZEWSKI, Małgorzata GUMIENNA, Paweł JEŻOWSKI, Michał ŚWIĄTEK, Barbara GÓRNA-SZWEDA, Iga RYBICKA, Millena RUSZKOWSKA, Maciej Ireneusz KLUZ, Matteo BORDIGA	31
P.II.6. STRUCTURING AND STABILITY OF PLANT-BASED BURGERS ENRICHED WITH POTATO PROTEIN AND IRON: INSIGHTS FROM TEXTURE, WATER PROPERTIES, AND LOW-FIELD NMR - Martyna Maria WRÓBEL, Krzysztof SMARZYŃSKI, Millena RUSZKOWSKA, Hanna Maria BARANOWSKA, Przemysław Łukasz KOWALCZEWSKI	32
P.II.7. HIGHLIGHTING THE INFLUENCE OF BROCCOLI MICROGREENS (<i>BRASSICA OLERACEA</i> , VAR. <i>ITALICA</i>) ADDED TO COW'S TELEMEA CHEESE* ON THE PURCHASING PREFERENCES OF THE FINAL CONSUMER - Oana LIVADARIU, Laura-Maria VALS, Paulina VALS	33
P.II.8. BIO-BASED CAPSULES WITH PEPTIDES AND <i>LACTOBACILLUS CASEI</i> AS AUGMENTATION VECTORS FOR BIOLOGICALLY ACTIVE FOOD PRODUCTS - Oana Camelia IATCU, Monica IAVORSCHI, Ancuța Veronica LUPAESCU, Roxana Elena GHEORGHITA	34

SUBSECTION III: MEDICAL AND PHARMACEUTICAL BIOTECHNOLOGY

P.III.1. MICROSCOPIC ANALYSIS OF THE STEM AND LEAF OF <i>MELISSA OFFICINALIS</i> L. (LEMON BALM) - Ovidiu-Ștefan IONESCU, Monica ENACHE	35
P.III.2. MICROBIAL BIOSURFACTANTS AS ANTIMICROBIAL AND THERAPEUTIC AGENTS: A MINI-REVIEW OF RECENT ADVANCES - Roxana Mădălina STOICA, Nicoleta STAMATE-ENE, Elena Simina LAKATOS, Elena Cristina RADA, Diana-Gabriela GROPOȘILĂ-CONSTANTINESCU	36

SUBSECTION IV: ENVIRONMENTAL BIOTECHNOLOGY

P.IV.1. BIOTECHNOLOGICAL BIOREMEDIATION SOLUTIONS FOR ENVIRONMENTS CONTAMINATED WITH PHARMACEUTICAL WASTE – A REVIEW - Gabriela-Lucica MĂRGĂRIT, Diana-Gabriela GROPOȘILĂ-CONSTANTINESCU, Silvana-Mihaela DĂNĂILA-GUIDEA, Diana-Elena VADANA	37
P.IV.2. BIOINDICATORS, A KEY TOOL IN ASSESSING TOXIC EXPOSURE - Gabriela LUȚA, Evelina GHERGHINA, Daniela BALAN, Hatice TURKTEN	38
P.IV.3. SILICON-BASED ELICITORS FOR SUSTAINABLE CROP PROTECTION - Maria-Mihaela ZUGRAVU, Aglaia POPA, Yildiray ISTANBULLU	39

BOOK OF ABSTRACTS
SECTION 6: BIOTECHNOLOGY

SUBSECTION V: MISCELLANEOUS

P.V.1. MECHANISMS FOR STRENGTHENING THE ECONOMIC SECURITY OF ENTERPRISES IN THE REPUBLIC OF MOLDOVA - Raissa DUȘCOV	40
P.V.2. DEVELOPING COMPETENCIES IN CUTTING-EDGE TECHNOLOGIES FOR GREEN AGRICULTURE AND INDUSTRIAL APPLICATIONS - Nicoleta RADU, Mihai Dan CARAMIHAI, Francisca BLANQUEZ CANO, Adrian SILVA, Narcisa Elena BĂBEANU	41
P.V.3. CONTEMPORARY LEARNING TRAINING TEACHING METHODOLOGY FOR EXPLORING THE EUROPEAN GREEN DEAL: LINKING AGRICULTURE, BIODIVERSITY, AND EU POLICY - Nicoleta RADU, Mihai Dan CARAMIHAI, Francisca BLANQUEZ CANO, Adrian SILVA, Narcisa Elena BĂBEANU	42
P.V.4. AI-ENHANCED ADDITIVE MANUFACTURING IN BIOTECHNOLOGY: BRIDGING THE DIGITAL GAP THROUGH 3D SCANNING AND GENERATIVE DESIGN OPTIMIZATION - Ștefan Rafael PORUMBEL, Radu Cristian TOMA, Filofteia Camelia DIGUȚĂ, Alexandru Constantin ALDEA, Gabriela Lucica MĂRGĂRIT, Diana-Gabriela GROPOȘILĂ-CONSTANTINESCU, Sahar DELKHAHI, Narcisa Elena BĂBEANU	43

**ORAL
PRESENTATIONS**

O.1. CONTRIBUTION TO THE STUDY OF CONSERVATION BY THE METHOD OF LYOPHILIZATION OF FUNGI AND BACTERIA

Tamara SÎRBU¹, Valerina SLANINA², Cristina MOLDOVAN²

¹Institute of Microbiology and Biotechnology of Technical University of
Moldova, 1 Academiei, Chisinau, Republic of Moldova

²Technical University of Moldova, 1 Academiei, Chisinau,
Republic of Moldova

Corresponding author email: tamara.sirbu@imb.utm.md

Abstract

Microorganisms, especially filamentous fungi and bacteria, are a safe and inexhaustible source of potential producers of bioactive substances for agricultural use. The preservation and storage of these microorganisms plays an important role in biotechnology. There are different protective media for lyophilization of microorganisms, but this parameter is necessary to optimize in dependence of microorganism subjected to lyophilization. This study aims to elucidate the action of various protective media used in the process of lyophilization, strains of filamentous fungi and bacteria, isolated from aquatic basins, with high antimicrobial potential over a wide range of phytopathogens, on the viability and stability of antimicrobial properties after lyophilization. Four protective media were developed based on skimmed milk supplemented with glucose, sucrose and antioxidants in different concentrations. As a result of the research, the optimal protective medium for the lyophilization of bacteria and filamentous fungi was selected. After lyophilization in optimized media, the viability of bacteria varied within 88-92%, and of fungi 92-98%, compared to the initial titre, which ensures the preservation and long-term preservation of biotechnological interest strains.

Key words: *fungi, bacteria, protective medium, lyophilization.*

O.2. IMPACT OF POST-HARVEST HANDLING AND PROCESSING ON THE MICROBIAL AND PHYSICOCHEMICAL QUALITY OF CHOCHO (*LUPINUS MUTABILIS*) IN ECUADOR

Gabriela Nicoleta TENEA

Universidad Tecnica del Norte, Avenida 17 de Julio 5-21, Ibarra, Ecuador

Corresponding author email: gntenea@utn.edu.ec

Abstract

*Chocho (*Lupinus mutabilis*), an important Andean legume, experiences diverse post-harvest practices that shape its microbial communities and physicochemical properties, ultimately influencing food quality and safety. This study investigated the microbiome along the chocho supply chain by analyzing field-harvested seeds (C), open-market ready-to-eat grains (A), and supermarket grains (K) using 16S rRNA and ITS amplicon sequencing. Physicochemical parameters, including moisture, pH, titratable acidity, and total alkaloid content, were also assessed. Distinct microbial assemblages were observed: field samples exhibited high fungal richness dominated by xerophilic taxa; open-market grains showed the greatest bacterial diversity and increased opportunistic yeasts; supermarket grains displayed lower but more uniform microbial loads due to processing. Significant correlations linked genera such as *Pseudomonas*, *Pantoea*, *Papiliotrema*, and *Candida* with moisture, pH, and alkaloid levels. Alkaloid content was effectively reduced in market and supermarket grains but remained elevated in field samples. These findings underscore the need for standardized debittering and hygienic handling to ensure consistent chocho quality and minimize contamination risks.*

Key words: *metagenomics, 16S and ITS barcoding, chocho, food safety, diversity.*

O.3. “NEW” CROPS TO ADAPT MEDITERRANEAN AGRICULTURE TO THE CURRENT CLIMATE EMERGENCY

Oscar VICENTE, Monica BOSCAIU

Universitat Politècnica de València, Ingeniero Fausto Elio s/n, Valencia, Spain

Corresponding author email: ovicente@upvnet.upv.es

Abstract

The Green Revolution of the 1960s-1970s enabled the development of high-yielding crop varieties, dramatically improving food production, but also causing serious sustainability problems, as these cultivars depend on intensive inputs and management that harm the environment. Additionally, they exhibit limited tolerance to abiotic stresses. Consequently, climate change - characterised by increasing average temperatures, more frequent and severe droughts, extreme weather events, and increasing soil salinisation - poses a major threat to global food security, especially in the Mediterranean, one of the most affected regions in the world. Addressing these threats in Mediterranean agriculture can include introducing “new” resilient crops, domesticated and cultivated elsewhere, as a complementary strategy to the biotechnological improvement of abiotic stress tolerance of existing varieties or domesticating stress-tolerant wild species. Beyond resilience, these crops must align with local environmental and economic conditions and support the EU Green Deal goals, including reduced agrochemical input requirements, suitability for organic agriculture, improved food quality, and multiple uses for the harvested products. This contribution will highlight and discuss several promising candidates, such as quinoa, teff, triticale, camelina, chia, or sweet potato.

Key words: *climate change, food security, abiotic stress tolerance, alternative crops, EU Green Deal.*

O.4. IMMUNOLOGICAL ASPECTS REGARDING THE EVALUATION OF CELLULAR INDICES IN CATTLE

Rita GOLBAN

Technical University of Moldova, 168 Ștefan cel Mare Blvd, MD-2004,
Chisinau, Republic of Moldova

Corresponding author email: golbanrita@gmail.com

Abstract

The paper represents a study conducted on cattle regarding the evaluation of cellular indices, the main ones in triggering cellular immunity depending on different age periods. Aspects of the behavior of the immune cell system against antigens represented by bacteria, parasites, fungi, etc. are presented. The objective of this research is to present an evaluation of some cellular indices in cattle depending on age and to follow the behavior of immune resistance. The results of the study generate possibilities for assessing the importance of immune cellular effectors in determining the resistance of the animal organism and provide valuable information about the reactivity of the animal organism according to the levels of some immune cellular indicators.

Key words: *cell, immunological indices, immune system, lymphocytes.*

O.5. EFFECT OF DIETARY FIBRE OF DIFFERENT BOTANICAL ORIGIN ON THE MOLECULAR DYNAMICS OF THE LIPID FRACTION AND PHYSICAL PROPERTIES OF CHOCOLATE

**Hanna Maria BARANOWSKA¹, Weronika KWIATKOWSKA²,
Przemysław SIEJAK², Przemysław Łukasz KOWALCZEWSKI³**

¹Department of Physics and Biophysics Poznan University of Life Sciences,
28 Wojska Polskiego St., Poznan, Poland

²Poznań University of Life Sciences, 28 Wojska Polskiego St., Poznań, Poland

³Andrzej Frycz Modrzewski Krakow University, 1 Gustawa Herlinga-
Grudzińskiego St., Kraków, Poland

Corresponding author email: hanna.baranowska@up.poznan.pl

Abstract

Chocolate is highly appreciated for its sensory properties; however, its high fat and sugar content limits its perception as a healthy food product. Dietary fibre enrichment represents a promising strategy to improve its nutritional value, while potentially affecting its structural and physical properties. This study aimed to evaluate the effect of dietary fibres of different botanical origin on the molecular dynamics of the lipid fraction and selected physical properties of dark chocolate. Chocolates were formulated with oat, cocoa, blackcurrant, and chokeberry fibres added at 5%, 10%, and 15% (w/w). A control chocolate without fibre was also analysed. Molecular properties of lipid protons were investigated using low-field nuclear magnetic resonance (LF NMR) by measuring spin-lattice (T_1) and spin-spin (T_2) relaxation times and calculating mean correlation times (τ_c) based on BPP theory. Texture, colour, antioxidant activity, and consumer acceptance were also assessed. Fibre addition significantly modified proton mobility within fatty acid chains, explaining observed texture changes. The strongest restriction of molecular motion occurred at 10% fibre addition, with the effect strongly dependent on fibre botanical origin.

Key words: chocolate, dietary fibre, low-field NMR, molecular dynamics.

O.6. MODERNIZATION OF THE CONTROL SYSTEM OF CONVECTIVE-TYPE CABINET DEHYDRATORS AND PROVIDING LABORATORY RESEARCH ON FOOD DRYING

**Marko PETKOVIĆ¹, Alexander LUKYANOV², Vasilii DOLGOV²,
Nemanja MILETIĆ¹**

¹University of Kragujevac, Faculty of Agronomy,
Cara Dušana 34, Čačak, Serbia

²Don State Technical University, Gagarin sq. 1,
344002 Rostov-on-Don, Russia

Corresponding author email: marko.petkovic@kg.ac.rs

Abstract

This paper presents an integrated hardware and software solution for improving the accuracy and monitoring of convective drying experiments, specifically tested on apple slices. To address product shrinkage, the authors developed a semi-automatic image processing program that calculates slice surface area with 1% accuracy. Unlike traditional sampling, this system processes every slice to determine an area reduction factor (e.g., 27% of apples), providing precise data to refine dynamic drying models. For process control, the study utilizes an ESP32 microcontroller-based IoT system. Key technical specifications include: precision (temperature maintained within 0.5°C; humidity resolution of 0.1%), frequency (1-second control cycles with 1-minute telemetry intervals) and connectivity (data is transmitted wirelessly to a cloud service for 24 hours of continuous monitoring). The resulting high-resolution telemetry allows researchers to assess moisture loss rates and energy consumption in real time. This level of detail enables the development of advanced drying models based on differential equations rather than simple time-based functions.

Key words: *apple drying, shrinkage, microcontroller, IoT, telemetry.*

O.7. SENSORY CHARACTERISTICS AND QUALITY PARAMETERS OF CHERRY LIQUEURS PRODUCED USING DIFFERENT TECHNOLOGICAL METHODS

Nemanja MILETIĆ¹, Bojana LAZAREVIĆ², Matija MUNJIĆ¹,
Alexander LUKYANOV³, Marko PETKOVIĆ¹, Branko POPOVIĆ⁴,
Vladimir FILIPOVIĆ⁵

¹Faculty of Agronomy, Food Technology Department, University of Kragujevac, Cara Dušana 34, 32000 Čačak, Serbia

²High School “Dragačevo” Guča, Vuka Karadžića b.b., 32240 Lučani, Serbia

³Department of Automation of Production Processes, Don State Technical University, Gagarin sq. 1, 344002, Rostov-on-Don, Russia

⁴Fruit Research Institute, Department of Fruit Processing Technology, Kralja Petra I 9, 32000 Čačak, Serbia

⁵Faculty of Technology Novi Sad, University of Novi Sad, Boulevard Cara Lazara 1, 21101 Novi Sad, Serbia

Corresponding author email: n.m.miletic@kg.ac.rs

Abstract

The aim of this study was to investigate the sensory properties and quality parameters of cherry liqueurs obtained using different technological processes. Three types of raw material - fresh, dried and freeze-dried - were used to determine how the treatment of the fruit affects chemical composition, extraction efficiency, and organoleptic characteristics of the final product. Each sample underwent two extraction methods in apple distillate: ultrasonication at room temperature and reflux extraction at boiling point, to compare yields, color stability, bioactive compound concentration, and overall sensory quality. The paper includes the importance of extraction techniques, and the influence of fruit processing on quality parameters. Physicochemical analyses covered color, pH, total phenolics, anthocyanin content, and alcohol concentration, complemented by sensory panel evaluations. Results provide insight into the optimal combination of raw material and extraction method for producing high-quality cherry liqueur, offering potential for industrial optimization and development of products with enhanced sensory attributes.

Key words: sour cherry liqueur, freeze-drying, ultrasonication, reflux extraction, sensory analysis.

O.8. UTILIZATION OF SNAIL-BASED PRODUCTS IN CIRCULAR BIOECONOMY

**Dana COPOLOVICI, Cristian MOISA, Andreea LUPITU,
Flavia BORTES, Lucian COPOLOVICI**

“Aurel Vlaicu” University of Arad, 2 Elena Dragoi Street, Arad, Romania

Corresponding author email: dana.copolovici@uav.ro

Abstract

Hydroponic agriculture is being transformed by the integration of photocatalytic decontamination and eco-friendly fertilizers. Photocatalytic processes remove chemical and biological contaminants from water and air, while nutrient-rich, environmentally responsible fertilizers support sustainable crop growth, enhance resource-use efficiency, and align hydroponic systems with circular economy principles, particularly in urban and resource-limited contexts. Concurrently, snail-derived resources show substantial potential for sustainable agriculture - food, environmental, and industrial applications. Snail meat is a high-quality protein source rich in essential amino acids, whereas snail shells - rich in calcium carbonate and biodegradable - are emerging as versatile biomaterials for environmental remediation, composites, cosmetics, and related applications. The lack of standardized processing methods, scalability issues, and limited environmental and economic assessments constrain their broader adoption. Future research should prioritize method standardization, comprehensive impact analyses, and the development of cost-effective, sustainable processing technologies to integrate snail-based products into circular bioeconomy models.

Key words: *circular bio-economy, proteins, snail-based products.*

O.9. PILOT EVALUATION OF MECHANICAL PARAMETERS INFLUENCING GRAPE SEED OIL YIELD IN SMALL AGRICULTURAL PRESSES

Carmen BĂLȚATU¹, Sorin Ștefan BIRIȘ², Ana-Maria TĂBĂRAȘU¹,
Dragoș Nicolae DUMITRU¹, Eugen MARIN¹

¹INMA - Bucharest, 6 Ion Ionescu de la Brad Blvd, District 1,
Bucharest, Romania

²National University of Science and Technology Politehnica Bucharest,
313 Splaiul Independenței, District 6, Bucharest, Romania

Corresponding author email: carmen.vasilachi@gmail.com

Abstract

Vineyard by-products, particularly grape seeds generated in large quantities during winemaking, represent a valuable biological resource for the production of high-added-value oils through sustainable processing technologies. This study presents a pilot evaluation of key mechanical parameters influencing grape seed oil yield during cold pressing in small agricultural screw presses. The experimental investigation focused on the effects of screw rotation speed, applied mechanical pressure, and material feed rate on the efficiency of the oil extraction bioprocess. Controlled laboratory-scale trials were conducted using grape seed biomass, and oil yield was determined gravimetrically under different operating conditions. The results indicate that mechanical pressure and screw rotation speed exert a dominant influence on extraction efficiency, while feed rate primarily affects process stability and material flow behavior. Although the study does not aim to define optimal operating conditions, clear performance trends were identified. The findings provide relevant insights into the technological transformation of vineyard-derived biomass and support further development of efficient small-scale bioprocessing systems for grape seed oil production.

Key words: *bioprocessing, grape seed oil, mechanical parameters, pilot study, vineyard by-products.*

O.10. DEVELOPMENT AND CHARACTERISATION OF POLYVINYL ALCOHOL BASED POLYMERIC SYSTEMS AS POTENTIAL PLATFORMS FOR BIOMEDICAL AND AGRICULTURAL APPLICATIONS

**Eduard-Gabriel CONSTANTIN^{1,2}, Mihaela Violeta GHICA^{1,2},
Cristina Elena DINU-PÎRVU^{1,2}, Ioana LUCA^{1,2},
Irina-Alexandra DUMITRESCU^{1,2}, Durmuş Alpaslan KAYA³,
Lăcrămioara POPA^{1,2}, Valentina ANUȚA^{1,2},
Mădălina Georgiana ALBU KAYA⁴, Iuliana Diana BĂRBULESCU⁵,
Răzvan Mihai PRISADA^{1,2}**

¹Department of Physical and Colloidal Chemistry, Faculty of Pharmacy,
“Carol Davila” University of Medicine and Pharmacy, 6 Traian Vuia Str.,
District 2, 020956, Bucharest, Romania

²Innovative Therapeutic Structures Research and Development Center
(InnoTher), “Carol Davila” University of Medicine and Pharmacy,
6 Traian Vuia Str., District 2, 020956, Bucharest, Romania

³Department of Field Crops, Faculty of Agriculture, Hatay Mustafa Kemal
University, 31034 Antakya-Hatay, Turkey

⁴Department of Collagen, Division of Leather and Footwear Research
Institute, National Research and Development Institute for Textiles and
Leather, 93 Ion Minulescu Str., District 3, 031215, Bucharest, Romania

⁵Faculty of Biotechnologies, University of Agronomic Sciences and
Veterinary Medicine of Bucharest, 59 Mărăști Blvd., District 1,
011464, Bucharest, Romania

Corresponding author email: mihaela.ghica@umfcd.ro

Abstract

In the context of developing biocompatible materials for medical and agricultural applications, polyvinyl alcohol (PVA) has emerged as a versatile polymer, serving as the core component of the formulations investigated in this study. The work focused on the development of PVA-based gel and film systems for topical drug delivery systems and wound dressings, as well as for soil mulching and controlled-release fertilizer carriers. Preliminary studies were conducted to select appropriate concentrations of polymer, plasticizer and crosslinking agent. The resulting gels underwent rheological characterization, and were subsequently processed into films by casting. The films were evaluated in terms of visual appearance, water absorption capacity, and surface wettability. Based on the gels flow properties and the films hydrophilicity, two

BOOK OF ABSTRACTS
SECTION 6: BIOTECHNOLOGY

formulations were selected for further investigation: 10 and 15% PVA gels containing 15% citric acid relative to dry substance. To improve their physicochemical properties, the gels were then blended with a 3% methylcellulose (MC) gel in various ratios. The newly obtained gels exhibited enhanced pseudoplastic behaviour, which facilitates the film-forming process, resulting in films with significant potential for future biomedical and agricultural applications.

Key words: *polyvinyl alcohol, hydrogels, films, methylcellulose, flow behaviour, hydrophilicity.*

**POSTER
PRESENTATIONS**

SUBSECTION I: AGRICULTURAL BIOTECHNOLOGY

P.I.1. RESULTS OBTAINED FROM THE USE OF THE BACTERIUM *AZOTOBACTER CHROOCOCCUM* IN MAIZE CULTIVATION

**Paul Alexandru PARDEK¹, Nicu Cornel SABAU²,
Cristina Maria MAERESCU², Ioana Maria BORZA²,
Radu Petru BREJEA²**

¹University of Oradea, Doctoral School of Engineering Sciences, Agriculture,
1 University Street, 410087, Oradea, Romania

²University of Oradea, Faculty of Environmental Protection,
26 Gen. Magheru Street, 410048, Oradea, Romania

Corresponding author email: pardekpaul@yahoo.com

Abstract

The present study evaluates the effect of Azotobacter chroococcum inoculation on maize (hybrid KWS Kashmir) grown under drought-prone conditions in Fegernic, Bihor County (Romania), during the 2024-2025 growing seasons. The experimental design consisted of two treatments - control (non-inoculated) and bioinoculated - arranged in randomized blocks with three replications. Soil and weather parameters, vegetative growth, chlorophyll index, leaf water potential, and yield were recorded and statistically compared between years. Results demonstrated that A. chroococcum inoculation significantly improved plant vigor, root length, and leaf relative water content under water stress. In 2024, under (severe drought), inoculated maize maintained a 14.8% higher chlorophyll index and yielded 9.6% more grain than the control. In 2025 (moderate drought), the yield advantage increased to 11.2%. The bioinoculated plots also exhibited enhanced nitrogen uptake and improved soil biological activity, indicating a synergistic effect between Azotobacter and the rhizosphere under limited moisture.

Key words: *Azotobacter chroococcum, maize, drought stress, KWS Kashmir, yield response.*

P.I.2. ELECTRON-BEAM CROSSLINKING OF ALGINATE/ACRYLIC ACID HYDROGELS: SWELLING BEHAVIOR, RELEASE KINETICS, AND MIGRATION EFFECTS

Ion NIȚU, Elisabeta Elena POPA, Amalia Carmen MITELUȚ

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

Corresponding author email: elena.eli.tanase@gmail.com

Abstract

Hydrogels, characterized as three-dimensional polymeric networks, possess a high capacity to absorb and retain large amounts of water, making them suitable for soil-plant applications. In this study, eight hydrogel formulations were prepared by electron-beam irradiation using different proportions of sodium alginate, carboxymethyl cellulose (CMC), acrylic acid, and potassium persulfate as initiator. Swelling degree was evaluated to assess water uptake capacity and superabsorbent behavior. Controlled-release tests investigated water and nutrient delivery in soil, while migration analyses in swelling water examined the release of low-molecular-weight components. Swelling results indicated superior performance for CMC-free hydrogels, reaching 9233.51% after 48 h in water, approximately four times higher than hydrogels containing CMC. In nutrient solution, swelling ratios decreased due to ionic interactions. Soil burial experiments showed water release values of 62-80% over 3-7 days, whereas nutrient release remained limited (2-24%), confirming controlled-release behavior. Migration assessed through radish seed germination showed indices of 60-109%, with no apparent phytotoxic effects. These results support the use of CMC-free hydrogels as water-retention materials in soil-plant systems.

Key words: *controlled-release, electron-beam crosslinking, hydrogels, superabsorbent materials, swelling performance.*

**P.I.3. RECOVERY OF BIOACTIVE COMPOUNDS
FROM SELECTED INDUSTRIAL PLANT WASTES
AND BY-PRODUCTS-CASE STUDIES ON:
TOMATO PROCESSING RESIDUES, OLIVE WASHING
WATERS AND SEA BUCKTHORN BY-PRODUCTS**

**Adina NICHITA¹, Ioana Loredana STANCIU²,
Mihaela GEICU-CRISTEA¹, Mona Elena POPA¹**

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
Faculty of Biotechnologies, 59 Mărăști Blvd, District 1, Bucharest, Romania

²College of Economics “Virgil Madgearu”, Ploiești, Romania

Corresponding author email: mihaela.geicu@usamv.ro

Abstract

Industrial processing of plant raw materials generates significant amounts of solid and liquid residues, which are frequently underutilized despite their high biochemical potential. By-products resulting from tomato processing, wastewater from olives and sea buckthorn residues represent heterogeneous waste streams originating from different technological processes, yet sharing a common characteristic: a substantial content of biologically active compounds. These residues contain phenolic compounds, carotenoids, organic acids and dietary fibers, exhibiting antioxidant, antimicrobial and functional properties. This review provides a comparative analysis of agro-industrial wastes derived from tomato, olive and sea buckthorn processing, with emphasis on their chemical composition, environmental impact and biotechnological valorization potential. Current extraction and recovery methods, both conventional and emerging, are discussed in terms of efficiency, sustainability and industrial-scale applicability. In addition, potential applications of recovered bioactive compounds in the field of food biotechnologies are highlighted, in accordance with sustainable production systems and circular economy principles.

Key words: *bioactive compounds, olive, sea buckthorn, tomato, waste.*

P.I.4. MYCOTOXINS DEACTIVATOR BASED ON SPENT BREWER’S YEAST CELL WALLS AND DIATOMACEOUS EARTH

**Simona-Laura ROTARU¹, Carmen LUPU², Malina DESLIU-AVRAM²,
Florin OANCEA²**

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

²National Institute for Research and Development in Chemistry and
Petrochemistry, 202 Splaiul Independentei, District 6, Bucharest, Romania

Corresponding author email: florin.oancea@icechim.ro

Abstract

This study reports the development of a composite material prepared from spent brewer’s yeast (SBY) cell walls and diatomaceous earth (DE) and evaluates its capacity to deactivate mycotoxins. Both SBY and DE are decreasing mycotoxin bioavailability through biosorption, while simultaneously supplying bioactive components that may support physiological responses involved in mitigating mycotoxins-induced toxicity. Polysaccharides derived from SBY cell walls interact with mycotoxins through hydrogen bonding and van der Waals forces. The high-surface-area, nanoporous architecture of DE provides numerous adsorption sites with strong affinity for mycotoxin molecules. The SBY cell wall- DE composition demonstrated good adsorption efficiency, exceeding 60% for aflatoxin B1 (AFB1) and ochratoxin A (OTA), and a moderate adsorption efficiency, of 35.72% for deoxynivalenol (DON). SBY exhibited notable antioxidant activity, resulted from cell wall polysaccharides and hop-derived polyphenols retained during the brewing process. DE released soluble silicon species under acidic conditions simulating gastric digestion. The potential contributions of antioxidant activity and bioavailable silicon to the attenuation of mycotoxin-related deleterious effects are examined and discussed.

Key words: *mycotoxin adsorption, antioxidant activity, soluble silicon, mycotoxin-induced toxicity mitigation.*

P.I.5. MYCOTOXIN OCCURRENCE IN FEED AND FEED RAW MATERIALS IN SOUTHERN ROMANIA IN 2024

**Simona-Laura ROTARU¹, Veronica TUDORICA², Carmen LUPU³,
Florin OANCEA³**

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

²Carmistin International, 172-176 Bucharest-Ploiești Road, Bucharest,
Romania

³National Institute for Research and Development in Chemistry and
Petrochemistry, 202 Splaiul Independentei, District 6, Bucharest, Romania

Corresponding author email: florin.oancea@icechim.ro

Abstract

This study provides an assessment of mycotoxin contamination in feed and feed raw materials originating from Southern Romania in 2024. We quantified the concentrations of several major mycotoxins - aflatoxin B1 (AFB), zearalenone (ZEA), total fumonisins (FUM), ochratoxin A (OTA), deoxynivalenol (DON), and T2-toxin - in a large set of samples, including complete feed, cereal grains (corn, wheat, barley), grain by-products (cereal grits and brans), protein sources (pea, gluten, sunflower meal, soybean meal), and feed additives (sugar beet molasses). AFB levels exceeded the maximum permitted concentration in 60 of 1,684 samples (3.56%), while OTA surpassed regulatory thresholds in 4 of 1,581 samples (0.25%). Two samples contained DON concentrations above the EU limit of 12 mg/kg, and ZEA levels in several samples approached the upper allowable thresholds. The highest frequencies of contamination were observed in corn (AFB, OTA, ZEA, FUM, DON), gluten (AFB), and barley (T2-toxin). Overall, the pattern of co-occurring mycotoxins suggests a vulnerability of corn crops in Southern Romania to pre-harvest mycotoxin contamination, likely exacerbated by ongoing climatic changes.

Key words: *maximum allowed threshold, pre-harvest mycotoxin - corn crop vulnerability, climate change.*

SUBSECTION II: FOOD BIOTECHNOLOGY

P.II.1. INVESTIGATIONS ON THE USE OF EGG PROTEIN DERIVATIVES AND HYDROLYSATES FOR PUDDING FORTIFICATION

**Mihaela BRUMĂ (CĂLIN), Ina VASILEAN, Iuliana BANU,
Nicoleta STĂNCIUC, Gabriela RÂPEANU, Iuliana APRODU**

“Dunarea de Jos” University of Galati, 111 Domneasca Street,
Galati, Romania

Corresponding author email: iuliana.aprodu@ugal.ro

Abstract

In the context of growing need for high-quality protein products, the fortification of foods with complete protein sources represents a sustainable strategy to prevent protein malnutrition. The present study aimed to develop a high-protein dessert, by fortifying a commercial starch-based pudding mix with egg-derived protein ingredients and their hydrolysates. The fortification level was decided in such to obtain “high-protein” products, whereas maintaining desirable sensory properties. Protein fortification of pudding with egg powders significantly altered the colour parameters. Among all fortified samples, the highest total colour difference compared to the control was noticed in case of the puddings prepared with yolk proteins and hydrolysates (ΔE of 7.15 ± 0.00 and 8.93 ± 0.02 , respectively), highlighting the strong pigmenting effect of carotenoids. The egg white proteins addition significantly improved water-holding capacity and resulted in high sensory acceptability of the pudding. The use of egg proteins hydrolysates resulted in reduced overall acceptance. Although egg proteins hydrolysis ensured significant reduction of the antigenic properties, the bitter aftertaste of the peptides limited the use of the hydrolysates for puddings fortification at such levels to allow the high protein claim.

Key words: egg proteins, pudding, protein hydrolysates, functional properties, rheological behavior.

P.II.2. IMPROVING THE QUALITY OF ALTERNATIVE VEGAN BURGER PRODUCTS THROUGH THE USE OF ENZYMATIC TREATMENT

**Krzysztof SMARZYŃSKI¹, Millena RUSZKOWSKA²,
Hanna Maria BARANOWSKA³,
Przemysław Łukasz KOWALCZEWSKI⁴**

¹Gdynia Maritime University, Morska 81/87, Gdynia, Poland

²Department of Quality Management, Gdynia Maritime University,
Morska 81/87, Gdynia, Poland

³Department of Physics and Biophysics Poznan University of Life Sciences,
Wojska Polskiego 28, Poznań, Poland

⁴Collegium Medicum, Andrzej Frycz Modrzewski Krakow University,
Gustawa Herlinga-Grudzińskiego 1, Kraków, Poland

Corresponding author email: k.smarzynski@sd.umg.edu.pl

Abstract

In recent years, a dynamic increase in interest in vegan products has been observed, driven by growing consumer awareness of environmental protection, healthy lifestyles, and animal welfare. One of the key challenges in the production of vegan foods is achieving an appropriate structure and texture that can effectively substitute traditional meat products. An alternative to conventional extrusion processes is the use of enzymes, such as transglutaminase, for the structuring of plant proteins. Transglutaminase, commonly referred to as “meat glue”, is capable of forming cross-links between protein molecules, resulting in a more compact and stable structure. The rheological properties and molecular dynamics of the obtained dough were characterized using low-field NMR, as well as the rheological properties, texture, and molecular dynamics of the formed burgers. The results demonstrated that the use of plant protein blends significantly influences on mechanical properties of vegan burgers. Moreover, a clear relationship was identified between enzymatic treatment parameters and consumer attractiveness of the final products, determining their overall desirability.

Key words: *plant-based meat analogues, vegan food, enzymatic structuring, functional food.*

P.II.3. QUALITY ASSESSMENT OF CORN EXTRUDATES ENRICHED WITH SPIRULINA AND CHLORELLA AS FUNCTIONAL SNACK PRODUCTS

**Millena RUSZKOWSKA¹, Krzysztof SMARZYŃSKI¹,
Martyna WRÓBEL¹, Hanna Maria BARANOWSKA²,
Przemysław Łukasz KOWALCZEWSKI³**

¹Department of Quality Management, Gdynia Maritime University,
Morska 81/87, Gdynia, Poland

²Department of Physics and Biophysics Poznan University of Life Sciences,
Wojska Polskiego 28, Poznań, Poland

³Collegium Medicum, Andrzej Frycz Modrzewski Kraków University,
Gustawa Herlinga-Grudzińskiego 1, Kraków, Poland

Corresponding author email: m.ruszkowska@wznj.umg.edu.pl

Abstract

*Corn snacks are widely consumed, yet their nutritional value is limited, particularly regarding protein content and bioactive compounds. Incorporation of microalgae such as spirulina (*Arthrospira platensis*) and chlorella (*Chlorella vulgaris*) offers a promising approach to enhance the functional quality of extruded snacks. This study aimed to evaluate the quality of corn extrudates enriched with spirulina and chlorella compared with a control product. Five variants were examined: a control sample and extrudates containing 1.5% or 3% spirulina or chlorella, all formulated with 2% Na₃PO₄. Quality assessment included physicochemical properties (moisture content, water activity, color, pigment content), textural and structural characteristics, expansion and porosity indices, as well as sorption properties, storage stability, and sensory evaluation. The results demonstrated that microalgae addition significantly affected the quality attributes of corn extrudates. Products enriched with 1.5% spirulina or chlorella showed the most favorable balance between enhanced functional properties and sensory acceptability. These findings confirm the potential of microalgae as valuable ingredients for the development of innovative functional snack products.*

Key words: *corn extrudates, spirulina, chlorella, functional snacks, extrusion, product quality.*

P.II.4. FOOD SAFETY RISK ANALYSIS BASED ON AN IMPROVED HACCP METHODOLOGY: AN APPLIED STUDY

**Maria POPA¹, Mirel GLEVITZKY^{1,2}, Gabriela-Alina DUMITREL²,
Dorin-Victor POPA¹, Doriana Maria POPA³, Ana VÎRSTA⁴**

¹“1 Decembrie 1918” University of Alba Iulia, 5 Gabriel Bethlen Street,
Alba Iulia, Romania

²University Politehnica of Timisoara, 6 Vasile Pârvan Blvd,
Timisoara, Romania

³Alba Iulia County Emergency Hospital, 23 Revoluției 1989 Blvd,
Alba Iulia, Romania

⁴University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Mărăști Blvd, District 1, Bucharest, Romania

Corresponding author email: mirel_glevitzky@yahoo.com

Abstract

Food safety is a core objective of the modern food industry, directly affecting consumer health and trust in the food supply chain. This paper presents an applied food safety risk analysis based on an improved Hazard Analysis and Critical Control Points (HACCP) methodology that addresses the limits of traditional qualitative approaches. The proposed method integrates a semi-quantitative framework that differentiates between inherent process risk and residual risk after control measures are applied. Hazards are assessed by probability and severity, while the performance of the food safety management system is evaluated separately using a Control Capacity Index (CCI), which considers monitoring automation level and human reliability factors. The methodology is demonstrated through a case study covering key production stages in bread manufacturing. The results show that differentiating between hazard assessment and control performance allows for clearer prioritization of risks and more precise identification of vulnerabilities. By incorporating indicators based on automation and human quality, HACCP evolves from a static compliance tool into a more complex, dynamic risk management system. The approach supports the requirements of ISO 22000 and Codex Alimentarius and promotes continuous improvement and evidence-based decision-making in the agri-food sector.

Key words: *Food safety, HACCP, risk analysis, Control Capacity Index (CCI), food industry.*

P.II.5. POTATO PROTEIN-BASED VEGAN BURGERS AS MODULATORS OF GUT MICROBIOTA AND INTESTINAL BIOACTIVITY AFTER *IN VITRO* DIGESTION

**Przemysław Łukasz KOWALCZEWSKI¹, Małgorzata GUMIENNA²,
Paweł JEŻOWSKI³, Michał ŚWIĄTEK⁴, Barbara GÓRNA-SZWEDA²,
Iga RYBICKA⁵, Millena RUSZKOWSKA⁶, Maciej Ireneusz KLUZ¹,
Matteo BORDIGA⁷**

¹Andrzej Frycz Modrzewski Krakow University, mkluz@uafm.edu.pl,
Kraków, Poland

²Poznań University of Life Sciences, 31 Wojska Polskiego St., Poznań, Poland

³Poznan University of Technology, 4 Berdychowo St., Poznań, Poland

⁴Institute of Microbial Technologies, 9 NSZZ Solidarność Avenue,
Turek, Poland

⁵Poznań University of Economics and Business, 10 Niepodległości Avenue,
Poznań, Poland

⁶Gdynia Maritime University, 81-87 Morska St., Gdynia, Poland

⁷Università degli Studi del Piemonte Orientale “A. Avogadro”,
2 Largo Donegani St., Novara, Italy

Corresponding author email: pkowalczewski@uafm.edu.pl

Abstract

*The growing consumption of plant-based meat analogues has increased interest in their potential health effects beyond basic nutrition. This study evaluated potato protein-based vegan burgers as a functional food model, focusing on intestinal bioactivity and gut microbiota modulation following in vitro digestion. Burger formulations enriched with dietary fibre and plant-derived iron sources were subjected to simulated gastrointestinal digestion, including a colonic fermentation stage with human fecal microbiota. The bioaccessible fractions were assessed for cytotoxic effects against human colorectal cancer cell lines (Caco-2 and HT-29) and normal colon epithelial cells (CCD 841 CoN). Additionally, changes in selected microbial populations and the activity of bacterial enzymes associated with intestinal health, β -glucuronidase and β -glucosidase, were determined. Digested burger fractions exhibited selective, dose-dependent cytotoxicity toward cancer cells while maintaining low toxicity toward normal epithelial cells. Fermentation promoted the growth of beneficial *Lactobacillus* and *Bifidobacterium* populations and maintained β -glucuronidase activity at physiologically low levels. The results indicate that potato protein-based vegan burgers may support gut microbial homeostasis and generate bioactive digestion products, highlighting their potential role as health-oriented plant-based meat alternatives.*

Key words: gut microbiota modulation, in vitro digestion, bioactive peptides, colorectal cancer cells, functional plant-based foods.

P.II.6. STRUCTURING AND STABILITY OF PLANT-BASED BURGERS ENRICHED WITH POTATO PROTEIN AND IRON: INSIGHTS FROM TEXTURE, WATER PROPERTIES, AND LOW-FIELD NMR

**Martyna Maria WRÓBEL¹, Krzysztof SMARZYŃSKI¹,
Millena RUSZKOWSKA¹, Hanna Maria BARANOWSKA²,
Przemysław Łukasz KOWALCZEWSKI³**

¹Gdynia Maritime University, ul. Morska 81-87, Gdynia, Poland

²Poznań University of Life Sciences, ul. Wojska Polskiego 28, Poznań, Poland

³Andrzej Frycz Modrzewski Krakow University, ul. Gustawa Herlinga-
Grudzińskiego 1, Kraków, Poland

Corresponding author email: m.wrobel@sd.umg.edu.pl

Abstract

The development of plant-based burgers requires careful control of structure, stability, and nutritional functionality to meet consumer expectations and safety requirements. This study investigated the impact of potato protein-based formulations and two iron fortification strategies on the physical properties, water behavior, and molecular characteristics of plant-based burgers. Burger formulations were produced using a protein base dominated by potato protein and supplemented with plant fibres, hydrocolloids, and either ferritin-enriched plant sprouts or inorganic iron sulfate. The products were evaluated in terms of color, pH, water activity, textural profile, and molecular water dynamics using low-field nuclear magnetic resonance (LF NMR). Spin-lattice (T_1) and spin-spin (T_2) relaxation times were determined for both raw patties and thermally processed burgers. The results demonstrated that formulation and iron source significantly affected texture parameters, including hardness and chewiness, as well as water distribution and mobility within the matrix. LF NMR analysis revealed distinct differences in relaxation behaviour, indicating changes in water binding and structural organization. The study confirms that potato protein enables the development of stable plant-based burgers and LF NMR provides valuable insight into structure-property relationships.

Key words: meat analogues, water mobility, textural profile analysis, protein structuring, functional fortification.

**P.II.7. HIGHLIGHTING THE INFLUENCE OF BROCCOLI
MICROGREENS (*BRASSICA OLERACEA* VAR. *ITALICA*)
ADDED TO COW’S TELEMEA CHEESE* ON THE
PURCHASING PREFERENCES OF THE FINAL
CONSUMER**

Oana LIVADARIU¹, Laura-Maria VALS¹, Paulina VALS²

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
Faculty of Biotechnologies, 59 Marasti Blvd, District 1, Bucharest, Romania

²SC PICCOLO ANGELO SRL, 7 Valea cu Tei Street, Tulcea, 827080,
Greci, Romania

Corresponding author email: lauramariav21@gmail.com

Abstract

The present study analyses the impact of the product obtained by incorporating broccoli microplants (microgreens/sprouts) into a cow’s telemea cheese pie on the sensory acceptability and purchasing preferences of the final consumer. Broccoli microplants (microgreens/sprouts) were obtained under aseptic conditions and incorporated in different proportions into the pie, in compliance with food safety requirements. The product was evaluated by means of sensory analysis and an online questionnaire. The obtained results indicate a moderate influence on aroma and texture, without negatively affecting overall acceptability, while taste and colour were positively evaluated. Taste and perceived quality proved to be determining factors in the purchase decision, alongside a price level considered appropriate. The recorded results indicate a favourable acceptance of the product and highlight the potential of broccoli microplants (microgreens/sprouts) as a functional ingredient in formulations of cow’s telemea cheese pie.

Key words: *broccoli, cow’s telemea cheese pie, microplants (microgreens/sprouts).*

**P.II.8. BIO-BASED CAPSULES WITH PEPTIDES AND
LACTOBACILLUS CASEI AS AUGMENTATION VECTORS
FOR BIOLOGICALLY ACTIVE FOOD PRODUCTS**

**Oana Camelia IATCU, Monica IAVORSCHI,
Ancuța Veronica LUPAESCU, Roxana Elena GHEORGHITA**

“Ștefan cel Mare” University of Suceava, 13 University, Suceava, Romania

Corresponding author email: roxana.puscaselu@usm.ro

Abstract

The aim of this study was to develop biopolymer 10%, respectively 20% capsules with Lactobacillus casei and encapsulated peptides, to obtain a functional food product. After obtaining by extrusion method, microstructural changes, diameter, color, transmittance and opacity of the capsules were evaluated. Increasing the percentage of peptides and L. casei did not influence the diameter and color, but reduced transmittance and increased opacity. The developed capsules presented spherical shape, without pores or fissures in the matrix, but with an irregular surface. Natural yogurt was used as a food matrix for the development of an innovative food product, enriched with probiotics. Determination of acidity, syneresis, water retention capacity, swelling ratio, color analysis, as well as antioxidant activity were evaluated. The color of the product did not change during the storage period. An increase in acidity was observed in all samples analyzed. In addition, the yogurt enriched with capsules retained its antioxidant activity over a longer storage period. The addition of peptide and probiotic capsules into yogurt improves the properties of the product and contributes to supporting the health of consumers.

Key words: dairy product, sodium alginate, biotechnology, nutrition, delivery.

**SUBSECTION III:
MEDICAL AND PHARMACEUTICAL
BIOTECHNOLOGY**

**P.III.1. MICROSCOPIC ANALYSIS OF THE STEM AND
LEAF OF *MELISSA OFFICINALIS* L. (LEMON BALM)**

Ovidiu-Ștefan IONESCU, Monica ENACHE

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Mărăști Blvd, District 1, Bucharest, Romania

Corresponding author email: monica.enache@biotehnologii.usamv.ro

Abstract

Melissa officinalis is an easy-to-grow perennial plant, very well known in Romania, with medicinal, culinary (spice), ornamental and melliferous importance, being used since ancient times. In beekeeping, it provides nectar and pollen, and the plant is used to lure swarms and is often grown near beehives ('bee balm'). *Melissa officinalis* has several industrial applications, being used in the food industry as a flavoring agent and antimicrobial food preservative, also its fragrant essential oil is used in the cosmetic and perfume industry. In the pharmaceutical industry, the leaves (*Melissae folium*) are used as plant products, for example in the form of aromatic tea, but also the volatile oil (*Melissae aetheroleum*) obtained by steaming freshly harvested leaves or stems is used. In the current study, wet mounts of fresh *Melissa officinalis* leaves and stems were analyzed, which highlight most of the microscopic characteristics used in the botanical identification. At the same time, the analysis of microscopic characteristics of fresh lemon balm plant was necessary in order to be able to compare to the microscopic images of lemon balm tea bags.

Key words: botanical identification, lemon balm, *Melissa officinalis*, *Melissae folium*, optical microscope images.

P.III.2. MICROBIAL BIOSURFACTANTS AS ANTIMICROBIAL AND THERAPEUTIC AGENTS: A MINI-REVIEW OF RECENT ADVANCES

**Roxana Mădălina STOICA¹, Nicoleta STAMATE-ENE¹,
Elena Simina LAKATOS^{2,3}, Elena Cristina RADA⁴,
Diana-Gabriela GROPOȘILA-CONSTANTINESCU⁵**

¹National Institute for Chemical-Pharmaceutical Research and Development-
ICCF, 112 Vitan Avenue, District 3, 031299, Bucharest, Romania

²Institute for Research in Circular Economy and Environment “Ernest Lupan”,
400609, Cluj-Napoca, Romania

³Faculty of Industrial Engineering, Robotics and Product Management, Technical
University of Cluj-Napoca, 400641, Cluj-Napoca, Romania

⁴Insubria University, Theoretical and Applied Science Department, Italy

⁵University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty
of Biotechnologies, 59 Mărăști Blvd, District 1, 011464, Bucharest, Romania

Corresponding author email: roxym_stoica@yahoo.com

Abstract

Microbial biosurfactants are amphiphilic molecules produced by diverse microorganisms and are increasingly investigated as alternative antimicrobial agents in the context of increasing antimicrobial resistance (AMR). This mini-review summarizes current knowledge on the antimicrobial and antibiofilm activities of major biosurfactant classes, including rhamnolipids, lipopeptides, sophorolipids, and mannosylerythritol lipids (MELs), with emphasis on their mechanisms of action and structure-activity relationships. Rhamnolipids and lipopeptides exhibit the highest antimicrobial potency, primarily through membrane disruption, whereas sophorolipids and MELs show reduced antimicrobial activity but improved biocompatibility. All classes act mainly through physico-chemical interactions with microbial membranes, resulting in membrane disruption and inhibition of biofilm formation. In addition, several studies report enhanced efficacy of conventional antibiotics in combination with biosurfactants against multidrug-resistant pathogens. Despite these advantages, their clinical application remains limited by production costs, process variability, and regulatory constraints. Nevertheless, the use of renewable and agro-industrial waste substrates for biosurfactant production aligns with circular economy principles and improves their sustainability profile. Overall, microbial biosurfactants represent promising candidates for next-generation antimicrobial strategies, although further optimization and translational studies are required to support their practical implementation.

Key words: *microbial surfactants, antimicrobial activity, therapeutic applications.*

SUBSECTION IV: ENVIRONMENTAL BIOTECHNOLOGY

P.IV.1. BIOTECHNOLOGICAL BIOREMEDIATION SOLUTIONS FOR ENVIRONMENTS CONTAMINATED WITH PHARMACEUTICAL WASTE - A REVIEW

**Gabriela-Lucica MĂRGĂRIT,
Diana-Gabriela GROPOȘILĂ-CONSTANTINESCU,
Silvana-Mihaela DĂNĂILĂ-GUIDEA, Diana-Elena VADANA**

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

Corresponding author email: diana.groposila@biotehnologii.usamv.ro

Abstract

*In recent years, increasing attention has been directed toward the issue of waste generation and the development of strategies for its mitigation. The environmental impact of pharmaceutical waste - originating from medical facilities, the pharmaceutical industry, pharmacies, and households - containing persistent and biologically active compounds capable of contaminating soils and aquatic systems, promoting ecological imbalances and the emergence of antimicrobial resistance, can be reduced through the application of biotechnological approaches as sustainable remediation solutions. The study highlights the effectiveness of organisms such as *Pseudomonas* spp., *Trametes versicolor*, and *Chlorella vulgaris* in decreasing the concentrations of persistent pharmaceutical compounds. The conclusions emphasize the necessity of adopting integrated management strategies and strengthening the regulatory framework, thereby positioning bioremediation as a priority direction for the protection of ecosystems and public health.*

Key words: *pharmaceutical waste, bioremediation, *Pseudomonas* spp., *Trametes versicolor*, *Chlorella vulgaris*.*

P.IV.2. BIOINDICATORS, A KEY TOOL IN ASSESSING TOXIC EXPOSURE

**Gabriela LUȚĂ¹, Evelina GHERGHINA¹, Daniela BALAN¹,
Hatice TURKTEN²**

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

²Ondokuz Mayıs University, Faculty of Agriculture, Kurupelit,
55139, Samsun, Turkey

Corresponding author email: daniela.balan@usamv.ro

Abstract

Biomonitoring uses living organisms - bioindicators - to assess environmental health, while biomonitors specifically provide quantitative data on pollution levels, such as accumulation rates. Bioindicators - plants and animals - can provide valuable information about ecosystem exposure to a wide range of pollutants, as they are able to absorb and accumulate specific toxins from soil, water and atmosphere. This paper provides an overview of the main aspects of the potential of biomonitoring as an effective tool for assessing exposure to toxic substances and for identifying interventions needed to mitigate it.

Key words: *bioindicators, biomonitoring, ecosystem damage, environmental contaminants, environmental pollution.*

P.IV.3. SILICON-BASED ELICITORS FOR SUSTAINABLE CROP PROTECTION

Maria-Mihaela ZUGRAVU¹, Aglaia POPA¹, Yildiray ISTANBULLU²

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

²Central Research Institute of Food and Feed Control, Adalet Mh. 1. Hürriyet
Caddesi, Bursa, Turkey

Corresponding author email: aglaia.popa@bth.usamv.ro

Abstract

Silicon and its nano-formulations have emerged as powerful elicitors that activate plant immune responses and improve resistance against a wide range of pathogens in crops. Recent studies demonstrate that silicon-based products are able to penetrate root and leaf tissues, trigger systemic acquired resistance in a dose-dependent manner, and rely on salicylic acid signalling to confer broad-spectrum disease protection. Field and greenhouse trials across diverse species show that these formulations can reduce disease indices through physical reinforcement of cell walls, enhanced production of antioxidant enzymes, and priming of pattern-triggered immunity. In addition, to direct pathogen suppression, Si-based products act as biostimulants that modulate the plant microbiome, lower the need for synthetic pesticides, and thus diminish chemical residues in the environment, aligning with One Health goals that link plant health, ecosystem integrity, and human well-being. This review synthesizes current knowledge on the mechanisms of Si-elicited immunity, evaluates the efficacy of Si-based formulations for post-harvest and field protection of crops, and outlines research gaps and regulatory considerations needed to advance Si technologies as safe, sustainable tools within an integrated One Health framework.

Key words: *crops, elicitors, One Health, pathogens, silicon.*

**SUBSECTION V:
MISCELLANEOUS**

**P.V.1. MECHANISMS FOR STRENGTHENING
THE ECONOMIC SECURITY OF ENTERPRISES
IN THE REPUBLIC OF MOLDOVA**

Raisa DUȘCOV

“Dunărea de Jos” University of Galați, 47 Domneasca Street, Galati, Romania

Corresponding author email: duscov19@mail.ru

Abstract

Economic security is essential for the sustainable development and competitiveness of enterprises, especially in economies facing instability and rapid digital change. In the Republic of Moldova, small and medium-sized enterprises (SMEs) encounter significant challenges such as limited access to finance, legislative uncertainty, digital risks, and weak managerial capacity. This study analyzes the main mechanisms that can strengthen the economic security of Moldovan SMEs. Using a qualitative research approach based on literature review, policy analysis, case studies, and interviews with SME managers, the study identifies key vulnerabilities and evaluates existing security mechanisms. The findings show that economic security can be enhanced through effective risk management, diversification of financial sources, adoption of digital and cybersecurity solutions, improved corporate governance and legal compliance, investment in human capital, and cooperation with public institutions. The study concludes that economic security cannot be achieved through isolated measures, but requires an integrated and systematic approach. Implementing coordinated mechanisms increases enterprise resilience to economic shocks and supports sustainable economic growth in the Republic of Moldova.

Key words: *economic security, enterprises, Republic of Moldova, risk management, financing, innovation, governance, regulation.*

P.V.2. DEVELOPING COMPETENCIES IN CUTTING- EDGE TECHNOLOGIES FOR GREEN AGRICULTURE AND INDUSTRIAL APPLICATIONS

**Nicoleta RADU¹, Mihai Dan CARAMIHAI²,
Francisca BLANQUEZ CANO³, Adrian SILVA⁴,
Narcisa Elena BĂBEANU¹**

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
Faculty of Biotechnologies, 59 Marasti Blvd, Bucharest, Romania

²UNST Politehnica Bucharest, 313 Splaiul Independentei, District 6,
Bucharest, Romania

³University Autònoma de Barcelona, 08193, Bellaterra, Barcelona, Spain

⁴University of Porto, Praça de Gomes Teixeira, 4099-002, Porto, Portugal

Corresponding author email: nicoleta.radu@biotehnologii.usamv.ro

Abstract

A sustainable green future depends on developing competencies in advanced technologies across energy, agriculture, and industry for graduate students of Master's and Doctoral programs. This study aimed to assess graduate students' perceptions from three European universities regarding the key sustainability strategies through a structured survey focusing on digitalisation, agriculture, biodiversity conservation, and the circular economy. The majority of graduate students agreed that renewable energy reduces carbon footprint, air and water pollution, and enhances public health. Students demonstrated a clear understanding of the EU Green Agriculture objectives, emphasizing food security and environmental footprint reduction. Positive perceptions extended to biodiversity conservation, with support for effective management, monitoring, and clear conservation goals. Respondents endorsed circular economy principles, including resource efficiency, material redesign, and waste recapture, and aligned with the EU's industrial strategy for a progressive and sustainable economic transition. These findings indicate that the graduate students possess both awareness and favorable attitudes toward advanced technological solutions for sustainability. The results underscore the successful implementation of digital resources developed in academic curricula for students from Master's and Doctoral programs from three European universities.

Key words: *graduate student competencies, sustainable, green agriculture.*

**P.V.3. CONTEMPORARY LEARNING TRAINING
TEACHING METHODOLOGY FOR EXPLORING
THE EUROPEAN GREEN DEAL: LINKING
AGRICULTURE, BIODIVERSITY, AND EU POLICY**

**Nicoleta RADU¹, Mihai Dan CARAMIHAI²,
Francisca BLANQUEZ CANO³, Adrian SILVA⁴,
Narcisa Elena BĂBEANU¹**

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
Faculty of Biotechnologies, 59 Marasti Blvd, District 1, Bucharest, Romania

²UNST Politehnica of Bucharest, 313 Splaiul Independentei, District 6,
Bucharest, Romania

³University Autònoma de Barcelona, 08193, Bellaterra, Barcelona, Spain

⁴University of Porto, Praça de Gomes Teixeira, 4099-002, Porto, Portugal

Corresponding author email: nicoleta.radu@biotehнологii.usamv.ro

Abstract

This study evaluates the student satisfaction with modern tools learning sessions on green digitization across Spain, Romania, and Portugal. Graduate participants were surveyed to assess how the system created influenced engagement, learning, and motivation. Questions focused on the effectiveness of gamification in encouraging participation, the perceived value of participation awards, the correlation between game points and progress, and the impact on learning outcomes. Results indicate that students responded positively, reporting increased participation due to gamified elements, satisfaction with awards, and a clear alignment between points and game levels. Moreover, participants highlighted improved learning outcomes and a deeper understanding of course content as a direct result of the gaming system. These findings suggest that gamification can be a powerful tool in higher education for Master's and Doctoral programs, particularly for courses addressing digital and green transformation, fostering both motivation and effective learning among graduate students from three European universities.

Key words: modern learning training teaching, European Green Deal.

P.V.4. AI-ENHANCED ADDITIVE MANUFACTURING IN BIOTECHNOLOGY: BRIDGING THE DIGITAL GAP THROUGH 3D SCANNING AND GENERATIVE DESIGN OPTIMIZATION

**Ștefan Rafael PORUMBEL¹, Radu Cristian TOMA¹,
Filofteia Camelia DIGUȚĂ¹, Alexandru Constantin ALDEA¹,
Gabriela Lucica MĂRGĂRIT¹,
Diana-Gabriela GROPOȘILĂ-CONSTANTINESCU¹,
Sahar DELKHAHI², Narcisa Elena BĂBEANU¹**

¹University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

²University of Milano-Bicocca, Milano, Italy

Corresponding author email: radu.toma@biotehnologii.usamv.ro

Abstract

The rise of Industry 4.0 technologies has transformed the biotechnology field by shifting competence requirements toward integrating biological sciences, digital design, and additive manufacturing systems. This study investigates the use of AI-enhanced 3D printing in higher education within the biotechnological field. The framework integrates Gemini AI for generative design optimization and predictive error compensation, enabling a transition from conventional computer-aided design workflows to an adaptive, data-driven production cycle. The ecosystem enables a continuous digital-to-physical iteration process where students design, prototype, and assess laboratory components. High-speed fabrication shortens production time, while AI-assisted optimization enhances dimensional accuracy and structural performance. The approach integrates additive manufacturing into core discipline activities and reinforces the connection between experimental practice and digital engineering. Empirical results showed a 40% decrease in prototyping failure rates and an over 90% drop in operational costs compared to traditional laboratory procurement models. Integrating affordable additive manufacturing infrastructures improves technical independence, engineering literacy, and practical problem-solving abilities. The results indicated that AI-supported fabrication systems offer a scalable approach to advancing biotechnology education and preparing graduates for technology-focused, data-driven careers.

Key words: *AI-Enhanced Manufacturing, Generative Design, 3D Scanning & Reverse Engineering, Digital Gap in Higher Education, Gemini Multimodal AI, Frugal Science.*



ISSN 2343 – 9653
ISSN-L 2343 – 9653