

INOPTEP 2025  **PTEP 2025**

**NINTH INTERNATIONAL CONFERENCE
SUSTAINABLE POSTHARVEST AND
FOOD TECHNOLOGIES
INOPTEP 2025**

and

**XXXVII NATIONAL CONFERENCE
PROCESSING AND ENERGY
IN AGRICULTURE
PTEP 2025**

April 7th – 10th, 2025, ZLATIBOR, SERBIA

BOOK OF ABSTRACTS ZBORNIK APSTRAKATA

**DEVETA MEĐUNARODNA KONFERENCIJA
ODRŽIVE POSLEUBIRAJUĆE I
PREHRAMBENE TEHNOLOGIJE
INOPTEP 2025**

i

**XXXVII NACIONALNA KONFERENCIJA
PROCESNA TEHNIKA I ENERGETIKA
U POLJOPRIVREDI
PTEP 2025**

7 – 10. april, 2025, ZLATIBOR, SRBIJA

SCIENTIFIC COMMITTEE / NAUČNI ODBOR

(Scientific Committee conducted a review of conference abstract)

International members:

Prof. Dr. Marco Dalla Rosa, Italy, University of Bologna,
Prof. Dr. Paola Pittia, Italy, University of Teramo, Faro, ISEKI Food Association President,
Prof. Dr. Rui Costa, Portugal, Polytechnic Institute of Coimbra, ISEKI Food Association Secretary General,
Prof. Dr. Rafat Al Afif, Austria, BOKU, Vienna,
Prof. Dr. Silva Cristina, Portugal, Portuguese Catholic University,
Prof. Dr. Cecilia Hodur, Hungary, University of Szeged,
Prof. Dr. Vanja Jurišić, Croatia, University of Zagreb,
Prof. Dr. Zuzana Hlavačová, Slovakia, Slovak University of Agriculture in Nitra,
Prof. Dr. Costas Biliaderis, Greece, Aristotle University of Thessaloniki,
Prof. Dr. Vlasta Vozarova, Slovakia, Slovak University of Agriculture in Nitra,
Prof. Dr. Vangelče Mitrevski, North Macedonia, University of Bitola,
Prof. Dr. Dorota Kręgiel, Poland, Lodz University of Technology,
Prof. Dr. Attila Gere, Hungary, Hungarian University of Agriculture and Life Sciences,
Dr. Branimir Šimić, Croatia, Agricultural Institute Osijek,
Prof. Dr. Cosmin Sălășan, Romania, University of Life Sciences "King Mihai I", Timișoara,
Prof. Dr. Izabela Witońska, Poland, Lodz University of Technology,
Prof. Dr. Danijela Bursać Kovačević, Croatia, University of Zagreb,
Prof. Dr. Neven Voća, Croatia, University of Zagreb.

National members:

Prof. Dr. Milivoj Radojčin, Faculty of Agriculture, University of Novi Sad,
Prof. Dr. Ivan Pavkov, Faculty of Agriculture, University of Novi Sad,
Prof. Dr. Filip Kulić, Faculty of Technical Science, University of Novi Sad,
Dr. Sonja Gvozdenac, Institute of Field and Vegetable Crops Novi Sad,
Dr. Goran Todorović, Maize Research Institute "Zemun Polje", Belgrade,
Dr. Olivera Đuragić, Institute of Food Technology, University of Novi Sad,
Dr. Aleksandra Đukić Vuković, ass. prof., Faculty of Technology and Metallurgy, University of Belgrade,
Dr. Branislav Šojić, ass. prof., Faculty of Technology, University of Novi Sad,
Dr. Milka Vujaković, Agricultural Extension Service "Agricultural Station", Novi Sad,
Dr. Rade Stanisavljević, Institute for Plant Protection and Environment, Belgrade,
Dr. Lana Đukanović, Institute for Plant Protection and Environment, Belgrade,
Dr. Mladenka Pestorić, Institute of Food Technology, University of Novi Sad,
Prof. Dr. Maša Bukurov, Faculty of Technical Science, University of Novi Sad,
Prof. Dr. Aleksandra Dimitrijević, Faculty of Agriculture, University of Belgrade,
Prof. Dr. Nebojša Novković, Faculty of Agriculture, University of Novi Sad,
Prof. Dr. Jelena Pejin, Faculty of Technology, University of Novi Sad,
Prof. Dr. Siniša Bikić, Faculty of Agriculture, University of Novi Sad,
Prof. Dr. Vladimir Bugarski, Faculty of Technical Science, University of Novi

Publisher / Izdavač

National Society of Processing and Energy in Agriculture, Novi Sad, Serbia
Nacionalno društvo za procesnu tehniku i energetiku u poljoprivredi, Novi Sad,
Trg Dositeja Obradovića 8

Co-publisher / Suizdavač

Faculty of Agriculture, Novi Sad, Serbia
Poljoprivredni fakultet, Novi Sad, Trg Dositeja Obradovića 8

Editor in Chief / Glavni i odgovorni urednik: Prof. Dr. Milivoj Radojčin

Editors / Urednici

Prof. Dr. Siniša Bikić
Doc. Dr. Aleksandra Đukić-Vuković

For Publisher / Za izdavača: Mr. Miladin Kostić

Technical editor / Tehnički urednik: Prof. Dr. Siniša Bikić

Printed by / Štampa: Offsetprint, Novi Sad, Primorska 84

This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) (<https://creativecommons.org/licenses/by/4.0/>)

Edition / Tiraž: 150

ISBN: 978-86-7520-629-3

E-mail: ptep@ptep.org.rs

www.ptep.org.rs

CONFERENCE ORGANIZERS:

- UNIVERSITY OF NOVI SAD, FACULTY OF AGRICULTURE, DEPARTMENT OF AGRICULTURAL ENGINEERING, NOVI SAD
- NATIONAL SOCIETY OF PROCESSING AND ENERGY IN AGRICULTURE

ORGANIZATORI KONFERENCIJE:

- UNIVERZITET U NOVOM SADU, POLJOPRIVREDNI FAKULTET
- DEPARTMAN ZA POLJOPRIVREDNU TEHNIKU, NOVI SAD
- NACIONALNO DRUŠTVO ZA PROCESNU TEHNIKU I ENERGETKU U POLJOPRIVREDI, NOVI SAD,

CONFERENCE CO-ORGANIZERS:

- ISEKI - Food Association
- Institute for Food Technology, Novi Sad.
- Maize Research Institute
- "Zemun Polje", Zemun,
- Faculty of Technology, Novi Sad,
- Faculty of Technical Science, Novi Sad,

SUORGANIZATORI KONFERENCIJE:

- ISEKI – Food association, Beč, Austrija,
- Institut za prehrambene tehnologije, Novi Sad
- Institut za kukuruz
- "Zemun Polje", Zemun
- Tehnološki fakultet, Novi Sad,
- Fakultet tehničkih nauka, Novi Sad,

CONFERENCE HONORARY COMMITTEE:

- Prof. Dr. Mirko Babić, PTEP honorary president, University of Novi Sad, Serbia,
- Prof. Dr. Nenad Magazin, Dean of the Faculty of Agriculture, University of Novi Sad, Serbia,
- Dr. Jelena Begović, Minister for Science, Technological Development and Innovation of the Republic of Serbia,
- Prof. Dr. Paola Pittia, President of the ISEKI Food Association, Austria,
- Vladimir Galić, Provincial Secretary for Agriculture, Water Management and Forestry, Autonomous Province of Vojvodina, Serbia,
- Prof. Dr. Branko Markoski, Provincial Secretary for Higher Education and Scientific Research, Autonomous Province of Vojvodina, Serbia,
- Dr. Ljubiša Šarić, Director of the Institute of Food Technology, University of Novi Sad, Serbia,
- Dr. Miodrag Tolimir, Director of the Maize Research Institute "Zemun Polje", Serbia,
- Prof. Dr. Dragana Latković, Director of the Institute of Field and Vegetable Crops, Novi Sad, Serbia,
- Prof. Dr. Zita Šereš, Dean of the Faculty of Technology, University of Novi Sad, Serbia.

POČASNI ODBOR KONFERENCIJE:

- Prof. Dr Mirko Babić, Počasni predsednik PTEP, Univerzitet u Novom Sadu, Srbija
- Prof. Dr Nenad Magazin, Dekan Poljoprivrednog fakulteta, Univerzitet u Novom Sadu, Srbija
- Dr Jelena Begović, Ministarka nauke, tehnološkog razvoja i inovacija Republike Srbije
- Prof. Dr Paola Pittia, Predsednica ISEKI Food Association, Austrija
- Vladimir Galić, Pokrajinski sekretar za poljoprivredu, vodoprivredu i šumarstvo, Autonomna Pokrajina Vojvodina, Srbija
- Prof. Dr Branko Markoski, Pokrajinski sekretar za visoko obrazovanje i naučnoistraživačku delatnost, Autonomna Pokrajina Vojvodina, Srbija
- Dr Ljubiša Šarić, direktor Naučnog instituta za prehrambene tehnologije, Univerzitet u Novom Sadu, Srbija
- Dr Miodrag Tolimir, Direktor Instituta za kukuruz "Zemun Polje", Srbija
- Prof. Dr Dragana Latković, Direktor Instituta za ratarstvo i povrtarstvo, Novi Sad, Srbija
- Prof. Dr Zita Šereš, v.d. Dekanka Tehnološkog fakulteta, Univerzitet u Novom Sadu, Srbija

SUPPORTERS:

Ministry of Science, Technological Development
and Innovation Republic of Serbia
Government of the Autonomous
Provincial Secretariat for Higher Education
and Scientific Research,
Secretariat for Agriculture, Water
Management and Forestry

POKROVITELJI KONFERENCIJE:

Ministarstvo nauke, tehnološkog razvoja i
inovacija Republike Srbije,
Vlada AP Vojvodine:
Pokrajinski sekretarijat za visoko obrazovanje i
naučnoistraživačku delatnost,
Sekretarijat za poljoprivredu, vodoprivredu i
šumarstvo

**CONFERENCE ORGANIZING
COMMITTEE:**

Mr. Miladin Kostić, President of the PTEP, Sava-
coop, Novi Sad, Serbia,
Prof. Dr. Milivoj Radojčin, Secretary General of
the PTEP, University of Novi Sad, Faculty of Ag-
riculture, Serbia,
Prof. Dr. Ivan Pavkov, vice dean, University of
Novi Sad, Faculty of Agriculture, Serbia
Prof. Dr. Aleksandra Đukić Vuković, University of
Belgrade, Faculty of Technology and Metallurgy,
Serbia,
Prof. Dr. Siniša Bikić, University of Novi Sad,
Faculty of Agriculture, Novi Sad,
Marko Nenadić dipl.ing, Uljarice Bačka doo Novi
Sad, Serbia,
Dr. Olivera Đuragić, University of Novi Sad, Insti-
tute of Food Technology, Serbia,

**ORGANIZACIONI ODBOR
KONFERENCIJE:**

Mr. Miladin Kostić, predsednik PTEP, Savacoop,
Novi Sad, Srbija
Prof. Dr. Milivoj Radojčin, generalni sekretar
društva PTEP, Poljoprivredni fakultet, Univerzitet u
Novom Sadu, Srbija
Prof. Dr. Ivan Pavkov, prodekan, Poljoprivredni
fakultet, Univerzitet u Novom Sadu, Srbija
Prof. Dr. Aleksandra Đukić Vuković, Tehnološko-
metalurški fakultet, Univerzitet u Beogradu, Srbija
Prof. Dr. Siniša Bikić, Poljoprivredni fakultet,
Univerzitet u Novom Sadu, Srbija
Marko Nenadić dipl.ing, Uljarice Bačka doo Novi
Sad, Srbija
Dr. Olivera Đuragić, Naučni institut za
prehrambene tehnologije Novi Sad, Univerzitet u
Novom Sadu, Srbija

SPONSORS

NINTH INTERNATIONAL CONFERENCE
SUSTAINABLE POSTHARVEST AND FOOD TECHNOLOGIES INOPTEP 2025,
XXXVII NATIONAL CONFERENCE
PROCESSING AND ENERGY IN AGRICULTURE PTEP 2025
and
14th SEMINAR FOR TECHNOLOGISTS AND MANAGERS OF SILO AND
SEED PROCESSING

GENERAL SPONZOR / GENERALNI SPONZOR



RWA Srbija

SILVER SPONSOR / SREBRNI SPONZOR

Libela Elsi NS, d.o.o., Novi Sad, Serbia



PETKUS, d.o.o. Zrenjanin



MLINOSTROJ, d.o.o. Novi Sad



CONTENT

Munevera Begić, Semina Pinjić, Eldar Hasandić, Lejla Biber, QUALITY OF SMOKED CHICKEN BREASTS PRODUCED UNDER TRADITIONAL CONDITIONS WITH THE ADDITION OF VARIOUS SPICES.....	1
Lejla Biber, Melisa Ljuša, Jasmin Grahić, Munevera Begić, APPLICATION OF INFORMATION TECHNOLOGIES IN BEEKEEPING FOR PRODUCTION IMPROVEMENT AND BIODIVERSITY CONSERVATION	3
Dubravka Bigović, Katarina Šavikin, Nemanja Krgović, Jelena Živković, EFFECTS OF CHOKEBERRY AND TART CHERRY BASED DIETARY SUPPLEMENTS IN DYSLIPIDEMIC INDIVIDUALS.....	5
Jasmina Lapić, Anica Bebek Markovinović, Nikolina Račić, Lana Vujanić, Marko Kostić, Dušan Rakić, Senka Djaković, Danijela Bursać Kovačević, BIOACTIVE POTENTIAL OF <i>Arbutus unedo</i> L. LEAVES: INFLUENCE OF GEOGRAPHICAL LOCATION, EXTRACTION METHOD AND SOLVENT TYPE.....	7
Petar Čanak, Mioljub Mišović, Goran Pošarac, Miloš Crevar, Vesna Perić, Bojan Mitrović, Milan Stevanović, SEED TREATMENT: EVOLUTION AND ALTERNATIVES	9
Beatrice Cellini, Silvia Tappi, Fatemeh Shanbeh Zadeh, Junior Bernardo Molina Hernandez, Marco Dalla Rosa, Pietro Rocculi, Lucia Vannini, COLD PLASMA TO TREAT READY-TO-EAT APPLES: AN ACTIVE SOLUTION AGAINST <i>ARCOBACTER</i> SPP. AND <i>CRONOBACTER</i> SPP. CONTAMINATION	11
Zorana Golubović, Ivan Zlatanović, Vojislav Simonović, Božica Bojović, ADVANCEMENTS AND CHALLENGES OF 3D PRINTING IN MODERN AGRICULTURE	12
Lenka Grubač, Milana Pribić, Jelena Pejin, IMPACT OF DIFFERENT MASHING REGIMES ON TECHNOLOGICAL PARAMETERS OF ALCOHOL-FREE BEER	14
Jasna Halambek, Ivana Kolić, Predrag Putnik, Danijela Bursać Kovačević, Sandra Zavadlav, FUTURE TRENDS AND LIMITATIONS OF ESSENTIAL OILS AND PLANT EXTRACTS AS ADDITIVES IN THE FORMULATION OF EDIBLE PACKAGING.....	16
Nevena Hromiš, Senka Popović, Danijela Šput, Jovana Pantić, Sandra Bulut, Zorica Tomićić, Ivana Čabarkapa, THE STRUCTURE OF THE PROTEIN CONCENTRATE OBTAINED BY THE ULTRASONIC AND CHEMICAL DEPROTEINIZATION PROCESS OF THE SPINY CRAYFISH SHELL FROM THE DANUBE RIVER.....	18
Rosalba Lanciotti, Clara Gomez-Urios, Renato Illiano, Davide Gottardi, Lorenzo Siroli, Francesca Patrignani, EFFECT OF HIGH-PRESSURE TREATMENTS ON THE QUALITY AND SHELF-LIFE OF AN ORANGE-BERGAMOT BEVERAGE.....	20
Mirjana Ljubojević, Biljana Božanić Tanjga, Nataša Simin, Marija Lesjak, Tijana Narandžić, Magdalena Pušić Devai, Veljko Šarac, Milana Čurčić, DIVERSIFYING ROSES FOR 21ST CENTURY'S ENVIRONMENTAL AND SOCIAL NEEDS	21
Muamer Mandra, Azra Šinanović, Mladenka Pestorić, Nikola Maravić, Dubravka Škrobot, Dragana Ubiparip Samek, Miloš Županjac, PIVOT PROFILE METHOD IN SENSORY EVALUATION OF CHICKEN BREAST.....	23
Marko Nedić, THE FUTURE OF A BIOGAS IN SERBIA	25
Ana Cristina De Auiar Saldanha Pinheiro, Davide Gottardi, Lorenzo Siroli, Muhammad Rehan Khan, Daniele Alberoni, Diana Di Gioia, Lucia Vannini, Pietro Rocculi, Rosalba Lanciotti, Francesca Patrignani, FULL CHARACTERIZATION OF CHITOSAN, RESULTING FROM THE VALORISATION OF FISH WASTE, TO BE USED FOR THE FORMULATION OF BIOSTIMULANTS	27
Mladenka Pestorić, Dragana Ubiparip Samek, Nikola Maravić, Predrag Ikonić, Tatjana Peulić, Miloš Županjac, Nenad Magazin, SENSORY LEXICON FOR FROZEN ARILJE RASPBERRIES.....	28
Mladenka Pestorić, Dragana Ubiparip Samek, Nikola Maravić, Tatjana Peulić, Renata Kovač, Mirjana Milutinović, Jovana Mićović, SENSORY CHARACTERIZATION OF FRESH ARILJE RASPBERRIES USING RAPID EVALUATION TECHNIQUES	29
Robert Daniel Neagu, Corina Dana Misca, Delia-Gabriela Dumbrava, Camelia Moldovan, Viorica Mirela Popa, Marius Robert Lungu, Diana Nicoleta Raba, NUTRITIONAL PROFILE OF SOME EDIBLE FRESHWATER AND MARINE FISH SPECIES. A REVIEW	30
Cosmin Salasan, Iasmina Iosim, Carmen Dumitrescu, Cosmina Toader, Tabita Adamov, Cristian Gaina, Raul Pascalau, THE LINK BETWEEN THE STRUCTURAL ADJUSTMENTS AND THE CROP RANGE IN ROMANIAN WESTERN AGRICULTURE	31
Katarina Šavikin, Jelena Živković, Nemanja Krgović, Dubravka Bigović, BENEFICIAL IMPACTS OF CHOKEBERRY AND TART CHERRY BASED DIETARY SUPPLEMENTS IN DIABETICS	32
Marina Šćiban, Dragana Lukić, Vesna Vasić, Jelena Prodanović, Teodora Subić, NOVEL APPROACHES TO UTILIZING OF PRUNING RESIDUES OF RASPBERRIES AND BLACKBERRIES	34

Fatemeh Shanbeh Zadeh, Beatrice Cellini, Gebremedhin Gebremariam Gebremical, Junior Bernardo Molina Hernandez, Pietro Rocculi, Silvia Tappi, Fausto Gardini, Santina Romani, Lucia Vannini, INNOVATIVE NON-THERMAL TECHNOLOGY TO IMPROVE SAFETY AND QUALITY IN READY-TO-EAT VEGETABLES.....	36
Branimir Šimić, Luka Andrić, Matija Domačinović, Snežana V. Jovanović, I. Miškulin, Ivana Prakatur, THE INFLUENCE OF GENOTYPE AND SOWING DENSITY ON AGRONOMIC CHARACTERISTICS OF CORN HYBRIDS FOR SILAGE PRODUCTION	37
Đorđe Petrić, Milica Vranešević, OPTIMIZATION OF PUMPING STATIONS IN VOJVODINA THROUGH ENERGY CONSUMPTION ANALYSIS AND IMPROVEMENT OPPORTUNITIES	39
Milica Vranešević, Maja Meseldžija, Jasna Grabić, BLUE CARBON IN FRESHWATER ECOSYSTEMS OF VOJVODINA, SERBIA: POTENTIALS AND CHALLENGES	40
Jasna Halambek, Ivana Kolić, Denis Kotarski, Predrag Putnik, Danijela Bursać Kovačević, Sandra Zavadlav, INNOVATIVE THREE-DIMENSIONAL 3D-ESSERTS WITH DIETARY SUPPLEMENTS IN EDIBLE PACKAGING	41
Jana Žilović, Aleksandra Đukić-Vuković, Mihajlo Bogdanović, Jovana Grbić, Vanja Tadić, Ana Žugić, FERMENTATION OF POPLAR BUD EXTRACTS USING LACTIC ACID BACTERIA	43
Jelena Živković, Dejan Pljevljakušić, Dubravka Bigović, Katarina Šavikin, CHEMICAL CHARACTERIZATION OF CHOKEBERRY SEEDS AND THEIR DERIVED OIL: COMPOSITION AND POTENTIAL HEALTH BENEFITS	45
Ana Matin, Ivan Brabdić, Vanja Jurišić, Božidar Matin, Tajana Krička, Mateja Grubor, Karlo Špelić, COMPARISON OF THE NUTRITIONAL COMPOSITION OF MAIZE GRAIN UNDER DIFFERENT DRYING TREATMENTS	47
Aleksandar Miljatović, Veljko Vukoje, Mirela Tomaš Simin, MEASURING THE PRODUCTIVITY CHANGE IN SERBIAN FARMS USING FADN DATA	49
Dragana Novaković, Dragan Milić, Beba Mutavdžić, Vladislav Zekić, Maja Radišić, Srboľjub Nikolić, Milan Mihajlović, Tihomir Novaković, PANEL REGRESSION ANALYSIS OF PROFITABILITY FACTORS OF OIL PRODUCTION COMPANIES FROM THE REPUBLIC OF SERBIA	51
Dobrivoj Poštić, Ratibor Štrbanović, Nenad Đurić, Nikola Koković, Nenad Pavlović, Ivana Živković, Rade Stanisavljević, YIELD OF EARLY POTATOES IN THE CONDITIONS OF WESTERN SERBIA	53
Danica Savanović, Ana Velemir, Aleksandar Savić, Ljiljana Topalić Trivunović, Branislav Šojić, Jovo Savanović, Jelena Knežević, BIOLOGICAL PROPERTIES OF FRESH CREAM CHEESE WITH THE ADDITION OF SELECTED PLANT SPECIES	55
Rade Stanisavljević, Dobrivoj Poštić, Ratibor Štrbanović, Violeta Oro, Mile Sečenski, Marijenka Tabaković, Jasmina Knežević, VITALITY OF PUMPKIN SEEDS FROM DIFFERENT REGIONS DURING A THREE-YEAR STORAGE PERIOD	57
Marijenka Tabaković, Natalija Kravić, Vesna Perić, Vojka Babić, Rade Stanisavljević, Violeta Oro, RESPECT AND CARE FOR TRADITIONAL UNDERSTANDINGS OF AGROBIODIVERSITY	59
Branislav Šojić, Snežana Škaljac, Branimir Pavlić, Eva Ivanišová, Monika Božiková, Danica Savanović, Michal Binczarski, SAGE ESSENTIAL OIL EXHIBITS ANTIOXIDATIVE AND ANTIMICROBIAL ACTIVITY IN CHICKEN COOKED SAUSAGES	61
Sarah Aisyah Khurun Hizar, Hasmadi Mamat, Rovina Kobun, Norliza Julmohammad, Siti Faridah Mohd Amin, Nor Qhairul Izzreen Mohd Noor, Mohd Sharizan Md Sarip, Azrul Nurfaiz Mohd Faizal, Nicky Rahmana Putra, Ahmad Hazim Abdul Aziz, SOLUBILITY CORRELATION OF SABAH GREEN ROBUSTA COFFEE (COFFEA CANEPHORA) BEAN EXTRACT IN SUPERCRITICAL CARBON DIOXIDE EXTRACTION.....	63
Macdalyna Esther Ronie, Hasmadi Mamat, Ahmad Hazim Abdul Aziz, Mohamad Khairi Zainol, Norazlina Mohammad Ridhwan, Rovina Kobun, Nicky Rahmana Putra, PHYTOCHEMICALS AND ANTIOXIDANT ACTIVITIES OF SARAWAK BARIO RICE VARIETIES	64
Danijela Šuput, Senka Popović, Nevena Hromiš, Jovana Pantić, Aleksandra Cvetanović, APPLICATION OF BIOINDICATORS IN BIOPOLYMER PACKAGING MATERIALS	65
Vladimir Kozomora, Andreja Živkov, Nikola Oluški, Slobodan Tašin, Maša Bukurov, MICROFLUIDICS AND MICROFABRICATION.....	67
Ivana Živković, Nenad Pavlović, Jelena Stoilković, Marijenka Tabaković, Marina Ivanović, Aleksandra Rakonjac, Vesna Perić, CLIMATE CHANGE IMPACTS ON SEED PRODUCTION AND QUALITY OF PEPPER.....	69
Ana Žugić, Vanja Tadić, Marija Tasić Kostov, Ivana Nešić, ENCAPSULATION OF CANNABIDIOL-RICH HEMP EXTRACT.....	71
Vanja Tadić, Ana Žugić, Dragica Bojović, Miomir Šoškić, Ivana Nešić, COMPARATIVE CHEMICAL STUDY OF THREE JUNIPERUS SPECIES	73

Rafat Al Afif, Siniša Bikić, Milivoj Radojčin, KEY OBSTACLES IN OPTIMIZING BIOGAS PRODUCTION FOR POWERING COMBINED HEAT AND POWER AND FUEL CELL: A CASE STUDY REVIEW	75
Mihajlo Bogdanović, Jovana Grbić, Dragana Mladenović, Ana Žugić, Vanja Tadić, Predrag Petrović, Aleksandra Djukić-Vuković, VALORIZATION OF NETTLE TEA INDUSTRY BY-PRODUCTS THROUGH INNOVATIVE GREEN EXTRACTION AND FERMENTATION FOR FUNCTIONAL FOOD APPLICATIONS.....	76
Jovana Grbić, Mihajlo Bogdanović, Dragana Mladenović, Saša Lazović, Tanja Radu, Aleksandra Djukić-Vuković, A NOVEL BIOREFINERY APPROACH FOR FRACTIONATION OF CROP RESIDUES	78
Dragana Mladenović, Jovana Grbić, Mihajlo Bogdanović, Dušan Mijin, Ljiljana Mojović, Aleksandra Đukić-Vuković, NATURAL DEEP EUTECTIC SOLVENTS FOR DELIGNIFICATION AND VALORIZATION OF AGRO-INDUSTRIAL WASTE	80
Büşra Oktar, Atul Baliram Khalangre, Ana Cristina De Aguiar Saldanha Pinheiro, Urszula Tylewicz, Pietro Rocculi, Marco Dalla Rosa, OPTIMIZING GREEN PEA DRYING: EFFECTS OF PULSED ELECTRIC FIELD ON DRYING KINETICS AND SUSTAINABILITY	82
Monika Božiková, Peter Hlaváč, Matúš Bilčík, Daniela Kunecová, Ľubomír Kubík, EXPERIMENTAL IDENTIFICATION OF PELLET'S THERMAL AND THERMO-ENERGETIC PARAMETERS PRODUCED FROM AGRICULTURAL AND FOOD WASTE.....	83
Irzada Taljić, Edita Sarić, Esma Karahmet Farhat, Almir Toroman, THE PRODUCTION OF TEMPEH. 84 Olivera Đuragić, Marija Milašinović-Šeremešić, Sladana Rakita, Danka Dragojlović, THE ROLE OF THE CAMELINA OIL IN DOG DIETS	85
Vanja Jurišić, Karlo Špelić, Ivan Brandić, Gabrijel Barčić, Ana Matin, THE ROLE OF SUSTAINABLE AGRICULTURE IN BIOECONOMY	87
Michal Binczarski, Milivoj Radojčin, Ivan Pavkov, Izabela Witonska, THE ROLE OF SUGAR PLATFORM COMPOUNDS IN THE SUSTAINABLE PROCESSING OF INDUSTRIAL BIO-WASTE	89
Izabela Witonska, Milivoj Radojčin, Ivan Pavkov, Michal Binczarski, PRODUCTION OF HIGH-PROTEIN FEED BASED ON BEET PULP AND RAPESEED MEAL.....	90
Adam Dobosz, Ewa Wiktorowska-Sowa, Milivoj Radojčin, Ivan Pavkov, Michal Binczarski, Izabela Witonska, ENERGY POTENTIAL OF THE SUGAR INDUSTRY IN THE CONTEXT OF USING MOLASSES AS THE MAIN RAW MATERIAL FOR BIOGAS PRODUCTION.....	91
Franciszek Osowski, Milivoj Radojčin, Ivan Pavkov, Michal Binczarski, Izabela Witonska, USE OF DEFECATION LIME FROM SUGAR PRODUCTION AS FERTILIZER IN SUSTAINABLE SUGAR FACTORY MANAGEMENT.....	92
Emina Sijahović, Hamdija Čivić, Drena Gadžo, Almina Kalić, APPLICATION OF BIOINOCULANTS IN THE FUNCTION OF OPTIMIZING AND REDUCING THE USE OF MINERAL FERTILIZERS FOR ACHIEVING A HIGHER YIELD AND QUALITY OF SILAGE MAIZE	93
Marco Dalla Rosa, ARTIFICIAL INTELLIGENCE IN FOOD PROCESSING.....	94
Nevena Ilić, Marija Milić, Sladana Davidović, Miona Miljković, Suzana Dimitrijević-Branković, Katarina Mihajlovski, EXPLORING THE POTENTIAL OF AGRO-INDUSTRIAL LIGNOCELLULOSIC WASTE FOR LACCASE PRODUCTION BY WHITE-ROT FUNGUS AND LACCASE COMPREHENSIVE CHARACTERIZATION.....	95
Ignacijo Biluš, Luka Kevorkijan, HYDRODYNAMIC CAVITATION IN VENTURI CHANNELS WITH DIFFERENT DIVERGENT ANGLES	97
Vladimir Kitanovski, Monika Lutovska, Zoran Trifunov, Sani Demiri, Olga Popovska, Stevan Kjosevski, INCORPORATING NEXUS ECOLABELS INTO HOUSEHOLD LEVEL FOOD WASTE MITIGATION STRATEGIES – ENVIRONMENTAL PERSPECTIVES FROM LIFE CYCLE ASSESSMENT	99
Aleksandra Djukić-Vuković, Jovana Grbić, Mihajlo Bogdanović, Dragana Mladenović, Jian Hao, Junsong Sun, Saša Lazović, Andromachi Tzani, Anastasia Detsi, Hemaka Bandulasena, Tanja Radu, SPARKGREEN PROJECT: GREEN TECHNOLOGIES FOR VALORIZATION OF AGRI-FOOD RESIDUES	100
Luka Kevorkijan, Tomislav Čavrgov, Ignacijo Biluš, Luka Lešnik, NUMERICAL AND EXPERIMENTAL DETERMINATION OF WIND TURBINE CHARACTERISTICS	101
Stevan Kjosevski, Monika Lutovska, Vladimir Mijakovski, Zoran Trifunov, Vladimir Kitanovski, SOME ASPECTS OF POSITIONING PHOTO VOLTAIC PANELS IN AGROVOLTAICS APPLICATIONS.....	103
Nadežda Seratlić, Nevena Hromiš, Branislav Šojić, Senka Popović, Danijela Šuput, Jovana Pantić, Ivana Čabarkapa, POTENTIAL APPLICATION OF CHITOSAN-BASED BIOPOLYMER COATINGS ON FERMENTED DRY SAUSAGES: VARIOUS APPLICATION TECHNIQUES AND THEIR IMPACT ON PRODUCT QUALIT	104
Milivoj Radojčin, Siniša Bikić, Ivan Pavkov, Rafat Al Afif, EXPERIENCE WITH PRODUCTION OF CARBON NANOPARTICLES FROM AGRICULTURAL BIOMAS	106

FERMENTATION OF POPLAR BUD EXTRACTS USING LACTIC ACID BACTERIA

Jana ŽILOVIĆ^{1,2}, Aleksandra ĐUKIĆ-VUKOVIĆ², Mihajlo BOGDANOVIĆ³, Jovana GRBIĆ³, Vanja TADIĆ¹, Ana ŽUGIĆ¹

¹Department of Pharmaceutical Research and Development, Institute for Medicinal Plant Research
“Dr. Josif Pančić”, Belgrade, Tadeuša Košćuška 1, Serbia

²University of Belgrade, Faculty of Technology and Metallurgy, Belgrade, Karnegijeva 4, Serbia

³University of Belgrade, Innovation Centre of Faculty of Technology and Metallurgy, Belgrade,
Karnegijeva 4, Serbia

Contact: jana.zilovic00@gmail.com

Poplar bud extracts of various poplar species are implemented in traditional medicine for wound healing due to their astringent and antiseptic properties. In recent years, poplar trees have been cultivated for the purpose of wood biomass production, whereas side shoots and buds are discarded and used as fuel. On the other hand, lactic acid bacteria (LAB) are widely used in producing fermented and functional food products, for their probiotic properties and ability to produce enzymes, acids, and other bioactive compounds. The aim of this study was to examine the chemical composition of prepared poplar bud extracts before lactic acid fermentation, as well as the effect the extracts had on the viability of LAB cells. Due to abundance and high availability, buds of cultivated poplar species *Populus x euramericana* (Dode) Guinier I-214 were utilized in this research.

Maceration and ultrasonic extraction were the selected methods for extracting poplar buds, while 50% (v/v) ethanol was used as a solvent. The obtained liquid extracts were evaporated using a rotary vacuum evaporator. The chemical composition of poplar bud extracts was examined by high-performance liquid chromatography (HPLC), while their antimicrobial activity was assessed using the agar well diffusion method. Fermentation of prepared extracts was carried out using *Lacticaseibacillus rhamnosus* ATCC 7469, *Ligilactobacillus salivarius* ATCC11741, and *Lactiplantibacillus plantarum* 299v as model microorganisms. The potential antimicrobial activity of extracts was assessed against *Escherichia coli*, *Bacillus cereus*, *Staphylococcus aureus* and *Candida albicans*. To analyze the effect of extract concentration on the fermentation process and cell viability, two different concentrations of extracts were prepared, by dissolving the extracts in 3% DMSO and sterile water. After 24 hours of fermentation, the number of viable LAB cells and the pH of the extracts were measured.

The results of the HPLC analysis demonstrated that the poplar bud extract obtained by ultrasonic extraction (UE) had an overall higher concentration of polyphenolic compounds than the macerate (M). Notably, UE mainly contained phenolic acids (caffeic and rosmarinic acid), while M was predominantly comprised of flavonoids (pinocembrin, chrysin, and pinostrobin). The number of viable LAB cells after extract fermentation showed that prepared poplar bud extracts were not suitable for the cultivation and survival of examined bacterial species. Consequently, only a certain number of *L. plantarum* cells were viable after fermentation in the UE extract, which contained 8 mg/ml of dry extract. The agar well diffusion test revealed that the prepared extracts exhibited antimicrobial activity towards *Staphylococcus aureus* and *Bacillus cereus*, but did not show inhibitory effects against *Escherichia coli* and *Candida albicans*. Furthermore, the decrease in the pH value of the extracts after 24 hours of fermentation indicated biotransformations by the examined LAB species.

In conclusion, in order to better understand the transformations that occur during fermentation, it is important to analyze the chemical composition of the extracts after fermentation. Additionally, alternative extraction methods and solvents should be explored to obtain extracts with improved solubility.

Keywords: poplar, extraction, polyphenols, microbial transformation, lactic acid bacteria

Acknowledgment of funding: This study was supported by Alliance of International Science Organizations (Project: SparkGREEN, ANSO-CR-PP 2022-08) and the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-66/2024-03/200003, 451-03-65/2024-03/200135 and 451-03-66/2024-03/200287).

FERMENTACIJA EKSTRAKATA PUPOLJAKA TOPOLE BAKTERIJAMA MLEČNE KISELINE

Jana ŽILOVIĆ^{1,2}, Aleksandra ĐUKIĆ-VUKOVIĆ², Mihajlo BOGDANOVIĆ³, Jovana GRBIĆ³, Vanja
TADIĆ¹, Ana ŽUGIĆ¹

¹Odsek za farmaceutska istraživanja i razvoj, Institut za proučavanje lekovitog bilja “Dr Josif
Pančić”, Beograd, Tadeuša Košćuška 1, Srbija

²Univerzitet u Beogradu, Tehnološko-metalurški fakultet, Beograd, Karnegijeva 4, Srbija

³Univerzitet u Beogradu, Inovacioni centar Tehnološko-metalurškog fakulteta, Beograd, Karnegijeva
4, Srbija

Kontakt: jana.zilovic00@gmail.com

Ekstrakti pupoljaka različitih vrsta topole se u tradicionalnoj medicini koriste za zarastanje rana, zbog svog adstringentnog i antiseptičnog delovanja. Topole se danas gaje u cilju proizvodnje drvene biomase, a mladi bočni izdanci sa pupoljcima se odsecaju i najčešće koriste za ogrev. Sa druge strane, bakterije mlečne kiseline (BMK) imaju široku primenu u proizvodnji funkcionalne i fermentisane hrane, kao probiotici i proizvođači enzima, kiselina i drugih biološki aktivnih jedinjenja. Cilj ovog istraživanja bio je određivanje hemijskog sastava pripremljenih ekstrakata pupoljaka topole pre mlečno-kiselinske fermentacije, kao i ispitivanje uticaja ekstrakata na vijabilnost ćelija BMK. Kao biljna sirovina u ovom istraživanju, korišćeni su pupoljci gajene topole vrste *Populus x euramericana* (Dode) Guinier I-214.

Ekstrakti su pripremljeni maceracijom i ultrazvučnom ekstrakcijom, pri čemu je kao rastvarač korišćen 50% (v/v) etanol. Dobijeni tečni ekstrakti su upareni do suva pomoću rotacionog vakuum uparivača. Analiza hemijskog sastava izvršena je tečnom hromatografijom visokih performansi (HPLC), dok je antimikrobna aktivnost ispitana agar difuzionom metodom. Kao model mikroorganizmi za fermentaciju pripremljenih ekstrakata korišćeni su *Lactocaseibacillus rhamnosus* ATCC 7469, *Ligilactobacillus salivarius* ATCC11741 i *Lactiplantibacillus plantarum* 299v. Potencijalna antimikrobna aktivnost ekstrakata ispitivana je prema *Escherichia coli*, *Bacillus cereus*, *Staphylococcus aureus* i *Candida albicans*. U cilju analize uticaja koncentracije suvog ekstrakta na proces fermentacije i vijabilnost ćelija BMK, pripremljene su dve koncentracije ekstrakata, rastvaranjem odgovarajuće mase ekstrakta u 3% DMSO i sterilnoj vodi. Nakon 24 sata fermentacije, utvrđen je broj vijabilnih ćelija BMK i pH vrednost ekstrakata.

Rezultati HPLC analize pokazali su da ekstrakt dobijen ultrazvučnom ekstrakcijom (UZ) sadrži višu koncentraciju polifenolnih jedinjenja u poređenju sa maceratom (M). Ekstrakt UZ dominantno sadrži fenolne kiseline, pri čemu su najzastupljenije kofeinska i rozmarinska kiselina. Sa druge strane, uzorak M se pretežno sastoji od flavonoida, poput pinocembrina, hrizina i pinostrobina. Broj vijabilnih ćelija BMK ukazao je da pripremljeni ekstrakti pupoljaka topole nisu pogodni za rast posmatranih bakterijskih vrsta. Rast i preživljavanje pokazale su jedino bakterije vrste *L. plantarum*, u uzorku UZ koncentracije suvog ekstrakta 8 mg/ml. Agar difuzionim testom utvrđeno je da pripremljeni ekstrakti pokazuju antimikrobnu aktivnost prema *Staphylococcus aureus* i *Bacillus cereus*, ali nisu delovali inhibitory na ćelije *Escherichia coli* i *Candida albicans*. Smanjenje pH vrednosti ekstrakata nakon 24 sata fermentacije može biti pokazatelj biotransformacija koje su nastale usled dejstva BMK.

U cilju boljeg razumevanja biotransformacija koje su se odvale u ekstraktima, neophodno je izvršiti hemijsku karakterizaciju ekstrakata nakon fermentacije. U daljem radu bi trebalo ispitati mogućnost implemetacije alternativnih metoda ekstrakcije ili primene drugačijeg rastvarača, kako bi se dobili ekstrakti pogodnijih karakteristika, prevashodno u pogledu rastvorljivosti.

Ključne reči: topola, ekstrakcija, polifenoli, mikrobne transformacije, bakterije mlečne kiseline

Zahvalnica: Autori se zahvaljuju Alijansi internacionalnih naučnih organizacija (Projekat: SparkGREEN, ANSO-CR-PP 2022-08) i Ministarstvu nauke, tehnološkog razvoja i inovacija Republike Srbije (Broj ugovora: 451-03-66/2024-03/200003, 451-03-65/2024-03/200135 i 451-03-66/2024-03/200287).