ISC GREEN 2022

BOOK OF ABSTRACTS

2nd International Student GREEN Conference

2 - 3 June 2022

Osijek, Croatia

ISC GREEN 2022

KNJIGA SAŽETAKA

2. međunarodna studentska GREEN konferencija

2. - 3. 6. 2022.

Osijek, Hrvatska

KNJIGA SAŽETAKA
BOOK OF ABSTRACTS

2. međunarodna studentska GREEN konferencija
2nd International Student GREEN Conference

Izdavač
Published by

Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek *Josip Juraj Strossmayer University of Osijek,Faculty of Food Technology Osijek*

Glavna i izvršna urednica
Chief and Executive Editor

Mirna Habuda-Stanić

Uređivački odbor/*Editorial Board*

Valentina Bušić, Dajana Gašo-Sokač, Mirna Habuda-Stanić, Sanda Hasenay, Ivana Lauš, Ivana Šuvak-Pirić

Tehnička urednica/*Technical Editor*

Ivana Lauš

Dizajn logotipa/*Logo design*

Lara Stanić

Osijek, 2022.

ISBN: 978 - 953 - 7005 - 91 - 7
EAN: 9789537005917

CIP zapis dostupan je u računalnom katalogu Gradske i sveučilišne knjižnice Osijek pod brojem 150618082. *A CIP catalogue record of this publication is available from the City and University Library Osijek under 150618082.*

2nd International Students Conference
ISC GREEN 2022
2-3 June 2022 Osijek - Croatia

Pokrovitelji:	***Under the Auspice of:***
Europska zastupnica gđa Sunčana Glavak	*Member of the European Parliament Mrs. Sunčana Glavak*
Ministarstvo znanosti i obrazovanja Republike Hrvatske	*Ministry of Science and Education of the Republic of Croatia*
Ministarstvo poljoprivrede Republike Hrvatske	*Ministry of Agriculture of the Republic of Croatia*
Ministarstvo zdravstva Republike Hrvatske	*Ministry of Health of the Republic of Croatia*
Ministarstvo regionalnoga razvoja i fondova Europske unije	*Ministry of Regional Development and EU Funds of the Republic of Croatia*
Akademija tehničkih znanosti Hrvatske	*Croatian Academy of Engineering*
Hrvatska gospodarska komora	*Croatian Chamber of Economy*
Osječko-baranjska županija	*Osijek-Baranja County*
Grad Osijek	*City of Osijek*

Organizatori/*Organizers*

- Agronomski i prehrambeno-tehnološki fakultet Sveučilišta u Mostaru/*University of Mostar, Faculty of Agriculture and Food Technology*
- Agronomski fakultet Sveučilišta u Zagrebu/*University of Zagreb, Faculty of Agriculture*
- Akademija za umjetnost i kulturu u Osijeku/*Academy of Arts and Culture in Osijek*
- Centar za istraživanje okoliša i razvoj, Sveučilište Dokuz Eylül *u* Izmiru/*Center for Environmental Research and Department (CEVMER), Dokuz Eylül University*
- Europsko udruženje za higijensko inženjerstvo i dizajn/*European Hygienic Engineering & Design Group (EHEDG)*
- Ekonomski fakultet u Osijeku/*Faculty of Economics in Osijek*
- Fakultet akvatičnih znanosti Sveučilišta u Istambulu/*Faculty of Aquatic Sciences; Istanbul University*
- Fakultet agrobiotehničkih znanosti u Osijeku/*Faculty of Agrobiotechnical Sciences Osijek*
- Fakultet za dentalnu medicinu i zdravstvo Osijek/*Faculty of Dental Medicine and Health Osijek*
- Fakultet elektrotehnike, računarstva i informacijskih tehnologija Osijek/*Faculty of Electrical Engineering, Computer Science and Information Technology Osijek*
- Fakultet kemijskog inženjerstva i tehnologije Sveučilišta u Zagrebu/*University of Zagreb, Faculty of Chemical Engineering and Technology*
- Fakultet strojarstva i brodogradnje Sveučilišta u Zagrebu/*University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture*
- Fakultet za odgojne i obrazovne znanosti/*Faculty of Education in Osijek*
- Hrvatska agencija za poljoprivredu i hranu/*Croatian Agency for Agriculture and Food*
- Hrvatska komora zdravstvenih radnika – Strukovni razred za djelatnost sanitarnog inženjerstva/*Croatian Chamber of Health Workers - Vocational class for sanitary engineering*
- Fakultet zdravstvenih studija Univerziteta Sarajevo/*Faculty of Health Studies, University of Sarajevo*
- Filozofski fakultet Osijek/*Faculty of Humanities and Social Sciences Osijek*
- Geotehnički fakultet Sveučilišta u Zagrebu/*University of Zagreb, Faculty of Geotehnical Engineering*
- Grad Osijek/*City of Osijek*
- Građevinski i arhitektonski fakultet Osijek/*Faculty of Civil* Engineering *and Architecture Osijek*
- Međunarodna federacija za zdravstvenu ekologiju/*International Federation of Environmental Health (IFEH)*
- Mreža parkova rijeke Dunav/*Danube Parks*
- Javna ustanova Park prirode Kopački rit/*Kopački rit Nature Park*
- Javna ustanova za zaštitu prirode Osječko-baranjske županije/*Public institution for nature protection of Osijek-Baranja County*
- Javna ustanova Županijska razvojna agencija Osječko-baranjske županije/*Development Agency of Osijek-Baranja County*
- Katolički bogoslovni fakultet u Đakovu/*Catholic Faculty of Theology in Đakovo*
- Kemijsko-tehnološki fakultet Split/*Faculty of Chemistry and Technology, University of Split*
- Kineziološki fakultet Osijek/*Faculty of Kinesiology Osijek*
- Medicinski fakultet Osijek/*Faculty of Medicine Osijek*
- Medicinski fakultet Sveučilišta u Rijeci/*Faculty of Medicine of the University of Rijeka*
- Metalurški fakultet Sveučilišta u Zagrebu/*Faculty of Metallurgy, University of Zagreb*
- Nastavni zavod za javno zdravstvo Osječko-baranjske županije/*Teaching Institute for Public Health of Osijek-Baranja County*
- Pravni fakultet Osijek/*Faculty of Law Osijek*
- Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu/*Faculty of Food Technology and Biotechnology, University of Zagreb*
- Prehrambeno-tehnološki fakultet Osijek/*Faculty of Food Technology Osijek*
- Odjel za biologiju Sveučilišta u Osijeku/ *Josip Juraj Strossmayer University of Osijek, Department of Biology*
- Odjel za fiziku Sveučilišta u Osijeku/ *Josip Juraj Strossmayer University of Osijek, Physics Department*
- Odjel za ekologiju, agronomiju i akvakulturu Sveučilišta u Zadru/*Department of Ecology, Agronomy and Aquaculture, University of Zadar*
- Odjel za kemiju Sveučilišta u Osijeku/ *Josip Juraj Strossmayer University of Osijek, Department of Chemistry*
- Odjel za matematiku Sveučilišta u Osijeku/ *Josip Juraj Strossmayer University of Osijek, Department of Mathematics*
- Osječko-baranjska županija/*Osijek-Baranja County*
- Sveučilište u Dubrovniku/*University of Dubrovnik*
- Sveučilište Josipa Jurja Strossmayera u Osijeku/*Josip Juraj Strossmayer University of Osijek*
- Sveučilište u Slavonskom Brodu/*University in Slavonski Brod*
- Sveučilište Sjever/*University North*
- Sveučilište u Zagrebu/*University of Zagreb*
- Sveučilište u Zadru/*University of Zadar*
- Tehnološki i metalurški fakultet Skopje/*Faculty of Technology and Metallurgy, University of Skopje*
- Tehnološki fakultet Tuzla/*Faculty of Technology, University of Tuzla*
- Univerzitet u Bihaću/*University of Bihać*
- Univerzitet u Novom Sadu/*University of Novi Sad*
- Univerzitet u Tuzli/*University of Tuzla*
- Veleučilište "Lavoslav Ružička" u Vukovaru/*Polytechnic Lavoslav Ružička Vukovar*
- Veleučilište Velika Gorica/*Polytechnic Velika Gorica*
- Zdravstveno veleučilište u Zagrebu/*University of Applied Health Sciences in Zagreb*

Sadržaj / *Contents*

Knjiga sažetaka / *Book of abstracts*
Sadržaj / *Contents*

Knjiga sažetaka / *Book of abstracts*
Sadržaj / *Contents*

Knjiga sažetaka / *Book of abstracts*

Sadržaj / *Contents*

TEHNIČKE ZNANOSTI
TECHNICAL SCIENCES

Knjiga sažetaka / *Book of abstracts*
Sadržaj / *Contents*

BIOTEHNIČKE ZNANOSTI
BIOTECHNICAL SCIENCES

Plenarna predavanja / *Plenary lectures*

Stop the Pedocide of Chernozem in Ukraine - Suicide of Humanity

Ferdo Bašić[1]*, Ivo Šlaus[2]

[1] Croatian Academy of Sciences and Arts, Croatian Soil Science Society, Trg Nikole Šubića Zrinskog 11, Zagreb, Croatia
[2] Croatian Academy of Sciences and Arts, Croatian Pugwash Society, Trg Nikole Šubića Zrinskog 11, Zagreb, Croatia
*Corresponding author: ferdo.basic1@gmail.com

Abstract: If Moses had known what would happen to the soil of the Promised Land, they would have had the eleven commandments of God today, and that 11th would have read: MAN, KEEPTHE SOIL! Lowdermilk 1953… conclusion of the study of the soil of the Holy Land. We are what we eat… from the soil through the plant and man flows a continuous series of substances. We are Spirit-filled, moist soil package. F. Hole 1987 - University of Maryland - Good Soul and poet among soil scientists! The sedentary way of life and culture (from the Latin culter – part of the plow) aroseabout 8,000 BC from the dark (seed of Good sprouting in the darkness of Hades) deposits of the Nile (Arabic khem alchemy, chemistry), Euphrates, Tigris, Indus, Ganges and Yangtze ... After the "childhood" and "youth" of Homo sapiens in almost arcadian conditions along rivers full of fish,and forests full of wildlife after filling the areas along river valleys, the conditions for "maturation" and "mature age" our great-ancestor finds ondark soils, formed on aeolian (wind) deposits - loess and fine sand - Chernozem (Chernozjom, مزونري , chernozem, Phaeozem, Schwarzerde, Mollisol). The consummate Gift of Nature / Creator, humus-rich, dark (like Hades of Queen Persephone), the steppe soil chernozem becomes permanent stronghold of the survival and progress of Homo sapiens. It should be declared a transgenerational, ever after heritage of Humanity under the supervision of FAO OUN! One of the authors of this text (F. Bašić), childhood and youth lives on Chernozem in Ilok / Vukovar, 51st year of activity in science and education (life sciences), as a witness of aggression on Croatia deeply etched in the memory of life the manuscript of the destruction of Croatian chernozem, and recognizes it in the manuscript that today writes the history of Ukraine and draws a geopolitical atlas of the world. Personally (F. Bašić), I am a friend of the Russian people, music, art, poetry, a follower of the genius Russian founder of soil science V.V. Dokuchaev, however, life experience in soil destroying (defensive trenches and embankments, bombing, blasting, contamination by heavy metals, PAH, Cd, Pb, radionucleides) call for an energetic voice against the current war in Ukraine. I point out the consequences of the pedocide of the global granary of Chernozem soil type, which jjeopardizes global food security.
In his monograph Ruskii Chernozem, based on the results of research on that soil of Ukraine, V.V.Dokuchaev; followed by KD Glinka and Curtis, F. Marbut (who learned Russian at a late age to understand Dokuchaev's original thoughts), Schatz (Russian descent), H. Jenny, Mitscherlich, Kubienand many Russians, such as Kovda, Kononova, Lebedeva and numerous other famous Russians, emphasize the key role of chernozem. Without chernozem yields, the current population

in its current numbers cannot achieve global food security and survival of the civilization as we know it! Taking into account the current war events in Ukraine, we expect the economy tomorrow to face a green economy - branches of the economy based on photosynthesis, which means agriculture with proper food processing, forestry with a suitable wood processing industry. Or: social, economic, environmental and climate (CO_2 neutral) sustainable development, based on the "fruits of photosynthesis" with an abundant source of oxygen from the process of photosynthesis! Based on the reasoned arguments, in the name of humanity, we take the liberty of warning: STOP THE PEDOCIDE OF CHERNOZEM IN UKRAINE !!! REMEMBER YOUR HUMANITY AND FORGET EVERYTHING ELSE!

Keywords: soil, chernozem, Ukraine, war, humanity, global food security

Waste Management and Climate Change

Susana Paixao*

Polytechnic of Coimbra, Coimbra Health School, Lagar dos Cortiços S. Martinho do Bispo, Coimbra, Portugal
*Corresponding author: supaixao@estescoimbra.pt

Abstract: Since the beginning, humankind has been generating waste. With the progress of civilization, the waste generated became a more complex type. There's waste everywhere, in our lakes, in our cities, and even in more recondite places like Everest, and the consequences for our biodiversity are disastrous.
Climate change is already having a major impact on people's lives and health-threatening the base of good health like clean air, clean water, and nutritious food, among others. Consequences of climate change, like extreme weather events, happen in the smallest and most remote villages, or the largest and most sophisticated cities.
There is a very strong relationship between climate change and waste production. This presentation intends to reflect on this relationship as well as to emphasize land policies in order to combat climate change like turning waste into a resource, encouraging innovation, and inspiring change towards a more circular economy.
In the end, it is important to understand that borders are virtual for environmental health issues. What happens in one part of the world will certainly have disastrous consequences for the entire planet, and how important it is to ACT NOW.

Keywords: environmental health; waste management; climate change

Usmena priopćenja / *Oral lectures*

Prirodne znanosti /
Natural sciences

E – faktor (engl. *environmental factor*) kg otpada / kg produkta

Ivana Bivolčević[1], Ana Horvat[1], Dajana Gašo–Sokač[2*]

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za kemiju, Ulica cara Hadrijana 8/A, Osijek, Hrvatska
[2*] Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, Osijek, Hrvatska
*Dopisni autor: dajana.gaso@ptfos.hr

Sažetak: Suočavanje s ekološkim problemima dovodi do buđenja svijesti u kemijskoj, farmaceutskoj te srodnim industrijama. Klasične metode sinteze imaju široku primjenu, no tijekom procesa dolazi do stvaranja velikih količina otpada. Zbog toga dolazi do sve većeg pritiska javnosti i struke da se smanji ili eliminira količina otpada. Sve osim željenog proizvoda tijekom proizvodnog procesa smatra se otpadom i opisuje se E-faktorom. E-faktor definira se kao kilogrami otpadnih produkata po kilogramu ciljanog produkta. Veći E-faktor znači više otpada što znači i veći otisak na okoliš. Međutim utjecaj otpada na okoliš ne određuje samo količina već i priroda otpada. Shodno tome uvodi se pojam kvocijent zaštite okoliša (EQ) koji se dobiva množenjem E faktora s proizvoljno dodijeljenim *„unfriendliness"* kvocijentom Q. Tradicionalni E-faktor predstavlja vrijednosti između jednostavnog (sE-faktor - isključuje vodu i otapala) i potpunog (cE-faktor – uzima u obzir sve procesne materijale). Najveće vrijednosti ima farmaceutska industrija zbog povećanja kompleksnosti molekula čija sinteza zahtjeva više koraka. E-faktor nastoji se smanjiti principima zelene kemije koja se definirana kao program za osmišljavanje, razvoj i primjenu kemijskih proizvoda i procesa koji reduciraju ili eliminiraju uporabu ili proizvodnju tvari opasnih po ljudsko zdravlje i okoliš.

Ključne riječi: zelena kemija, E- faktor, otpad, okoliš, zdravlje

E-factor (*environmental factor*) kg of waste / kg of product

Ivana Bivolčević[1], Ana Horvat[1], Dajana Gašo–Sokač[2*]

[1] Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica cara Hadrijana 8/A, Osijek, Croatia
[2*] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: dajana.gaso@ptfos.hr

Abstract: Dealing with environmental problems leads to awareness raising in the chemical, pharmaceutical and related industries. Classical methods of synthesis are widely used, but large amounts of waste are generated during the process. As a result, there is increasing pressure from the public and the profession to reduce or eliminate the amount of waste. Everything except the desired product during the production process is considered waste and it is described by the E-factor. The E-factor is defined as a kilogram of waste per kilogram of obtained product, but the impact of waste on the environment is not determined by the quantity itself but also by the nature of the waste. A higher E-factor means more waste and it also means a greater footprint on the environment. Accordingly, the term environmental quotient (EQ) is introduced, which is obtained by multiplying the E factor by an arbitrarily assigned "unfriendliness" quotient Q. Traditional E-factor represents values between simple (sE-factor - excludes water and solvents) and complete (cE factor - considers all process materials). The pharmaceutical industry has the greatest value due to the increasing complexity of molecules whose synthesis requires several steps. The E-factor seeks to reduce the principles of green chemistry, which is defined as a program for the design, development, and application of chemical products and processes that reduce or eliminate the use or production of substances dangerous to human health and the environment.

Keywords: green chemistry, E-factor, waste, environment, health

Carbon oxide gas sensing potential of $BaTiO_3$ nanostructures

Ivan Kovač*, Igor Lukačević, Maja Varga Pajtler, Matko Mužević

Josip Juraj Strossmayer University in Osijek, Department of Physics, Trg Ljudevita Gaja 6, Osijek, Croatia
*Corresponding author: ikovac@fizika.unios.hr

Abstract: Because carbon dioxide gases are abundant in both our environment and industry, there is a constant hunt for inexpensive and effective gas sensors. We propose detecting optical signals from ultrathin $BaTiO_3$ nanostructures as the basis for carbon oxide sensing. We simulate the sensitivity of electrical and optical properties of ultrathin $BaTiO_3$ nanostructures to distinct adsorption sites on the (001)-$BaTiO_3$ surface using density functional theory. Significant changes in optical activity have been recorded, including absorption, reflection, and EELS spectra. The optical signals follow a monotonous trend with respect to molecule concentration, according to a supercell size investigation. Charge transfer between the (001)-$BaTiO_3$ surface and the adsorbed gas molecules explains the variations. Our comprehension of the sensing mechanism increases as we gain a better understanding of the physical and chemical basis of the events at the nanoscale. Simultaneously, the findings may pave the way for new sensor designs.

Keywords: sensors, gas, nanostructures, DFT

Problem optimizacije prehrane

Branka Miholek, Magdalena Nedić, Katarina Kopić, Ivana Kuzmanović Ivičić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za matematiku, Trg Ljudevita Gaja 6, Osijek, Hrvatska
*Dopisni autor: ikuzmano@mathos.hr

Sažetak: Optimizacijski problemi u matematici problemi su u kojima se odgovarajućim matematičkim metodama pokušava postići najbolji ishod u nekom modelu. Problem odabira prehrambenih namirnica i njihovih količina koje će zadovoljiti nutritivne potrebe, a pri tome će biti primjerice cijenovno najprihvatljivije, složen je optimizacijski problem koji je osobito primjenjiv za prehranu većih skupina ljudi, kao što je primjerice vojska. Upravo je prehrana vojske popularizirala ovaj problem tijekom II. svjetskog rata. U današnje vrijeme aktualan je i problem optimalne prehrane s ciljem unosa manje kalorija ili smanjenog unosa soli i dr. Svi navedeni problemi u prehrani mogu se matematički zapisati kao problem optimizacije linearne funkcije uz linarne uvjete. Koristeći matematički model problema prehrane, konstruiran je sustav koji omogućava izradu personaliziranog optimalnog plana prehrane koristeći linearno programiranje. Personalizirani matematički model formira se obzirom na parametre koje zadaje korisnik (primjerice, cilj koji želi ostvariti planom prehrane, namirnice koje preferira u svojoj prehrani, cijena obroka, minimalne ili maksimalne količine pojedinih makronutrijenata itd.). Nakon konstrukcije personaliziranog modela u obliku problema linearnog programiranja, pristupa se njegovom rješavanju pomoću Simpleks metode. Dobiveno rješenje interpretira se u terminima ulaznih parametara te korisnik dobiva optimalni plan prehrane u obliku namirnica i količina koje treba konzumirati.

Ključne riječi: optimizacija prehrane, linearna optimizacija, linearno programiranje

Diet optimization problem

Branka Miholek, Magdalena Nedić, Katarina Kopić, Ivana Kuzmanović Ivičić*

Josip Juraj Strossmayer University of in Osijek, Department of Mathematics, Trg Ljudevita Gaja 6, Osijek, Croatia
***Corresponding author: ikuzmano@mathos.hr**

Abstract: In mathematics, optimization problems are problems in which the goal is to find the best solution to the model using appropriate mathematical methods. The problem of picking groceries and their quantities, which will meet the nutritional needs, while also being affordable, is a complex optimization problem that is particularly applicable for feeding larger groups of people, such as the military. That's what popularized this problem during World War II. Nowadays, the problem of optimal nutrition, with the goal of consuming fewer calories or reducing salt intake, etc. is also relevant. All of the listed diet problems can be mathematically written as a problem of linear function optimization under linear conditions. Using the mathematical model of the diet problem, a system is constructed which allows the creation of a personalized optimal plan using linear programming. A personalized mathematical model is formed according to the parameters set by the user (e.g. the goal he wants to achieve, groceries he prefers, meal prices, macronutrients, etc.). After that Simplex method is used for solving the problem. The obtained solution is interpreted in the terms of input parameters. Users get their optimal diet plan in the form of amounts of the groceries they picked.

Keywords: diet optimization, linear optimization, linear programming

Measuring radon activity concentration in the well water samples in the part of Valpovo municipality

Mirjam Pavošević, Marina Poje Sovilj*

Josip Juraj Strossmayer University in Osijek, Department of Physics, Trg Ljudevita Gaja 6, Osijek, Croatia
*Corresponding author: marina.poje@fizika.unios.hr

Abstract: Radon is a naturally occurring radioactive noble gas that can accumulate in closed facilities (such as houses, businesses, and public spaces, schools, and kindergartens). Radon is invisible, odorless and tasteless so measurement is the only way to determine its activity concentration in the sample. Inhalation of radon increases the risk of lung cancer, and radon is a leading cause of lung cancer in non-smokers (while in smokers it is the second leading cause after smoking, and with smoking, it has a synergistic effect). Radon enters closed facilities primarily from the ground beneath the facility, and to a lesser extent from building materials and the water supply network. Radon dissolves from the surrounding soil and accumulates in water - especially in wells (water that is not technologically treated). When such water is used for showering, washing dishes, etc., radon transforms from the liquid to the gaseous phase into the air (as when CO_2 exits from carbonated beverages when opened) where we then inhale it again. Part of the radon remains dissolved in water, which contributes to the ingestion dose for the households in the part of the municipality of Valpovo, and this issue will be the subject of this paper. The concentration of radon activities in gathered samples of well water is determined by the liquid scintillation method.

Keywords: radon activity concentration, water, wells, ingestion dose

Green synthesis of quinazolinone derivates

Fran Prašnikar[1], Mario Komar[2], Maja Molnar[2]*

[1] Josip Juraj Strossmayer University of Osijek, Department of Biology, CaraHadrijana 8/A, Osijek, Croatia
[2] Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: maja.molnar@ptfos.hr

Abstract: The synthesis of different quinazolinone derivatives was performed using green chemistry solvents and/or methods, deep eutectic solvents, microwave-assisted, and ultrasound-assisted synthesis, namely. Preparation of deep eutectic solvents for the synthesis of derivatives was carried out by mixing choline chloride and various amides, carboxylic acids, carbohydrates, and alcohols in a certain molar ratio at 80 °C, to form a clear liquid that will serve as a solvent. Optimization on the selected model reaction considering solvent type, temperature, and reaction time was performed. The starting compounds for the preparation of quinazolinone derivatives were anthranilic acid derivatives. The best conditions were found to be with the microwave-assisted synthesis in ethanol with a reaction time of 2 hours.

Keywords: Green chemistry; Quinazolinone derivatives; Deep eutectic solvents

Acknowledgment: This work has been supported in part by the Croatian Science Foundation under the project "Green Technologies in Synthesis of Heterocyclic Compounds" (UIP-2017-05-6593).

Voćni sokovi kao "zeleni" biokatalizatori u organskoj sintezi

Monika Rubil[1], Dajana Gašo-Sokač[2]*

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za kemiju, Ulica Cara Hadrijana 8/A, Osijek, Hrvatska
[2] Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, Osijek, Hrvatska
*Dopisni autor: dajana.gaso@ptfos.hr

Sažetak: Uloga prirodnog voćnog soka u organskoj sintezi privukla je zanimanje kemičara, posebno u okviru zelene kemije. Posljednih godina, istraživanja su usmjerena na pronalaženje ekološki prihvatljivijih katalizatora kao zamjenu za toksične i skupe do sada korištene katalizatore. Velika pozornost se posvećuje kemijskim reakcijama u kojima se kulture biljnih stanica te dijelovi biljaka koriste kao biokatalizatori. Primjer pronalaska alternative je uporaba voćnog soka kao homogenog katalizatora za različite transformacije jednostavnih i složenih molekula (stvaranje C-C veze, C-N te cijepanje C-O i C-N veza). Mnoge su prednosti korištenja ovakve vrste biokatalizatora. Neka od njih su ta što je voće jeftino i lako dostupno, a sok se može lako ekstrahirati i ima ekološki benigni karakter. Primjena voćnog soka kao prirodnog biokatalizatora osigurava visoku selektivnost, u blagim reakcijskim uvjetima u ekološki prihvatljivoj sintezi. Ispituje se uporaba različitih sokova poput limunovog, ananasovog i kokosovog. Limunov sok je pronašao primjenu u laboratorijskoj sintezi triazola te Knoevenagelovoj reakciji kondenzacije. Sok od ananasa je ispitivan za pripremu dihidropirimidinona, a kokosov sok u hidrolizi estera, amida i anilida. Iako dosadašnja istraživanja primjene voćnih sokova i saznanja nisu pronašla svoju primjenu u industrijskoj sintezi prirodnih proizvoda ili kompleksih sintetskih molekula vjeruje se da će i u budućnosti moguća primjena voćnih sokova u organskoj sintezi i transformaciji privlačiti zanimanje brojnih istraživača.

Ključne riječi: voćni sok; biokatalizator; zelena kemija; organska sinteza

Fruit juice as a "green" biocatalyst in organic synthesis

Monika Rubil[1], Dajana Gašo-Sokač[2]*

[1] Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
[2*] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: dajana.gaso@ptfos.hr

Abstract: The role of natural fruit juice in organic synthesis has attracted the interest of chemists, especially in the field of green chemistry. In recent years, research has focused on finding more environmentally friendly catalysts as a replacement for toxic and expensive catalysts used so far. Much attention is paid to chemical reactions in which plant cell cultures and parts of plants are used as biocatalysts. An example of finding an alternative is the use of fruit juice as a homogeneous catalyst for various transformations of simple and complex molecules (creation of C-C bonds, C-N and splitting of C-O and C-N bonds). There are many advantages to using this type of biocatalyst. Some of them are that fruit is cheap and easily available, and the juice can be easily extracted and has an ecologically benign character. The use of fruit juice as a natural biocatalyst ensures high selectivity, in mild reaction conditions in an environmentally friendly synthesis. The use of different juices such as lemon, pineapple and coconut is being tested. Lemon juice has found application in the laboratory synthesis of triazole and the Knoevenagel condensation reaction. Pineapple juice was tested for the preparation of dihydropyrimidinone, and coconut juice in the hydrolysis of esters, amides and anilides. Although previous research on the use of fruit juices and findings have not found its application in the industrial synthesis of natural products or complex synthetic molecules, it is believed that in the future the possible use of fruit juices in organic synthesis and transformation will attract many researchers.

Keywords: fruit juice; biocatalyst; green chemistry; organic synthesis

Green synthesis of iron nanoparticles using plant extracts

Martina Sušjenka[1], Martina Jakovljević Kovač[2], Mislav Mustapić[3], Maja Molnar[2]*

[1] Josip Juraj Strossmayer University of Osijek, Department of Biology, Cara Hadrijana 8/A, Osijek, Croatia
[2] Faculty of Food Technology Osijek, Josip Juraj Strossmayer University of Osijek, Franje Kuhača 18, Osijek, Croatia
[3] Department of Physics, Josip Juraj Strossmayer University of Osijek, Trg Ljudevita Gaja 6 Osijek, Croatia
*Corresponding author: mmolnar@ptfos.hr

Abstract: Recently, nanoparticles have aroused great interest among researchers around the world due to their specific characteristics that allow them to be used in various fields with an emphasis on medicine and pharmacy where they act as catalysts or biosensors. Common methods of nanoparticle synthesis involve the use of long-term chemical and physical methods involving complicated processes, so the method of synthesis using green solvents and plant extracts appears to be more environmentally friendly and safer to use. For the synthesis of nanoparticles from different iron salts, plant extracts of five different plants prepared using GRAS (generally recognized as safe) solvents will be used to examine their effect on the possibility of nanoparticle synthesis. The prepared extracts were tested for antiradical activity (DPPH method) and total phenol content. The obtained nanoparticles were characterized by the application of appropriate techniques. According to the obtained results, the influence of different synthesis methods was shown, with emphasis on the influence of different solvents, plants, and compositions of extracts.

Keywords: nanoparticle synthesis, iron nanoparticle, extraction, plants

Synthesis and application of new 2-methyl-1,3-dioctadecyl-1*H*-benzo[d]imidazol-3-ium cationic surfactant

Dora Tot[1], Nada Glumac[2], Nikola Sakač[3], Dean Marković[4], Marija Jozanović[1]*

[1] Josip Juraj Strossmayer University in Osijek, Department of Chemistry, Cara Hadrijana 8/A, Osijek, Croatia
[2] Medimurske Vode d.o.o., Ul. Matice hrvatske 10, Čakovec, Croatia
[3] University of Zagreb, Faculty of Geotechnical Engineering, Hallerova aleja 7, Varaždin, Croatia
[4] University of Rijeka, Department of Biotechnology, Ul. Radmile Matejčić, Rijeka, Croatia
*Corresponding author: mjozanovic@kemija.unios.hr

Abstract: Cationic surfactants are a part of the surface active compounds. They have a positively charged part (head) of a molecule while the rest of the molecule (tail) usually consists of one or more saturated or unsaturated hydrocarbon chains. Their primary role is to lower the surface tension of water. Cationic surfactants are often active ingredients in commercial products for washing, disinfection and preservation in products for professional, industrial and everyday use. Since cationic surfactants often have antimicrobial properties, new compounds could be used for novel formulations of anti SARS-CoV-2 disinfectants. In this paper we presented a synthesis of 2-methyl-1,3-dioctadecyl-1H-benzo[d]imidazol-3-ium cationic surfactant. The compound was characterized by NMR, IR, LC-MS, and elemental analysis. The compound was used for the fabrication of a surfactant sensor and was tested on antimicrobial properties for selected microorganisms.

Keywords: antimicrobial agent, benzimidazole, cationic surfactant, surfactant

Biomedicina i zdravstvo /
Biomedicine and health

Utjecaj *Legionella* na zdravlje ljudi

Jelena Baković, Iva Bungić, Patrik Josipović, Ivana Galić*, Ana Mojsović Ćuić

Zdravstveno veleučilište, Mlinarska 38, Zagreb, Hrvatska
***Dopisni autor: igalic@stampar.hr**

Sažetak: Bakterije roda *Legionella* su gram negativni aerobni patogeni. Biologija im je vezana za vodu, a opasnost za zdravlje ljudi nastaje kad dospiju u sustav za ljudsku potrošnju zbog ulijevanja površinskih voda, neispravnog spoja ili oštećenja vodovodnih cijevi. Do infekcije dolazi prilikom udisanja aerosola (kapljice veličine jednog do tri mikrometra) s bakterijom, koji je dovoljno sitan da prodre do kapilara u plućima. U radu je prikazano nekoliko načina uzorkovanja te pravilan transporti pohrana uzoraka vode. Navedene kultivacijske metode za ispitivanje Legionella uključuju normiranu metodu HRN ISO 11731:2017 te metodu uzgoja na mikrobiološkoj podlozi Legiolert. Ovemetode primjenjive su za ispitivanje raznih vrsta voda (vode s niskom i visokom koncentracijom pozadinske flore te niskom i visokom koncentracijom legionela). Posebno je istražen utjecaj ovih štapićastih bakterija na zdravlje ljudi, tj. na koji način se širi zaraza, kako se razmnožavaju, koje bolesti uzrokuju te koje mjere poduzeti kako bi se spriječilo njihovo širenje. Istraživanja su pokazalada se *Legionella pneumophila* nalazi u 85% ispitivanih uzoraka te da porast broja Legionella u uzorcima ovisi o temperaturi vode. Kako bi se spriječilo njezino razmnožavanje i kontrolirao rast potrebno se držati „Vodiča za prevenciju Legioneloza“ koje je objavila Svjetska zdravstvena organizacija.

Ključne riječi: sustav za ljudsku potrošnju; aerosol; mikrobiološka analiza uzorka; *Legionella pneumophila*

The impact of *Legionella* on human health

Jelena Baković, Iva Bungić, Patrik Josipović, Ivana Galić*, Ana Mojsović Ćuić

University of Applied Health Sciences, Mlinarska 38, Zagreb, Croatia
*Corresponding author: igalic@stampar.hr

Abstract: *Legionella bacteria* is a gram-negative aerobic pathogen. Their biology is linked to water, and the danger to human health arises when they enter the system for human consumption due to the inflow of surface water, a faulty connection, or damage to water pipes. Infection occurs when inhaling aerosols (droplets of one to three micrometers in size) with bacteria, which are small enough to penetrate the capillaries in the lungs. The paper presents several methods of sampling and proper transport and storage of water samples. The listed cultivation methods for testing *Legionella* include the standardized HRN ISO 11731:2017 method and the Legiolert microbiological culture method. These methods are applicable for testing various types of water (water with low and high concentrations of background flora and low and high concentrations of *Legionella*). The influence of these rod-shaped bacteria on human health was especially investigated, i.e. how the infection spreads, how they reproduce, what diseases they cause, and what measures to take to prevent their spread. Research has shown that Legionella pneumophila is found in 85% of the tested samples and that the increase in the number of Legionella in the samples depends on the water temperature. In order to prevent its reproduction and control its growth, it is necessary to adhere to the "Guidelines for the Prevention of Legionellosis" published by the World Health Organization.

Keywords: system for human consumption; aerosol; microbiological analysis of the sample; Legionella pneumophila

Usporedba mikrobioloških i fizikalno-kemijskih parametara kvalitete bazenske vode: bazeni punjeni slatkom vodom vs morskom vodom

Filip Ćorić[1], Arijana Cenov[1,2], Dražen Lušić[1,3], Marin Glad[1,2], Darija Vukić Lušić[1,2]*

[1] Zdravstveno-ekološki odjel, Nastavni zavod za javno zdravstvo Primorsko-goranske županije, Krešimirova 52 a, Rijeka, Hrvatska
[2] Medicinski fakultet Sveučilišta u Rijeci, Katedra za zdravstvenu ekologiju, Braće Branchetta 20, Rijeka, Hrvatska
[3] Fakultet zdravstvenih studija Sveučilišta u Rijeci, Katedra za temeljne medicinske znanosti, Viktora Cara Emina 5, Rijeka, Hrvatska
*Dopisni autor: darija.vukic-lusic@zzjzpgz.hr

Sažetak: U današnje vrijeme bazeni se koriste u različite namjene: rekreaciju i relaksaciju, sportske aktivnosti ili terapijske svrhe. Međutim, uz brojne blagodati koje pružaju, u bazenima se mogu pojaviti i različite vrste rizika. Boravak u bazenima tako je povezan s tjelesnim ozljedama, širenjem bolesti ili negativnim utjecajem različitih kontaminanata koji se mogu naći u vodi. Cilj ovoga istraživanja bio je ispitati i usporediti podatke o pokazateljima kvalitete bazenske vode kod bazena punjenih slatkom i morskom vodom. Temeljem rezultata mikrobioloških i fizikalno-kemijsko pokazatelja analizirano je na koji način osobine slatke i morske vode utječu na navedene pokazatelje. U razdoblju od 2016. do 2020. godine ukupno je ispitano 4943 uzoraka bazenske vode (3281 slatkei 1662 morske), uzetih iz bazena smještenih na području Primorsko-goranske županije. Statistička analiza ukazala je na značajne razlike u vrijednostima pokazatelja između bazena punjenih slatkomi morskom vodom. Morska voda imala je u usporedbi sa slatkom vodom niže vrijednosti temperature, koncentraciju rezidualnog klora te broj *Pseudomonas aeruginosa*, a veće vrijednosti elektrovodljivosti i trihalometana. Dobiveni rezultati ukazuju da morska voda predstavlja nepovoljniji medij za razvoj *P. aeruginosa*, međutim kao nusprodukat dezinfekcije u njoj nastaju veće koncentracije trihalometana, koji imaju nepovoljni učinak na zdravlje ljudi.

Ključne riječi: bazen, slatka voda, morska voda, pokazatelji kakvoće bazenske vode, *Pseudomonas aeruginosa*, trihalometani

Comparison of microbiological and physicochemical parameters of swimming pool water quality: pools filled with freshwater *vs* seawater

Filip Ćorić[1], Arijana Cenov[1,2], Dražen Lušić[1,3], Marin Glad[1,2], Darija Vukić Lušić[1,2]*

[1] University of Rijeka, Faculty of Medicine, Department of Environmental Health, Braće Branchetta 20, Rijeka, Croatia
[2] Teaching Institute of Public Health of Primorje-Gorski Kotar County, Department of Environmental Health, Krešimirova 52a, Rijeka, Croatia
[3] University of Rijeka, Faculty of Health Studies, Department of Basic Medical Sciences, Viktora Cara Emina 5, Rijeka, Croatia
*Corresponding author: darija.vukic-lusic@zzjzpgz.hr

Abstracts: Nowadays, swimming pools are used for various purposes: recreation and relaxation, sports activities, or therapeutic purposes. However, besides the many benefits they offer, swimming pools can also present different types of risks. Thus, spending time in swimming pools is associated with bodily injuries, the spread of diseases, or the negative effects of various contaminants that may be present in the water. The aim of this study was to examine and compare data on indicators of pool water quality in pools filled with fresh and seawater. Based on the results of microbiological and physico-chemical parameters, it was analyzed how the properties of fresh and seawater affect these parameters. In the period from 2016 to 2020, a total of 4943 pool water samples (3281 freshwater and 1662 seawater samples) from pools in Primorje-Gorski Kotar County were analyzed. Statistical analysis showed significant differences in the values of indicators between freshwater and seawater pools. Compared to freshwater, seawater had lower values for temperature, residual chlorine concentration, and number of *Pseudomonas aeruginosa*, and higher values for electrical conductivity and trihalomethanes. The results obtained indicate that seawater is an unfavorable medium for the development of P. aeruginosa. However, as a by-product of disinfection, higher concentrations of trihalomethanes are formed in it, which have a negative impact on human health.

Keywords: swimming pool, freshwater, seawater, swimming pool water quality parameters, *Pseudomonas aeruginosa*, trihalomethanes

Potential environmental sources of *Legionella* infections

Iva Kristić, Ivana Gobin*

University of Rijeka, Faculty of Medicine, Braće Branchetta 20/1, 51000 Rijeka, Croatia
*Corresponding author: ivana.gobin@uniri.hr

Abstract: Bacteria from the *Legionellaceae* family are one of the most common causative agents of atypical pneumonia. *L. pneumophila*, together with *L. longbeachae*, is the cause of 90% of infections with bacteria of the genus *Legionella*. Bacteria from these families are ubiquitous and can be found in anthropogenic and biogenic systems. They are isolated from various environmental sources such as rivers, sea, and soil. Legionellosis is a significant public health problem, and we are actively working to combat it. Despite all the efforts legionellosis, which includes legionnaires 'disease and Pontiac fever, is often undiagnosed, and when a diagnosis is set, the source of the epidemic often remains unknown. For many years, we have known classic sources of infections such as cooling towers, foam pools, blind pipe ends, humidifiers, and others. A particular problem is a biofilm that forms in such an environment. Legionella parasitizes in amoebae, which makes them resistant to disinfection. There are many preventive measures that are implemented to suppress the reproduction of *Legionella* and prevent the disease of legionellosis. This paper collects data from research related to the presence of *Legionella* in compost and soil mixtures, rainwater, thermal springs, sea, and wastewater.

Keywords: *Legionella***,** environment, biofilm

Oncogenic potential and pathways of the most common air pollutants

Matea Lukić[1], Valentina Kurevija[2], Ivan Štefanac[3,4], Tomislav Kurevija[1,3]*

[1] Josip Juraj Strossmayer University of Osijek, Faculty of Medicine, Josipa Huttlera 4, Osijek, Croatia
[2] University Hospital Center Osijek, Josipa Huttlera 4, Osijek, Croatia
[3] Health Center of Osijek-Baranja County, Park kralja Petra Krešimira IV 6, Osijek, Croatia
[4] Josip Juraj Strossmayer University of Osijek, Faculty of Dental Medicine and Health, Crkvena 21, Osijek, Croatia
*Corresponding author: tkurevija6@gmail.com

Abstract: Air pollution is one of the largest global environmental and public health problems. In addition to natural causes of pollution such as wildfires and volcanoes, there is an increasing number of artificially produced particles and gases that cause pollution. It is estimated that over 4 million people die every year from diseases associated with air pollution. Extreme examples in patients who have been exposed to excessive amounts of air pollutants for a long time, such as some occupational diseases, suggest cautious monitoring and researching air quality. Even small amounts of pollutants present in the air have an impact on health. According to the global monitoring of air quality, the vast majority of the world population iinhalesair whose pollution level exceeds WHO guideline limits. It is not only that air pollution causes and exacerbates lung diseases but has a negative impacton many other organic systems and health conditions. The most severe among them are oncologicaldiseases. The most common air pollutants in the world are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2,5}$), and ground ozone (O_3). The aim of this study is to comprehend the current relevant knowledge about their oncogenic potential and their pathways inoncogenesis.

Keywords: air pollution, cancer, oncogenesis

In silico analysis of endocrine-disrupting potential of Bisphenol A analogues

Jovana Radulović, Maja Milanović*

University of Novi Sad, Faculty of Medicine, Department of Pharmacy, Novi Sad, Serbia
*Corresponding author: maja.milanovic@mf.uns.ac.rs

Abstract: Bisphenol A (BPA) as an endocrine disruptor is associated with adverse health effects [1,2]. Therefore, there is an urgent need for its replacement in everyday products. The aim of this *in silico* analysis was to evaluate the endocrine-disrupting potential of BPA analogues. Structural descriptors and pharmacokinetic properties of 24 compounds were calculated using *SwissADME* program. The biological activity and binding affinity of structural analogues for nuclear receptors were predicted by *ERpred*, *Molinspiration* and *Endocrine Disruptome* programs. In this study, 19 analogues showed high permeability through intestinal membranes while 15 compounds could permeate through the blood-brain barrier. *In silico* analysis revealed that lipophilicity was a key parameter for good oral bioavailability of analyzed compounds. All analogues expressed the high affinity towards estrogen α and β receptors. Additionally, 12 compounds were identified as androgen receptor antagonist. Bisphenol Z, bisphenol C, BisOPP-A, 4,4'-bis (N-carbamoyl-4-methylbenzenesulfomide)diphenylmethane and bisphenol A bis(bisphenyl phosphate) were identified as the most potent analogues due to their high binding affinity to more than 5 types of nuclear receptors.
Based on the obtained results, BPA structural analogues could not be considered as a safe alternative to BPA. *In vitro* and *in vivo studies* are necessary for the investigation of adverse effects of BPA analogues.

Keywords: bisphenol A; *in silico* analysis; endocrine disruptor; nuclear receptors; QSAR

Tehničke znanosti /
Technical sciences

Komparativna fizikalno-kemijska analiza tla sliva rijeke Bosne i brdskog područja

Jasmina Bajrić, Dženana Hasanić, Melisa Ahmetović*, Husejin Keran*

Univerzitet u Tuzli, Tehnološki fakultet Tuzla, Urfeta Vejzagića 8, Tuzla, Bosna i Hercegovina
*Dopisni autor: jasmina.bajricc@gmail.com, husejinkeran123@gmail.com

Sažetak: Tlo je jedan od najvažnijih dijelova prirodnog okoliša i uglavnom neobnovljivi prirodni resurs. Nositelj je brojnih funkcija poput proizvodnje hrane, klimatsko-ekološko-biološke regulacijei filtracije vode zbog čega je potrebno zaštititi i očuvati njegove prirodne funkcije održivim korištenjem. Sastoji se od organskih tvari, vode, zraka i minerala, a udio tih komponenti utječe na fizikalna svojstva tla. Kemijska svojstva tla definirana su njegovim kemijskim sastavom, pH vrijednosti, sorpcijom i salinitetom, zbog čega ih je zajedno s fizikalnim svojstvima nužno poznavati. Blizina rijeke na tlo može imati i pozitivan i negativan utjecaj, pa tako rijeka plaveći može obogatiti tlo organskim tvarima, ali može odnositi tlo ili uzrokovati eroziju i slično.
Cilj ovog rada je analiza fizikalno-kemijskih parametara tla u blizini rijeke Bosne te usporedba istih na brdskom području. U tu svrhu uzeti su uzorci zemljišta na dubini od 30 cm, a nakon pravilnog uzorkovanja, obrade i pripreme uzorka tla, provedena je analiza osnovnih fizikalno-kemijskih parametara. Uzetim uzorcima tla određena je struktura, tekstura, boja i poroznost, pH vrijednost u destiliranoj vodi i otopini KCl, električna provodljivost (EC), stupanj zaslanjenosti tla (TDS), sadržaj organske tvari te sadržaj fosfora.
Analiza uzetih uzoraka pokazala je da se radi o pjeskovitom tlu za uzorak uzet u blizini rijeke Bosne, odnosno glinovitom tlu u brdskom području. pH tla uzorkovan u blizini rijeke Bosne imao je kiseli pH, dok je uzorak uzet u brdskom području bio neutralan. Analiza je također pokazala prisutnost malog udjela organske tvari i fosfora. Na osnovu analiziranih parametara može se zaključiti da rijeke Bosna ima značajan utjecaj na sastav, strukturu te fizikalno-kemijske karakteristike tla, odnosno da na sastav tla utječu ekološki čimbenici poput hidrologije, reljefa, topografije i sl.

Ključne riječi: tlo, fizikalno-kemijska analiza, brdsko područje, sliv rijeke

Comparative physico-chemical analysis of the soil of the Bosna river basin and mountainous area

Jasmina Bajrić, Dženana Hasanić, Melisa Ahmetović*, Husejin Keran*

University in Tuzla, Faculty of Technology Tuzla, Urfeta Vejzagića 8, Tuzla, Bosnia and Herzegovina
*Corresponding author: jasmina.bajricc@gmail.com, husejinkeran123@gmail.com

Abstract: Soil is one of the most important parts of the natural environment and a mostly non-renewable natural resource. It is the holder of numerous functions such as food production, climate-ecological-biological regulation, water filtration, etc. which is why it is necessary to protect and preserve its natural functions through sustainable use. It consists of organic matter, water, air and minerals, and the proportion of these components affects the physical properties of the soil. The chemical properties of soil are defined by its chemical composition, pH value, sorption and salinity, which is why it is necessary to know them together with the physical properties. The proximity of rivers to the soil contributes to a positive or negative impact, which manifests itself in the form of uptake of organic matter, ie the decay and erosion of the soil.

Therefore, the aim of this work is to analyze the physicochemical parameters of the soil near the river Bosna and compare them to those in the mountainous area. For this purpose, soil samples were taken at a depth of 30 cm, and after proper sampling, processing and preparation of the soil sample, an analysis of basic physical and chemical parameters was performed. The samples taken were used to determine the structure, texture, color and porosity, followed by soil pH in distilled water and KCl, electrical conductivity (EC), degree of salinity of the soil (TDS), organic matter content, and phosphorus content.

The analysis of soil samples showed a result of sandy soil for the sample taken near the river Bosna and clay soil in the mountainous area, and that the pH reaction of the soil determined in KCl is acidic for the sample taken near the river Bosna, while for the sample taken in the mountainous area, it is neutral. The analysis also showed a small percentage of organic matter as well as phosphorus content. Based on the analyzed parameters, it can be concluded that the river Bosna and its proximity have a great influence on the composition, structure and physicochemical parameters, ie that environmental factors such as hydrology, relief, topography, etc. have a great role in the analysis of these parameters.

Keywords: soil, physico-chemical analysis, mountainous area, river basin

Physical fundamentals of wind turbines

Ana Čurić*, Vladimir Dananić

University of Zagreb, Faculty of Chemical Engineering and Technology, Department of Physics, Marulićev trg 19, Zagreb, Croatia
*Corresponding author: acuric@fkit.hr

People have learned to use wind energy since ancient times. First to sail, that it, to be able to move ships, and then to construct the first windmills that were used to obtain mechanical work to run the mills. As the human population increases, so does the need for energy production. This has led to the depletion of fossil fuels which are known to have an extremely detrimental impact on the environment. Consequently, alternative energy sources such as solar, wind, and tidal energy have attracted great interest. Wind energy is one of the cheapest and most affordable forms of renewable energy. To make full use of this energy and take a step closer to a brighter future, careful and accurate construction of machines is needed that will be able to convert the kinetic energy of wind into electrical energy. To achieve this, it is necessary to understand the basic laws of physics and apply them to obtain the maximum possible efficiency of a wind-electric turbine. In this paper, there will be a more detailed explanation of the physical basis of wind turbines and an examination of some impacts of wind turbines on the environment.

Keywords: renewable energy; wind energy; wind turbines; physical; environment

Kako dob, spol i mjesto stanovanja utječu na ugljični otisak stanovništva u Hrvatskoj

Ivana Filipić, Lovorka Gotal Dmitrović*

Sveučilište Sjever, Ul. 104. brigade 3, Varaždin, Hrvatska
***Dopisni autor:** lgotaldmitrovic@unin.hr

Sažetak: Ugljični otisak označava količinu ekvivalenta ugljikovog (IV) oksida (CO_2) koja se emitira u atmosferu kroz svakodnevne aktivnosti. Cilj Europske unije je postati klimatski neutralna do 2050. godine, odnosno postići ugljičnu neutralnost, što znači da se želi postići ravnoteža između emisije ugljika i njegove apsorpcije iz atmosfere u ponore ugljika. Europska unija postavila je visoke ciljeve vezane uz klimatsko područje. Uz pomoć Zelenog plana Europa treba do 2050. godine postati prvi kontinent koji uklanja onoliko emisija CO_2 koliko ih proizvodi. Međutim, globalni godišnji rast emisije CO_2 iznosi 1,4 %. Prema podacima za 2016. godinu u svijetu se godišnje emitiralo oko 50 milijardi tona CO_2 to je u usporedbi s 1990. godinom povećanje od 40 % kada je proizvedeno oko 35 milijardi tona CO_2. Prema podacima Republika Hrvatska emitirala je 17,88 milijuna tona CO_2 u sklopu EU-27 (bez Velike Britanije zbog Brexita) čije su zemlje članice sveukupno emitirale 2,92 milijarde tona CO_2. Ugljični otisci mogu se smanjiti poboljšanjem energetske učinkovitosti i promjenom načina života i kupovnih navika. Kakve i kolike razlike su među stanovnicima Hrvatske ovisno o dobi, spolu i mjestu stanovanja prikazane su u ovom radu. Prikazane su distribucije vjerojatnosti i opisna statistika vrijednosti prema mjestu stanovanja i dobi, te su korištenjem statističkih testova određene postoji li statistički značajne razlike među spolovima i dobi.

Ključne riječi: klimatska neutralnost; ugljikov (IV) oksid; distribucije vjerojatnosti; statistički značajna razlika

How age, gender and place of residence affect the carbon footprint of the population in Croatia

Ivana Filipić, Lovorka Gotal Dmitrović*

University North, Ul. 104. brigade 3, Varaždin, Croatia
*Correspondent author: lgotaldmitrovic@unin.hr

Abstract: The term *´carbon footprint"* refers to the amount of carbon (IV) oxide equivalent (CO_2) released into the atmosphere through daily activities. The goal of the European Union is to become climate neutral by the year 2050, i.e. to achieve carbon neutrality, which means reaching a balance between carbon emissions and their absorption from the atmosphere into carbon sinks. The European Union has set high climate targets. With the help of the Green Plan, by 2050, Europe is to become the first continent to eliminate as many CO_2 emissions as it produces. However, the global annual CO_2 growth is 1.4%. According to data for 2016, the world emitted about 50 billion tons of CO_2 per year, which is an increase of 40% compared to 1990, when about 35 billion tons of CO_2 were produced. According to the data, the Republic of Croatia emitted 17.88 million tons of CO_2 within the EU-27 (excluding the United Kingdom due to Brexit), whose member countries released a total of 2.92 billion tons of CO_2. [2] Carbon footprints can be reduced by improving energy efficiency and changing lifestyles and shopping habits. The differences among the population of Croatia depending on age, gender, and place of residence are elaborated in this paper. Probability distributions and descriptive statistics of values by place of residence and age are presented, and statistical tests were used to determine whether there are statistically significant differences between gender and age.

Keywords: climate neutrality; carbon dioxide; probability distributions; statistically significant difference

Hidrogeografski potencijal rijeke Bednje

Ana Frntić, Matija Kancijan, Bojan Đurin*

Sveučilište Sjever, Odjel za graditeljstvo, Ul. 104. brigade 3, Varaždin, Hrvatska
*Dopisni autor: bdjurin@unin.hr

Sažetak: Rijeka Bednja obuhvaća oba aspekta hidrogeografije; univerzalnost i integralnost. U načelu sustavnosti predstavlja glavni element životnog ciklusa, dok sa gledišta integralnosti participira u sustavu gibanja vode. Glavni elementi istraživanja hidrogeografije temelje se na kvantitativnim vrijednostima hidroloških podataka, prema kojima rijeka Bednja čini važan segment u razgranatoj riječnoj mreži sjeverne Hrvatske. Analiziranjem hidrogeografskih elemenata kao što su podaci o vodotocima i vodostajima o kojima ovise geografske karakteristike rijeke Bednje, razvija se njen gospodarski potencijal. Kao jedna od mogućnosti, navodnjavanjem se povećavaju prinosi i poboljšavaju se pedološke značajke tla. Pravilnim korištenjem sustava navodnjavanje reduciraju se poremećaji u poljoprivrednim prinosima kao posljedica sušnosti u pojedinim godinama. Zbog idealnog geografskog položaja, velikog slivnog područja i bujičnosti vodotoka rijeke Bednje, vodni potencijal pruža široku lepezu suvremenih mjera i postupaka koji izravno utječu na ekološki aspekt obuhvaćenih područja. Jedan od mehanizama zaštite okoliša je proizvodnja električne energije putem malih hidroelektrana, a kojima se ujedno i značajno smanjuju emisije stakleničkih plinova.

Ključne riječi: rijeka Bednja; porječje; navodnjavanje; male hidroelektrane

Hydrogeographical potential of the river Bednja

Ana Frntić, Matija Kancijan, Bojan Đurin*

University North, Department of Civil engineering, Ul. 104. brigade 3, Varaždin, Croatia
*Correspondent author: bdjurin@unin.hr

Abstract: The Bednja river encompasses both aspects of hydrogeography; universality and integrity. In the principle of systematicity, Bednja represents the main element of the life cycle, while from the point of view of integrity it participates in the system of water movement. The main elements of hydrogeography research are based on quantitative values of hydrological data, according to which the river Bednja is an important segment in the extensive river network of northern Croatia. By analyzing hydrogeographic elements such as data on watercourses and water levels on which the geographical characteristics of the river Bednja depend, its economic potential is developing. As one of the possibilities, irrigation increases yields and improves the pedological characteristics of the soil. Proper use of irrigation systems reduces disturbances in agricultural yields as a result of drought in certain years. Due to the ideal geographical position, large catchment area, and torrential flow of the Bednja river, the water potential provides a wide range of modern measures and procedures that directly affect the ecological aspect of the covered areas. One of the mechanisms of environmental protection is the production of electricity through small hydropower plants, which also significantly reduce greenhouse gas emissions.

Keywords: river Bednja, catchment area, irrigation, small hydropower plants

Razvoj modela sustava za pripremu tehnološke vode u farmaceutskoj industriji

Hrvoje Habek, Lovorka Gotal Dmitrović*

Sveučilište Sjever, Ul. 104. brigade 3, Varaždin, Hrvatska
***Dopisni autor:** lgotaldmitrovic@unin.hr

Sažetak: U radu je prikazan razvoj modela za pripremu tehnološke vode za potrebe farmaceutske industrije. Posebni zahtjevi kavalitete tehnološke vode u farmaceutskoj industriji određeni su Hrvatskom i Europskom farmakopejom, a neki od parametara na kojima će se i bazirati ovaj rad su: koncentracija ukupnog organskog ugljika (TOC), vodljivost, koncentracija teških metala, koncentracija nitrata i mikrobiološka čistoća. Priprema tehnološko vode podijeljena je na fazu predpripreme i fazu proizvodnje i distribucije pročišćene vode, a uključuju tehnološke procese: filtriranja kroz 25 µm filter, omekšavanja ionskim izmjenjivačima, tretiranja UV-C zrakama valne duljine 254 nm (imaju baktericidno djelovanje), filtriranja kroz <3 µm filter, reverznu osmozu i kontinuiranu deionizaciju. Za razvoj modela koristi se metodologija simulacijskog modeliranja s ciljom optimizacije procesa pripreme tehnološke vode za potrebe farmaceutske industrije i osmišljavanje metodologije prikladne za značajne obrasce ponašanja onečišćenja. Analiza, modeliranje i optimizacija ponašanja sustava temelji se na opisu strukture, entiteta i odnosa značajki sustava. Modeli nude prikaz zakonitosti njegovog ponašanja i strukture, te na taj način omogućuju proučavanje najvažnijih parametara funkcioniranja cijelog sustava ili njegovih komponenti. Na taj način simulacijsko modeliranje je moćan alat za analizu stanja sustava, parametara poravnanja i odabira odgovarajućeg načina rada tehničkih sustava.

Ključne riječi: simulacijsko modeliranje, razboj modela, faza predpripreme, faza proizvodnje i distribucije pročišćene vode

Development of a model of process water treatment systems in the pharmaceutical industry

Hrvoje Habek, Lovorka Gotal Dmitrović*

University North, Ul. 104. brigade 3, Varaždin, Croatia
*Correspondent author: lgotaldmitrovic@unin.hr

Abstract: The paper presents the development of a model for the preparation of process water for the needs of the pharmaceutical industry. Special requirements for process water quality in the pharmaceutical industry are determined by the Croatian and European Pharmacopoeia, and some of the parameters in this paper will be based on: the concentration of total organic carbon (TOC), conductivity, heavy metal concentration, nitrate concentration, and microbiological purity. Process water preparation is divided into the pre-preparation phase and phase of production and distribution of purified water and includes technological processes: filtration through a 25 µm filter, softening with ion exchangers, treatment with UV-C rays of wavelength 254 nm (have bactericidal action), filtration through 3 micrometers filter, reverse osmosis and continuous deionization. For the development of the model, the simulation modeling methodology is used with the aim of optimizing the process of preparation of technological water for the needs of the pharmaceutical industry and devising a methodology suitable for significant patterns of pollution behavior. Analysis, modeling, and optimization of system behavior are based on a description of the structure, entities, and relationships of system features. Models offer an overview of the legality of its behavior and structure and thus allow the study of the most important parameters of the functioning of the whole system or its components. In this way, simulation modeling is a powerful tool for analyzing the state of the system, alignment parameters and selecting the appropriate mode of operation of technical systems.

Keywords: simulation modeling, model loom, pre-preparation phase, purified water production and distribution phase

Piezoelectric composite foams based on poly(vinylidene fluoride) and lead-free ceramic particles

Mateja Kubin, Aleksandra Buzharovska*

Ss. Cyril and Methodius University, Faculty of Technology and Metallurgy, Rudjer Boskovic 16, Skopje, N. Macedonia
*Corresponding author: abuzar@tmf.ukim.edu.mk

Abstract: Producing green energy from readily available sources, such as wind, solar, vibrations, human motion, and heat, has become the main focus for sustainable development. Piezoelectricity is the ability of some materials to accumulate charges when mechanical pressure is applied. This property can be used to generate a low amount of energy to power small-scale electronic devices widely used in modern technologies. Commercially available piezoelectric materials are mainly composed of lead-based ceramics, which are highly brittle, difficult to manufacture, and a hazard to living beings. On the other hand, polymer composite materials are flexible, biocompatible, and easily processable, making them a suitable alternative for various applications. In this research, we present polymer composite foams based on poly(vinylidene fluoride) (PVDF) and barium titanite ($BaTiO_3$) particles produced with the thermally induced phase separation (TIPS) method. Different amounts of ceramic particles were used and their influence on the morphological, structural, and thermal properties was investigated. Determination of the polymer's electroactive phase was done using FTIR-ATR and XRD techniques. The structure of the polymer foams was observed by Scanning electron microscopy (SEM). Thermal analysis was performed using TGA and DSC measurements. The results showed that the addition of ceramic particles increased the electroactive phase content and crystallinity of the foams.

Keywords: energy harvesting; piezoelectricity; PVDF; $BaTiO_3$

Korelacija u hidrologiji – primjer s vodostajima Drave i Dunava kod Kopačkog rita

Marija Pejić, Silvia Iva Miličević, Stela Meškić, Marta Šćuka, Željko Šreng*, Siniša Maričić

Sveučilište Josipa Jurja Strossmayera u Osijeku, Građevinski i arhitektonski fakultet Osijek, Vladimira Preloga 3, Osijek, Hrvatska
***Dopisni autor:** zsreng@gfos.hr

Sažetak: U hidrologiji se prate i izučavaju parametri hidrološkog ciklusa. Prvi od korištenih parametara za gospodarenje vodom bili su vodostaji, a upečatljiv primjer toga su staroegipatski nilomjeri. U vodnom gospodarenju koriste se hidrotehničke građevine za čije projektiranje su nužni vodni parametri pa se već odavno prate i vodostaji naših velikih rijeka (Save, Drave i Dunava). U području sutoka Drave i Dunava „preživjelo" je poplavno područje, zaštićeno kao park prirode Kopački rit. U ovom radu se razmatraju vodostaji na tri lokacije oko Rita te se statističkim postupcima dokazuje njihova međuovisnost. Korišteni su podatci o dnevnom vodostaju za period 2001.-2019. godine opaženi na hidrološkim stanicama Batina (Dunav), Belišće (Drava), Osijek (Drava) i Aljmaš (Dunav). Utvrđeni su regresijski pravci parova (dviju stanica) istovremenih vodostaja. Potvrđeno je da dominantno na Kopački rit utječe Dunav, a odstupanja nekih podataka mogu se protumačiti međusobnim utjecajem i razlikama u režimu rijeka Drave i Dunava te retencijskim efektima Kopačkog Rita.

Ključne riječi: hidrologija, vodostaj, korelacija, regresija, Kopački rit

Correlation in hydrology - an example of Drava and Danube water levels near Kopački rit

Marija Pejić, Silvia Iva Miličević, Stela Meškić, Marta Šćuka, Željko Šreng*, Siniša Maričić

Josip Juraj Strossmayer University of in Osijek, Faculty of Civil Engineering Osijek, Vladimira Preloga 3, Osijek, Croatia
*Corresponding author: zsreng@gfos.hr

Abstract: In hydrology, the parameters of the hydrological cycle are monitored and studied. The first of the parameters used for water management was water level. An impressive example of this are ancient Egyptian nilometers. The design of hydraulic structures, used in water management, requires knowledge of water parameters, such as water levels. The water levels of our large rivers (the Sava, the Drava and the Danube) have been monitored for a long time. In the confluence area of Drava and Danube, a floodplain "survived", protected as the Nature park called Kopački rit. This paper examines the water levels at three locations around Kopački rit and demonstrates their interdependence by statistical procedures and analysis. Daily water level data for the period 2001 - 2019 were used at the water stations Batina (Danube), Belišće (Drava), Osijek (Drava) and Aljmaš (Danube). The regression line of pairs (two stations) of simultaneous water levels has been determined. It is established that the Kopački rit is dominantly influenced by the Danube, and deviations from some data can be interpreted by mutual interactions and differences in the regimes of the Drava and Danube rivers and the retention effects of the Kopački rit.

Keywords: hydrology, water level, correlation, regression, Kopački rit

Hidrometrija i zaštita okoliša

Ivana Pintarić, Magdalena Drožđan, Bojan Đurin[1]

Sveučilište Sjever, Odjel za graditeljstvo, Ul. 104. brigade 3, Varaždin, Hrvatska
*Dopisni autor: bdjurin@unin.hr

Sažetak: Hidrometrija je grana hidrologije koja se bavi mjernim metodama, tehnikama mjerenja i mjernim uređajima. Osnovni zadaci hidrometrije su određivanje elemenata vodnog režima (vodostaj, dubina, brzina strujanja, protok,…), obrada podataka mjerenja i organizacija hidrometrijskih postaja. Zaštita okoliša je skup odgovarajućih aktivnosti i mjera kojima je cilj sprječavanje onečišćenja i zagađenja okoliša. Na prvi pogled izgleda kao da zaštita okoliša i hidrometrija nemaju ništa zajedničko, ali u stvarnosti nije tako. Živimo u vremenu klimatskih promjena koje su vezane i uz vodu. Promjenom količine vode i njezine temperature mijenja se i cijeli ekološki sustav. Pomoću hidrometrije kontroliramo kolike su te promjene te kakav utjecaj one imaju na sve nas. Porast vode od nekoliko centimetara možda i ne zvuči kao veliki problem, ali kada uzmemo u obzir što tih nekoliko centimetara može učiniti na obali, dolazimo do problema. Kontroliranjem protoka u vodotocima dolazimo do okvirne slike o razmjeru oscilacija vode i samim time možemo unaprijed predvidjeti okvirno što nas očekuje. Cilj ovog izlaganja je opisati hidrometriju i njezinu vezu sa zaštitom okoliša.

Ključne riječi: hidrometrija; zaštita okoliša; klimatske promjene; voda

Hydrometry and environmental protection

Ivana Pintarić, Magdalena Drožđan, Bojan Đurin*

University of the North, Department of Civil Engineering, Varaždin, Croatia
*Corresponding author: bdjurin@unin.hr

Abstract: Hydrometry is a branch of hydrology that deals with measurement methods,measurement techniques, and measuring devices. The basic tasks of hydrometry are determining elements of the water regime (water level, depth, flow rate, velocity,…), processing measurement data, and organization of hydrometric stations. Environmental protection is a set of appropriate activities and measures aimed at preventing environmental pollution. At first glance, it seems that environmental protection and hydrometry have nothing in common, but in reality, they do. We livein a time of climate change, which is also related to water. By changing the amount of water and itstemperature, the entire ecological system changes. With the help of hydrometry, we control how much these changes are and what impact they have on all of us. A few centimeters of water may not sound like a big problem, but when we consider what those few centimeters can do on the shore, we come to a problem. By controlling the flow in watercourses, we get a rough idea of the scale of water oscillations, and thus we can predict in advance what we expect. The aim of this paperis to describe hydrometry and its connection with environmental protection.

Keywords: hydrometry; environmental protection; climate changes; water

Primjena drvnog pepela u cestogradnji

Pavica Senić, Sanja Dimter*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Građevinski i arhitektonski fakultet Osijek, Vladimira Preloga 3, Osijek, Hrvatska
***Dopisni autor:** sdimter@gfos.hr

Sažetak: Drvni pepeo neizbježan je nusproizvod proizvodnje energije iz obnovljivih izvora. Nesagorivi je kruti ostatak koji nastaje prilikom spaljivanja drvne biomase pri proizvodnji električne i toplinske energije. Ulazak Hrvatske u Europsku uniju donio je za sobom zadatak povećanja proizvodnje energije iz obnovljivih izvora. Većina novoootvorenih elektrana za proizvodnju energije koriste drvnu masu, što znatno povećava količine drvnog pepela kojeg je potrebno prihvatljivo zbrinuti. Zbog prikladnih kemijskih i fizikalnih svojstava, problem zbrinjavanja moguće je riješiti primjenom u građevinarstvu. Ovisno o porijeklu drvne mase i uvjetima izgaranja prilikom proizvodnje električne i toplinske energije, drvni pepeo posjeduje različita svojstva. U radu će biti dan pregled mogućih primjena drvnog pepela pri gradnji cesta.

Ključne riječi: drvni pepeo; drvna biomasa; cestogradnja; održivi razvoj

Application of wood ash in road construction

Pavica Senić, Sanja Dimter*

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Civil Engineering and Architecture Osijek Vladimira Preloga 3, Osijek, Croatia
*Corresponding author: sdimter@gfos.hr

Abstract: Wood ash is an inevitable by-product of renewable energy production. It is an incombustible solid residue that is formed from burning wood biomass during electricity and heat production. Croatia's entry into the European Union has brought the task of increasing energy production from renewable sources. Most newly opened power plants use wood mass for energy production, which significantly increases the amount of wood ash that needs to be adequately disposed of. Due to the appropriate chemical and physical properties, it is possible to solve the problem of disposal by application in construction. Depending on the origin of the wood mass and the combustion conditions when producing electricity and heat, wood ash possesses various properties. The paper will provide an overview of the possible application of wood ash when building roads.

Keywords: wood ash; wood biomass; road construction; sustainable development

Energy storage material based on eco-friendly composites

Ema Stojchevska, Aleksandra Bužarovska*

Faculty of Technology and Metallurgy, Ss Cyril and Methodius University in Skopje, Rudjer Boskovic 16, Skopje, Republic of Macedonia
*Corresponding author: abuzar@tmf.ukim.edu.mk

Abstract: Dielectric materials received great attention in different electrical applications and have a vital role in high-frequency electronic circuits and capacitors. Ferroelectric ceramics possess excellent dielectric properties and the ability to store a large amount of electrical energy. $BaTiO_3$ as an environmentally friendly material that possesses high dielectric constant and breakdown strength is considered a common filler in composites intended for designing a supercapacitor. However, in order to increase the flexibility and overall mechanical properties of $BaTiO_3$, thermoplastic polyurethane (TPU) was used as an inexpensive and flexible polymer matrix. The aim of this study was to prepare lead-free composites based on TPU as a polymer matrix, $BaTiO_3$, and MWCNTs as conductive filler, via the solvent casting method. Moreover, the surface of $BaTiO_3$ and MWCNTs was modified in order to introduce proper functional groups. The results showed specific interactions between TPU and the fillers confirmed by FTIR analysis. Consequently, the dielectric constant of the samples increased and dielectric loss decreased with the addition of $BaTiO_3$ and MWCNTs fillers.

Keywords: Dielectric materials, $BaTiO_3$, TPU, capacitors

Idejno pejsažno rješenje Dugava – "Slojnice vremena"

Luka Šarić, David Štrbac, Sanja Gašparović*

Sveučilište u Zagrebu, Arhitektonski fakultet, Fra Andrije Kačića Miošića 26, Zagreb**,** Hrvatska
*Dopisni autor: sgaspar@arhitekt.hr

Sažetak: Revitalizacija i urbana obnova temeljene na zelenoj infrastrukturi, neka su od osnovnih načela Zelene tranzicije i Novog europskog Bauhausa. Mogućnosti njihove primjene u kontekstu urbanističke preobrazbe istražuju se na primjeru zagrebačkog naselja Dugave. Planiranje modernističkog Novog Zagreba u razdoblju 1960 – 1980-ih bilo je temeljeno na ideji života u parku. No proces razvoja grada nastavlja se sve do danas kada pritisak urbanizacije, društvene i okolišne promjene nameću zahtjeve preispitivanja novih potreba stanovnika i unapređenja javnih prostora. Urbanističkim analizama obilježja naselja (broj stanovnika, starost naselja, udio i dovršenost javnih sadržaja) utvrđuju se polazišta za planiranje preobrazbe, a anketnim istraživanjem aspiracije stanovnika o najpoželjnijim javnim prostorima te njihovom karakteru i namjeni. Projektni prijedlog oživljavanja i prenamjene zapuštenog i neiskorištenog povijesnog rukavca Save u novi višenamjenski perivoj naselja temelji se na načelima ekološke, društvene i ekonomske održivosti. Pejsažno oblikovanje zasnovano na rješenjima temeljenim na prirodi koja iziskuje mala ulaganja pri izgradnji i održavanju. Prirodna sukcesija ravnopravni je dionik hortikulturnog uređenja, a manje prostorne arhitektonske intervencije daju prostoru sadržaj i namjenu, podjednako uvažavajući biotop i potrebe stanovnika. Idejno pejzažno rješenje istražuje prostorni potencijal minimalnih intervencija u malom i velikom mjerilu koji udružuje načela održivog razvoja i suvremenih koncepata polifunkcionalnosti pejsažne arhitekture.

Ključne riječi: identitet prostora, urbana obnova, zelena infrastruktura, održivi razvoj, prirodna sukcesija

Conceptual design of landscape architecture - "Layers of time"

Luka Šarić, David Štrbac, Sanja Gašparović*

University of Zagreb, Faculty of Architecture, Fra Andrije Kačić Miošića 26. Zagreb Croatia
*Corresponding author: sgaspar@arhitekt.hr

Abstract: Revitalization and urban renewal based on green infrastructure are some of the basic principles of the Green Transition and the New European Bauhaus. The possibilities of their application in the context of urban transformation are being investigated on the example of the Zagreb neighborhood of Dugave. The planning of modernist New Zagreb in the 1960s and 1980s was based on the idea of living in a park. But the process of city development continues today when the pressure of urbanization, social and environmental changes demand reconsidering new needs of residents and improving public spaces. Urban analysis of the characteristics of districts (number of inhabitants, age of settlements, share and completion of public facilities) and survey of the aspirations of residents about the most desirable public spaces and their character and purpose, determined the starting points for planning and transformation. The principles of ecological, social and economic sustainability are the basis of the project proposal for the revival and transformation of the neglected and unused historical meander of the Sava river into a new multipurpose park. The landscape design sought nature-based solutions that require little investment during construction and maintenance. Natural succession is an equal participant in horticultural landscaping, and smaller architectural interventions give the space content and purpose, while respecting the biotope and the needs of the citizens. The conceptual landscape solution explores the spatial potential of minimal interventions on small and large scales that combines the principles of sustainable development and modern concepts of polyfunctional landscape architecture.

Keywords: identity, green infrastructure, urban renewal, sustainable development, natural succession

Analiza dunavskog vodostaja hidrološke stanice Aljmaš

Marta Šćuka, Stela Meškić, Silvia Iva Miličević, Marija Pejić, Željko Šreng*, Siniša Maričić

Sveučilište Josipa Jurja Strossmayera u Osijeku, Građevinski i arhitektonski fakultet Osijek, Vladimira Preloga 3, Osijek, Hrvatska
*Dopisni autor: zsreng@gfos.hr

Sažetak: Hidrologija je bazična disciplina hidrotehnike. Na osnovu vodnih parametara osmišljavaju se i dimenzioniraju hidrotehničke građevine. Jedan od osnovnih vodnih parametara je vodostaj. Promjene vodostaja ukazuju na vodni režim pa se za duži period opažanja može odrediti njegov prosječan karakter. Inženjerima u hidrotehnici potrebno je znanje o hidrološkim obradama podataka te se ono podučava u nastavi na Građevinskom i arhitektonskom fakultetu. U radu se predstavlja provedena obrada skupa podataka o vodostaju rijeke Dunav kod Aljmaša. Obuhvaćeno je 20 godina svakodnevnih opažanja vodostaja u periodu 2000.-2019. godine. Provedena je osnovna statistička obrada te su utvrđeni ekstremi i prosječni vodostaj, kao i trend promjena. Zatim je urađena analiza učestalosti i vjerojatnosti razmatranih vodostaja. To je omogućilo usporedbu osnovnih pokazatelja prijašnje obrade (za podatke perioda 1951.-1990.) i ovom prilikom izvedenih. Primjetna su odstupanja koja ukazuju na promjene ovog vodnog parametra na lokaciji Aljmaš što je upozoravajuće za hidrotehnička razmatranja i rješenja.

Ključne riječi: hidrologija, vodostaj, obrada podataka, učestalost, trajanje, Dunav

Analysis of the Danube water level of the Hydrological Station Aljmaš

Marta Šćuka, Stela Meškić, Silvia Iva Miličević, Marija Pejić, Željko Šreng*, Siniša Maričić

Josip Juraj Strossmayer University of in Osijek, Faculty of Civil Engineering Osijek, Vladimira Preloga 3, Osijek, Croatia
*Corresponding author: zsreng@gfos.hr

Abstract: Hydrology is the basic discipline of hydraulic engineering. Hydraulic structures are designed based on water parameters. One of the basic water parameters is the water level. Changes in water level indicate a water regime, so for a longer period of observation, its average character can be determined. Hydrotechnical engineers require knowledge of hydrological data processing that is taught at the Faculty of Civil engineering and Architecture. This paper presents the processing of the data set of the water level on the Danube River near Aljmaš. It covers 20 years of daily observation of water levels from the period 2000 – 2019. Basic statistical processing was carried out and extremes and average water levels were determined, as well as trends of change. An analysis of the frequency and probability of the water levels was done. This made it possible to compare the basic indicators of previous processing (from the period 1951 - 1990) and the one performed on this occasion. There are noticeable deviations indicating changes in this water parameter at the Aljmaš location site, which is a warning for hydrotechnical considerations and solutions.

Keywords: hydrology, water level, data processing, frequency, duration curves, Danube

Biotehničke znanosti /
Biotechnical sciences

Sugar and sweeteners on the Croatian market

Mirjam Andrijević, Ivana Varga*

Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia
*Corresponding author: ivana.varga@fazos.hr

Abstract: In recent years the awareness of the consequences of consumption of white sugar has raised. There is a growing demand for sweeteners, ie low-calorie substitute sugars, they give almost as sweet a taste as sugar and most importantly are good for human health. Sugar from sugar beet and sugar cane are used not only in direct consumption but also in the production of beverages, confectionery, biscuits, and other food and non-food products. There are many substitutes for sugars, and these are natural and artificial sweeteners. Natural sweeteners have something lower caloric value, and unlike artificial sweeteners, they also contain some vitamins and minerals that give nutritional value. Xylitol is one of the quality natural sweeteners. It is a great choice for diabeticsand vegans. Also, there is a xylitol similar sweetener because none has an effect on blood sugar levels, and does not create caries on teeth. In addition to these natural sweeteners, it is very good for the body of molasses because it contains 100 grams only 287kcal. Cyclamen and aspartame are offered as artificial sweeteners. They are added to food production and drinks. Cyclamate is still usedin the manufacture of medicines because it masks the bitter taste of antibiotics, and aspartame tolerates high temperatures and is used in the production of dairy and carbonated products and drinks. It is necessary to know that aspartame is toxic, so you should be careful when consuming it.On market, the ideal sweetener does not exist and some research indicates the danger of using sweeteners. It is important that all sweeteners consume moderately and aware of the health consequences.

Keywords: sugar, artificial sweeteners, healthline

Novi trendovi u algakulturi – kružna ekonomija temeljena na uzgoju mikroalgi

Oliver Barić, Tena Radočaj, Ana Gavrilović*

Sveučilište u Zagrebu Agronomski fakultet, Svetošimunska cesta 25, 10000 Zagreb, Hrvatska
*Dopisni autor: agavrilovic@agr.hr

Sažetak: Mikroalge su raznolika skupina jednostaničnih autotrofnih organizama koji se zbog velikog neiskorištenog potencijala za komercijalnu upotrebu smatraju resursom budućnosti. Glavne prednosti naspram drugih sirovina su: brzi rast, jednostavnost uzgoja, mogućnost cjelogodišnje proizvodnje u vanjskim sustavima ili fotobioreaktorima, minimalna količina vode potrebne za uzgoj, niska cijena proizvodnje i sposobnost vezanja atmosferskiog CO_2. Mikroalge se uzgajaju za hranidbu u akvakulturi, a njihovi metaboliti kao što su razni pigmenti, biostimulanti, višestrukonezasićene masne kiseline, enzimi i mnogi drugi koriste se za proizvode visoke vrijednosti u prehrambenoj, nutricionističkoj, farmaceutskoj, kozmetičkoj industriji, proizvodnji biogoriva i drugim industrijama. Dodatna korist može se ostvariti upotrebom mikroalgi za pročišćavanje otpadnih voda u akvakulturi što se pokazalo učinkovitom metodom, a dobivena algalna biomasa može se koristiti kao sirovina u daljnjoj proizvodnji. Unatoč visokom potencijalu za razvitak proizvoda dobivenih od mikroalgi koji postižu visoku cijenu na tržištu, proces proizvodnje biogoriva je još uvijek skup naspram konvencionalnih alternativa. Zato se nastoji smanjiti cijena i optimizirati proizvodnja proučavanjem bioloških, genetskih i biokemijskih osobina te razvitkom biogoriva četvrte generacije korištenjem genetički modificiranih sorti mikroalgi.

Ključne riječi: mikroalge, biotehnologija, održiva proizvodnja

New trends in algaeculture - microalgae based circular economy

Oliver Barić, Tena Radočaj, Ana Gavrilović*

University of Zagreb Faculty of Agriculture, Svetošimunska cesta 25, 10000 Zagreb, Croatia
*Corresponding author: agavrilovic@agr.hr

Abstract: Microalgae are a diverse group of autotrophic single-cellular organisms regarded as a next-generation resource with huge potential for commercial applications. High growth rate, simplicity of cultivation process, ability to be produced all year long in both large-scale outdoor systems and photobioreactors, minimal water usage, low production cost, and mitigation of atmospheric CO_2 are their main advantages compared to other raw materials. Microalgae are being cultivated for feed in aquaculture, their metabolites such as various pigments, biostimulants, polyunsaturated fatty acids, enzymes, and many more are used to make high-value products in food, nutraceutical, pharmaceutical, cosmetical, biofuel and other industries. Additional benefits can be achieved by utilizing microalgae for wastewater treatment in aquaculture, which is proven to be one of the most effective methods for wastewater purification and the derived algal biomass can be utilized in further production. Despite the great potential of the production of high-value products utilizing microalgae, the process of biofuel production is still expensive compared to conventional alternatives. Therefore, many efforts are being made to lower the cost and optimize biofuel production by gaining a better understanding of algal biology, genetics and biochemical properties, and by developing biofuels of the fourth generation by using genetically modified algae strains.

Keywords: microalgae, biotechnology, sustainable production

Proizvodnja piva s dodatkom zaostalog kruha iz pekarske industrije

Mario Ćorić, Andrea Karlović, Anita Lalić*

Agronomski i prehrambeno-tehnološki fakultet sveučilišta u Mostaru, Biskupa Čule bb, Mostar, Bosna i Hercegovina
*Dopisni autor: anita.juric@aptf.sum.ba

Sažetak: Proizvodnja piva s dodatkom starog kruha predstavlja stvaranje nove palete okusa za ljubitelje craft pivarstva. Korištenjem zaostalog kruha, ne samo da se postigne drugačiji okus, nego se zaostali kruh iz pekarske industrije ponovno valorizira te se tako sprječavaju ekonomski gubitci. S obzirom na činjenicu da se veliki dio zaostalog kruha odlaže na otpad, njegova ponovna upotreba pozitivno utječe i na ekološki i socijalni aspekt. U istraživanju je kuhano pivo s dodatkom 1/3 zaostalog kruha i 2/3 ječmenog slada (bazni slad, minhenski te karamel slad). Tokom kuhanja piva dodane su 3 različite sorte hmelja (German traditional- za gorčinu, te Cascade i Simcoe za aromu piva) nakon čega je sladovina ohlađena na sobnu temperaturu. Tako pripremljenoj sladovini dodan je kvasac čime je uslijedio proces fermentacije, odležavanja i punjenje piva u boce. U sklopu istraživanja odrađena je senzorska analiza piva u kojoj je sudjelovalo jedanaest ispitanika od čega je pet ispitanika pivo ocijenilo kao zadovoljavajuće, pet dobro, a jedan vrlo dobro. U laboratoriju su izmjereni polifenoli te boja i gorčina piva.

Ključne riječi: zaostali kruh, craft pivo, fermentacija

Beer production with the addition of remaining bread from the bakery industry

Mario Ćorić, Andrea Karlović, Anita Lalić*

Faculty of Agriculture and Food Technology, University of Mostar, Biskupa Čule bb, Mostar, Bosnia and Herzegovina
*Dopisni autor: anita.juric@aptf.sum.ba

Abstract: Brewing beer with the addition of leftover bread represents the creation of a new range of flavors for craft beer lovers. By using leftover bread, not only is it achieve a different taste, but leftover bread from the bakery industry is valorized again, thus preventing economic losses. Given the fact that a large part of their remaining bread is disposed of as waste, its reuse has a positive effect on both the ecological and social aspects. In this research, beer was brewed with the addition of 1/3 of leftover bread and 2/3 of barley malt (base malt, Munich and caramel malt). During brewing, 3 different types of hops were added (German traditional - for bitterness, and Cascade and Simcoe for beer aroma), after which the wort was cooled to room temperature. Yeast was added to the wort prepared in this way, which followed the process of fermentation, aging, and bottling of beer. As part of the research, sensory analysis of the beer was carried out, in which seventeen subjects participated, of which four subjects rated the beer as bad (because of the bitterness of the beer), five satisfactory, two very good and six as good. Polyphenols, color and bitterness of beer were measured in the laboratory. The analyzed beer is classified as American Pale Ale, the so-called APA beer.

Keywords: leftover bread, craft beer, fermentation

Parazit *Hysterothylacium aduncum* (Nematoda) - potencijalna opasnost za sniženje tržišne kvalitete srdele i inćuna u Sjevernom Jadranu

Raoul Filipas[1], Oliver Barić[2], Irena Vardić[3], Ana Gavrilović[2]*

[1]Sveučilište u Splitu Sveučilišni odjel za studije mora, Ruđera Boškovića 37, Split, Hrvatska
[2]Sveučilište u Zagrebu, Agronomski fakultet, Svetošimunska cesta 25, Zagreb, Hrvatska
[3]Institut Ruđer Bošković, Zavod za istraživanje mora i okoliša, Laboratorij za akvakulturu patologiju akvatičkih organizama, Bijenička cesta 54, Zagreb, Hrvatska
*Dopisni autor: agavrilovic@agr.hr

Sažetak: Ovim radom istražena je parazitofauna visceralne šupljine komercijalno najznačajnijih vrsta male plave ribe u Sjevernom Jadranu: srdele, *Sardina pilchardus* (Walbaum, 1792) i inćuna, *Engraulis encrasicolus* (Linnaeus, 1758). Uzorci su prikupljeni iz lovina okružujuće mreže plivarice u lipnju i srpnju 2021. godine. Vizualnim pregledom i lupom ukupno je pregledano 341 srdela i 100 inćuna. Sakupljeni endoparaziti identificirani su korištenjem PCR metode pri čemu je amplificirana ITS regija. Dobivene sekvence pokazale su podudarnost od 99.7 % sa sekvencama vrste *Hysterothylacium aduncum* iz baze podataka GenBank. Prevalencija *H. aduncum* u srdeli iznosila je 4.1 %, a u inćunima 5 % što je niže u usporedbi s istraživanjima provedenim u Južnom Jadranu i Sredozemnom moru. Osim što oštećuje organe i uzrokuje smrtnost tijekom migracije iz gastrointestinalnog trakta, prisutnost ovog parazita izaziva rizik od povlačenja ribe s tržišta jer ne ispunjava standarde kvalitete hrane. Također, predstavlja potencijalnu zoonozu, no kako su u svijetu do sada poznata dva slučaja zaraze ljudi u kojima su paraziti identificirani morfološki, potrebno je provesti daljnja istraživanja s genetičkom potvrdom vrste.

Ključne riječi: srdela, inćun, *Hysterothylacium aduncum*, Jadransko more

Parasite *Hysterothylacium aduncum* (Nematoda) – a potential threat to lower the market quality of sardines and anchovies in the North Adriatic

Raoul Filipas[1], Oliver Barić[2], Irena Vardić[3], Ana Gavrilović[2]*

[1]University of Split, Department of Marine Studies, Ruđera Boškovića 37, Split, Croatia;
[2]University of Zagreb Faculty of Agriculture, Svetošimunska cesta 25, Zagreb, Croatia;
[3]Ruđer Bošković Institute, Division for Marine and Environmental Research, Laboratory for Aquaculture and Pathology of Aquatic Organisms, Bijenička cesta 54, Zagreb, Croatia
*Corresponding author: agavrilovic@agr.hr

Abstract: A study was conducted in the Northern Adriatic to determine the parasitofauna of the visceral cavity of the two most commercially important small pelagic fish species in the Adriatic: sardine, *Sardina pilchardus,* and anchovy, *Engraulis encrasicolus*. The samples were obtained from commercial purse seine catches in June and July of 2021. A total of 341 sardines and 100 anchovies were examined macroscopically and using a binocular magnifier. The collected parasites were identified genetically by PCR amplification of the partial ITS (internal transcribed spacer) region. Obtained sequences showed 99.7% identity to the sequences of *Hysterothylacium aduncum* (Rudolphi, 1802) from the GenBank. The prevalence *H. aduncum* in sardines and anchovies in this investigation was 4.1% and 5%, which is lower than in other research conducted in the Mediterranean and Southern Adriatic. Apart from causing mortalities when migrating from the gastrointestinal tract and damaging internal organs, this parasite poses a risk of product rejection due to non-compliant food quality standards. Additionally, *H. aduncum* has zoonotic potential, but since it has only been recorded twice in humans and identified only morphologically, this is still uncertain and further research is needed in addition to the genetic affirmation of the species.

Keywords: sardine, anchovy, *Hysterothylacium aduncum*, Adriatic Sea

Utjecaj ekstrakta čuvarkuće (*Sempervivum tectorum*) na rast bakterija *Escherichia coli* i *Salmonella* spp.

Lamija Goro[1], Blažo Lalević[2], Saud Hamidović[1]*

[1] Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Zmaja od Bosne 8, Sarajevo, Bosna i Hercegovina
[2] Univerzitet u Beogradu, Poljoprivredni fakultet, Nemanjina 6, Beograd, Srbija
*Dopisni autor: s.hamidovic@ppf.unsa.ba

Sažetak: Porast rezistencije prema antibioticima i nedostatak novih antimikrobnih sredstava rezultirali su razvojem novih učinkovitih i pristupačnih metoda za sprečavanje mikrobnih infekcija, posebno u zemljama u razvoju, gdje je oko 10 % smrtnih slučajeva povezano s infektivnim bolestima. Pojava izolata bakterija *Escherichia coli* i *Salmonella* spp. s većim brojem fenotipova otpornih na antibiotike smatra se ozbiljnim i globalnim zdravstvenim problemom. Proizvodi prirodnog porijekla koji imaju antimikrobno djelovanje, privlače interes jer predstavljaju dobru alternativu sintetičkim proizvodima. Do sada je poznat veliki broj biljnih ekstrakata koji su pokazali dobre rezultate u suzbijanju rasta bakterija *Escherichia coli* i *Salmonella* spp. Cilj ovog rada bio je ispitivanje utjecaja ekstrakta čuvarkuće (*Sempervivum tectorum*) na rast navedenih bakterija. Ekstrakcija je izvršena iz svježih listova čuvarkuće (*Sempervivum tectorum*). Čiste kulture bakterija *Escherichia coli* i *Salmonella* spp., nacijepljene su na podlogu Mueller–Hinton. Ispitivanje rasta ovih bakterija praćeno je test-difuzijskom metodom gdje su diskovi filter papira promjera 6 mm impregnirani ekstraktom i postavljeni na hranljivu podlogu. Inkubacija je obavljena na temperaturi od 37 °C u trajanju od 24 h. U kontrolnoj varijanti, korištena je destilirana voda. Rezultati ukazuju na smanjenje rasta ispitivanih bakterija nakon vremena inkubacije. Ovi rezultati potvrđuju i potencijalnu primjenu ekstrakta čuvarkuće u smanjenju infekcije bakterijama *Escherichia coli* i *Salmonella* spp.

Ključne riječi: ekstrakt čuvarkuće, test-difuzijska metoda i antimikrobna aktivnost

Effect of Sempervivum tectorum on the growth of bacteria *Escherichia coli and Salmonella spp.*

Lamija Goro[1], Blažo Lalević[2], Saud Hamidović[1*]

[1] University in Sarajevo, Faculty of Agriculture and Food Sciences, Zmaja od Bosne 8, Sarajevo, Bosnia and Herzegovina
[2] University in Belgrade, Faculty of Agriculture, Nemanjina 6, Beograd, Serbia
*Corresponding author: s.hamidovic@ppf.unsa.ba

Abstract: The increase in resistance to antibiotics and the lack of new antimicrobial agents have resulted in the development of new effective and affordable methods to prevent microbial infections, especially in developing countries, where about 10% of deaths are related to infectious diseases. The emergence of *Escherichia coli* and *Salmonella spp*. isolates with a greater number of antibiotic-resistant phenotypes are considered a serious and global health problem. Products of natural origin that have antimicrobial activity attract interest because they represent a good alternative to synthetic products. Until now, a large number of plant extracts are known that have shown good results in suppressing the growth of bacteria *Escherichia coli* and *Salmonella spp*. The aim of this work was to examine the effect of the extract of Sempervivum tectorum on the growth of the mentioned bacteria. Extraction was performed from fresh leaves of Sempervivum tectorum. Pure cultures of bacteria *Escherichia coli* and *Salmonella spp*. were collected on Mueller-Hinton medium. The test of the growth of these bacteria was followed by the test-diffusion method, where filter paper discs with a diameter of 6 mm were impregnated with the extract and placed on a nutrient medium. Incubation was carried out at a temperature of 37 °C for 24 h. In the control variant, distilled water was used. The results indicate a decrease in the growth of the tested bacteria after the incubation period. These results also confirm the potential use of the extract of the houseplant in reducing infection with *Escherichia coli* and *Salmonella spp*.

Keywords: water, water quality, minerals, the taste of water

Okusi vode Hrvatske

Laura Hanić[1], Lara Jagečić[1], Lahorka Budić[1], Marija Stjepanović[1], Mario Šiljeg[2], Mirna Habuda-Stanić[1]*

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, Osijek, Hrvatska
[2] Ministarstvo gospodarstva i održivog razvoja, Ulica grada Vukovara 78, Zagreb, Hrvatska
*Dopisni autor: habudastanic@gmail.com

Sažetak: Kemijski čista voda je tekućina bez boje, okusa i mirisa. Iako uglavnom vodu na navedeni način i percipiramo, karakteristike voda mogu se značajno razlikovati što dokazuju i rezultati istraživanja o kvaliteti vode za ljudsku potrošnju provedena diljem Hrvatske. Naime, analitička izvješća ukazuju na značajne razlike u vrijednostima parametara pokazatelja kvalitete vode, naročito razlike u mineralnom sastavu te pojavnosti i udjelima pojedinih kemijskih tvari. Općenito, kvalitetu vode određuju fizikalna, kemijska, biološka i radiološka svojstva koja moraju biti u skladu sa zakonskim odredbama kako bi se stavnovništvu osigurala zdravstveno ispravna voda putem vodoopskrbnih sustava. Voda kao univerzalno otapalo, sadrži otopljene minerale čije koncentracije ovise prije svega o okolišnu u kojem se voda nalazi. Podzemne vode tako najčešće sadrže povećane koncentracije kationa kao što su kalcij (Ca^{2+}), magnezij (Mg^{2+}) te aniona poput bikarbonata (HCO_3^-), klorida (Cl^-) i sulfata (SO_4^{2-}), a često su prisutne i povišene koncentracije iona željeza i mangana. Istraživanja pokazuju da upravo navedeni prirodni sastojci vode uzrokuju specifičan i osebujan okus. Cilj ovog rada je prikaz i usporedba okolišno uvjetovanog kemijskog sastava vode za ljudsku potrošnju u gradovima Republike Hrvatske koji je i temeljni razlog varijacije okusa vode za ljudsku potrošnju pojedinih vodoopskrbnih sustava u Hrvatskoj.

Ključne riječi: voda**,** kvaliteta vode, mineralne tvari, okus vode

Water taste in Croatia

Laura Hanić[1], Lara Jagečić[1], Lahorka Budić[1], Marija Stjepanović[1], Mario Šiljeg[2], Mirna Habuda-Stanić[1]*

[1] University of Josip Juraj Strossamyer in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
[2] Ministry of Economy and Sustainable Development, Ulica Grada Vukovara 78, Zagreb, Croatia
*Corresponding author: habudastanic@gmail.com

Abstract: Chemically clean water is a liquid without color, taste, and smell. Even though water is perceived in this way, water characteristics can greatly differ which research results on water quality for human consumption throughout Croatia have proved. To be specific, analytical reports designate significant differences in values of parameters that indicate water quality, especially differences in mineral composition, appearance, and share of individual chemical matter. In general, water quality is determined by physical, chemical, biological, and radiological properties that have to be in accordance with law regulations so that residents can be insured with healthy drinking water throughout the water supply system. Water is a universal solvent that contains dissolved minerals whose concentration depends, above anything else, on the environment in which water is located. Underground water mostly contains increased concentration of cations such as calcium (Ca^{2+}), magnesium (Mg^{2+}), and anions like bicarbonate (HCO_3^-), chloride (Cl^-) and sulfate (SO_4^{2-}), also there is often a present increased concentration of iron and manganese ions. Research shows that precisely these listed natural water ingredients cause-specific and peculiar tastes. The main point of this paper is the display and comparison of the environment caused the chemical composition of water for human consumption in cities of the Republic of Croatia which is, also, the main cause of variation in the taste of water for human consumption in individual water supply systems in Croatia.

Keywords: water, water quality, minerals, taste of water

Sinteza, konformacijska analiza i biološka evaluacija tripeptidâ izvedenih iz ferocen-1,1'-diamina s Ala-Pro sekvencom

Marina Ivančić, Gloria Kovač, Monika Kovačević*

Sveučilište u Zagrebu, Prehrambeno-biotehnološki fakultet, Pierottijeva 6, Zagreb, Hrvatska
*Dopisni autor: marina.ivancic.sunshine@gmail.com

Sažetak: Pronalazak odgovarajućih terapijskih rješenja u liječenju zaraznih bolesti te sveprisutna antimikrobna rezistencija predstavljaju najveći znanstveno-tehnološki izazov pri čemu posebno mjesto zauzimaju dizajn i priprava farmakološki potentnih biomolekula. Istraživanje malih molekulskih kalupa koji oponašanju uvjete unutar prirodnih sustava pokazalo se učinkovitim pristupom u kreiranju održivih rješenja čemu svjedoče primjeri postojećih peptidomimetičkih i ferocenskih terapeutika. Konjugacijom ferocenske osnove i prirodnih proteinogenih aminokiselina pripravljaju se peptidomimetici unaprijeđenih farmakokinetičkih, farmakodinamičkih svojstava i terapeutskog potencijala čime se mogu prevladati nedostatci i ograničenost terapeutske primjene prirodnih peptida i proteina.
Shodno navedenom, u ovome radu provedena je sinteza, konformacijska analiza (IR-, NMR-, CD-spektroskopija) te određivanje antioksidacijskog i antimikrobnog profila ferocenskih tripeptidâ Ac-L-Ala-L-Pro-*NH*-Fn-*NH*-D-Pro-Boc i Ac-D-Ala-L-Pro-*NH*-Fn-*NH*-D-Pro-Boc s ciljem ispitivanja utjecaja ferocenskog sintona i kiralnosti aminokiselinskih sekvenci na kiralno uređenje i biološku aktivnost tripeptidâ. Provedenim istraživanjem utvrđena je bioaktivna konformacija i antioksidacijska aktivnost za oba tripeptida. Kako bi se dodatno istražila racionalizacija ekonomskih i ekoloških zahtjeva pri dizajnu bioaktivnih ferocenskih derivata, u nastavku istraživanja cilj je optimizirati njihovu pripravu i molekulsko modeliranje primjenom zelenih otapala, mehanokemijskim reakcijama i sintezom potpomognutom mikrovalovima.

Ključne riječi: ferocen; peptidomimetici; razvoj bioaktivnih molekula; antimikrobna aktivnost; antioksidacijska aktivnost

Synthesis, conformational anlysis and biological evaluation of tripeptides derived from ferrocene-1,1'-diamine and Ala-Pro sequence

Marina Ivančić, Gloria Kovač, Monika Kovačević*

University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, Zagreb, Croatia
*Corresponding author: marina.ivancic.sunshine@gmail.com

Abstract: Finding appropriate therapeutic solutions in the treatment of infectious diseases and the ubiquitous antimicrobial resistance represent the greatest scientific and technological challenge, with a special place occupied by the design and preparation of pharmacologically potent biomolecules. The study of small molecular forms that mimic conditions within natural systems has proven to be an effective approach in creating sustainable solutions, as evidenced by examples of existing peptidomimetic and ferrocene therapeutics. Peptidomimetics of improved pharmacokinetic, pharmacodynamic properties and therapeutic potential are prepared by conjugation of ferrocene base and natural proteinogenic amino acids, which can overcome the shortcomings and limitations of the therapeutic use of natural peptides and proteins. Therefore, in this paper, synthesis, conformational analysis (IR-, NMR-, CD- spectroscopy) and determination of antioxidant and antimicrobial profile of ferrocene tripeptides Ac-L-Ala-L-Pro-*NH*-Fn-*NH*-D-Pro-Boc and Ac-D-Ala-L-Pro-*NH*-Fn-*NH*-D-Pro-Boc were performed in order to investigate the influence of ferrocene synton and chirality of amino acid sequences on the chiral arrangement and biological activity. The conducted research determined the bioactive conformation and antioxidant activity for both tripeptides. The aim of further research is the additional rationalization of economic and environmental requirements in the design of bioactive ferrocene derivatives by optimizing their preparation and molecular modeling using green solvents, mechanochemical reactions, and microwave-assisted synthesis.

Keywords: ferrocene; peptidomimetics; design of bioactive molecules; antimicrobial activity; antioxidant activity

Okoliš i alergije na hranu - poveznice

Latica Kučinac, Mirna Habuda-Stanić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, 31000 Osijek, Hrvatska
*Dopisni autor: habudastanic@gmail.com

Sažetak: Intolerancija na hranu i alergije postaju sve ozbiljniji problem posljednjih desetljeća, a često ih se povezuje i s prisutnošću raznih onečišćenja u okolišu. Mnogi ljudi, posebno djeca, osjetljivi su na određene sastojke hrane ili hranu u cjelini. Kako se razvijaju alergije i netolerancije, tako se razvijaju i prehrambeni proizvodi koji isključuju takvu hranu ili alergene u njima. Iz tog razloga na policama možemo vidjeti sve više proizvoda s podebljanim slovima otisnutim BEZ GLUTENA i sličnih, a ako pogledamo deklaracije, svaki alergen koji svaka namirnica sadrži bit će i podebljan. S obzirom na hranu, alergijske reakcije mogu izazvati: gluten, laktoza, jaja, kikiriki, soju, riba i morske plodove te razne aditivi. Za osobe koje su netolerantne ili alergične na neku namirnicu, nije problem izbjegavanje, već je problem što se dodaju drugim namirnicama kao pojačivači okusa, tvari kao sastavni dio hrane ili kao aditivi. Aditivi su jedan od alergena koji su opasni, ne samo za pojedince, već i za sve nas. Neki od njih mogu biti štetni po zdravlje i stoga kancerogeni. U ovom radu biti će prikazani uzroci intolerancije na hranu te odgovori prehrambene industrije koja osmišljavanjem i proizvodnjom modificiranih tradicionalnih prehrambenih proizvoda nastoji olakšati zdravstvene tegobe osobama koje uzrokuje intolerancija na pojedine sastojke hrane i koje se suočavaju sa sve češćim zdravstvenim problemom današnjice.

Ključne riječi: okoliš, alergeni, alergije, hrana

Environment and food allergy - relations

Latica Kučinac, Mirna Habuda-Stanić*

Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, 31000 Osijek, Croatia
*Corresponding author**:** habudastanic@gmail.com

Abstract: Food intolerance and allergy have become increasingly serious problems in recent decades. Many people, especially children, are sensitive to certain food ingredients or food as a whole. As allergies and intolerances develop, so do food products that exclude such foods or allergens in them. For this reason, we can see more and more products on the shelves with GLUTEN-FREE and similar labels printed in bold letters, and if we look at the declarations, every allergen that each food contains will also be written in bold. With regard to foods, allergic reactions can be caused by: gluten, lactose, eggs, peanuts, soy, fish and seafood, and various additives. For people who are intolerant or allergic to food, the issue is not avoiding them, it is that they are added to other foods as flavor enhancers, substances as an integral part of food, or as additives. Additives are one of the allergens that are dangerous, not only for individuals but for all of us. Some of which can be harmful to health and therefore carcinogenic. To bring the concern of food intolerance closer to myself, and to you, I decided to make a presentation in which I will explain more deeply the topic that is becoming a growing problem.

Keywords: environment, allergens, allergies, food

Expression of recombinant lytic polysaccharide monooxygenases from ferns

Mirna Larva[1,2], Daniel Kracher[2]*

[1] University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, Zagreb, Croatia
[2] Graz University of Technology, Institute of Molecular Biotechnology, Petersgasse 14, Graz, Austria
*Corresponding author: daniel.kracher@tugraz.at

Abstract: Controlled enzymatic degradation of resistant biopolymers opens up new possibilities in using renewable biological resources, paving the way to transition from a fossil fuel-based economy to a renewable energy-based economy. Recently discovered, lytic polysaccharide monooxygenases (LPMOs) play a vital role in the degradation of organic polymers in nature and have thus evoked significant industrial and academic interest. LPMOs contain a powerful redox mechanism that allows them to degrade resistant and previously challenging to degrade polysaccharides such as cellulose and chitin. The starting enzyme in this study is the insecticidal LPMO from the fern Tectaria macrodonta (TmLPMO), as the only LMPO of plant origin identified to date and a promisingcandidate for the development of biological insecticides. Based on RNA sequence databases, a phylogenetic tree was formed by which over 40 potential plant LPMO enzymes were identified. In addition to the T. macrodonta fern, two additional fern species (Onoclea sensibilis and Thyrsopteriselegans) were selected as sources of LPMO enzymes for the first recombinant expression in E. coli to demonstrate activity as confirmation of successful expression. The products of these genes wereproved to be functional lytic monooxygenase.

Keywords: biopolymer degradation, lytic polysaccharide monooxygenase (LPMO), ferns

The most common soybean products in human nutrition

Marin Vujošević, Ivana Varga*

Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia
*Corresponding author: ivana.varga@fazos.hr

Abstract: Soybean is a high nutritional value legume native to Asia. This paper describes the use of soy in the human diet. The beginning of soybean cultivation and its history, the presence of soy in the human diet worldwide, which is only 7%, is also described. According to the studied literature, soy has a positive effect (anticancer properties, soy lecithin which reduces the occurrence of dementia increases the concentration and isoflavones that increase estrogen activity) and adverse effect (harmful carcinogenic nitrosamines and emulsifier E 621 which is an allergen) to the human body. Isoflavones are polyphenols belonging to the group of phytoestrogens, compounds of plant origin that show estrogenic activity. Soy products are one of the richest sources of isoflavones. The paper presents recipes for the preparation of dishes and soy products such as cheese (tofu), soy milk and soy sauce.

Keywords: soybean, human nutrition, food, health

Društvene znanosti / *Social sciences*

Implementacija terenske nastave u sklopu TZK-a

Blago Čepo, Rita Šolaja, Ivan Paravac, Marin Marinović*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Kineziološki fakultet Osijek, Drinska ul. 16A, Osijek, Hrvatska
*Dopisni autor: marin.marinovic@hotmail.com

Sažetak: Razvoj moderne tehnologije omogućio je djeci i mladima komunikaciju, učenje i stjecanje znanja bez da moraju napustiti svoju sobu. Međutim, bez obzira na mnogobrojne pozitivne dobrobiti koje su došle s modernom tehnologijom, pojavile su se određene negativne posljedice na dječji organizam. Povećan boravak u zatvorenom prostoru rezultirao je smanjenim kretanjem što je dovelo do pojave raznih zdravstvenih problema kao što su pretilost, niska razina funkcionalnih i motoričkih sposobnosti te mnogi psihološki problemi koji nisu bili toliko rašireni prije pojave moderne tehnologije. Budući da djeca provode sve više vremena na raznim pametnim uređajima, a sve manje u prirodi, godišnji fond sati tjelesne i zdravstvene kulture bi trebao biti znatno veći te bi se dio istih trebao odvojiti za terensku nastavu tj. nastavu u prirodi. Terenskom nastavom u prirodi djeca bi dobila uvid u razne aktivnosti kao što su bicikliranje, klizanje, planinarenje, skijanje… Proširenjem spektra njima poznatih aktivnosti bi se povećala i zainteresiranost za nastavak bavljenja tjelesnom aktivnošću odnosno sportom. U ovom preglednom radu analizirane su terenske aktivnosti koje bi obogatile nastavu tjelesne i zdravstvene kulture te su sukladno pregledanoj literaturi objašnjene smjernice prema kojima bi se nastava TZK-a trebala odvijati kako bi se smanjili negativni efekti modernog načina života.

Ključne riječi: kineziologija**,** nastava u prirodi, tjelesna aktivnost, tjelesna i zdravstvena kultura

Implementation of field teaching in PE

Blago Čepo, Rita Šolaja, Ivan Paravac, Marin Marinović*

Josip Juraj Strossmayer University of in Osijek Faculty of Kinesiology Osijek, Drinska ul. 16A, Osijek, Croatia
*Corresponding author: marin.marinovic@hotmail.com

Abstract: The development of modern technology has enabled children and young people to communicate, learn and acquire knowledge without having to leave their room. However, regardless of the numerous positive benefits that have come with modern technology, there have been certain negative consequences for children's bodies. Increased stay indoors resulted in reduced movement which led to various health problems such as obesity, low level of functional and motor skills and many psychological problems that were not so widespread before the advent of modern technology. Since children spend more and more time on various smart devices, and lessand less in nature, the annual pool of hours of physical and health education should be significantlylarger, and a part of them should be set aside for field classes, i.e. classes in nature. Field lessons innature would give children an insight into various activities such as cycling, skating, hiking, skiing... By expanding the spectrum of activities, they are familiar with, interest in continuing to engage in physical activity, i.e. sports, would increase. In this review paper, field activities that would enrich the teaching of physical and health education were analyzed and, in accordance with the reviewed literature, the guidelines according to which the teaching of physical education should take place in order to reduce the negative effects of the modern lifestyle were explained.

Keywords: kinesiology, teaching in nature, physical activity, physical and health culture

Korištenje QR kodova u organizaciji kulturnih događaja kao primjer ekološki prihvatljivog rješenja

Mateja Grbić[1], Bruno Mandić[2], Damir Šebo[1]*

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Akademija za umjetnost i kulturu u Osijeku, Ul. kralja Petra Svačića 1/f, Osijek, Hrvatska
[2] Sveučilište Josipa Jurja Strossmayera u Osijeku, Ekonomski fakultet u Osijeku, Trg Ljudevita Gaja 7, Osijek, Hrvatska
*Dopisni autor: damir.sebo@aukos.hr

Sažetak: Kulturne i kreativne industrije nastoje svoje djelovanje usmjeriti prema digitalizaciji, to je moguće ostvariti pomoću interneta, novih oblika komunikacije te korištenjem suvremenih tehnologija. Veliki doprinos tome ima ICT sektor kao pokretač digitalizacije sadržaja i novih oblika komunikacije s ciljanom skupinom korisnika. Pomoću ICT tehnologije i interneta mijenjaju se pravila poslovanja te se otvaraju nove mogućnosti komuniciranja, sve postaje transparentno i dostupno ciljanim korisnicima. Digitalizacija sadržaja važan je potencijal naspram tradicionalnih srodnih medija. Cilj ovoga rada jest prikazati kako je korištenje QR kodova, u kulturnim i kreativnim industrijama, efikasnije i ekološki učinkovitije. Provedenim istraživanjem nad studentskom populacijom, cilj je prikazati percepciju studenata o korištenju QR kodova u kulturnim i kreativni industrijama te analizirati koliko se njih služi novim oblicima komuniciranja i digitalnim sadržajima. Papirnati promotivni materijali mogu se zamijeniti QR kodovima te se pomoću njih može saznati više informacija o određenoj organizaciji ili događaju. U današnjem svijetu informacije su sve, većina populacije služi se pametnim telefonima te pomoću njih imaju omogućen brži pristup informacijama. Korištenjem suvremene tehnologije, kao što su QR kodovi, omogućava se lakša interakcija i pružaju se dodatne informacije koje mogu biti korisne korisniku.

Ključne riječi: ICT, kultura, QR kod, ekologija

The use of QR codes in the organization of cultural events as an example of an environmentally friendly solution

Mateja Grbić[1], Bruno Mandić[2], Damir Šebo[1]*

[1] Josip Juraj University of Osijek, Academy of Arts and Culture in Osijek, Ul. kralja Petra Svačića 1/f, Osijek, Croatia
[2] Josip Juraj University of Osijek, Faculty of Economics in Osijek, Trg Ljudevita Gaja 7, Osijek, Croatia
*Dopisni autor: damir.sebo@aukos.hr

Abstract: Cultural and creative industries strive to direct their activities toward digitalization, which can be achieved using the Internet, new forms of communication, and the use of modern technologies. The ICT sector makes a big contribution to this as a driver of the digitalization of content and new forms of communication with the target group of users. Digitalization of content is an important potential in comparison to traditional related media. The aim of this paper is to show how the use of QR codes, in cultural and creative industries, is more efficient and more ecologically efficient. Through research conducted on the student population, the goal is to show students' perception of the use of QR codes in the cultural and creative industries and to analyze how many of them use new forms of communication and digital content. Paper promotional materials can be replaced with QR codes and can be used to find out more information about a specific organization or event. In today's world, information is everything. Using modern technology, such as QR codes, enables easier interaction and provides additional information that can be useful to the user.

Keywords: ICT, culture, QR code, ecology

Slikovnica u funkciji ekološkog odgoja i kao poticaj ranog čitanja djece predškolske dobi

Hanna Jakovac, Kristina Krpan, Irella Bogut, Valentina Majdenić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet za odgojne i obrazovne znanosti, Ul. cara Hadrijana 10, Osijek, Hrvatska
*Dopisni autor: vmajdenic@gmail.com

Sažetak: Ekološki problemi danas predstavljaju prijetnju održivosti okoliša, a osnovni uzrok ovih problema je ljudsko ponašanje. Cilj rada je istražiti ulogu slikovnice u ekološkom odgoju kao i njen utjecaj na razvoj ekološke svijesti kod djece te utvrditi utječe li na usvajanja osnova održivog načina života. Uz informacijsko-odgojnu, spoznajnu, iskustvenu i estetsku funkciju, kao i zabavnu funkciju,. Istražiti će se i važnost čitanja slikovnica kao poticaj ranog čitanja kod djece predškolske dobi. Ispitanici i metode: Ispitanici su 120 (46 %) roditelja iz cijele Hrvatske i 141 (54 %) odgojitelja diljem Hrvatske. U statističku obradu uključeno je (N=261) ispitanika, ženskog spola je 254, a muškog spola 7. Odgojitelji i roditelji su ispunjavali online anonimni anketni upitnik samostalno osmišljen. U statističkoj obradi korišten je statistički program MedCalc® Statistical Software version 20 i i IBM SPSS Statistics 23. Rezultati pokazuju da odgojitelji koriste ekološke slikovnice u svom odgojno-obrazovnom radu s djecom, ali ne dovoljno. Slikovnice koriste kao sredstvo usvajanja ekološke svijesti i ekološkog odgoja kod djece. Pozitivno promišljanje odgojitelja o slikovnicama kao sredstvu ekološkog odgoja pokazalo se točnim. Potvrdili smo da su roditelji ekološki osviješteni, pa tako smatraju i za odgojitelje isto. U svom druženju s djecom rado koriste eko-slikovnice u svojstvu poučavanja ekološko prihvatljivom ponašanju. Rad je potvrdio da roditelji i odgojitelji pozitivno promišljaju o ekološkim slikovnicama, vrlo često ih koriste kao sredstvo poučavanja ekološkom odgoju. Potrebno je potaknuti Ministarstvo odgoja i obrazovanja i fakultete na učinkovitije sustavno obrazovanje odgojitelja. Poželjno je poticati kvalitetnu suradnju između odgojitelja i roditelja kako bi uspješno poučavali djecu ekološkom odgoju s ciljem da djeca očuvaju planet i za buduće generacije.

Ključne riječi: ekološki problemi, ekološka svijest, slikovnica, ekološki odgoj

Picture book in the function of ecological education and as an encouragement for early reading of preschool children

Hanna Jakovac, Kristina Krpan, Irella Bogut, Valentina Majdenić*

Josip Juraj University of Osijek, Faculty of Education, Cara Hadrijana 10, Osijek, Hrvatska
*Correspondence author: vmajdenic@gmail.com

Abstract: Environmental problems today pose a threat to environmental sustainability, and the root cause of these problems is human behavior. The aim of this study was to investigate the role of the picture book in environmental education as well as its impact on the development of environmental awareness in children. Determine whether adoptions affect the foundations of a sustainable lifestyle. Observe in addition to the information-educational, cognitive, experiential and aesthetic function, as well as the entertainment function. The importance of reading picture books as an incentive for early reading in preschool children will also be explored. The respondents are 120 (46%) parents from all over Croatia and 141 (54%) educators from all over Croatia. The statistical processing included (N = 261) respondents. Educators and parents completed an online anonymous self-designed survey questionnaire. The statistical program MedCalc® Statistical Software version 20 ii IBM SPSS Statistics 23 was used in the statistical processing. Obtained results show that educators use ecological picture books in their educational work with children, but not enough. Picture books are used as a means of adopting ecological awareness and ecological upbringing in children. Educators' positive thinking about picture books as a means of ecological education provedto be correct. We have confirmed that parents are environmentally aware, so they consider the same for educators. In their socializing with children, they like to use eco-picture books as teaching environmentally friendly behavior. The lack of environmental education is not only present in Croatian kindergartens but is also manifested throughout the world. This study confirmed that parents and educators think positively about ecological picture books, very often using them as a means of teaching ecological education. It is necessary to encourage the Ministry of Education and the faculty to more effective systematic education for educators. It is desirable to encourage quality cooperation between educators and parents in order to successfully teach children environmental education with the aim that children preserve the planet for future generations.

Keywords: ecological problems, ecological awareness, picture book, ecological education

Ekološki proizvodi i usluge kao dio kulturnog identiteta određenog područja

Boris Juvančić[1], Marin Seleš[2]*, Jerko Glavaš[1]

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Ekonomski fakultet u Osijeku, Trg Ljudevita Gaja 7, 31000 Osijek, Hrvatska
[2] Pučko otvoreno učilište Osijek, Ul. Lorenza Jagera 6, 31000, Osijek, Hrvatska
*Dopisni autor: ravnatelj@pucko-uciliste.hr

Sažetak: Poimanje kulture danas se očituje u nizu parametara koji nisu usko vezani uz kulturne događaje ili djela iz područja književnosti, slikarstva i ostalih umjetnosti. Kultura nekog određenog područja očituje se i u načinu funkcioniranja društvene zajednice, vrijednosti koje dominiraju u njoji stavu zajednice prema očuvanju i razvoju kulturnog identiteta. Ekološka poljoprivredna gospodarstva mogu biti jedni od važnijih dionika pri oblikovanju tog identiteta. Svojom ponudom koja može uključivati razne ekološki uzgojene proizvode, ali i mogućnostima smještaja na samoj lokaciji, spomenuta gospodarstva mogu definirati percepciju nekog kraja te ga učiniti kulturno ekološki razvijenim. Prezentiranjem svoje ponude putem web shopova mogu generirati dobit od prodaje, ali i od privlačenja potencijalnih turista koji ciljano posjećuju područja u kojima postoji ponuda tog tipa. Aktivnijim uključivanjem i kreiranjem akcijskih planova koji u prvi plan stavljaju posebitosti nekog područja koji se može definirati kao ekološki osviješten i održiv, moguće je utjecatii na sam kulturni identitet. Istraživanjem se ispituje značaj ekološki razvijenog područja pri odabiru konzumiranja proizvoda i usluga te odabiru destinacija za putovanje. Istovremeno, ispituje se i uloga web shopova i ciljanog oglašavanja ekoloških gospodarstava pri povećanju prodaje svojih proizvodai usluga.

Ključne riječi: ekološki proizvod; područje; kulturni identitet, web shop, turizam

ECO-products and services as part of the cultural identity of a particular area

Boris Juvančić[1], Marin Selеš[2]*, Jerko Glavaš[1]

[1] Josip Juraj Strossmayer University in Osijek, Faculty of Economics in Osijek, Trg Ljudevita Gaja 7, 31000 Osijek, Croatia
[2] Public Open University Osijek, Ul. Lorenza Jagera 6, 31000, Osijek, Croatia
*Corresponding author: ravnatelj@pucko-uciliste.hr

Abstract: The concept of culture today is manifested in a series of parameters that are not closely related to cultural events or works from the field of literature, painting, and other arts. The culture of a certain area is also reflected in the way the social community functions, the values that dominate it, and the community's attitude towards the preservation and development of cultural identity. Organic farms can be one of the most important stakeholders in shaping that identity. With their offer, which can include a variety of organically grown products, as well as accommodation options at the location itself, the aforementioned farms can define the perception of a region and make it culturally and ecologically developed. By presenting their offer through web shops, they can generate profit from sales, but also from attracting potential tourists who visit areas where there is an offer of this type. By more active involvement and creation of action plans that put in the foreground the peculiarities of an area that can be defined as ecologically aware and sustainable, it is possible to influence the cultural identity itself. The research examines the significance of an ecologically developed area when choosing to consume products and services and choosing travel destinations. At the same time, the role of web shops and targeted advertising of ecological farms in increasing sales of their products and services are examined.

Keywords: ecological product; territory; cultural identity, web shop, tourism

Moć glazbe u promicanju zaštite okoliša i brige za mlade - primjer orkestra iz Paragvaja

Dunja Keža, Mirna Sabljar*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Akademija za umjetnost i kulturu u Osijeku, Ul. kralja Petra Svačića 1/f, Osijek, Hrvatska
*Dopisni autor: msabljar@aukos.hr

Sažetak: Način života u postindustrijskoj fazi čovječanstva inaugurirao je pitanje zaštite okoliša kao jedno od najvažnijih (pitanja) suvremenog društva. Svakodnevna proizvodnja velikih količina otpada, osim što uništava prirodne resurse, utječe na društveni i ekonomski kontekst života. To je vidljivo u životima ljudi na mjestima koja su odlagališta otpada. Takvo mjesto je i Cateura, predgrađe glavnog grada Paragvaja, Asunciona. Stanovnici Cateure zarađuju za život recikliranjem, a djeca iz zajednice često ne pohađaju školu nego pomažu roditeljima u recikliranju. Kao inženjer zaštite okoliša, a ujedno i glazbenik, u Cateuri djeluje i Favio Chavez koji je osnovao *The Recycled Orchestra* u kojemu sviraju mladi na instrumentima koji su izgrađeni od recikliranih materijala. Sviranjem u orkestru mladi su Cateure dobili priliku upoznati glazbu, družiti se, a koncertima ukazuju na suživot s ogromnim količinama otpada. Cilj je rada ukazati koliko glazba ima moć da osim svoje univerzalne umjetničke vrijednosti bude i pokretač promjena kako za svaku mladu osobu, ali i za širi društveni kontekst. Prikazujući koliko bavljenje glazbenim aktivnostima ima moć pridonijeti razvoju pojedinca i zajednice drugi je cilj potaknuti pojedince djelovati na dobrobit i bolji život ranjivih skupina djece i mladih te zaštiti okoliša.

Ključne riječi: glazba; glazbena pedagogija; orkestar; otpad: zaštita okoliša

The power of music in promoting environmental protection and care for young people - an example of an orchestra from Paraguay

Dunja Keža , Mirna Sabljar*

Josip Juraj University of Osijek, Academy of Arts and Culture in Osijek, Ul. kralja Petra Svačića 1/f, Osijek, Croatia
*Corresponding author: msabljar@aukos.hr

Abstract: The way of life in the post-industrial phase of humanity has raised the issue of environmental protection, one of the most important (issues) of modern society. The daily production of large amounts of waste, in addition to destroying natural resources, affects the social and economic context of life. This is evident in the lives of people in places that are landfills. Such a place is Cateura, a suburb of Paraguay's capital, Asuncion. Cateura residents make a living through recycling, and children from the community often don't attend school because they help their parents recycle. Favio Chavez, who's an environmental engineer, a musician, and a resident of Catuera, founded The Recycled Orchestra: an Orchestra operated by young people who play on instruments built from recycled materials. By playing in the orchestra, young Cateures were allowed to get to know music, socialize, and indicate the coexistence of huge amounts of waste. The paper aims to point out how much music has the power to be, in addition to its universal artistic value, a driver of change both for each young person and for the wider social context. Music clearly highly contributes to the development of the individual and the community, and in this example, it also encourages individuals to act up and protect the environment: by that it ensures the well-being and better life for vulnerable groups of people, such as children and young people.

Keywords: music; music pedagogy; orchestra; waste: environmental protection

Popularizacija modernih načina tjelesne aktivnosti u prirodi

Ivan Paravac, Blago Čepo, Rita Šolaja, Marin Marinović*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Kineziološki fakultet Osijek, Drinska ul. 16A, Osijek, Hrvatska
*Dopisni autor: marin.marinovic@hotmail.com

Sažetak: Moderan način života direktno utječe na povećanje hipokinezije, a time i rizika od mnogih kroničnih bolesti. Jedan od glavnih razloga pojave hipokinezije u modernom svijetu je ne efikasan način promocije tjelesne aktivnosti i zdravlja. Tradicionalni načini promocije tjelesne aktivnosti i zdravlja dominantno su se fokusirali na promociju i edukaciju o dobrobitima zadovoljavanjem određene razine tjelesne aktivnosti. Rezultat tradicionalnih pokušaja su educirana javnost o pozitivnim učincima tjelesne aktivnosti i dobrobitima za zdravlje što nije urodilo željenim efektima jer podaci pokazuju veliki pad u tjelesnoj aktivnosti ljudi, a pogotovo je zabrinjavajuća činjenica da sve više i više djece ne zadovoljava preporuke Svjetske zdravstvene organizacije o potrebnoj razini tjelesne aktivnosti. U ovom preglednom radu analizirani su kratkoročni i dugoročni efekti tradicionalnog načina promocije tjelesne aktivnosti i zdravlja te moderni načini kojima primarna svrha nije bila promocija tjelesne aktivnosti i zdravlja, a u velikoj mjeri su na globalnoj razini utjecali baš na to. Također, u ovom preglednom radu, iznesene su preporuke za buduće projekte kojima je cilj promocija tjelesne aktivnosti i zdravlja te načini koji su se pokazali najdjelotvorniji.

Ključne riječi: hipokinezija, kineziologija, suvremeni sadržaji, tjelesna aktivnost

Popularization of the modern ways of physical activities in nature

Ivan Paravac, Blago Čepo, Rita Šolaja, Marin Marinović*

Josip Juraj Strossmayer University of in Osijek Faculty of Kinesiology Osijek, Drinska ul. 16A, Osijek, Croatia
*Corresponding author: marin.marinovic@hotmail.com

Abstract: The modern way of life directly affects the increase in hypokinesia, and thus the risk of many chronic diseases. One of the main reasons for the appearance of hypokinesia in the modern world is the inefficient way of promoting physical activity and health. Traditional ways of promoting physical activity and health have predominantly focused on promotion and education about the benefits of meeting a certain level of physical activity. The result of traditional attempts is an educated public about the positive effects of physical activity and its benefits for health, which did not produce the desired effects, because the data show a large drop in people's physical activity, and the fact that more and more children do not meet the recommendations of the World Health Organization on the required level is especially worrying. physical activities. In this overview paper, the short-term and long-term effects of the traditional way of promoting physical activity and health were analyzed, as well as modern ways whose primary purpose was not the promotion of physical activity and health, and to a large extent, on a global level, they influenced just that. Also, in this overview, recommendations for future projects aimed at promoting physical activity and health and the methods that have proven to be the most effective are presented.

Keywords: hypokinesia, kinesiology, contemporary content, physical activity

Pravni aspekti zaštite okoliša kroz kliničku nastavu Zelene pravne klinike Pravnog fakulteta Osijek

Tena Pokas, Anja Škalic, Ana Đanić Čeko*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Pravni fakultet Osijek, Ulica cara Hadrijana 8/A, Osijek, Hrvatska
*Dopisni autor: adjanic@pravos.hr

Sažetak: Zelena pravna klinika proizašla je iz projekta „*Transformacija - Novi pristup upravljanju zaštićenim i NATURA 2000 područjima*“, kao jedna od mnogih projektnih aktivnosti, a čiji je partner bio i Pravni fakultet Osijek. Nakon završetka projekta, sklopljen je Sporazum o suradnji između Pravnog fakulteta Osijek i Udruge za zaštitu prirode i okoliša Zeleni Osijek. Osnovana je odlukom Fakultetskog vijeća od 11. siječnja 2021. kao zasebna ustrojbena jedinica Pravnog fakulteta Osijek. Zelena pravna klinika svojim edukativnim aktivnostima i javnim djelovanjem nastoji potaknuti svijest o važnosti ekoloških pitanja te osigurati nužnu i primjerenu pravnu zaštitu svih građana u područjima zaštite prirode i okoliša. Kroz kliničku nastavu, mentori i kliničari nude beplatnu pravnu pomoć u u području zaštite okoliša, surađuju s releavantnim dionicima te okolišnim organizacijama, provode brojne druge aktivnosti s ciljem razvoja kulture zaštite okoliša. Svrha rada je prikazati pravne aspekte zaštite okoliša kroz kliničku nastavu studenata u okviru Zelene pravne klinike.

Ključne riječi: zaštita okoliša, Zelena pravna klinika, klinička nastava, Zakon o zaštiti okoliša

Legal aspects of Environmental Protection through clinical teaching of the Green Law Clinic of the Faculty of Law Osijek

Tena Pokas, Anja Škalic, Ana Đanić Čeko*

Josip Juraj Strossmayer University of in Osijek**,** Faculty of Law Osijek, Ul. Stjepana Radića 13, Osijek, Croatia
*Corresponding author: adjanic@pravos.hr

Abstract: The Green Law Clinic arose from the project *" Transformation – A New Approach to the Management of Protected and NATURA 2000 Areas"*, one of many project activities, and whose partner was the Faculty of Law Osijek. After the completion of the project, an Agreement of Cooperation was concluded between the Faculty of Law Osijek and the Association for Nature and Environmental Protection Green Osijek. It was established by the decision of the Faculty Council on 11 January 2021 as a separate organizational unit of the Faculty of Law Osijek. Through its educational activities and public activities, the Green Law Clinic seeks to raise awareness of the importance of environmental issues and ensure the necessary and appropriate legal protection of all citizens in the fields of nature and environmental protection. Through clinical teaching, mentors and clinicians offer free legal aid in the field of environmental protection, cooperate with relevant stakeholders and environmental organizations, and carry out numerous other activities aimed at developing a culture of environmental protection. The purpose of this paper is to present the legal aspect of environmental protection through clinical teaching of students within the Green Law Clinic.

Keywords: environmental protection, Green Law Clinic, clinical teaching, environmental law

Načelo onečišćivač plaća i njegova primjena u praksi

Vlatka Šokec, Ana Elena Troha, Ana Đanić Čeko*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Pravni fakultet Osijek, Ulica cara Hadrijana 8/A, Osijek, Hrvatska
*Dopisni autor: adjanic@pravos.hr

Sažetak: Načelo onečišćivač plaća jedno je od temeljnih načela zaštite okoliša čija je primjena propisana nacionalnim zakonodavstvom, a koje se primjenjuje u području zaštite okoliša, pravnom stečevinom Europske unije i načelima međunarodnog prava zaštite okoliša. Primjenom načela onečišćivače se potiče da ne uzrokuju štetu u okolišu te se traži da odgovaraju za onečišćenje koje prouzrokuju. Praktična primjena ovoga načela u praksi je raznolika, obzirom da nemaju sve države funkcionalan pravni okvir za primjenu načela, a sama svrha primjene načela odvija se u dva smjera; jedan smjer podrazumijeva pružanje pomoći onima kojima nastala šteta prouzroči posljedice, dok drugi smjer podrazumijeva primjenu načela kako bi se ograničilo ili spriječilo onečišćenje i štetne djelatnosti. Ovim radom se želi prikazati primjena načela u nacionalnim i europskim politikama te primjeri dobre prakse.

Ključne riječi: onečišćivač plaća, načela zaštite okoliša, zelene politike, praksa, Zakon o zaštiti okoliša

The polluter pays principle and its application in practice

Vlatka Šokec, Ana Elena Troha, Ana Đanić Čeko*

Josip Juraj Strossmayer University of in Osijek**,** Faculty of Law Osijek, Ul. Stjepana Radića 13, Osijek, Croatia
*Corresponding author: adjanic@pravos.hr

Abstract: The polluter pays principle is one of the fundamental principles of environmental protection whose application is legitimated by national legislation, and which is applied in the field of environmental protection, the acquis of the Europe Union and the principles of international environmental law. The application of the polluters' principle encourages pollutants not to cause damage to the environment and requires them to be held accountable for the pollution they cause. However, the practical application of this principle in practice is diverse, given that not all countries have a functional legal framework for the application of the principle, and the very purpose of applying the principle takes place in two directions; one direction involves providing help to those affected by the damage, while the other direction involves the application of principles to limit or prevent pollution and harmful activities. This paper aims to show the application of principles in national and European policies and examples of good practice.

Keywords: polluter pays principle, principles of environmental protection, green politics, law practice, environmental law

Zašto druge zemlje kao prijevozno sredstvo loriste bicikl, a Hrvatska ne?

Rita Šolaja, Ivan Paravac, Blago Čepo, Marin Marinović*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Kineziološki fakultet Osijek, Drinska 16a, Osijek, Hrvatska
*Dopisni autor: Marin.Marinovic@hotmail.com

Sažetak: Bicikl, kao prijevozno sredstvo, izuzetno je popularno sredstvo za putovanje od svoga nastanka do danas. Iako je takav oblik prijevoznog sredstva izuzetno jeftin i koristan za zdravlje i okoliš, pojavom novih prijevoznih sredstava kao što su automobili, u nekim zemljama izgubio se njegov značaj. Zbog sve većeg zagađenja okoliša, korištenje bicikla predstavlja nadu za pomak prema budućnosti s nultom emisijom CO_2. Europska biciklistička federacija (ECF) smatra da je svijetu potrebno mnogo više bicikliranja ako se želi boriti protiv klimatskih promjena, stoga su mnoge zemlje, posebice Finska, Danska, Nizozemska i Njemačka kao glavno prijevozno sredstvo zamijenili automobile s biciklom jer su uvidjeli koje sve dobrobiti ima kako na zdravlje, ali tako i na okoliš. U Republici Hrvatskoj je to obrnuto, sve više se povećava broj automobila, a smanjuje postotak bicikliranja. U ovom preglednom radu analizirani su mehanizmi motivacije i uređenja zemalja kod kojih se u velikoj mjeri bicikl koristi kao prijevozno sredstvo te su ti mehanizmi uspoređeni s mehanizmima koji se koriste u Hrvatskoj.

Ključne riječi: biciklizam, kineziologija, okoliš, prijevozno sredstvo

Why do other countries use bikes as a vehicle and Croatia do not?

Rita Šolaja, Ivan Paravac, Blago Čepo, Marin Marinović*

Josip Juraj Strossmayer University in Osijek, Faculty of Kinesiology Osijek, Drinska 16a, Osijek, Croatia
*Corresponding author: Marin.Marinovic@hotmail.com

Abstract: The bicycle, as a means of transportation, has been an extremely popular means of travel since its inception to the present day. Although this form of transport is extremely cheap and beneficial to health and the environment, the emergence of new means of transport such as cars has lost its importance in some countries. Due to increasing environmental pollution, the use of bicycles represents hope for a shift towards a future with zero CO_2 emissions. The European Cycling Federation (ECF) believes that the world needs much more cycling if it wants to fight climate change, so many countries, especially Finland, Denmark, the Netherlands and Germany, have replaced cars with bicycles as their main means of transport both to health but also to the environment. In the Republic of Croatia, the opposite is true, the number of cars is increasing, and the percentage of cycling is decreasing.
In this review paper, the mechanisms of motivation and organization of countries where bicycles are largely used as a means of transport are analyzed, and these mechanisms are compared with the mechanisms used in Croatia.

Keywords: cycling, kinesiology, environment, means of transport

Aktivnim djelovanjem protiv negativnih posljedica *brze mode*

Marina Žilić, Renata Jukić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Filozofski fakultet Osijek, Lorenza Jägera 9, Osijek, Hrvatska
*Dopisni autor: rjukic@ffos.hr

Sažetak: Osnovni cilj održivog razvoja jest pomiriti potrebe društva i privrede, a da se pritom ne našteti okolišu i da se očuvaju njegove prirodne vrijednosti za buduće naraštaje. U najveće zagađivače okoliša ubraja se i modna industrija, odnosno koncept tzv. *brze mode*. Taj pojam pojavljuje se 1980-ih godina, a označava promotivne strategije i marketinški alat za frekvenciju i manipulaciju kupaca kako bi stvarali "potrebu" za većom količinom i češćom promjenom odjeće. Većina ljudi modu promatra kao zabavu ili čak kao potrebu, no u realnosti je tekstilna industrija na vrhu svjetskih zagađivača okoliša. Cilj svake industrije bi trebala biti čežnja za održivosti.U modnoj industriji ona uključuje produktivnost kao što je upotreba eko održivih i obnovljivih materijala, kvaliteta i dugovječnost proizvoda, ali i društvena svojstva poput sigurnosti posla, poštene plaće i kvalitetu života općenito. (Kušević, 2020) Održivi razvoj je ugrožen mnogim posljedicama globalizacije, pa tako i razvojem i unaprjeđivanjem *Fast Fashion* proizvodnje i usponom tekstilne industrije.
Aktivno djelovanje protiv *fast fashion* proizvodnje i dosadašnjeg poslovanja modne industrije se vodilo na ne tako tradicionalnom modelu. Riječ je o individualnoj akciji, odnosno o svjesnom djelovanju pojedinca kod kojeg se pojavila tzv. „eko-krivnja“. Ovo nije rješenje jer, primjerice kako Scully (2021) navodi podatak da 76% zagađenja dolazi od industrije i kompanija, dok samo 3% dolazi iz kućanstava. Iz ovog se može zaključiti da nije dovoljno da se stvari mijenjaju od pojedinca. Scully (2021) smatra da je kolektivno djelovanje jedini način da pokret bilo koje vrste uspije ostvariti svoje ciljeve.

Ključne riječi: održivi razvoj, *brza moda* (*fast fashion)*, zagađenje okoliša, aktivno djelovanje

Active action against the negative consequences of *fast fashion*

Marina Žilić, Renata Jukić*

Josip Juraj University of Osijek, Faculty of Humanities and Social Sciences, 9 Lorenz Jäger St., Osijek, Croatia
*Corresponding author: rjukic@ffos.hr

Abstract: The main goal of sustainable development is to reconcile the needs of society and the economy, without harming the environment and preserving its natural values for future generations. The biggest polluters of the environment include the fashion industry, ie the concept of the so-called fast fashion, i.e. the term which appeared in the 1980s denotes promotional strategies and marketing tools to manipulate customers to create a “need” for more quantity and more frequent change of clothing. Most people view fashion as entertainment or even as anecessity, but in reality, the textile industry is at the top of the world’s environmental polluters. Thegoal of every industry should be longing for sustainability. In the textile industry, it includes productssuch as the use of eco-sustainable and renewable materials, product quality and product lifetime, but also social characteristics such as job security, fair wages and quality of life in general. (Kušević, 2020) Development and improvement of fast fashion production pose a threat to sustainable development. Active action against fast fashion production and the previous business of the fashion industry was conducted on an unorthodox model. It is an individual action, ie the conscious action of an individual in whom the so-called term "eco-guilty". This is not a solution because, for example, as Scully (2021) states, 76% of pollution comes from industry and companies, while only 3% comes from households. Therefore, it can be concluded that things cannot change on an individual level, but in Scully's (2021) words collective action is the only way for a movement of any kind to succeed in achieving its goals.

Keywords: sustainability, pollution, *fast fashion*, active action

Humanističke znanosti / *Humanities*

Etika zemlje

Kristina Lovrenović, Filip Pavić, Boško Pešić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Filozofski fakultet Osijek, Lorenza Jagera 9, 31000, Osijek, Hrvatska
***Dopisni autor:** bpesic@ffos.hr

Sažetak: Čovjekova sposobnost umovanja i njegova subjektivnost, suprotno drugačijem vjerovanju, nisu lišeni njegove okoline u kojoj se nalazi. Za zdrav razum i sposobnost razmišljanja potrebna nam je priroda. Čovječanstvo na Zemlju gleda kao na artikl kojim rukuje i kojim se koristi za vlastite potrebe, no rješenje je u tome da se izjednače. Potrebno je dovesti u pitanje granice civilizacijskog uznapredovanja pa riješiti iduće paradokse: znanost kao napredak čovječanstva ili kao uništavanje prirode, zemlja kao sluga ili zemlja kao biotička zajednica i slično. Etika zemlje se suprotstavlja prevladavajućoj antropocentričkoj etici. Antropocentrička etika čovjeka stavlja u središte a sve ostale članove zajednice u podređen položaj. Etika zemlje mijenja takav položaj homo sapiensa tako što čovjeka postavlja iz osvajača zemljišne zajednice u njezina ravnopravna člana, odnosno stanovnika. To podrazumijeva poštovanje prema ostalim članovima biotičke zajednice te prema samoj zajednici. Kant navodi da ako čovjek već nije u mogućnosti cijeniti intrinzičnu vrijednost živih bića druge vrste, tada on mora njih poštovati jer neprimjerenim ponašanjem čovjeka spram bilja i životinja ostavlja utjecaj na samog čovjeka. Čovjek stoga barem posredno mora iskazivati poštovanje prema drugim vrstama.

Ključne riječi: etika, antropocentrizam, biocentrizam, zemlja, jednakost

Land Ethics

Kristina Lovrenović, Filip Pavić, Boško Pešić*

Josip Juraj Strossmayer University in Osijek, Faculty of Humanities and Social Sciences Osijek, Lorenza Jagera 9, 31000, Osijek, Croatia
*Corresponding author: bpesic@ffos.hr

Abstract: Person's ability to think and his subjectivity, despite the contrary belief, is not independent of their environment. Rational thinking and the ability to think depends on the nature around us. Humanity views the Earth as an inferior article that it freely uses for its own needs while what is needed lies in the idea to equalize the two. It is needed to bring into question the process of technological advancement and thus think about the following paradoxes: science as advancement or destruction of nature; Earth as a slave or as an equal member of a biotic community, etc. Earth ethics opposes the prevailing anthropocentric ethics. Anthropocentric ethics puts man at the center and all other members of the community in a subordinate position. Earth ethics changes this position of homo sapiens by placing man from the superior conqueror of the land to its equal member. Kant states that if a man is no longer able to appreciate the intrinsic value of living beingsof another kind, then he must respect them because man's inappropriate behavior towards plants and animals leaves an impact on the man himself. Man must therefore at least indirectly show respect for other species.

Keywords: ethics, anthropocentrism, biocentrism, land, equality

Duhovnopovijesni temelji ekološke krize

Karla Pružinac, Boško Pešić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Filozofski fakultet Osijek, Lorenza Jagera 9, 31000, Osijek, Hrvatska
***Dopisni autor:** bpesic@ffos.hr

Sažetak: Ovo izlaganje pokušat će dati svoj doprinos razumijevanju ekološke krize, u kojoj se danas neupitno nalazimo, usmjeravanjem na njene duhovne i povijesne korijene kako ih prikazuje suvremeni talijansko-njemački filozof Vittorio Hösle. Ekološka kriza, prema Hösleu, nastaje paralelno s razvojem tehnike, čija se dijalektika očituje s jedne strane kao iskazivanje čovjekove nadmoći i iskorištavanje prirode, a s druge kao praktično zadovoljenje potreba. Iako tehnika olakšava zadovoljenje ljudskih potreba, pridonosi i stvaranju novih potreba, koje ovise o tehnici. Problem je u tome što i njihovo zadovoljenje proizvodi nove metapotrebe, te se taj proces pokazuje beskonačnim. Opasnost ekološke krize temelji se na tom beskonačnom procesu nadmetanja kvantitativnim i objektivirajućim mišljenjem, koje sa sobom nosi potrebu dokazivanja nadmoći nad drugima i prirodom. Takvo duhovno stanje svijet vodi u vlastitu propast, jer nadmetanjem bez cijene ili ne shvaća ili prihvaća rizik i neizbježnu sudbinu vlastita uništenja. Naime, objektiviranjem drugog i prirode iskorištavanjem i uništenjem, zbog međusobne ovisnosti postojanja u cjelini, nužno vodi i do vlastite propasti. Iako se ekološka kriza razvija s napretkom tehnike, tehnika sama nije njezin uzrok. Tehnika je samo oruđe koje ju je pokrenulo i isto ju tako može zaustaviti, a tim oruđem rukuje duhovna svijest čovječanstva.

Ključne riječi: antropocentrizam; duhovna povijest; tehnika; ekološka kriza

Spiritual-historical foundations of the ecological crisis

Karla Pružinac, Boško Pešić*

Josip Juraj Strossmayer University in Osijek, Faculty of Humanities and Social Sciences Osijek, Lorenza Jagera 9, 31000, Osijek, Croatia
*Corresponding author: bpesic@ffos.hr

Abstract: This presentation will try to contribute to the understanding of the ecological crisis, which we are undoubtedly in today, by focusing on its spiritual and historical roots as shown by the contemporary Italian-German philosopher Vittorio Hösle. The ecological crisis, according to Hösle, arises in parallel with the development of technology, the dialectic of which manifests itself on the one hand as the manifestation of man's supremacy and the exploitation of nature, and on the other as the practical satisfaction of needs. Although technology facilitates the satisfaction of human needs, it also contributes to the creation of new needs, which depend on technology. The problem is that their satisfaction also produces new meta-needs, and this process turns out to be endless. The danger of the ecological crisis is based on this endless process of competition with quantitative and objectifying thinking, which entails the need to prove superiority over others and nature. Such a spiritual state leads the world to its destruction because by competing without a price it either does not understand or accepts the risk and inevitable fate of its destruction. Namely, by objectifying the other and by exploiting and destroying nature, due to the mutual dependence of existence as a whole, it necessarily leads to one's downfall. Although the ecological crisis develops with the progress of technology, technology itself is not its cause. Technology is only a tool that started it and can also stop it, and this tool is handled by the spiritual consciousness of humanity.

Keywords: anthropocentrism, spiritual history, technique, ecological crisis

Višedisciplinarno / *Interdisciplinary*

Pollution of Water Bodies - Mucilage

Kardelen Akin[1], Mirna Habuda-Stanić[2*]

[1] Marmara University, Göztepe Yerleşkesi 34722 Kadıköy – İstanbul, Turkey
[2] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: habudastanic@gmail.com

Abstract: Mucilage is a yellow-white, viscous, thick and sticky hydrocolloid. It is produced by most plants and some microorganisms for various purposes such as adhesion, protection against infection and as a source of nutrients. Mucilage can also appear in the marine environment as a result of the intensive growth of some seaweeds, mainly caused by climate change and increased seawater temperature and the uncontrolled discharge of untreated wastewater. The intensive appearance of mucilage in water bodies with reduced water flow has a negative effect on the surrounding environment and causes economic problems. One of the most affected places by this phenomenon is the Turkish Sea of Marmara, in whose bay is located one of the most populous cities in Europe, Istanbul. The appearance of mucilage in seawater is especially intense during the warmer part of the year, and the most pronounced so far was in the summer of 2021. The appearance of mucilage in the sea causes clogging of fishermen's nets, makes life in the sea impossible and negatively affects the tourism sector. In 2021, Turkish scientists made extraordinary efforts to reduce the amount of mucilage in the Sea of Marmara. They collected mucilage from the sea surface and transported it by pumping systems to a treatment plant and disposal facility. In the same time, they increased the oxygen level in the seawater by oxygenation devices placed 30 meters deep in the sea in designated pilot areas. The effective prevention of mucilage occurrence can be achieved by the reduction of industrial wastewater and pollution discharge into the environment, efficient treatments of wastewater, and transition to organic agricultural practice in surrounding agricultural lands.

Keywords: mucilage, water quality, wastewater, Turkey

Onečišćenje šuma

Mia Brezar, Jelena Vrban, Mirna Habuda–Stanić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, Osijek, Hrvatska
*Dopisni autor: habudastanic@gmail.com

Sažetak: Za onečišćenje šuma odgovorni su brojni čimbenici, no najčešće u to ljudske aktivnosti poput intenzivne poljoprivrede, loše gospodarenje vodama i otpadom te ostali abiotički i biotički čimbenici. Istraživanje stanja šuma pokazalo je da je u Hrvatskoj zdravo 74 % stabala, slabo oštećeno 18 % stabala te srednje do jako oštećeno 8 % stabala. Organske i anorganske tvari koje se nakupljaju u tlu, sporo se razgrađuju te zaostaju i desetljećima u tlu nakon onečišćenja šuma. Analize su pokazale da se štetne tvari najviše nakupljaju u korijenu i stabljici drveća. Uz navedeno, jedan od značajnih negativnih čimbenika su i kisele kiše, koje mogu oštetiti iglice, pupoljake i koru stabla te uzrokovati anomalije u rastu drveta, oštećenje korijenja te slabije otpornosti na nepovoljne vremenske uvjete. Da bi se smanjilo onečišćenje šuma potrebno je osigurati odvoženje otpada na deponije te smanjiti onečišćenja koje u šume dospijevaju uslijed obližnjih poljoprivrednih aktivnosti i drugo.

Ključne riječi: onečišćenje šuma, odlaganje otpada, kisele kiše

Forest pollutions

Mia Brezar, Jelena Vrban, Mirna Habuda–Stanić*

Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: habudastanic@gmail.com

Abstract: Numerous factors are responsible for forest pollution, but most of them are result of human activities such as intensive agriculture, poor water and waste management, and other abiotic and biotic factors. Surrey in Croatia sown that 74% of trees are healthy, 18% of trees are slightly damaged, and 8% of trees are moderate to severely damaged. Organic and inorganic substances that accumulate in the soil slowly decompose and remain in the soil for decades after forest pollution. Analyzes have shown that pollutants mainly accumulate in the roots and stems of trees. Among the above described, the significant negative effect on forest health has the occurrence of acid rain, which can damage the needles, buds, and bark of the tree and cause anomalies in the growth of the tree, damage to the roots, and lower resistance to adverse weather conditions. In order to reduce forest pollution, it is necessary to ensure appropriate waste management and reduction of the pollution that reaches the forests due to nearby agricultural activities and other things.

Keywords: forest pollution, waste disposal, acid rain

Energy Poverty

Charly Fallot[1], Hrvoje Lepeduš[2], Mirna Habuda-Stanić[3*]

[1] University of Technology of Belfort-Montbéliard (UTBM), Rue de Leupe, Sevenans, France
[2] Josip Juraj Strossmayer University of in Osijek, *Faculty of Humanities and Social Sciences* in Osijek, Lorenza Jagera 9, Osijek, Croatia
[3] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: habudastanic@gmail.com

Abstract: Energy poverty is a new and increasingly frequently used term that denotes an individual status in which bills for energy consumption represent an extremely high share of total household expenses. This situation forces individuals/families to consume less energy in their households (saves on lighting, heating and cooling rooms, and maintaining basic hygiene conditions). According to data from the European Commission, more than 34 million people in the European Union experienced some form of energy poverty and among them, the most vulnerable demographic group (retired people) are most affected. Unfortunately, the conflict in Ukraine additionally contributes to the increase in energy prices, and thus increases the percentage of the population that is exposed to energy poverty. This situation significantly reduces the quality of life and can have negative effects on the mental and physical health of the individual. One of the possible solutions that can reduce the energy poverty of the population is the establishment of legal regulations that will contribute to the quality construction of residential buildings by ensuring quality insulation properties and the use of renewable energy sources. This paper presents other technical and technological solutions that can contribute to the reduction of energy poverty of the global population in an environmentally friendly way.

Keywords: energy poverty, renewable energy, health, living

Greenroom festival

Klara Ivezić, Darija Kuharić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Akademija za umjetnost i kulturu u Osijeku, Ul. kralja Petra Svačića 1/f, Osijek, Hrvatska
*Dopisni autor: darija.kuharic@gmail.com

Sažetak: Srednjovjekovno-barokni dvorac Prandau-Normann glavno je obilježje grada Valpova, uz koji se posebno ističu perivoj kao jedan od najdragocjenijih povijesnih perivoja kontinentalne Hrvatske. Park je poseban po svojoj umjetničkoj i estetskoj vrijednosti, ali i starosti te raritetnosti zasađenih biljnih vrsta. Pripada tipu engleskih pejzažnih parkova, a nastao je početkom 19. stoljeća. Osnivač parka je bio također član obitelji Prandau - barun Josef Ignac. Park je proglašen hortikulturnim spomenikom prirodne i vrtne arhitekture. Sedam godina zaredom na tom se prostoru (2012.-2019.) krajem kolovoza organizirao Greenroom festival. Održavanje ove manifestacije na lokalitetu navedenih kulturnih, povijesnih, baštinskih i krajobraznih rariteta različito je prihvaćeno u javnosti.

Ključne riječi: dvorac Prandau-Normann, perivoj, park, Greenroom festival, Valpovo

Greenroom Festival

Klara Ivezić, Darija Kuharić*

Josip Juraj Strossmayer University of in Osijek, The Academy of Arts and Culture in Osijek, Ul. kralja Petra Svačića 1/f, Osijek, Croatia
*Corresponding author: darija.kuharic@gmail.com

Abstract: The medieval-baroque Prandau-Normann castle is the main feature of the town ofValpovo, next to which the park stands out as one of the most precious historical parks in continental Croatia. The park is special for its artistic and aesthetic value, but also for the age and rarity of the planted plant species. It belongs to the type of English landscape park and was created at the beginning of the 19th century. The founder of the park was also a member of the Prandau family - Baron Josef Ignac. The park has been declared a horticultural monument of natural and garden architecture. For seven years in a row (2012-2019), the Greenroom festival was organized at the endof August. The holding of this manifestation in the locality of the mentioned cultural, historical, heritage and landscape rarities was accepted differently by the public.

Keywords: Prandau-Normann castle, garden, park, Greenroom festival, Valpovo

Uz pomoć zaslona kamere: zelene engleske poslovice i idiomi

Laura Kolarević, Ea Barišić, Darija Kuharić*

Sveučilište Josipa Jurja Strossmayerau Osijeku, *Akademija* za umjetnost i kulturu u *Osijeku*, Kralja Petra Svačića 1/f, Osijek, Hrvatska
*Dopisni autor: darija.kuharic@gmail.com

Sažetak: Dok poslovice tumačimo kao izraze nekoliko riječi koja su postala popularna s ciljem prenošenja misli, učenja ili moralnih savjeta, definicija idioma je višestruka. Često ih se definira kao osebujne riječi ili izraze, koji se teško prevodiv ili neprevodiv na drugi jezik. Ovi figurativni izrazi u jeziku poznati su izvornim govornicima, no u učenju stranog jezika mogu biti zbunjujući. Namjera je ovoga rada prikazati poznate i manje poznate engleske poslovice i idiome koji sadrže riječ *green* pomoć autorskih fotografija, dati objašnjenje i primjere na hrvatskom jeziku.

Ključne riječi: poslovice, idiomi, engleski jezik, zelena boja, fotografija

With a Little Help of the Camera Screen: Green Proverbs and Idioms in English

Laura Kolarević, Ea Barišić, Darija Kuharić*

Josip Juraj Strossmayer University of in Osijek, The Academy of Arts and Culture in Osijek, Kralja Petra Svačića 1/f, Osijek, Croatia
*Corresponding author: darija.kuharic@gmail.com

Abstract: While we interpret proverbs as expressions of a few words that have become popular with the aim of conveying thoughts, teachings, or moral advice, the definition of an idiom is multiple. They are often defined as peculiar words or expressions, which are difficult to translate or untranslatable into another language. These figurative expressions in the language are familiar to native speakers, but they can be confusing when learning a foreign language. The purpose of this paper is to show well-known and less well-known English proverbs and idioms that contain the word green with the help of the author's photos, to give explanations and examples in Croatian.

Keywords: proverbs, idioms, English, green, photography

The Color Green in Marketing

Lucia Murković, Darija Kuharić*

Josip Juraj Strossmayer University of in Osijek, The Academy of Arts and Culture in Osijek, Kralja Petra Svačića 1/f, Osijek, Croatia
*Corresponding author: darija.kuharic@gmail.com

Abstract: Since vision is the most dominant and developed sense with the most significant power to influence consumers` perception, it plays an essential role in sending a powerful message to consumers. When it comes to colors, they present an unavoidable part of marketing communication. According to some investigations, more than 90% of buyers focus on its visual appearance, whereas almost 85% of them find the color to be the main reason for purchasing the product. Color psychology is, therefore, a vital marketing tool. Within the scope of this presentation, the focus is on the green in marketing. This color generally stands for health and nature, but other meanings such as hope, growth, youth, refreshment, tranquility, balance, and reassurance are often named as emotional triggers for the green.

Keywords: marketing, color psychology, green

Recikliranje akumulatora (punjivih baterija)

Robert Stanić[1], Mirna Habuda-Stanić[2*]

[1] Sveučiište Josipa Jurja Strossmayera u Osijeku, Fakultet elektrotehnike, računarstva i informacijskih tehnologija Osijek, Kneza Trpimira 2B, Osijek, Hrvatska
[2] Sveučiište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, Osijek, Hrvatska
*Dopisni autor: habudastanic@gmail.com

Sažetak: Akumulatori (punjive baterije) su elektrokemijske komponente koje na temelju kemijske reakcije između dva ili više elementa proizvode električnu energiju. Akumulatori se danas koriste za različite namjene, a mogu pronaći na niz raznih mjesta i u više oblika, vrsta i izvedbi. U praksi su u uporabi najčešće olovno-sumporne (PbS) punjive baterije (akumulatori) koje se koriste kao izvori električne energije pri pokretanju automobila, dok se litij-ionske punjive baterije (Li-ion) najčešće koriste kao izvori energije u prijenosnim uređajima i lakim električnim vozilima poput bicikla i romobila. Kod uređaja kao što su fotoaparati i slični uređaji s visokim trenutnim pražnjenjem, najčešće se koriste nikal-metal-hibridne (NiMH, Ni-MH) punjive baterije, dok dugi niz godina korišteni nikal-kadmijevi (Ni-Cd) akumulatori se danas nastoje izbaci iz upotrebe jer sadrže visokotoksičan kadmij. Sve navedene punjive baterije nakon određenog broja punjenja i pražnjenja gube svoja svojstva te ih je nužno zamijeniti novima. Pri tome je nužno stare baterije zbog iznimno štetnog utjecaja na okoliš, odložiti u reciklažna dvorišta ili reciklaže centre gdje ih ovlaštene tvrtke prikupljaju i recikliraju. Reciklaža starih punjivih baterija odnosno akumulatora svake godine u ukupnim količinama bilježi uzlazni trend. Na službenim stranicama Europske komisije navodi se da je 2019. godine na području EU prodano približno 205 000 tona prijenosnih baterija, od kojih je oko 100 000 tona propisno prikupljeno i reciklirano. Procesom recikliranja punjivih baterija i akumulatora mogu dobiti sekundarne sirovine (plastika, olovo, sumpor, litij) koje se mogu koristiti za ponovnu proizvodnju istih ili drugih proizvoda.

Ključne riječi: punjive baterije, recikliranje, okoliš

Recycling of accumulators (rechargeable batteries)

Robert Stanić[1], Mirna Habuda-Stanić[2*]

[1] Josip Juraj Strossmayer University of in Osijek, Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Ul. Kneza Trpimira 2B, Osijek, Croatia
[2,*] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: habudastanic@gmail.com

Abstract: Accumulators (rechargeable batteries) are electrochemical components that produce electricity based on a chemical reaction between two or more elements. Today, accumulators are used for various purposes and can be found in a number of different places and in many forms, types and designs. In practice, lead-sulfur (PbS) rechargeable batteries (accumulators) are most often used as sources of electricity when starting a car, while lithium-ion rechargeable batteries (Li-ion) are most often used as energy sources in portable devices and light electric vehicles such as bicycles and scooters. In devices such as cameras and similar devices with a high instantaneous discharge, nickel-metal-hybrid (NiMH, Ni-MH) rechargeable batteries are most often used, while nickel-cadmium (Ni-Cd) batteries, which have been used for many years, are now being phased out. out of use because they contain highly toxic cadmium. All mentioned rechargeable batteries lose their properties after a certain number of charging and discharging, and it is necessary to replace them with new ones. Due to the extremely harmful impact on the environment, it is necessary to dispose of old batteries in recycling yards or recycling centers where authorized companies collect and recycle them. The recycling of old rechargeable batteries, i.e. accumulators, shows an upward trend in total quantities every year. The official website of the European Commission states that approximately 205,000 tons of portable batteries were sold in the EU in 2019, of which around 100,000 tons were properly collected and recycled. By recycling rechargeable batteries and accumulators, secondary raw materials (plastic, lead, sulfur, lithium) can be obtained, which can be used for the reproduction of the same or other similar products.

Keywords: rechargeable batteries, recycling, environment

Posterska priopćenja / *Poster presentations*

Prirodne znanosti /
Natural sciences

Distribution of Cyanobacterial Toxins in Manyas Lake, Turkey

Anıl Algedik*, Latife Koker, Meriç Albay, Reyhan Akçaalan

Department of Marine and Freshwater Resources Management, Faculty of Aquatic Sciences, Istanbul University
*Corresponding author: algedikanil@gmail.com

Abstract: Lake Manyas, also known as a 'bird paradise', is a wetland protected by the RAMSAR convention. The lake, which hosts many migratory bird species, is an ecosystem where bird observations are made intensively and pioneering the understanding of the importance of wetlands in our country. Lake Manyas, which is a shallow lake, is hypereutrophic in terms of water quality due to the high concentrations of nutrients, especially nitrogen and phosphorus. From time to time, with the contribution of the trophic situation and other environmental conditions, excessive increases in cyanobacteria, which are frequently encountered in the world and in our country, and which are capable of producing toxins as secondary metabolites, occur in the lake. Some of these metabolites, called cyanotoxins, have adverse effects on both aquatic life and other living things that come into contact with water. Cyanotoxins have different molecular structures and may have toxic effects depending on the organs they affect. The most common hepatotoxic cyanotoxin in the world is microcystin. In order to detect the presence and variants of microcystin in Lake Manyas, monthly surface water sampling was carried out at four stations selected between January 2019 and December 2020, and toxin concentrations were determined. In order to reveal the trophic status of the lake, some physicochemical (Temperature, Dissolved Oxygen, pH, Conductivity, Secchi disc depth, Ortho-phosphate, Total phosphorus, Dissolved inorganic nitrogen) and biological (chlorophyll-a concentration) were measured. Carlson Trophic Status Index values were found to be above the value >62, representing hypereutrophy. As a result of the study, the concentration of microcystin in the lake, varying between 0.07 µg/L and 1.64 µg/L, was measured. Using liquid chromatography high-resolution mass spectrometry (LC-HRMS), 9 variants of microcystin (MC-LR, MC-RR, MC-YR, MC-LY, MC-LW, MC-RR-desmethylated, MC-HiLR, MC-LF, MC-LA) were detected in the lake. Although the concentration of microcystin in the lake during this study was well below 20 µg/L, the limit value for bathing waters according to the Regulation on the Management of Bathing Water Quality, the presence of microcystin in the lake throughout the year indicates that monitoring of cyanobacteria blooms in the lake should be done on a regular basis.

Keywords: cyanotoxins, eutrophication, lake Manyas, Turkey

Synthesis of cerium-based high-entropy perovskites and their application in the degradation of organic dyes

Roberto Basara, Ana Ivanković, Sara Goman, Tomislav Šilješ, Dalibor Tatar, Jelena Kojčinović, Igor Djerdj*

Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: igor.djerdj@kemija.unios.hr

Abstract: Cerium-based nanostructured high-entropy oxides (HEO) are promising catalysts due to the high reactivity of cerium. High-entropy oxides have already shown outstanding photocatalytic properties toward the decomposition of organic dyes. In this work, cerium-based nanostructured HEOs with perovskite structure were synthesized using a green and inexpensive modified citrate sol-gel method. Nitrate salts of lanthanide elements were used as precursors in the synthesis. In accordance with green chemistry principles, water was used as a non-toxic solvent. The synthesized compounds were characterized by powder X-ray diffraction (PXRD), thermogravimetric analysis coupled with differential scanning calorimetry (TGA/DSC), and X-ray photoelectron spectroscopy (XPS). The photocatalytic activity of the compounds was tested towards the degradation of synthetic organic dyes, such as methylene blue (MB), naphthol green (NG), and rhodamine B (RDB), with and without the addition of hydrogen peroxide as an initiator. The results showed that these compounds are promising candidates for the degradation of water-soluble organic dyes.

Keywords: green chemistry; methylene blue; nanostructured high entropy oxides; photocatalysis

Evaluation of Antioxidant Potential of Phenolic Compounds Present in Bitter Aloe, *Aloe ferox* Mill.

Ante Begić, Ana Amić*

Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: aamic@kemija.unios.hr

Abstract: Native to southern Africa, bitter aloe (*Aloe ferox* Mill.) has long been used in traditional medicine. Leaves of bitter aloe are very rich in phytonutrients that exhibit a wide range of health beneficial activities, such as antibacterial, antiviral, antifungal, antidiabetic, anti-inflammatory and immunomodulatory activity. Extracts of black elderberry have also shown antioxidant capacity. The aim of this work was to evaluate the antioxidant potential of selected phytoactive compounds present in bitter aloe leaves (flavonoids and phenolic acids) *in silico* using density-functional theory. The focus was on thermodynamics and studied mechanisms underlying antioxidant activity were hydrogen atom transfer and sequential proton loss electron transfer. Obtained results indicate that studied compounds possess free radical scavenging potency and are able of deactivating various free radicals. Obtained results indicate second hydrogen atom transfer and the second sequential proton loss electron transfer processes as less energy demanding than the first ones.

Keywords: antioxidant activity; aloe; flavonoids; phenolic acids; DFT

Chemical robots

Petra Bolješić*, Dominik Goman, Martina Medvidović-Kosanović

Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8A, Osijek, Croatia
*Corresponding author: petra.boljesic@gmail.com

Abstract: Chemical robots are a subset of soft robotics, which are made of softer materials compared to classical mechanical robots, such as polymer gel, semi-permeable shells with a storage compartment, etc. Chemical robots can, therefore "mimic" the movements of a living organism. In today's world, chemobots could have many different applications. Some of these could be administering drugs within the organism itself, recovering valuable chemicals from diluted resources, or assisting in environmental disasters (e.g., oil spills in the ocean). An example of chemical robots with such applications are Chobots (chemical swarm robots), whose structure and size resemble a single-celled organism. Chemical robots can also be used in chemistry laboratories where they can perform some basic chemical processes such as distillation, mixing, titration, etc. They enable faster and more efficient production of target molecules. In addition to chemical robots, biological robots, known as bio-bots, should also be mentioned. They are made of hydrogels that form the skeleton in which we see two uprights that reinforce the muscle strips as tendons and also form the feet of the robots. Bio-bots are moved by muscle strips whose contraction and relaxation are controlled by electrical pulses, and as the pulse frequency increases, so do the contractions, which leads to faster movement of the bio-bots.

Keywords: chemical robots, bio-bots, polymer gel, soft robots

Study of Antioxidant Potency of Selected Compounds Present in Shepherd's Purse, *Capsella bursa-pastoris* (L.) Medik.

Matija Cepanec, Ana Amić*

Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: aamic@kemija.unios.hr

Abstract: Shepherd's purse, *Capsella bursa-pastoris* (L.) Medik., is a wild plant commonly used in traditional medicine for various purposes. In this work, we evaluated the antioxidant potential of selected phytoactochemicals present in this plant (flavonoids and phenolic acids) using *in silico* approach in order to better understand the mechanisms underlying this type of bioactivity. Hence, we studied the thermodynamics of hydrogen atom transfer and sequential proton loss electron transfer. Our results indicate studied compounds as compounds with good or high free radical scavenging potency. So, these compounds are able to efficiently deactivate various free radicals. Based on these results, it seems that the second hydrogen atom transfer and second sequential proton loss electron transfer processes as less energy demanding than the first ones.

Keywords: antioxidant potency; Shepherd's purse; phenolic compounds

Chemical composition and antioxidant potential of *Ocimum basilicum* hydrolates

Teodora Cvanić*, Anja Saveljić, Vanja Šeregelj, Olja Šovljanski

University of Novi Sad, Faculty of Technology Novi Sad, Bulevar cara Lazara 1, Novi Sad, Serbia
*Corresponding author: teodora.cvanic@uns.ac.rs

Abstract: *Ocimum basilicum* is an annual plant that belongs to *Lamiaceae* family and it is considered one of the most employed medical plants. It is widely used in the food, cosmetics and perfume industry and it offers a lot of health benefits. Hydrosols are by-products obtained from the process of hydro-distillation of essential oils. They include a certain number of the same molecules and biological features as the essential oil, but their potential is still being evaluated. With that in mind, this research is focused on investigating the antioxidant activity of two hydrosols of *Ocimum basilicum varieties*: var. *genovese* and var. *minimum*. Three antioxidant tests were used (DPPH, ABTS and reducing power (RP)), and they showed small, but still significant antioxidant potential within both variants. Both hydrosols exhibited slightly higher scavenging activity against $ABTS^{\bullet+}$ (2.91 and 1.51 µmol TE/mL), than by $DPPH^{\bullet}$ (2.10 and 0.94 µmol TE/mL), respectively. While their reducing power was 0.76 and 0.48 µmol TE/mL. Considering that in the literature there is either no data about basils hydrolates antioxidant activity or there is no shown activity, this study presents results of its potential for further research.

Keywords: basil; hydrosol; antioxidant activity; *Ocimum basilicum* var. genovese; *Ocimum basilicum* var. minimum.

Computational Prediction of pKa Values of Selected Compounds Present in Valerian, *Valeriana officinalis* L.

Aleksandra Čavlek, Ana Amić *

Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: aamic@kemija.unios.hr

Abstract: Native to southern Europe and Asia, valerian (*Valeriana officinalis* L.) has long been used in traditional medicine, mainly due to valerian phytochemical composition. Some of the compounds found in valerian are various alkaloids, terpenes and flavanones. The aim of this work was to determine pKa value of selected phytochemicals present in valerian using Acd/pKa computational program. This is a program used for precise calculations of acid-base ionisation constants, eg. pKa. For some phytochemicals, experimental pKa values have not been experimentally determined, and in literature various calculated values can be found. These values may have an important role in understanding mechanisms underlying various types of bioactivity, such as antioxidant activity. Prediction of pKa values may also help in deciphering the correct order of hydroxyl groups deprotonation, which is important for understanding studied mechanisms of bioactivity.

Keywords: valerian; pKa; ACD/pKa

Ultrasound Assisted Green synthesis of Zirconia Nanoparticles Using the Aqueous Extract of *Viscum album* L. Leafs

Ivan Ćorić[1], Elvira Kovač Andrić[1], Ana Petrović[2], Vlatka Gvozdić[1]*

[1] Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8/A, Osijek, Croatia
[2] Josip Juraj Strossmayer University of Osijek, Faculty of Dental Medicine and Health, Crkvena 21, Osijek, Croatia
*Corresponding author: vgvozdic@kemija.unios.hr

Abstract: Green synthesis is a method that uses non-toxic, biodegradable chemicals for the synthesis of nanomaterials. This study reports an eco-friendly approach for the ultrasound-assisted synthesis of zirconia nanoparticles. In the present study, for the first time, we report a suitable green procedure for the synthesis of zirconia nanoparticles using an aqueous extract of *Viscum album*, as a reducing and capping agent. The biosynthesized nanoparticles were characterized by UV-visible (UV-Vis) spectrophotmetry, Fourier transform infrared spectroscopy (FTIR), powder X-ray diffraction (PXRD) and thermogravimetric analysis (TGA). In addition, the catalytic activity of the resulting nanoparticles was evaluated by degradation of methylene blue dye. The results of the characterization of the synthesized nanoparticles indicate the successful synthesis using *Viscum album* extract as a reducing agent, with UV-Vis apsorption peak at 210 nm. The FTIR identified major phytochemical compounds, which could be responsible for bio-reducing potential. The PXRD peaks show a major tetragonal phase, which is confirmed by intensity peaks at $2\theta = 30^{\circ}$, 50° and 60°. A smaller portion of the produced ZrO_2 nanoparticles has a monoclinic phase. From PXRD data, the crysrallite diameter of ZnO_2 was obtained using the Scherrer equation to be 30 nm. The investigation displayed the good catalytic activity of zirconia nanoparticles on the degradation of methylene blue dye. The results showed that methylene blue has been degraded after a few hours.

Keywords: green synthesis, zirconia nanoparticles, leafs

Zelena kemija – zelena otapala

Kristina Đambić[1], Doris Prokopec[1], Dajana Gašo–Sokač[2*]

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za kemiju, Ulica Cara Hadrijana 8/A, Osijek, Hrvatska
[2*] Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, Osijek, Hrvatska
*Dopisni autor: dajana.gaso@ptfos.hr

Sažetak: Prema definiciji Američke agencije za zaštitu okoliša (EPA-e) zelena kemija je definirana kao kemija koja je usmjerena na dizajniranje proizvoda i procesa koji minimaliziraju ili uklanjaju uporabui proizvodnju štetnih tvari. Programom zelene kemije razvijene su alternative štetnim organskim otapalima tzv. zelena otapala. Najviše potencijala u istraživanjima pokazale su ionske tekućine i eutektička otapala. Ionske tekućine su soli građene od organskih kationa (različito supstituiranih) te odgovarajućih aniona koje su u tekućem agregatnom stanju obzirom na izrazitu veličinu te asimetričnost iona. Poželjna su zelena alternativa zbog brojnih prednosti poput izrazite stabilnosti, niske hlapljivosti, nezapaljivosti, niskog tališta (ispod 100°C), niske toksičnosti i velike sposobnost otapanja različitih spojeva. Eutektička otapala (eng. Deep Eutectic Solvents, DES) su smjesa dviju ili više komponenti u krutom ili tekućem stanju, koja u određenom omjeru imaju niže talište nego pojedinačne komponente smjese. Za pripremu ovih otapala koriste se jeftine, sigurne, neotrovne i biorazgradive tvari, sklone stvaranju vodikovih veza, a tijekom procesa priprave samog otapala ne dolazi do stvaranja nusprodukata i otpada. Najčešće se eutektička otapala dobivaju miješanjem kvaterne amonijeve soli s metalnom soli ili nekim drugim donorom vodika, koji ima mogućnost stvaranja kompleksa s halogenidnim ionom kvaterne amonijeve soli. Navedena se otapala ističu i kao dizajnirana otapala, zbog širokog spektra spojeva koji se mogu koristiti za njihovu pripravu, a shodno tome moguće je konfigurirati njihova fizikalno-kemijska svojstva.

Ključne riječi: zelena kemija, zelena otapala, ionske tekućine, eutektička otapala

Green chemistry - green solvents

Kristina Đambić [1], Doris Prokopec [1], Dajana Gašo-Sokač [2,*]

[1] Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
[2*] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: dajana.gaso@ptfos.hr

Abstract: According to the U.S. Environmental Protection Agency (EPA) definition, green chemistry is defined as chemistry that is aimed at designing products and processes that minimize or eliminate the use and production of harmful substances. The green chemistry program developed alternatives to harmful organic solvents – the so-called green solvents. The most potential in studies showed ionic liquids and eutectic solvents. Ionic liquids are salts made of organic cations (variously substituted) and corresponding anions which are in a liquid aggregate state in view of the extreme size and asymmetricality of ions. Green alternatives are preferred due to their many advantages such as extreme stability, low volatility, non-flammability, low melting points (below 100°C), low toxicity and high ability to dissolve various compounds. Eutectic solvents (Deep Eutectic Solvents, DES) are a mixture of two or more components in a solid or liquid state, which in a certain proportion have a lower melting point than individual components of the mixture. For the preparation of these solvents, inexpensive, safe, non-toxic and biodegradable substances are used, prone to the formation of hydrogen bonds, and during the process of preparation of solvents, the formation of by-products and waste does not occur. Most often, eutectic solvents are obtained by mixing quaternary ammonium salt with a metal salt or another hydrogen donor, which has the ability to create a complex with a halogenide ion of a quaternary ammonium salt. These solvents also stand out as designed solvents, due to the wide range of compounds for their preparation, accordingly, it is possible to configure their physicochemical properties.

Keywords: green chemistry, green solvents, ionic liquids, eutectic solvents

Analiza ishrane i antropogenih čestica u gvalicama bijele rode (*Ciconia ciconia* L.) na području Hrvatske

Petar Glavaš[1], Dora Bjedov[2], Dora Gradečak[1], Mirta Sudarić Bogojević[1], Vlatka Gvozdić[3], Alma Mikuška[1*]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za biologiju, Cara Hadrijana 8/A, Osijek, Hrvatska
[2]Hrvatski institut za bioraznolikost, BIOTA doo, Maksimirska cesta 129/5, Zagreb, Hrvatska
[3]Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za kemiju, Cara Hadrijana 8/A, Osijek, Hrvatska
*Dopisni autor: alma.mikuska@biologija.unios.hr

Sažetak: Mikroplastika je izravni nositelj kemikalija pticama, potencijalni vektor za prijenos zagađivala sadržanih u plastici i zagađivala adsorbiranih na samu plastiku. Mogućnosti apsorpcije, adsorpcije i otpuštanja postojanih zagađivala plastike u prirodu određeni su samim polimerima koji čine plastiku. Ciljevi ovog istraživanja su analizom gvalica na jednostavan i neinvazivan način dobiti uvid o hranidbenim navikama roda te naglasiti važnost korištenja spektroskopskih tehnika u studijama s radom na plastici. Gvalice bijelih roda (n = 20) uzorkovane su tijekom gnijezdeće sezone 2020. godine u Hrvatskoj prilikom prstenovanja ptića. Izolirane antropogene čestice analizirane su infracrvenom spektroskopijom s Fourierovom transformacijom (FTIR), a izolirana fauna identificirala se pomoću determinacijskih ključeva. Najčešći organski polimeri povezani s plastičnim masama dobiveni FTIR analizom su: dotriakontan, oktakozan, bromomesitilen, oktadecilamin, polistiren i enzakril poliacetal. Najčešći ostaci plijena nađeni u gvalicama su iz skupina ravnokrilaca (Orthoptera), tvrdokrilaca (Coleoptera), gujavica (Lumbricidae) i glodavaca (Rodentia). Tijekom gnijezdeće sezone bijele rode traže hranu u blizini gnijezda, shodno tome analiza gvalica može poslužiti kao relativni indikator lokalnog zagađenja mikroplastikom i bioraznolikosti staništa. Implementiranje FTIR analize u budućim studijama s radom na plastici je nužno radi izbjegavanja pogrešne identifikacije organskih polimera za sintetičke polimere i dobivanje jasnijeg shvaćanja potencijalne ozbiljnosti vektorskog prenošenja zagađivala putem plastike na ptice.

Ključne riječi: antropogene čestice, gvalice, FTIR analiza, mikroplastika

Analyses on diet and anthropogenic particles in pellets of white stork (*Ciconia ciconia* L.) from Croatia

Petar Glavaš[1], Dora Bjedov[2], Dora Gradečak[1], Mirta Sudarić Bogojević[1], Vlatka Gvozdić[3], Alma Mikuška[1*]

[1] Josip Juraj Strossmayer University of Osijek, Department of Biology, Cara Hadrijana 8/A, Osijek, Croatia
[2] Croatian Institute for Biodiversity, BIOTA Ltd, Maksimirska cesta 129/5, Zagreb, Croatia
[3] Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: alma.mikuska@biologija.unios.hr

Abstract: A direct carrier of chemicals to birds is microplastics and a potential vector for the transmission of pollutants contained in plastics and pollutants adsorbed to the plastic itself. The possibilities of absorption, adsorption and release of persistent plastic pollutants into the environment are determined by the polymers themselves that make up the plastic. The aims of this study are to analyze the pellets to gain insight into the dietary habits of storks in a simple and non-invasive way and to emphasize the importance of using spectroscopic techniques in studies with the work on plastics.
Pellets (n = 20) were sampled during the breeding season in 2020 in Croatia while ringing nestlings. The anthropogenic particles were analysed by Fourier transform infrared spectroscopy (FTIR) and the fauna was identified using identification guides. The most common organic polymers connected with plastic masses obtained by FTIR analysis are: dotriacontane, octacosane, bromomesitylene, octadecyllamine, polystyrene and enzacry polyacetal. The most common prey remains found in pellets are from Orthoptera, Coleoptera, Lumbricidae and Rodentia.
Given that during the nesting season, white storks are looking for food near the nest, analysis of the pellets can serve as a relative indicator of local microplastic pollution and habitat biodiversity. The implementation of FTIR analysis in future studies with the work on plastic is necessary in order to avoid the misidentification of organic polymers for synthetic polymers and to obtain a clearer understanding of the potential severity of vector transmission of pollutants through plastics to birds.

Keywords: anthropogenic particles, pellets, FTIR analysis, microplastics

Potential antitumor activity of copper (II) complex with chromone-2-carboxylic acid

Marija Jakić[1], Stjepan Šarić[1], Nikolina Filipović[1*], Berislav Marković[1], Katarina Mišković Špoljarić[2]*

[1]Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
[2] University of Osijek, Faculty of Medicine, Josipa Hutlera 4, Osijek, Croatia
*Corresponding authors: katarina.mišković@mefos.hr, nfilipovic@kemija.unios.hr

Abstract: Copper is one of the essential metals in biological systems and decades ago "in vitro" research showed that copper plays an important role in angiogenesis. With this realization, research on copper complexes with chelated ligands began. Elevated copper concentrations have been observed in many human cancers. Copper toxicity is caused by its ability to produce reactive oxygen species (ROS), replace binding sites with other metal ions, peroxidize lipids, and directly cleave DNA and RNA. The copper (II) complex with chromone-2-carboxylic acid was synthesized using the classical solution chemistry method, and its antitumor activity was investigated by MTT assay on 7 cell lines. The malignant cell lines were: Caco-2, HT -29 MDA-MB 231, KATO III, Hep-G2, NCI-H358. The normal cell line was MRC-5. The studied copper (II) complex suppressed cell growth of Hep-G2 cells at the highest concentration (10-5 M) by 64.8%, followed by NCI-H358, MRC-5 and HT -29 (45.6%; 45.3%; 43.4%). The inhibitory effect of copper (II) complex on KATO III, MDA-MB 231 and Caco-2 is less than 25%, indicating a low proliferation inhibitory effect. The results presented here indicate that the novel copper (II) complex may represent a promising structural starting point for the development of a new generation of potential antitumor agents.

Keywords: copper (II) complexes; antitumor activity; hydroxypyrones

Comparison of Phytochemicals Present in German (*Matricaria chamomilla* L.) and Roman Chamomile (*Chamaemelum nobile* L.) and Evaluation of their Antioxidant Potential

Rajna Marija Jozić, Ana Amić*

Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: aamic@kemija.unios.hr

Abstract: Chamomile tea is a remedy with a very long history of use and one of the most popular remedies in traditional medicine throughout the world. Dried leaves and tea infusions of German and Roman chamomile show some differences in phytonutrient content. Phytonutrients found in dried German chamomile include caffeic and ferulic acid, while catechin, gallocatechin and epicatechin were found in the tea infusion. In the case of Roman Chamomile, lignans were determined in the tea infusion. Other than determining the phenol profile of these two plants, our aim was also to evaluate the antioxidant potential of selected compounds *in silico* using density-functional theory. The main focus was on thermodynamics and the studied mechanisms were hydrogen atom transfer and sequential proton loss electron transfer. Based on obtained results it is clear that the studied compounds possess significant free radical scavenging potency and can efficiently deactivate various free radicals. Second hydrogen atom transfer and second sequential proton loss electron transfer processes are determined to be less energy demanding than the first ones.

Keywords: German chamomile; Roman chamomile; polyphenols; in silico; antioxidant potential

Preliminary research of phyto- and zooplankton structure in common carp ponds

Kristina Kligl[1], Roko Grebenar[1*], Filip Stević[1], Tanja Žuna Pfeiffer[1], Anita Galir Balkić[1], Dubravka Špoljarić Maronić[1], Nikolina Bek[1], Tajana Majić Vidaković[2]

[1] Josip Juraj Strossmayer University of Osijek, Department of Biology, Ulica cara Hadrijana 8/A, 31000 Osijek, Croatia
[2] PP Orahovica d.o.o., Stjepana Mlakara 5, 33515 Orahovica, Croatia
*Corresponding author: roko.grebenar@biologija.unios.hr

Abstract: The objective of this study was to determine the structure of phytoplankton and zooplankton in four carp (*Cyprinus carpio* Linnaeus, 1758) ponds – two ponds with juveniles and two ponds with adult carp. Phytoplankton diversity was similar in all ponds, but differences were found in predominant species and total abundance (from $59.7x10^6$ cells/L to $79.0x10^6$ cells/L). The diatom *Aulacoseira pusilla* (22% of total cells/L) was the predominant species in one pond with juveniles, while chlorococalean *Ankistrodesmus arcuatus* (13%) dominated in the second pond with juvenile fish. In general, the well-developed species in all ponds were chlorococcales (genera *Ankistrodesmus*, *Monoraphidium, Plagioselmis, Lemmermania, Pseudodidymocystis and Scenedesmus*) with relative abundance from 5 to 22%. Cyanobacteria *Microcystis wesenbergii* reached high abundance (15%) only in one pond with adult fish. Qualitative analyses of zooplankton revealed significant differences in microcrustacean composition. The most abundant cladoceran species were *Chydorus sphaericus* (21 and 44%, respectively) and *Bosmina longirostris* (38 and 33%, respectively), while copepods were dominated by the genera *Acanthocyclops* (72 and 45%, respectively). Copepodites were abundant in ponds with adult fish, while a larger number of adult copepods were found in a pond with juvenile fish. The results suggest distinct phyto- and zooplankton communities and their potentially important role in carp pond function.

Keywords: fishpond; *Cyprinus carpio*; algae; cyanobacteria; microcrustacea

Ekonomija atoma u sintezi paracetamola

Monika Kovačević[1], Mia Samardžija[2], Dajana Gašo-Sokač[2]*

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za kemiju, Ulica cara Hadrijana 8/A, Osijek, Hrvatska
[2] Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 18, Osijek, Hrvatska
*Dopisni autor: dajana.gaso@ptfos.hr

Sažetak: Paracetamol je lijek koji se koristi za ublažavanje glavobolje, bolova u zglobovima i mišićima te za smanjenje tjelesne temperature. Moguće ga je dobiti različitim sintetskim putevima iz fenola, a budući da je paracetamol jedan od najčešće korištenih analgetika, mnogo se truda ulaže u razvijanje novih, ekološki prihvatljivijih i ekonomski isplativijih sintetskih puteva. Sinteze treba osmisliti tako da se maksimalno ugrade polazni spojevi u konačni produkt u skladu s drugim principom zelene kemije. Jedan od ciljeva kojima se teži u okviru zelene kemije je povećanje ekonomije atoma u organskim sintezama. Ekonomija atoma (engl. *Atom Economy* AE) se definira kao omjer molekularne mase izoliranog produkta i zbroja molekularnih masa svih reaktanata, a rezultat se izražava u %-tcima. Industrijski, paracetamol se sintetizira nitriranjem fenola natrijevim nitratom, pri čemu nastaju izomeri nitrofenola (*orto*- i *para*-), od kojih je *o*-nitrofenola sporedni produkt. Nadalje, nitro skupina se zatim hidrogenira, te se produkt *p*-aminofenol acetilira anhidridom octene kiseline. Opisane su i uspoređene konvencionalna i zelena metoda sinteze paracetamola, s naglaskom na zelenu metodu i samo povećanje ekonomije atoma. Ekonomija atoma u različitim metodama sinteze paracetamola varira i iznosi 36 %, 38 % do čak 58 %.

Ključne riječi: paracetamol; zelena kemija; zelena sinteza; ekonomija atoma

Atom Economy in Synthesis of Paracetamol

Monika Kovačević[1], Mia Samardžija[1], Dajana Gašo-Sokač[2]*

[1] Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica cara Hadrijana 8/A, Osijek, Croatia
[2] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: dajana.gaso@ptfos.hr

Abstract: Paracetamol is a drug used to relieve headaches, muscle pain and to reduce body temperature. It is possible to get it by various synthetic routes from phenol, and since paracetamol is one of the most commonly used analgesics, a lot of effort is invested in developing new, environmentally friendly and more acceptable and economically viable synthetic routes. In accordance with the second principle of green chemistry synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final products. One of the goals pursued under green chemistry is to increase the economy of atoms. Atom economy can be defined as the molecular weight of the isolated product divided by the sum of the molecular weights of the reactants, the result is expressed in %. Industrially, paracetamol is synthesized by nitriding phenol with sodium nitrate to form isomers of nitrophenol (*ortho* and *para*), of which *o*-nitrophenol is a by-product. Furthermore, the nitro group is then hydrogenated and the *p*-aminophenol product is acetylated with acetic anhydride. This paper describes and compares the conventional and green methods of paracetamol synthesis, with an emphasis on the green method and increase in the atomic economy. The atom economy in different methods of paracetamol synthesis varies and ranges from 36%, 38% to as much as 58%.

Keywords: paracetamol; green chemistry; green synthesis; atomic economy**.**

Analysis of drinking water quality in the area of Osijek-Baranja County

Lidija Ribić[1*], Zorana Katanić[1], Željka Romić[2], Mario Jakopec[2], Martina Medvidović-Kosanović[3]

[1] Josip Juraj Strossmayer University of Osijek, Department of Biology, Cara Hadrijana 8A, Osijek, Croatia
[2] Vodovod, Poljski put 1, Osijek, Croatia
[3] Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8A, Osijek, Croatia
*Corresponding author: lidijaribic2@gmail.com

Abstract: Industrialization and the increase of the human population lead to drinking water pollution, and climate change is significantly affecting the availability and quality of water. Drinking water quality has to be checked daily. To test the health safety of drinking water in Osijek-Baranja County, water samples were collected from 6 locations and the following parameters were analysed: aerobic mesophilic bacteria incubated at 36 °C and 22 °C, *Escherichia coli*, free chlorine, temperature, pH, turbidity, and color. The study was conducted during the winter and summer of 2019 allowing assessment of the water quality depending on the period of the year. Locations near and far from the raw water treatment plant were selected to determine the possibility of poor water quality at more distant locations. The results indicate the health safety of drinking water in the tested area, but a slight deterioration of water quality was observed during the summer period. Given the distance from the raw water treatment plant, a significant difference in concentration of free chlorine was found which poses a higher risk for the development of bacteria in the water at more distant locations.

Keywords: pollution, climate change, health, treatment, safety control

Investigation of the Impacts of Ocean Acidification on the Respiration Rate in Manila Clam (*Ruditapes philippinarum*)

İdil Salihoğlu*, Ece Yalçın, Melek Zeynep Şengül, Zeynep Maral Uzyol, Önder Kılıç, Murat Belivermiş

Istanbul University, Faculty of Science, Department of Biology, Vezneciler, Istanbul, Turkey
*Corresponding author: idilsalihoglu44@gmail.com

Abstract: Due to the phenomenon called "ocean acidification", the acidity in the seawater surface has increased about 30% compared to the pre-industrial revolution era and will continue to increase according to the models. In this study, the effects of both local and global acidification on the respiratory rate of manila clams (*Ruditapes philippinarum*) were investigated. As an experiment design, ten clams were taken and each of them was placed into 20L glass aquariums containing 10L artificial seawater in the laboratory. During the seven-day acclimatization period, the temperature of the seawater was adjusted to 20 °C, the salinity to 25 and the pH to 8.10. After the acclimatization period, the clams were exposed to three different pH_T levels (total pH) for 10 days, one group to control pH_T level (8.10) and two groups to acidified pH_T level (7.63 and 7.30). Two aquariums were used for each experimental condition (two replicates; 6 aquariums total). Adjustment of pH in the water was made with the pH feedback control system, which injects CO_2 gas into the water. In this system, an automatic control unit is used, including IKS Aquastar control unit, glass pH probes and solenoid valves. The pH_{NBS} values and the total pH calibration was recorded by the system every 15 minutes and with these parameters, a mean experimental pH_T values were calculated. At the end of the experiment, the oxygen consumption in each group was measured with the oxygen probes connected to the IKS Aquastar control unit and the oxygen consumption per unit time was calculated. Oxygen consumptions per clam were found as 1.19 ± 0.02, 0.80 ± 0.09, 0.16 ± 0.10 mg O_2 h-1 for pH 8.10, 7.63 and 7.30 groups, respectively. It is known that stressors such as seawater acidification and warming in the marine environment affect the metabolic rate as well as the energy budget distribution of marine ectoderms. Oxygen consumption rate is one of the parameter showing the metabolic rate the best. In this study, it was observed that the respiratory rate of clams decreased significantly in proportion to acidification. It is predicted that they go into a state of reduced metabolism by reducing their oxygen consumption. This will reduce the reproductive success and adaptation of the species in the long run.

Keywords: ocean acidification; manila clam; oxygen consumption

Biological profiling of *Ocimum basilicum* essential oils

Anja Saveljić*, Teodora Cvanić, Vanja Šeregelj, Olja Šovljanski

University of Novi Sad, Faculty of Technology Novi Sad, Bulevar cara Lazara 1, Novi Sad, Serbia
*Corresponding author: anja.saveljic@uns.ac.rs

Abstract: The *Ocimum* representatives are known as a treatment for many illnesses and sicknesses from ancient times. One of them, *Ocimum basilicum*, has a vital role due to its various medicinal goods, commonly cultivated as a herbaceous plant used as a culinary herb. It is best known as a plant with pharmacological activities to prevent cardiovascular disorders, diabetes, menstrual spasms, digestive disorders, *etc* [1]. Considering the above, the research aim was to evaluate *in vitro* antioxidant potential of essential oils of two *Ocimum basilicum* varieties: var. *genovese* and var. *minimum*. Using three antioxidant tests (DPPH, ABTS and reducing power (RP)), it can be concluded that significant differences between the two investigated variants of *O. basilicum* do not exist. Respectively, both essential oils in the concentrations of 250 mg/mL, showed the highest scavenging activity against ABTS•+ (478.065 and 508.36 µmol TE/mL), followed by DPPH• (41.77 and 43.23 µmol TE/mL). Their reducing power was lower with 21.0 and 22.71 µmol TE/mL values. The essentialoil obtained from var. *minimum* exhibits slightly stronger activity than one from var. *genovese* but based on the results both can be considered proper antioxidant agents.

Keywords: basil; antioxidant activity, *Ocimum basilicum* var. Genovese, *Ocimum basilicum* var. minimum

Quaternization Reactions of Isonicotinamide According to the Principles of Green Chemistry

Vice Tomičić, Valentina Bušić*

Josip Juraj Strossmayer University in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: valentina.busic@ptfos.hr

Abstract: Green chemistry is the chemistry that designs chemical processes and products using greener, more environmentally benign solvents. It maximizes products, minimizes by-products and simplifies processes leading to reduced energy consumption. The Menshutkin reaction is a reaction by which tertiary amines are converted to quaternary salts. In this S_N2 reaction, the neutral reactants are converted to charged products. Most organic solvents used in the conventional synthesis of pyridinium quaternary salts are volatile, hazardous, toxic like acetone and anhydrous dimethylformamide, anhydrous benzene, acetonitrile, etc. According to the 12 principles of green chemistry we tried to focus our research on the use of safer and more environmentally friendly solvents – deep eutectic solvents. The quaternization reactions of isonicotinamide with substituted 2-bromoacetophenones (4-F, 4-Br, 4-Ph, 4-OCH_3, 4-NO_2) were performed. Both conventional and ultrasound methods were successfully performed. The ultrasound method gave similar yields as the conventional method. The highest yield was obtained by the conventional method in the quaternization reaction of isonicotinamide and 2-bromo-4'-phenylacetophenone in the eutectic solvent choline chloride: oxalic acid 1: 1 (96%), while in the same eutectic solvent by the ultrasonic method in the quaternisation reaction 2- bromine-4'-phenylacetophenone the highest yield achieved (94%).

Keywords: green chemistry; eutectic solvents; isonicotinamide derivatives, ultrasound synthesis

Antioksidacijski odgovor industrijske konoplje pri uzgoju na različitim svjetlosnim intervalima

Antonia Vicić[1]*, Selma Mlinarić[2], Martina Šrajer Gajdošik[1]

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za kemiju, Ulica Cara Hadrijana 8/A, Osijek, Hrvatska
[2] Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za biologiju, Ulica Cara Hadrijana 8/A, Osijek, Hrvatska
*Dopisni autor: antonia.vicic@kemija.unios.hr

Sažetak: Industrijska konoplja (*Cannabis sativa* L. subsp. *sativa*) je biljka kratkog dana no podnosi velike promjene u duljini i intenzitetu dnevnog svjetla što dovodi do promjena u antioksidacijskom odgovoru na oksidacijski stres. Antioksidacijska aktivnost je čest predmet istraživanja zbog važnosti u obrani organizma od različitih bolesti te usporavanju njegova starenja. Cilj ovog istraživanja bio je istražiti utjecaj različitih svjetlosnih intervala (18/6, 20/4 i 24/0 (svjetlost/tama)) na antioksidacijski odgovor dviju sorti industrijske konoplje (Finola i USO) uzgajanih na ljubičastom osvjetljenju (~250 μmol m^{-2} s^{-1}). U tu svrhu određena je koncentracija produkata lipidne peroksidacije (TBARS) i aktivnosti gvajakol-peroksidaze (GPOD). Uzgoj na najduljem svjetlosnom intervalu (24/0) doveo je kod obje sorte do stvaranja najviše razine TBARS. S druge strane, sorta USO pokazala je najvišu aktivnost GPOD pri istim uvjetima uzgoja. Svjetlosni interval 16/8 djelovao je najmanje stresno na obje sorte. Povećane vrijednosti produkata lipidne peroksidacije i aktivnost GPOD ukazuju da su biljke pri uzgoju na svjetlosnom intervalu 24/0 u stanju najvećeg stresa. Pri tome je vjerojatno došlo do nastanka slobodnih radikala koji uzrokuju povećanje antioksidacijskog odgovora kako bi se spriječila oštećenja važnih bioloških molekula.

Ključne riječi: *Cannabis sativa* L subsp. *sativa*, lipidna peroksidacija, gvajakol-peroksidaza, svjetlosni interval, antioksidacijski odgovor

Antioxidant response of industrial hemp grown under different light intervals

Antonia Vicić[1]*, Selma Mlinarić[2], Martina Šrajer Gajdošik[1]

[1] Josip Juraj Strossmayer University of in Osijek, Department of Biology, Ulica cara Hadrijana 8/A, Osijek, Croatia
[2] Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: antonia.vicic@kemija.unios.hr

Abstract: Industrial hemp (*Cannabis sativa* L subsp. *Sativa*) is a short–day plant but it can withstand significant changes in the length and intensity of daylight, which leads to changes in the antioxidant response to oxidative stress. Antioxidant activity is often the focus of research because of its importance in slowing down aging and defending the organism against various diseases. The aim of this study was to investigate the effect of different light intervals (18/6, 20/4 and 24/0 (light/dark)) on the antioxidative response of two cultivars of industrial hemp (Finola and USO) grown under violet light (~250 μmol m^{-2} s^{-1}). For this purpose, the activity of guaiacol peroxidase (GPOD) and the concentration of lipid peroxidation products (TBARS) were determined. Cultivation at the longest light interval (24/0) led to the highest level of TBARS in both cultivars. On the other hand, cultivar USO exhibited the highest GPOD activity under the same growth conditions. The light interval 16/8 had the least stressful effect on both cultivars. Increased values of lipid peroxidation products and GPOD activity indicate that plants are under the most stress during the 24/0 light interval. It is possible that this caused the formation of free radicals which caused an increase in the antioxidant response to prevent damage to important biological molecules.

Keywords: *Cannabis sativa* L subsp. *Sativa*, lipid peroxidation, guaiacol peroxidase, light interval, antioxidant response

Physical and chemical analysis of transformer oil

Maja Vukić[1]*, Nikolina Groznica[1], Valentina Danković[1], Veljko Špica[2], Dominik Goman[1], Martina Medvidović-Kosanović[1]

[1] Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica Cara Hadrijana 8/A, Osijek, Croatia
[2] HEP, Physico-chemical laboratory of Reference center for transformers, Martina Divalta 199, Osijek, Croatia
*Corresponding author: majav0910@gmail.com

Abstract: Nowadays, electricity is considered to be the basis of life both in households and in industry. It is important to transmit electricity from the place of generation to the end user. During the transmission itself, the voltage decreases and there is a loss of electricity due to the resistance in the power lines. The transformer is one of the devices that transmit electricity, and its function is to convert an alternating current of a certain voltage into an alternating current of a higher or lower voltage, thus reducing the losses during electricity transmission. Each transformer contains oil, which serves as an insulator and coolant, and provides information about the quality of the transformer. Transformer oil oxidizes over time and becomes contaminated, which is reflected in its chemical and physical properties and ultimately leads to poor oil quality for transformer operation. In this study, oil quality was determined by oil appearance and color, refractive index, density, surface tension, dielectric loss coefficient, and specific resistance. Eight oil samples taken in the Slavonia region were analyzed, and four samples were found to be defective. Analysis of transformer oil is important because incorrect estimation of oil quality leads to shortening of the transformer's service life.

Keywords: transformer oil; surface tension; refractive index; specific resistance; dielectric loss coefficient

Electrochemical characterization of salicylic acid and its influence on the phytopathogenic fungus *Ophiostoma novo-ulmi*

Ines Živković[1]*, Zorana Katanić[1], Dominik Goman[2], Martina Medvidović-Kosanović[2]

[1] Josip Juraj Strossmayer University of in Osijek, Department of Biology, Ulica cara Hadrijana 8/A, Osijek, Croatia
[2] Josip Juraj Strossmayer University of in Osijek, Department of Chemistry, Ulica cara Hadrijana 8/A, Osijek, Croatia
*Corresponding author: zivkovicxines@gmail.com

Abstract: Numerous ancient civilizations knew and used salicylic acid, which is obtained from the bark and leaves of the *Salix* sp., but it was not until 1897 that Felix Hoffmann succeeded in synthesizing salicylic acid in a pharmaceutical laboratory. Salicylic acid is a simple phenolic compound that a large number of prokaryotic and eukaryotic organisms synthesize. In a 1979 study, salicylic acid was found to have a function in plant defense against various pathogens. In the territory of the Republic of Croatia, the presence of the phytopathogenic fungus *Ophiostoma novo-ulmi* was detected, which caused great damage in forest areas and caused the desiccation of elms [2]. In this study, voltammetric measurements will be used to investigate the oxidation of salicylic acid, determine the effect of scan rate and salicylic acid concentration on the oxidation peak potential and oxidation peak current, and provide insight into the oxidation mechanism of salicylic acid. By treating genetically different isolates of *O. novo-ulmi* with different concentrations of alcoholic and aqueous solutions of salicylic acid, the effect of salicylic acid on the growth rate of the fungus and differences in the effects of individual concentrations on the isolates will be determined.

Keywords: Salicylic acid; *Ophiostoma novo-ulmi*; voltammetry

Biomedicina i zdravstvo /
Biomedicine and health

Monitoring klimatskih elemenata i indeksa kvalitete zraka u gradu Bihaću

Medina Dindić, Dženana Zulić, Nejra Dolić, Dajana Raković, Ekrem Pehlić, Minela Ćejvan*

Univerzitet u Bihaću, Fakultet zdravstvenih studija, Nositelja hrvatskog trolista 4, Bihać, Bosna i Hercegovina
*Dopisni autor: minela.zapcevic@gmail.com

Sažetak: Čist zrak je potreba svakog živog bića na Zemlji. Čovjek zajedno sa zrakom udiše i sve veću koncentraciju onečišćujućih tvari koje su proizvod industrijalizacije, prometa, akcidentnih situacija, ali i svakodnevnih ljudskih aktivnosti. Kvaliteta zraka predstavlja koncentraciju onečišćujućih tvari u zraku u toku određenog vremenskog razdoblja. Određivanje kvalitete zraka temelji se na provođenju monitoringa kvalitete zraka koji se provodi u cilju preventivnog uočavanja prekoračenja granične vrijednosti parametara kvalitete zraka, a koji utječu na zdravlje stanovništva i okoliša. U ovom radu prikazane su vrijednosti klimatskih fizikalnih parametara: temperatura, vlažnost zraka, brzina strujanja zraka, intenzitet svjetlosti, ultravioletnog (UV) i elektromagnetnog zračenja, buka i tlak, koji su mjereni kako bi se utvrdilo fizičko stanje prizemnog sloja zraka. Pored klimatskih elemenata, prikazani su i rezultati mjerenja kemijskih parametara kvalitete zraka i to koncentracije lebdećih čestice ($PM_{2,5}$ i PM_{10}), koncentracije ugljikova monoksida (CO), ozona (O_3), sumporova dioksida (SO_2)i dušikova dioksida (NO_2). Navedena mjerenja proveo je Federalni hidrometeorološki zavod Bosne i Hercegovine. Područje Unsko-sanskog kantona i grada Bihaća ne karakterizira prekomjerna zagađenost, ali to ne smanjuje potrebu za uspostavom odgovarajućeg sustava upravljanja kvalitetom zraka. Upravljanje kvalitetom zraka u gradu Bihaću naročito je neophodno pri akcidentim situacija, kao što su požari u tvornicama i šumskim predjelima.

Ključne riječi: monitoring zraka; kvaliteta zraka; klimatski parametri; indeks kvalitete zraka

Monitoring of climate elements and air quality index in the city of Bihać

Medina Dindić, Dženana Zulić, Nejra Dolić, Dajana Raković, Ekrem Pehlić, Minela Ćejvan*

University of Bihac, Faculty of Health Studies, Nositelja hrvatskog trolista 4, Bihać, Bosnia and Herzegovina
*Corresponding author: minela.zapcevic@gmail.com

Abstract: Clean air is the need of every living being on Earth. Along with the air, man inhales an increasing concentration of pollutants, which are the product of industrialization, traffic, accidents, but also everyday human activities. Air quality is the concentration of pollutants in the air over a period of time. Determination of air quality is preceded by air quality monitoring, which serves to preventively register exceeded limit values of air quality parameters affecting the health of the population and the environment. This paper presents the results of climatic parameters, namely: temperature, humidity, air flow rate, light intensity, ultraviolet (UV) and electromagnetic radiation, noise and pressure, which were measured to determine the physical state of the ground air layer. In addition to climatic elements, the results of measuring air quality parameters were presented, namely, concentrations as follows: suspended particles ($PM_{2,5}$ and PM_{10}), carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2) and nitrogen dioxide (NO_2), whose measurement is being performed by the Federal Hydrometeorological Institute of Bosnia and Herzegovina. The area of Una-Sana Canton and the city of Bihać is not characterized by excessive pollution, but this does not diminish the need to establish an appropriate air quality management system. Air quality management in the city of Bihać is especially necessary in case of accidents, such as fires in factories and forest areas.

Keywords: air monitoring; air quality; climatic parameters; air quality index

Slikovna dijagnostika u sudskom veterinarstvu divljih životinja

Rebeka Jukić, Viktorija Turk, Ana Javor, Zoran Vrbanac, Magdalena Palić, Krešimir Severin, Hrvoje Capak*

Sveučilište u Zagrebu, Veterinarski fakultet, Heinzelova ulica. 55, Zagreb, Hrvatska
*Dopisni autor: hcapak@vef.unizg.hr

Sažetak: Slikovna dijagnostika u sudskom veterinarstvu jedna je od neinvazivnih metoda u utvrđivanju mogućih nestručnosti u liječenju, utvrđivanju uzroka uginuća, istraživanju zlostavljanja ili zanemarivanja životinja. Od slikovnih dijagnostičkih metoda primarno se koristi radiografija, a prema potrebi i kompjuterizirana tomografija (CT), magnetna rezonanacija (MR) i ultrazvuk. Primjenom klasične radiografije postmortalno je moguće odrediti vrijeme ozljede, porijeklo i trajanje postmoralnog intervala te uzrok uginuća. Doprinos slikovne dijagnostike u forenzičkoj veterinarskoj medicini može se podijeliti u nekoliko područja: identifikacija i utvrđivanje dobi životinje, traume koštanog tkiva, ozljede vatrenim oružjem, traume mekih tkiva, nalaz znakova zanemarivanja i prikrivenih znakova zlostavljanja. Kod divljih životinja, od kojih se većina nalazi pod određenim stupnjem zaštite, slikovna dijagnostika često se koristi u istraživanju uzroka uginuća, a obavezno prethodi razudbi životinje. Specifičnost takve dijagnostike jest u nedostatku anamnestičkih i kliničkih podataka. Posebice je važno u takvim slučajevima isključiti uzroke smrti pod djelovanjem čovjeka, primjerice stradavanje od vatrenog oružja, trovanje, kolizije s vozilima, udar električne struje i slično. Obzirom na broj pozitivnih nalaza u praksi, dokazana je opravdanost protokola rendgenskog snimanja lešina divljih životinja s nepoznatim uzrokom uginuća prije razudbe.

Ključne riječi: slikovna dijagnostika, radiografija, sudsko veterinarstvo, divlje životinje

Diagnostic imaging in forensic veterinary medicine of wildlife

Rebeka Jukić, Viktorija Turk, Ana Javor, Zoran Vrbanac, Magdalena Palić, Krešimir Severin, Hrvoje Capak*

University of Zagreb, Faculty of Veterinary Medicine, Heinzelova ulica. 55, Zagreb, Croatia
*Corresponding author: hcapak@vef.unizg.hr

Abstract: Diagnostic imaging is a discipline of veterinary forensic medicine involving noninvasive acquisition and interpretation of radiographs and other imaging studies related to the determination of the appropriateness of veterinary medical treatment, cause of death, and the investigation of animal abuse and neglect. Useful imaging modalities include primarily radiography, as well as computed tomography (CT), magnetic resonance (MR) and ultrasound. Survey radiography can answer questions related to the law, such as the timing of injuries, the possibility of neglect, the features and duration of the perimortem period, and the cause of death. The diagnostic imaging can be used for identification and age determination, osseus response to trauma, firearm injury, soft tissue injury, signs of neglect and mimics of abuse.

Due to the fact that most wildlife is endangered and protected species, imaging is often used to investigate the cause of death and necessarily precedes the dissection of the animal. The specificity of diagnostic imaging in these cases is the lack of anamnestic and clinical data. It is especially important to exclude the causes of death related to human influence, such as firearms injury, poisoning, collisions with vehicles, electrocution and so on. Given the number of positive findings in practice, the importance of the X-ray protocol prior to the dissection of wild animal carcasses has been proven.

Keywords: diagnostic imaging, radiography, forensic veterinary medicine, wildlife

Analiza fizikalno-kemijskih parametara rijeke Une

Antonia Jurić, Sara Hrnjica, Muris Hairlahović, Adis Trešnjić, Semra Mujakić, Jasmina Ibrahimpašić, Minela Ćejvan*

Univerzitet u Bihaću, Fakultet zdravstvenih studija, Nositelja hrvatskog trolista 4, Bihać, Bosna i Hercegovina
*Dopisni autor: minela.zapcevic@gmail.com

Sažetak: Una je rijeka u Bosni i Hercegovini koja se svojom ljepotom i bogatstvom sedrenih tvorevina izdvaja od ostalih, a procesom stvaranja sedre unikatna je prirodna pojava na teritoriji Bosne i Hercegovine. U ovom radu analizirani su fizikalno-kemijski parametri kvalitete vode rijeke Une u bihaćkom naselju Hatinac, koje se nalazi na desnoj obali rijeke Une nizvodno od centra grada Bihaća. Cijelom dužinom omeđeno je rijekom Unom, a na obali Hatinca nalaze se mnoga kupališta i uređeni prilazi rijeci Uni koji se koriste za sport i rekreaciju u ljetnim mjesecima. Uzorkovanja i analiza vode provedena su u jesen 2021. godine i proljeće 2022. godina. Ispitivani su fizikalno-kemijski pokazatelji: temperatura, pH vrijednost, elektroprovodljivost, otopljeni kisik, suspendirane tvari, biokemijska potrošnja kisika, kemijska potrošnja kisika, amonijak, nitrati i fosfor. Rezultati ispitivanja su pokazali da rijeka Una ima vodu kvalitete koja u skladu okvirnom direktivom o vodama te s primjetnim razlikama i umjereno povišenim koncentracijama suspendiranih tvari, amonijaka, nitrata i fosfora što ukazuje na postojanje organskog onečišćenja vode u ovom području. Stoga je potrebno je poduzeti mjere kojima se će se stanje kvalitete rijeke Une poboljšati i sačuvati.

Ključne riječi: rijeka Una; onečišćenje vode; fizikalno-kemijski parametri; senzorski parametri

Analysis of physicochemical parameters of the Una River

Antonia Jurić, Sara Hrnjica, Muris Hairlahović, Adis Trešnjić, Semra Mujakić, Jasmina Ibrahimpašić, Minela Ćejvan*

University of Bihac, Faculty of Health Studies, Nositelja hrvatskog trolista 4, Bihać, Bosnia and Herzegovina
*Corresponding author: minela.zapcevic@gmail.com

Abstract: Una is a river in Bosnia and Herzegovina that stands out from the others with its beauty and richness of travertine creations, and the process of creating travertine is a unique natural phenomenon within the territory of Bosnia and Herzegovina. In this paper, the physicochemical parameters of the Una River in the Bihac settlement Hatinac, which is located on the right bank of the Una River downstream from the center of Bihać, were analyzed. The entire length is bordered by the river Una, and on the banks of the Hatinac there are many beaches and landscaped approaches to the river Una, which are widely used for sports and recreation in the summer. Sampling was done in the fall of 2021 and spring of 2022. Physicochemical indicators were examined: temperature, pH value, electrical conductivity, dissolved oxygen, suspended solids, biochemical oxygen demand, chemical oxygen demand, ammonia, nitrates and phosphorus. The test results confirmed that the Una River showed good quality in accordance with the Water Framework Directive, with noticeable differences and moderately increased concentrations of suspended solids, ammonia, nitrates and phosphorus. It indicates the presence of organic water pollution in this area. Therefore, it is necessary to take measures to improve and preserve the condition of the Una River.

Keywords: Una River; water pollution; physicochemical parameters

WildRescueVEF – projekt unaprjeđenja i povećanje kapaciteta oporavilišta za divlje životinje na Veterinarskom fakultetu

Tvrtko Mataušić, Anamarija Nevistić, Danijela Horvatek Tomić, Maja Belić, Martina Đuras, Kim Korpes, Magdalena Kolenc, Manuela Belajsa, Hrvoje Capak*, Maja Lukač

Sveučilište u Zagrebu, Veterinarski fakultet, Heinzelova ulica. 55, Zagreb, Hrvatska
***Dopisni autor: hcapak@vef.unizg.hr**

Sažetak: Oporavilište za strogo zaštićene divlje životinje Veterinarskog fakuleta Sveučilišta u Zagrebu registrirano je 2017. godine. Zbog ograničenih kapaciteta oporavilišta, a u svrhu kvalitetnijeg zbrinjavanja strogo zaštićenih divljih vrsta i očuvanja bioraznolikosti republike Hrvatske, Veterinarski fakultet 2020. godine prijavljuje projekt „Unaprjeđenje i povećanje kapaciteta oporavilišta za divlje životinje“ u okviru Operativnog programa „Konkurentnost i kohezija 2014. – 2020.“, specifičnog cilja „Uspostava okvira za održivo upravljanje bioraznolikošću“. Projekt će trajati od 2021. do 2023. Godine. Osnovni cilj Oporavilišta je briga za pronađene iscrpljene, bolesne, ozlijeđene ili oduzete životinje, u svrhu njihovog izliječenja, oporavka i povratka u prirodu. Nabavom dijela opreme s projekta, oporavilište već bilježi veći broj rehabilitiranih jedinki u odnosu na prošle godine. Tako je 2021. godine prihvaćeno ukupno 90 jedinki (51 ptica, 31 gmaz i 8 sisavaca). Kroz projekt je planiranai edukacija djelatnika i studenata, kao i zainteresiranih skupina građana o očuvanju prirode i divljih životinjskih vrsta pute društvenih mreža, brošura, edukativnih radionica i volonterskih programa. Ulaganjem u preuređenje i opremanje prostora te edukaciju očekujemo porast broja prihvaćenih jedinki i poboljšanje uvijeta za njihov oporavak, a sve s ciljem vraćanja u prirodna staništa što većeg broja zaštićenih divljih životinja.

Ključne riječi: WildRescueVef, oporavilište, zaštićene divlje životinje

WildRescueVEF – Project of Improvement and Increasing of the Wildlife Rescue Centre Capacities

Tvrtko Mataušić, Anamarija Nevistić, Danijela Horvatek Tomić, Maja Belić, Martina Đuras, Kim Korpes, Magdalena Kolenc, Manuela Belajsa, Hrvoje Capak*, Maja Lukač

University of Zagreb, Faculty of Veterinary Medicine, Heinzelova ulica. 55, Zagreb, Croatia
*Corresponding author: hcapak@vef.unizg.hr

Abstract: The wildlife rescue center of the Faculty of Veterinary Medicine University of Zagreb was registered in 2017. Due to limited resources of the rescue center, in the interest of improving the quality of care for endangered wildlife and conservation of biodiversity in Croatia, in 2020 the Faculty of Veterinary Medicine is applying for a project "Improving and increasing the capacity of wildlife rescue center capacities" within the Operational Program "Competitiveness and Cohesion 2014 - 2020", with the specific goal "Establish a framework for sustainable biodiversity management". The project will last from 2021 to 2023. The main goal of the rescue center is to take care of the found exhausted, sick, injured or confiscated animals, for the purpose of their recovery and return to nature.

By getting part of the equipment from the project, the rescue center is already recording a higher number of rehabilitated animals compared to the last few years. In 2021, a total of 90 animals (51 birds, 31 reptiles and 8 mammals) were accepted. The project also plans to educate employees and students, as well as interested groups of citizens on the conservation of nature and wildlife species through social networks, brochures, educational workshops and volunteer programs. By investing in remodeling and equipping the space and education, we expect an increase in the number of accepted animals and improving the conditions for their recovery, all with the aim of returning as many protected wild animals as possible to their natural habitats.

Keywords: WildRescueVef, rescue center, protected wildlife

Postupci pri pronalasku divljih ptica – kako i kada pomoći?

Anamarija Nevistić, Tvrtko Mataušić, Danijela Horvatek Tomić, Manuela Belajsa, Hrvoje Capak*, Maja Lukač

Sveučilište u Zagrebu, Veterinarski fakultet, Heinzelova ulica. 55, Zagreb, Hrvatska
*Dopisni autor: hcapak@vef.unizg.hr

Sažetak: Divlje ptice su jedne od najčešćih pacijenata u oporavilištima za divlje životinje, što je posljedica različitih stradavanja, ali i nepotrebnog uzimanja zdravih životinja iz prirode. Postupci pri pronalasku ptica razlikuju se ovisno o dobi i stanju životinje. Goluždravci najčešće stradavaju nakon pada iz gnijezda. Obzirom da ptice nemaju razvijen osjet njuha, roditelji ih neće odbaciti nakon ljudske manipulacije. Ukoliko nema ozljeda, potrebno ga je nježno uhvatiti i vratiti u gnijezdo jer će tako imati najveću šansu za preživljavanje. Poletarci su mlade, opernaćene ptice koje se mogu vidjeti tijekom proljetnih mjeseci kako skakuću i pokušavaju letjeti. Nakon rasta letnog perja, sposobni su letjeti. Ukoliko nemaju ozljeda i ne prijeti im neposredna opasnost od predatora, nije potrebno intervenirati. U slučaju pronalaska ozlijeđene odrasle ptice, životinju je potrebno nježno uzeti koristeći rukavice ili ručnik i staviti u prethodno pripremljenu kutiju s otvorima za protok zraka. Kutiju je potrebno staviti na umjereno toplo, tiho i mirno mjesto i kontaktirati oporavilište za divlje životinje. Za ispravno postupanje pri pronalasku ptica potrebno je znati osnovne karakteristike ptica, a pri svakom kontaktu minimalizirati stres koji je jedan od glavnih razloga uginuća pri kontaktu s ljudima.

Ključne riječi: divlje ptice, oporavilište, poletarci, goluždravci

Wild birds first aid – when and how to help?

Anamarija Nevistić, Tvrtko Mataušić, Danijela Horvatek Tomić, Manuela Belajsa, Hrvoje Capak*, Maja Lukač

University of Zagreb, Faculty of Veterinary Medicine, Heinzelova ulica. 55, Zagreb, Croatia
*Corresponding author:: hcapak@vef.unizg.hr

Abstract: Wild birds are one of the most common patients in wildlife rehabilitation centres as a result of various casualties and the unnecessary animal rescue attempts of healthy animals. When the animal is found, the procedure varies depending on the age and condition of the animal. Nestlings often fall from the nest. Since birds do not have a sense of smell, the parents will not abandon the young after human manipulation. If there are no visible injuries, the nestling has to be gently put back into the nest to have the best odds of survival. Fledglings are young, feathered birds that can be seen in spring hopping and trying to fly. They will be able to fly once they grow flight feathers. If there are no injuries and no imminent danger from the predators, one should not intervene. When an adult bird is found injured, the animal should be carefully put using gloves or a towel in a cardboard box in a moderately warm and quiet place until the rehabilitation center is contacted. To know how to appropriately act, one should familiarize with the fundamental characteristics of birds and minimalize stress as it is a leading cause of death during contact with people.

Keywords: wild birds, rehabilitation, nestling, fledgling

Utjecaj energetskih pića na zdravlje djece

Katarina Rađa, Valentina Solić, Sara Sviben*, Ana Mojsović Ćuić

Zdravstveno veleučilište, Mlinarska 38, Zagreb, Hrvatska
*Dopisni autor: sara.sviben14@gmail.com

Sažetak: Nagli porast konzumacije energetskih pića među mladima posljednjih godina budi sve veću zabrinutost i zainteresiranost o njihovom utjecaju na zdravlje među roditeljima i zdravstvenim djelatnicima. Cilj ovog istraživanja je utvrditi učestalost konzumiranja energetskih pića kod osnovnoškolaca te njihovu informiranost o energetskim pićima općenito kao i njihovom utjecaju na zdravlje. Metode istraživanja obuhvatile su upitnik koji je osim pitanja o konzumiranju energetskih pića sadržavao i pitanja o socijalnim i demografskim karakteristikama ispitanika kao što su spol, razred i mjesto stanovanja. U istraživanju je sudjelovalo 80 ispitanika, 38 muškog spola i 42 ženskog spola, dobi 12 – 14 godina. Utvrđeno je da 20 % ispitanika konzumira energetska pića od čega je veći udio muških ispitanika. Većina ispitanika konzumira energetska pića jednom mjesečno ili rjeđe, a glavni razlog konzumacije energetskih pića je njihov okus. Svi, osim jednog ispitanika, svjesni su da energetska pića mogu imati utjecaj na njihovo zdravlje. Isti ti ispitanici nakon konzumacije energetskog napitka ne osjećaju ništa ili osjećaju da imaju više energije. Svega je jedan ispitanik uspio navesti tri sastojka energetskih pića. Upravo takvi podaci ukazuju na povećanu potrebu edukacije mladih o energetskim napitcima, ali i drugim bezalkoholnim pićima.

Ključne riječi: energetska pića, utjecaj na zdravlje, informiranost mladih

The effect of energy drinks on children's health

Katarina Rađa, Valentina Solić, Sara Sviben*, Ana Mojsović Ćuić

University of Applied Health Sciences, Mlinarska 38, Zagreb, Croatia
*Corresponding author: sara.sviben14@gmail.com

Abstract: Fast increase in the consumption of energy drinks among young people in recent years is causing increasing concern and interest among parents and health professionals about their impact on health. The aim of this research is to determine the frequency of consumption of energy drinks among elementary school students and their awareness of energy drinks in general as well as their impact on health. Research methods included a questionnaire that, in addition to questions about the consumption of energy drinks, also contained questions about the social and demographic characteristics of the respondents, such as gender, class and place of residence. 80 respondents, 38 male and 42 females, aged 12-14, participated in the research. It was found that 20% of respondents consume energy drinks, of which the proportion of male respondents is higher. Most respondents consume energy drinks once a month or less often, and the main reason for consuming energy drinks is their taste. All but one respondent is aware that energy drinks can have an impact on their health. These same subjects do not feel anything or feel that they have more energy after consuming an energy drink. Only one respondent was able to name three ingredients of energy drinks. Obtained data indicate that more effort has to invest to educate young people about the effects of energy drinks and other non-alcoholic drinks on their health and well-being.

Keywords: energy drinks, impact on health, youth awareness

Pogreške vezane uz označavanje pasa mikročipom

Lucija Žager, Nika Škiljan, Helena Šipoš, Lucija Grganović, Anita Kraljević, Hrvoje Capak*

Sveučilište u Zagrebu, Veterinarski fakultet, Heinzelova ulica. 55, Zagreb, Hrvatska
*Dopisni autor: hcapak@vef.unizg.hr

Sažetak: Mikročipiranje se dosada pokazalo najučinkovitijom metodom označavanja životinja. U Republici Hrvatskoj od 2011. godine zakonski je propisana obveza označavanja mikročipom svih pasa starijih od 90 dana, s mjestom aplikacije čipa u potkožje središnjeg dijela lijeve strane vrata. Najčešći neželjeni učinci koji su zabilježeni prilikom mikročipiranja kod pasa su: nestručna implantacija, višestruko mikročipiranje, gubitak signala mikročipa, oštećenjenje ili migracija mikročipa te neoplazije potaknute mikročipom. Svrha istraživanja bila je odrediti učestalost pogreški pri mikročipiranju koje se mogu rendgenski pratiti. Nasumičnim izborom pregledano je 1000 rendgenskih snimka pasa, regije vrata (po potrebi grudnog koša i prednjih ekstremiteta) iz arhive Zavoda za rendgenologiju, ultrazvučnu dijagnostiku i fizikalnu terapiju Veterinarskog fakulteta Sveučilišta u Zagrebu. Ukupno je pronađeno 186 (18,6 %) pasa s nekim oblikom nepravilnosti u označavanju mikročipom. Nije označeno mikročipom 9 (0,9 %) životinja. Migracija mikročipa utvrđena je kod 168 (16,9%) pasa, višestruko je označeno 8 (0,8 %) pasa i pronađen je svega 1 (0,1 %) pas s oštećenim mikročipom. Učestalost pogrešaka pri mikročipiranju je vrlo niska, a usavršavanjem u području biokompatibilnosti, u kliničkom radu sa psima njihov rizik sveden je na minimum. Migracija mikročipova svakako je najčešća komplikacija čiji mehanizam nastanka je i dalje nepoznat ali ne utječe bitno na zdravstveni status životinje.

Ključne riječi: mikročipiranje, pogreške, migracija mikročipa, pas

Mistakes related to microchipping of dogs

Lucija Žager, Nika Škiljan, Helena Šipoš, Lucija Grganović, Anita Kraljević, Hrvoje Capak*

University of Zagreb, Faculty of Veterinary Medicine, Heinzelova ulica. 55, Zagreb, Croatia
*Corresponding author:: hcapak@vef.unizg.hr

Abstract: Microchipping has been recognized as the most effective method of tracking and identifying animals. In Croatia, dogs older than 90 days mandatory should be microchipped since 2011. The application area of the chip is the central part of the left side of the neck subcutaneously. The most common adverse effects reported during microchipping dogs were: unprofessional implantation, multiple instances of microchipping, loss of signal, damaged microchip or its migration, as well as neoplasia caused by the microchip. The aim of this study was to determine the frequency of these mistakes during microchipping, noted during the X-ray imaging. In the data archive of the Department of Radiology, Ultrasound Diagnostic and Physical Therapy, Faculty of Veterinary Medicine University of Zagreb, 1000 radiography images of the dog's neck were randomly examined. If necessary, images of the thorax and forelimbs were examined as well. In total, there were 186 dogs (18.6%) with some kind of irregularity connected to microchipping. Nonmicrochipped animals turned out to be 9 (0.9%). Migration of the microchip was found in 168 dogs (16.9%), multiple microchipping was found in 8 dogs (0.8%) and only one dog (0.1%) was found with a damaged microchip. The frequency of microchipping mistakes is relatively rare, due to high biocompatibility the risk was reduced to a minimum in clinical work with dogs. The migration of microchips was the most common complication, however, the cause is still unknown but has not significantly affected animal health.

Keywords: microchipping, mistakes, microchip migration, dog

Tehničke znanosti /
Technical sciences

Liquid-liquid extraction of *endo*-1,4-xylanase in a microextractor

Sara Anđelović[1], Marko Božinović[1], Renata Vičević[1], Nikolina Zekić[1], Anita Šalić[1*], Bruno Zelić[1,2]

[1] University of Zagreb, Faculty of Chemical Engineering and Technology, Marulićev trg 19, Zagreb, Croatia
[2] University North, Trg dr. Žarka Dolinara 1, Koprivnica, Croatia
*Corresponding author: asalic@fkit.hr

Abstract: Nowadays, there's a growing interest in environmentally friendly extractions and many efforts were made to develop clean, sustainable, and efficient extraction processes. Aqueous two-phase systems (ATPSs) are considered an effective, versatile and important new green technology for downstream processing of biomolecules. ATPSs are liquid-liquid systems that can be obtained by mixing certain polymers, ionic liquids, deep eutectic solvents (DES) and short-chain alcohols withsalts or detergents. In this work, the extraction of the enzyme *endo*-1,4-β-xylanase from *Trametes versicolor* was performed in a microextractor with two ATPSs. The first ATPS was formed by mixing DES betaine:urea (1:3) with 30% (*w*/*w*) water and K_2HPO_4 and the second was formed as a mixture of polyethylene glycol (PEG1540) and $C_6H_9Na_3O_9$. Extraction with ATPS based on PEG1540 was performed under previously determined optimal process conditions (γ_{enyzme} = 0.3 mg/mL, w_{PEG} = 0.21). Extraction efficiency of E = 100%±1.20% was achieved for residence time of τ = 0.25 min. In addition, continuous extraction was performed in a microextractor with crude xylanase and extraction efficiency of E = 58.99%±5.69% was achieved. When extraction was performed using DES, the highest extraction efficiency was only E = 16.29%±3,28% making this system unfavorable compared to ATPS based on PEG.

Keywords: ATPS, xylanase, liquid-liquid extraction, microextractor

Inventivno proširenje koncepta povrata poštanske ambalaže

Anto Antunović[1], Marijan Binički[2], Tomislav Kljak[1]*

[1] Sveučilište u Zagrebu, Fakultet prometnih znanosti, Vukelićeva 4, Zagreb, Hrvatska
[2] Hrvatska pošta d.d., Jurišićeva ulica 13, Zagreb, Hrvatska
*Dopisni autor: tomislav.kljak@fpz.unizg.hr

Sažetak: U radu je predstavljena razrada mogućnosti inventivne usluge temeljene na proširenju koncepta povrata ambalaže, bilo za ponovno uporabu bilo sa svrhom odvojenog prikupljanja i daljnjeg recikliranja, u području poštanskog prometa. Iako se posljednjih godina i u domeni poštanskog prometa razvijaju i korisnicima nude naizgled slične usluge one su prvenstveno usmjerene na velike poštanske korisnike i specifične ambalaže (kontejneri, palete, vreće) dok se za individualne korisnike nudi mogućnost ponovne uporabe samo u slučaju povrata pošiljke sa robom pošiljatelju (web-trgovinama) od kojeg je pošiljku primio. Ovom invencijom se pretpostavlja višestruka uporaba osnovne poštanske ambalaže sa idejom omogućavanja ponovnog slanja korištene poštanske ambalaže između novih pošiljatelja i primatelja. Svrha je smanjiti količinu otpadne poštanske ambalaže, smanjiti nepotrebnu proizvodnju iste, a onu koju više nije moguće koristiti odvojeno prikupiti i uputiti na recikliranje. To u konačnici dovodi do smanjenja karbonskog otiska pružanja poštanskih usluga. Predlaže se polazni tarifni model kojim bi se uspostavili određeni mehanizmi motiviranja korisnika na takve nove oblike suradnje s davateljima poštanskih usluga. Inventivni pristup je ilustrativno prikazan na primjerima dvaju davatelja poštanskih usluga u Republici Hrvatskoj koji u eksploataciji koriste svoju tipiziranu ambalažu.

Ključne riječi: poštanski promet; poštanska pošiljka; povratna ambalaža; kružna ekonomija; okolišna održivost

Inventive extension of the concept of returnable postal packaging

Anto Antunović[1], Marijan Binički[2], Tomislav Kljak[1]*

[1] University of Zagreb Faculty of Transport and Traffic Sciences, Vukelićeva 4, Zagreb, Croatia
[2] Croatian Post d.d., Jurišićeva ulica 13, Zagreb, Croatia
*Corresponding author: tomislav.kljak@fpz.unizg.hr

Abstract: The paper presents an elaboration of the possibilities of an inventive service based on the extension of the concept of packaging return, either for reuse or for the purpose of separate collection and further recycling, in the field of postal traffic. Although in recent years in the field of postal traffic there are developing and offered to users seemingly similar services, they are primarily aimed at large postal users and specific packaging (containers, pallets, bags) while individual users are offered the possibility of reuse only in case of returning goods from which the shipment was received (online retailer). This invention presupposes the multiple uses of basic postal packaging with the idea of enabling the re-sending of used postal packaging between new senders and recipients. The purpose is to reduce the amount of wasted postal packaging, reduce unnecessary production of the same, and those that can no longer be in use to be collected separately and sent for recycling. This ultimately leads to a reduction in the carbon footprint of postal services providing. A starting tariff model is proposed which would establish certain mechanisms for motivating users to such new forms of cooperation with postal service providers. The inventive approach is illustrated by the examples of two postal service providers in the Republic of Croatia that use their standardized packages in operation.

Keywords: postal traffic; postal item; returnable packaging; circular economy; environmental sustainability

Miniaturized system for biodiesel production and purification

Željka Ćurić[1*], Martin Gojun[1], Anita Šalić[1*], Bruno Zelić[1,2]

[1] University of Zagreb, Faculty of Chemical Engineering and Technology, Marulićev trg 19, HR-10000 Zagreb, Croatia
[2] University North, Trg dr. Žarka Dolinara 1, 48 000 Koprivnica, Croatia
*Corresponding authors: asalic@fkit.hr, zcuric@fkit.hr

Abstract: Biodiesel, as a fuel alternative to diesel, is produced from renewable biological sources and is considered a renewable energy source. The most common method of biodiesel production is the transesterification process. The biodiesel produced by this process is not pure and contains traces of alcohol, soap, catalysts, water, metals, oil, and glycerides, which should be removed before using biodiesel. There are many different technologies that can be used to purify biodiesel, including wet washing (water, acidified water or organic solvents), dry washing (adsorption or ion-exchange), distillation (including reactive distillation), and membrane separation. The most commonly used process in the industry is wet washing, which requires large amounts of water and is not economically and environmentally justified. For this reason, the other mentioned technologies are intensively studied. In this work, biodiesel was produced in a microreactor by a transesterification process catalysed by lipase and purified by membrane ultrafiltration with a polyethersulfone membrane in continuously connected systems. A total of four different systems were developed and compared. A biodiesel yield of 90.7% and a glycerol mass fraction in the purified biodiesel of 0.025% were achieved during a residence time of 20 minutes in a system with two microreactor inlets.

Keywords: biodiesel, membrane ultrafiltration, microreactors, integrated systems

Pitanje transformacije: rušenje i zidanje bedema oko Tvrđe

Tea Hrgović, Ivan Cingel*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Građevinski i arhitektonski fakultet Osijek, Vladimira Preloga 3, Osijek, Hrvatska
***Dopisni autor:** ivan.cing@gmail.com

Sažetak: Osječka Tvrđa transformira se krajem 17. stoljeća nakon oslobođenja od osmanlijske vlasti, u baroknu tvrđavu prema Vaubanovim principima. Do kraja 18. stoljeća bastionska utvrđenja na površini od oko 80 ha opasavala su gradsku jezgru površine 15 ha. Uža zona zabrane gradnje (1. topnička potega) protezala se na oko 200 ha, čime je područje oko tvrđave tijekom stoljeća očuvano kao neizgrađeni prostor s potencijalom. S prestankom ondašnjih ratnih opasnosti, već 70-ih godina 19. stoljeća ruši se sjeverozapadni dio bedema i na tom mjestu uređuje Ambrozijev vrt. Prvom Regulatornom osnovom grada Osijeka iz 1912. predviđa se rušenje svih bedema - s provedbom čega se i počelo od 1923. - i odmjenjivanje ih perivojnim prstenom. 1925. je proveden međunarodni urbanistički natječaj kojim je na mjestu nekadašnjih bedema traženo perivojno rješenje s javnim sadržajima. Pobjedničko rješenje Alberta Escha nije realizirano, ali je na temelju njega 1928. izrađena Regulatorna osnova. 30-ih godina proširen je Perivoj kralja Tomislava i formira se niz novih južno od Tvrđe. Na trasi električnog tramvaja položenoj preko južnog dijela bedema nastat će današnja Europska avenija. Na taj način se urbana preobrazba osječkih bastionskih fortifikacija odvila prema modelu bečkog Ringa. Članak će u tom svjetlu problematizirati suvremene napore oko njihove restitucije.

Ključne riječi: Tvrđa, bastionska utvrđenja, bedem, transformacija, rušenje, Osijek

The question of transformation: the demolition and construction of the ramparts around the Fortress

Tea Hrgović, Ivan Cingel*

Josip Juraj Strossmayer University of in Osijek, Faculty of Civil Engineering Osijek, Vladimira Preloga 3, Osijek, Croatia
***Corresponding author: ivan.cing@gmail.com**

Abstract: At the end of the 17th century, after the liberation from Ottoman Empire, the Osijek Fortress was transformed into a baroque fortress according to Vauban's principles. By the end of the 18th century, bastion fortifications on an area of 80 ha surrounded the city center with an area of 15 ha. The inner construction prohibition zone (1st artillery line) stretched over 200 ha. The northwestern part of the ramparts was demolished in the 1970s and the Ambrose Garden was arranged there. The first Regulatory Basis of the City of Osijek from 1912 predict the demolition of all the ramparts - the implementation of which began in 1923 - and their replacement with a park ring. In 1925, an international competition was conducted to find a park solution with public facilities on the site of the former ramparts. Albert Esch's winning solution was not realized, but on the basis of it, in 1928, the Regulatory Basis was made. In 1930s, King Tomislav Park was expanded and formed through new ones south of the Fortress. Today's European Avenue will be built on the route of the tram laid across the southern part of the ramparts. The urban transformation of Osijek's bastion fortifications took place according to the model of the Vienna Ring. The article will problematize contemporary efforts to restitute them.

Keywords: Fortress, bastion fortifications, rampart, demolition, construction, Osijek

Izolacija i identifikacija mikroorganizama prisutnih u sredstvu za odstranjivanje masnoća

Ana Klemar*, Martina Miloloža, Dajana Kučić Grgić

Sveučilište u Zagrebu, Fakultet kemijskog inženjesrtva i tehnologije Zagreb, Trg Marka Marulića 19, Zagreb, Hrvatska
***Dopisni autor:** aklemar@fkit.hr

Sažetak: Sredstvo za odmašćivanje trgovačkog imena Mika-bakt koje se koristi za pročišćavanje kanalizacijskih sustava, separatora masti i crpnih stanica, predstavlja vodenu otopinu enzima i mikroorganizama. Aktivni sastojci su prirodni, nepatogeni mikroorganizmi (bakterije i kvasci) koji su u ovom radu identificirani. Uzgojem mikroorganizama na hranjivom i sladnom agaru, odredio se ukupan broj živih stanica (*Colony forming units*, CFU) bakterija i gljiva. Nakon 24/72 sata uzgoja, izolirane su najučestalije kolonije bakterija i gljiva. Izolirane bakterije su se pročistile tehnikom iscrpljivanja te je napravljen KOH test uz bojanje po Gramu i Schaffer-Fultonu i biokemijske testove (katalaza i oksidaza test). Završni korak identifikacije bakterija obuhvaćao je primjenu API stripa. Prema API 50 CH uz API 20 E identificirana je Gram pozitivna bakterija *Bacillus cereus*. Izolirane kulture kvasaca i plijesni identificirane su mikroskopiranjem morfoloških karakteristika kultura te uz Bergeyev priručnik.

Ključne riječi: izolacija; identifikacija; sredstvo za odmašćivanje; bakterija; plijesni i kvasci

Isolation and identification of microorganisms present in the degreasing agent

Ana Klemar*, Martina Miloloža, Dajana Kučić Grgić

University of Zagreb, Faculty of Chemical Engineering and Technology, Trg Marka Marulića 19, Zagreb, Croatia
*Corresponding author: aklemar@fkit.hr

Abstract: The degreasing agent with the trade name Mika-bakt, used for cleaning sewage systems, grease separators and pumping stations, is an aqueous solution of enzymes and microorganisms. The active ingredients are natural, non-pathogenic microorganisms (bacteria and yeasts) identified in this work. By culturing the microorganisms on nutrient and malt agar, the total number of living cells (Colony Forming Units, CFU) of bacteria and fungi was determined. After 24/72 hours of cultivation, the most abundant colonies of bacteria and fungi were isolated. The isolated bacteria were purified using the depletion technique, and a KOH test, Gram and Schaffer-Fulton staining, and biochemical tests (catalase and oxidase tests) were performed. The final step of bacterial identification involved the application of an API strip. According to API 50 CH and API 20 E, the Gram-positive bacterium *Bacillus cereus* was identified. Isolated cultures of yeasts and molds were identified by microscopy of the morphological characteristics of the cultures and using the Bergey manual.

Keywords: isolation; identification; degreasing agent; bacterium; molds and yeasts

Green synthesis of fluorinated optically pure compound

Ana-Katarina Marić, Nevena Milčić, Zvjezdana Findrik Blažević*

University of Zagreb, Faculty of Chemical Engineering and Technology, Marulićev trg 19, Zagreb, Croatia
*Corresponding author: zfindrik@fkit.hr

Abstract: Optically pure compounds are of great significance in the pharmaceutical industry, with the increasing interest in fluorinated derivatives. One important enzyme group employed in synthesizing various chiral building blocks is halohydrin dehalogenases (HHDHs). HHDHs can accept numerous anionic nucleophiles from cyanide, cyanate, thiocyanate to azide and nitrite. In their presence the ring-opening reaction of epoxide occurs, leading to β-substituted alcohol. The foundation of this work lies in a biocatalytic reaction shown in Fig. 1. Mathematical model for the synthesis of (*S*)-2-(4-fluorophenyl)-3-hydroxypropanenitrile was earlier developed by coupling kinetic equations with mass balances. A series of different batch experiments varying in initial concentrations of epoxide, NaCN and HHDH were conducted with aim of model validation. Enzyme deactivation influenced by initial epoxide concentration was observed within incubation experiments and operational stability decay was mathematically described and included in the model. With the increase in the epoxide concentration, enzyme stability decreased, while the cyanide nucleophile did not have a significant effect on the stability of the enzyme. Experimental data has shown a satisfactory match with an earlier developed mathematical model. Mathematical modeling has shown that synthesis in a batch/repetitive batch reactor is the optimal pathway for the production of this compound.

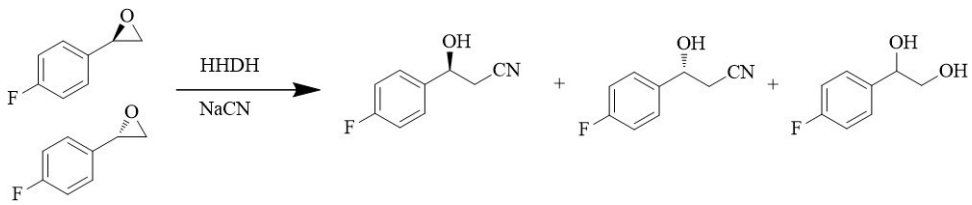

Figure 1. (*S*)-2-(4-fluorophenyl)-3-hydroxypropanenitrile synthesis through the HHDH-catalysed *rac*-2-(4-fluorophenyl)oxirane ring-opening reaction mediated by cyanide ions

Keywords: biocatalysis; optically pure compound; enzyme kinetics; mathematical modelling

Assessment of soil quality of municipal waste landfill in Novi Sad, Serbia

Dušan Milovanović*, Tijana Adamov, Mladenka Novaković, Ivana Mihajlović, Maja Petrović

University of Novi Sad, Faculty of Technical Sciences, Department of Environmental Engineering and Occupational Safety and Health, Trg Dositeja Obradovića 6, Novi Sad, Serbia
*Correspondence: dusanmilovanovic@uns.ac.rs

Abstract: The assessment of the soil quality of the municipal waste landfill in Novi Sad, Serbia, was conducted during one year research period within four sampling campaigns. Soil sampling was carried out according to the standard SRPS ISO 10381-2. The analyzes were performed in the Laboratory for Environmental and Occupational Monitoring, Department of Environmental Engineering, Faculty of Technical Sciences, University of Novi Sad. Concentration levels of heavy metals (Cd, Pb, Ni, Zn), dry matter, total organic carbon (TOC) and physicochemical parameters (pH value and electrical conductivity) were determined. TOC values ranged from 1.01% to 2.08%, which indicated a low load of organic matter in soil. Landfill soil samples showed pH values from 9.32 to 9.94, from which it can be concluded that the landfill of municipal waste in Novi Sad has a basic character, which indicates the older age of the landfill. Analysis of heavy metals indicated the presence of zinc and cadmium in municipal landfill soil samples in concentrations up to 38 and 98 mg/kg, respectively.

Keywords: soil quality; municipal landfill; TOC; heavy metals

Acknowledgement: This research (paper) has been supported by the Ministry of Education, Science and Technological Development through project no. 451-03-68/2022-14/ 200156 "Innovative scientific and artistic research from the FTS (activity) domain" and by the Provincial Secretariat for Science and Technological Development, AP Vojvodina, Republic of Serbia [grant number 142-451-2675/2021-01].

The potential of thermophilic microorganisms for environmental protection

Katarina Muzica, Monika Šabić Runjavec, Marija Vuković Domanovac*

University of Zagreb, Faculty of Chemical Engineering and Technology, Department of Industrial Ecology, Marulićev trg 19, Zagreb, Croatia
*Corresponding author: kmuzica@fkit.hr

Abstract: Thermophilic microorganisms have unique biochemical and physiological properties because they live under extreme conditions. They are a valuable source of thermoactive and thermostable enzymes suitable for use in industrial processes. The possibilities of using thermophilic organisms for environmental protection are numerous and increasing day by day thanks to new research. Some of the potential applications include: the production of hydrogen and ethanol as environmentally friendly fuels, bioremediation of petroleum pollutants, heavy metals, textile dyes, composting, and pesticide degradation. In industries such as pharmaceuticals, paper, textiles, and the food industry, thermophilic microorganisms are used to improve industrial processes in order to reduce the consumption of chemicals, energy, and other resources and to achieve a shift towards sustainable development and environmental awareness. This paper presents the potential of thermophilic microorganisms, which have developed various adaptive strategies to survive in the environment due to their natural ability to survive at elevated temperatures, which can provide great opportunities for industrial process improvement and bioremediation.

Keywords: microorganisms; thermophiles; environmental protection; bioremediation

Comparison of microplastic sampling techniques

Aleksandra Narevski, Dušan Milovanović, Goran Vujić, Dejan Ubavin*

University of Novi Sad, Faculty of Technical Sciences, Department of Environmental Engineering and Occupational Health and Safety, Trg Dositeja Obradovića 6, Novi Sad, Serbia
*Corresponding author: aleksandranarevski@uns.ac.rs

Abstract: Environmental plastic pollution has attracted a lot of public attention in the last few years, especially after the discovery of microplastic particles in the human organism. Scientific research on the presence of microplastics in the environment has been actively conducted over the last decade; it is found in various forms and compositions. Although the presence of microplastics has been proven in many environmental media, rivers are of the greatest concern as they are the main pathways of this pollution to marine ecosystems. As part of the TidyUp project, measurements of microplastics were carried out at selected locations on the Danube and Tisza rivers, to better understand the issue of river pollution by microplastics. Three sampling methods were used and compared: net, sedimentation box and pump method. Based on practical experience, it was determined that the pump method is the most optimal for use compared to other analyzed methods, easily adaptable to the conditions of the sampling location, applicable at different depths and economically acceptable. In future research, it is necessary to establish a methodology that will be applicable in different conditions, given that there is no standardized method of sampling, identification, and quantification of microplastics in river systems. In addition, it is necessary to shift the focus from examining the amount and composition and give priority to determining the impact of microplastics on human health and the environment.

Keywords: microplastics; river sampling; pollution

Acknowledgement: This study was supported by the projects F(ol)low the Plastic from source to the sea: Tisa-Danube integrated action plan to eliminate plastic pollution of rivers, DTP3-620-2.1 - Tid(y)Up, and Innovative scientific and artistic research from the FTS (activity) domain 451-03-68/2020-14-200156.

Analiza vegetacijskog pokrova na području Varaždinske županije metodama strojnog učenja

Magdalena Remetović, Nikola Kranjčić*

Sveučilište u Zagrebu, Geotehnički fakultet, Hallerova aleja 7, Varaždin, Hrvatska
*Dopisni autor: nikola.kranjcic@gfv.unizg.hr

Sažetak: Cilj ovog istraživanja je analiza vegetacijskog pokrova Varaždinske županije upotrebom metoda strojnog učenja. Izdvojene su najčešće korištene metode strojnog učenja kod analize vegetacijskog pokrova kroz raspoznavanje uzoraka i dubinske analize podataka. Rad daje pregled značajnih i najvažnijih satelitskih misija za snimanje Zemljine površine koje su omogućile prikupljanjei upotrebu satelitskih snimaka visoke i vrlo visoke rezolucije u kombinaciji s algoritmima strojnog učenja. U radu su korištene Sentinel-2 snimke područja Varaždinske županije. Analizirane su u 5 različitih vremenskih razdoblja, a za obradu satelitskih snimaka, klasifikaciju i naknadne analize korišteni su programi otvorenoga koda SAGA-GIS i QGIS. Na kraju je provedena analiza vegetacijskog pokrova pomoću vegetacijskog indeksa NDVI nakon čega su prikazani rezultati i doneseni zaključci o promjenama vegetacijskog pokrova na promatranom području.

Ključne riječi: strojno učenje, daljinska istraživanja, vegetacijski indeks, QGIS

Analysis of vegetation cover in the area of Varaždin County using machine learning methods

Magdalena Remetović, Nikola Kranjčić*

University of Zagreb Faculty of Geotehnical Engineering, Hallerova aleja 7, Varaždin, Croatia
*Corresponding author: nikola.kranjcic@gfv.unizg.hr

Summary: The aim of this research is to analyze the vegetation cover of Varaždin County using machine learning methods. The most commonly used machine learning methods in the analysis of vegetation cover through pattern recognition and in-depth data analysis have been singled out. The paper provides an overview of the significant and most important satellite missions for imaging the Earth's surface that have enabled the collection and use of high and very high-resolution satellite imagery in combination with machine learning algorithms. Images of the Sentinel-2 area of Varaždin County were used in this paper. They were analyzed in 5 different time periods, and for the processing of satellite images, classification and subsequent analyzes were used in the open source programs SAGA-GIS and QGIS. Finally, the analysis of vegetation cover was performed using the vegetation index NDVI, after which the results were presented and conclusions were made on changes in vegetation cover in the observed area.

Keywords: machine learning, remote sensing, vegetation index, QGIS

Geostintetici i održivost

Pavica Senić, Mirjana Šimunović, Jelena Kaluđer*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Građevinski i arhitektonski fakultet Osijek, Vladimira Preloga 3, Osijek, Hrvatska
***Dopisni autor:** jkaluder@gfos.hr

Sažetak: Geosintetici obuhvaćaju grupu proizvoda koji su barem dijelom proizvedeni od polimera. Danas postoji više vrsta geosintetika koji imaju različite funkcije kao što su primjerice ojačanje, stabilizacija, filtracija, dreniranje, nepropusnost i zaštita od erozije. Mnoštvo različitih proizvoda i funkcija omogućilo je primjenu geosintetika u prometnicama, stabilizaciji tla, odlagalištima otpada, nasipima, branama, potpornim konstrukcijama i drugim zahvatima. Zahvaljujući geosinteticima omogućena je zaštita od erozije, zaštita okoliša, ušteda agregata i ostalih prirodnih materijala, te mogućnost upotrebe recikliranih materijala i produženje životnog vijeka prometnica. U radu će biti dan pregled mogućih primjena geosintetika te utjecaja primjene geosintetika na održivost.

Ključne riječi: geosintetici; ekonomičnost; zaštita okoliša

Geosynthetics and sustainability

Pavica Senić, Mirjana Šimunović, Jelena Kaluđer*

Josip Juraj Strossmayer University of in Osijek, Faculty of Civil Engineering Osijek, Vladimira Preloga 3, Osijek, Croatia
*Corresponding author: jkaluder@gfos.hr

Abstract: Geosynthetics include a group of products that are at least partly made of polymers. There are several types of geosynthetics nowadays that have different functions such as reinforcement, stabilization, filtration, drainage, impermeability and erosion control. Many different products and functions have enabled the application of geosynthetics in roads, soil stabilization, landfills, embankments, dams, retaining walls and other constructions. Soil erosion control, environmental protection, reduction of the use of aggregates and other natural materials, the possibility of using recycled materials and extending the lifespan of roads can be achieved with geosynthetics. The paper will provide an overview of possible geosynthetics applications and the impact of the use of geosynthetics on sustainability.

Keywords: geosynthetics; economy; environmental protection

Polyethylene terephthalate as a vector for priority pollutants in the water: Adsorption isotherms and aquatic toxicity evaluation

Martina Šimonek*, Iva Fereža, Anamarija Pulitika, Stefani Tonković, Josipa Papac, Marin Kovačić, Hrvoje Kušić, Ana Lončarić Božić

University of Zagreb, Faculty of Chemical Engineering and Technology, Marulićev trg 19, Zagreb, Croatia
*Correspondence: msimonek@fkit.hr

Abstract: Microplastics are small particles that can cause adverse effects on the digestive, muscular and nervous system. Priority pollutants such as pesticides and pharmaceuticals can adsorb to the surface of microplastics and thus enter the food and cause great problems for the environment. In nature, they decompose into more toxic compounds due to different physico-chemical properties. The aim of this work was to establish the correlation between the properties of MPs and the adsorption capacity for the investigated pollutants as well as toxicity effects on tested organisms. For that purpose, we investigated the interactions of pristine and UV-aged polyethylene terephthalate (PET) MPs with pesticide atrazine (ATZ) and pharmaceutical diclofenac (DCF). The concentration of pollutants was monitored by High-Performance Liquid Chromatography. Aquatic toxicity was assessed by exposing the MPs samples to green microalgae *Selenastrum capricornutum* (*Pseudokirchneriella subcapitata*) according to the standard procedure ISO 8692:2012. The adsorption isotherms of ATZ and DCF on PET showed the best fit for the Langmuir model and that implies a monolayered adsorption process, and it was in general higher for aged than pristine MPs. Aquatic toxicity effects were enhanced in the case of UV-aged MPs, which is noticed as an increase in the dilution factor of such samples.

Keywords: microplastics; pesticides; pharmaceuticals; adsorption; toxicity

Acknowledgment: This study has been fully supported by the Croatian Science Foundation under the project Microplastics in water; fate and behavior and removal ReMiCRO (IP-2020-02-6033).

Deklariranje i dokazivanje zelenih svojstava građevnih proizvoda

Anamarija Zlovolić[1], Dunja Kadić[1], Goran Puž[2], Zlata Dolaček-Alduk[1]*

[1] Sveučilište Josipa Jurja Strossmayera u Osijeku, Građevinski i arhitektonski fakultet Osijek, Vladimira Preloga 3, Osijek, Hrvatska
[2] Hrvatske ceste d.o.o., Vončinina ul. 3, Zagreb, Hrvatska
*Dopisni autor: zlatad@gfos.hr

Sažetak: Trgovanje građevnim proizvodima na tržištu Europske unije regulirano je Uredbom (EU) br. 305/2011 Europskog parlamenta i Vijeća kojom se utvrđuju usklađeni uvjeti za stavljanje na tržište građevnih proizvoda. Uredbom se propisuju uvjeti stavljanja na tržište ili stavljanja na raspolaganje na tržištu građevnih proizvoda utvrđivanjem usklađenih pravila o načinu izražavanja svojstava građevnih proizvoda u odnosu na njihove bitne značajke i uporabu oznake CE na navedenim proizvodima. Pravila se temelje na uspostavi zajedničkog tehničkog jezika kojim su definirane bitne značajke proizvoda s obzirom na njihova svojstva u usklađenim tehničkim specifikacijama: usklađenim normama i europskim dokumentima za ocjenjivanje. Svojstva građevnih proizvoda u smislu njihovog učinka na okoliš iskazuju se kroz informacije koje se odnose na njihov cijeli životni ciklus pri čemu se kvantificira utrošak energije potrebne za proizvodnju, emisije tijekom proizvodnje, mogućnosti za demontažu i potencijal za recikliranje u dokumentu izjave o utjecaju proizvoda na okoliš (Environmental Product Declaration – EPD). Za dobivanje informacija o ovim svojstvima uspostavljene su mrežne baze podataka za zelene građevinske proizvode. Informacije o učinku pojedinih građevnih proizvoda na okoliš omogućuju izračun i donošenje ekološke ocjene građevine u cjelini.

Ključne riječi: građevni proizvod; okoliš; učinak; svojstvo; izjava

Declaring and demonstrating the green properties of construction products

Anamarija Zlovolić[1], Dunja Kadić[1], Goran Puž[2], Zlata Dolaček-Alduk[1]*

[1] Josip Juraj Strossmayer University of in Osijek, Faculty of Civil Engineering Osijek, Vladimira Preloga 3, Osijek, Croatia
[2] Hrvatske ceste d.o.o. Vončinina ul. 3, Zagreb, Croatia
*Corresponding author: zlatad@gfos.hr

Abstract: Trade of construction products in the European Union market is regulated by Regulation (EU) no. 305/2011 of the European Parliament and of the Council laying down harmonized conditions for the placing on the market of construction products. The Regulation lays down the conditions for placing on the market or making available on the market of construction products by laying down harmonized rules on how to express the properties of construction products in relation to their essential characteristics and the use of the CE marking on those products. The rules are based on the establishment of a common technical language that defines the essential characteristics of products regarding their properties in harmonized technical specifications: harmonized standards and European assessment documents. The properties of construction products in terms of their impact on the environment are expressed through information related to their entire life cycle, quantifying the energy consumption required for production, emissions during production, dismantling options and recycling potential in the environmental statement (Environmental Product Declaration - EPD). Network databases for green construction products have been set up to obtain information on these properties. Information on the impact of individual construction products on the environment enables the calculation and adoption of the ecological assessment of the building.

Keywords: construction product; environment; impact; property; declaration

Biotehničke znanosti /
Biotechnical sciences

RNA-vezujući protein Ssd1 i RNA egzosom djeluju u različitim putevima pri održavanju stabilnosti stanične stijenke kvasca *Saccharomyces cerevisiae*

Nikša Bekavac, Ana Novačić, Nada Šupljika, Igor Stuparević*

Sveučilište u Zagrebu, Prehrambeno-biotehnološki fakultet, Laboratorij za biokemiju, Pierottijeva 6, Zagreb, Hrvatska
*Dopisni autor: istuparevic@pbf.hr

Sažetak: RNA-vezujući protein Ssd1 posttranskripcijski regulira ekspresiju gena koji kodiraju za proteine uključene u održavanje stabilnosti stanične stijenke te utječe na biosintezu staničnestijenke kvasca. Uz njega, u metabolizmu RNA molekula i očuvanju integriteta stijenke središnju ulogu igra esencijalni, evolucijski očuvan proteinski kompleks RNA egzosom, koji procesira i degradira RNA molekule 3'-5' egzoribonukleaznom aktivnosti svoje dvije katalitičke podjedinice. Pokazano je da mutanti za katalitičke podjedinice RNA egzosoma pokazuju temperaturnu osjetljivost koja je posljedica kompromitirane stabilnosti stanične stijenke. Međutim, temperaturno-osjetljivi fenotip mutanta *rrp6* izraženiji je kod stanica kvasca *Saccharomyces cerevisiae* iz linije sojeva W303, koja nosi nefunkcionalnu inačicu polimorfnog alela koji kodira za protein Ssd1, *ssd1-d*. U radu ispitanje utjecaj ekspresije funkcionalnog alela *SSD1-V* s odgovarajućeg genomskog lokusa i s centromernogplazmida u stanicama mutanata za katalitičke podjedinice RNA egzosoma sojeva W303. Uz prisutnost alela *SSD1-V*, uočljiva je supresija defekta u rastu i morfologiji stanica mutanata *rrp6* i *dis3exo*$^-$ u odnosu na odgovarajuće *ssd1-d* stanice pri djelovanju povišene temperature i agenasa koji oštećuju staničnu stijenku. Rezultati upućuju da RNA egzosom i Ssd1 djeluju sinergistički pri održavanju integriteta stanične stijenke, što je karakteristično za proteine koji djeluju paralelnim putevima. Sukladno tome, u ovome radu pokazano je da međudjelovanje RNA-vezujućih proteina ima važnu ulogu u stabilizaciji stanične stijenke kvasca pri odgovoru na stresne uvjete.

Ključne riječi: kvasac *Saccharomyces cerevisiae*, RNA egzosom, biotehnologija, Ssd1, stanična stijenka

RNA-binding protein Ssd1 and RNA exosome act in different pathways to maintain cell wall stability in yeast *Saccharomyces cerevisiae*

Nikša Bekavac, Ana Novačić, Nada Šupljika, Igor Stuparević*

University of Zagreb, Faculty of Food Technology and Biotechnology, Laboratory for Biochemistry, Pierottijeva 6, Zagreb, Croatia
*Corresponding author: istuparevic@pbf.hr

Abstract: RNA-binding protein Ssd1 posttranscriptionally regulates the expression of genes encoding proteins involved in the maintenance of yeast cell wall stability and thereby influences its biosynthesis. A central role in RNA metabolism and maintenance of cell wall integrity is also played by the essential and evolutionary conserved RNA exosome protein complex, which processes and degrades RNA molecules through the 3'-5' exoribonuclease activities of its two catalytic subunits. It has been shown previously that mutants for one of the catalytic subunits of RNA exosome, Dis3 and Rrp6, are temperature-sensitive as an outcome of compromised cell wall stability. However, the temperature-sensitive phenotype of *rrp6* mutant cells is most pronounced in the yeast *Saccharomyces cerevisiae* W303 genetic background, which harbors the non-functional form of polymorphic allele encoding Ssd1 protein, *ssd1-d*. In this work, we studied the effect of expression of the functional allele *SSD1-V* from its genomic locus and from a centromeric plasmid in mutant cells for catalytic subunits of RNA exosome. Upon *SSD1-V* expression, defects in growth and morphology of *rrp6* and *dis3 exo*$^-$ mutant cells are suppressed compared to the corresponding *ssd1-d* cells during exposure to cell wall stress, such as high temperature and treatment with cell wall stressors. These results suggest that RNA exosome and Ssd1 act synergistically during cell wall integrity maintenance, which is characteristic of proteins acting in parallel pathways. Accordingly, this work demonstrated that the interplay of RNA-binding proteins has an important role in yeast cell wall stabilization as a response to stressful conditions.

Keywords: *Saccharomyces cerevisiae*, RNA exosome, biotechnology, Ssd1, cell wall

Effects of an intercropping system of walnut in Eastern Croatia on macronutrients status in soil and plant material

Ante Bubalo, Helena Žalac, Vladimir Ivezić, Goran Herman, Brigita Popović*

Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia
*Corresponding author: brigita.popovic@fazos.hr

Abstract: Intercropping is the combined cultivation of different woody species and agricultural crops which has a potentially significant impact on agricultural production. Intercropping, as a research topic, is insufficiently researched in the Republic of Croatia with only a few published papers. The aim of this research was to determine and present the impacts of intercropping on the status of micro and macronutrients in the soil and plant materials. The research took place at two localities - Ivankovo and Đakovo, where each locality was divided into 3 subplots – control (monocultural production of different crops), intercropping and walnut orchard. During this research, two different types of samples (soil and plant materials) were collected. The performed analysis included the measurements of the following nutrients in soil: AL- P and AL- K as well as in plant materials (P, K). The highest content of P in soil, out of all of the samples from both localities, was from intercropping plot from Ivankovo (195,4 mg/kg) while the lowest content of P in soil was in the control plot in Đakovo (68,7 mg/kg). The average content of K in soil samples was generally higher in intercropping plots than in control plots. Plant material samples had a higher concentration of all of the measured nutrients in intercropping plots and orchards than those acquired from control plots.

Keywords: intercropping, nutrients, sustainability, soil, plant

Opis morfoloških karakteristika šumskog drveća Parka prirode Medvednica

Ivan Juraj Čehulić*, Marilena Idžojtić

Sveučilišta u Zagrebu, Fakultet šumarstva i drvne tehnologije, Zavod za šumarsku genetiku, dendrologiju i botaniku, Svetošimunska cesta 23, Zagreb, Hrvatska
*Dopisni autor: jurica2210@gmail.com

Sažetak: Park prirode Medvednica po svojoj je raznolikosti i bogatstvu biljnog svijeta važno područje za dendrološka istraživanja. Šume koje prekrivaju preko polovine površine Parka prirode pripadaju u 12 šumskih biljnih zajednica, s ukupno 1205 biljnih vrsta. Drvenaste biljke su značajno zatupljene u ukupnoj flori Zagrebačke gore. U završnom radu je kroz opise morfoloških karakteristika i bioloških obilježja prikazana 51 svojta šumskog drveća zabilježena na području Parka prirode Medvednica, od kojih 49 svojti rastu kao drveće, a dvije vrste mogu rasti kao drveće ili veći grmovi. Listopadnih svojti ima 43 te su značajno brojnije u odnosu na vazdazelene, kojih je osam. Najrasprostranjenije su vrste rodova *Abies* Mill., *Acer* L., *Carpinus* L., *Castanea* Mill., *Fagus* L. i *Quercus* L. Svojte su poredane abecednim redoslijedom znanstvenih naziva. Za svaku svojtu naveden je hrvatski naziv, taksonomska pripadnost te autohtonost, odnosno alohtonost. Uz opis morfoloških karakteristika priložene su fotografije kore, lista, ploda i izbojka, kao rezultat terenskog rada, s ciljem sigurnije determinacije i kvalitetnijeg prikaza šumskog drveća.

Ključne riječi: dendroflora; morfološke karakteristike; Park prirode Medvednica; vrste šumskog drveća

Description of morphological characteristics of forest tree species in the Medvednica Nature Park

Ivan Juraj Čehulić*, Marilena Idžojtić

University of Zagreb, Faculty of Forestry and Wood Technology, Department of Forestry Genetics, Dendrology and Botany, Svetošimunska cesta 23, Zagreb, Croatia
*Corresponding author: jurica2210@gmail.com

Abstract: Medvednica Nature Park is an important area for dendrological research due to its diversity and lavishness of flora. Forests that cover over half of the Nature Park area belong to 12 forest plant communities, with a total of 1205 plant species. Woody plants are significantly represented in the general flora of Zagrebačka gora. In the final thesis, 51 species of forest trees recorded in the area of the Medvednica Nature Park will be presented through descriptions of morphological and biological characteristics. The species will be arranged in alphabetical order of their scientific names. For each taxon, the Croatian name, taxonomic affiliation, and whether the species is native or non-native, will be stated. The description of morphological characteristics will be represented by photographs of bark, leaves, fruits and twigs, as a result of fieldwork, with the goal of more precise determination and quality display of forest tree species.

Keywords: dendroflora, forest tree species, Medvednica Nature park, morphological characteristics

Antimikrobna aktivnost različitih uzoraka domaćeg meda

Jasmin Fazlić, Fejzo Bašić, Saud Hamidović*

Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Zmaja od Bosne 8, Sarajevo, Bosna i Hercegovina
*Dopisni autor: s.hamidovic@ppf.unsa.ba

Sažetak: Med je prezasićena otopina glukoze i fruktoze u vodi s određenom količinom bioaktivnih tvari. Nizak sadržaj vode, 17 % ukupnog volumena meda, čini med nepovoljnom sredinom za razvoj mikroorganizama, jer med "izvlači" vodu iz mikrobnih stanica uslijed čega oni ugibaju. Također, med pokazuje antimikrobna svojstva zbog prisutnih biokemijskih tvari koje su dospjele u med s različitih biljnih vrsta tokom same proizvodnje meda ili su produkt samih pčela. Kako mnogobrojna istraživanja ukazuju da med inhibira rast određenih bakterija, u ovom radu je ispitan utjecaj domaćeg meda na određene mikroorganizme. Korištene su dvije vrste domaćeg meda proizvedenog na području Bosne i Hercegovine: suncokretov i bagremov med. Za inokulaciju hranjive podloge korištene su čiste kulture gram negativnih bakterija, *Eschericia coli i Salmonella spp.* Antibaktrijsko djelovanje domaćeg meda određeno je disk difuzijskom metodom na podlozi Mueller–Hinton agaru, metodom bunarčića. Inkubacija je obavljena na temperaturi od 37 °C u trajanju od 24 h. U kontrolnoj seriji, korišten je med kupljen u lokalnoj trgovini, poznatog proizvođača. Dobiveni rezultati ukazuju da su obje vrste domaćeg meda imaju inhibitorno djelovanje na ispitivane bakterijske kulture, dok med kupljen u trgovini nije pokazao antibakterijsko djelovanje na ispitivane bakterijske kulture. Ovi rezultati potvrđuju potencijalno antimikrobno djelovanje domaćeg meda za inhibiciju rasta bakterija *Escherichia coli i Salmonella spp*.

Ključne riječi: suncokretov i bagremov med, *Escherichia coli, Salmonella spp*, antimikrobna aktivnost

Antimicrobial activity of different samples of domestic honey

Jasmin Fazlić, Fejzo Bašić, Saud Hamidović*

University of Sarajevo, *Faculty of Agricultural and Food* Sciences, Zmaja od Bosne 8, Bosnia and Herzegovina
*Corresponding author: s.hamidovic@ppf.unsa.ba

Abstract: Honey is an oversaturated solution of glucose and fructose in water with a certain amount of bioactive substances. The low water content, 17% of the total volume of honey, makes honey an unfavorable environment for the development of microorganisms, because honey "extracts" water from microbial cells, causing them to die. Also, honey shows antimicrobial properties due to the presence of biochemical substances that got into the honey from different plant species during the honey production itself or are a product of the bees themselves. As numerous studies indicate that honey inhibits the growth of certain bacteria, this paper examines the influence of domestic honey on certain microorganisms. Two types of domestic honey produced in Bosnia and Herzegovina were used: sunflower and acacia honey. Pure cultures of gram-negative bacteria, *Escherichia coli* and *Salmonella spp.* were used to inoculate the nutrient medium. The antibacterial activity of domestic honey was determined by the disk diffusion method on the Mueller-Hinton agar medium. Incubation was carried out at a temperature of 37 °C for 24 h. In the control series, honey purchased from a local store made by a well-known manufacturer was used. The obtained results indicate that both types of domestic honey have an inhibitory effect on the tested bacterial cultures, while the store-bought honey did not show any antibacterial effect on the tested bacterial cultures. These results confirm the potential antimicrobial activity of domestic honey to inhibit the growth of bacteria *Escherichia coli* and *Salmonella spp*.

Keywords: sunflower and acacia honey, *Escherichia coli*, *Salmonella spp.*, antimicrobial activity

Mjere očuvanja plemenite periske *Pinna nobilis* Linnaeus 1758 na otoku Lokrumu

Marija Gardijan[1*], Đivo Matović[1], Ozana Domijan[2], Tatjana Dobroslavić[1], Marijana Pećarević[1], Ana Bratoš Cetinić[1]

[1] Sveučilište u Dubrovniku, Odjel za primijenjenu ekologiju, Branitelja Dubrovnika 29, Dubrovnik, Hrvatska
[2] Javna ustanova Rezervat Lorkum, Put od Bosanke 4, Dubrovnik, Hrvatska
*Dopisni autor: mgardijan@unidu.hr

Sažetak: Otok Lokrum, posebni rezervat šumske vegetacije od 1948., također je i područje ekološke mreže - područje očuvanja značajno za vrste i stanišne tipove (POVS) za ukupno osam stanišnih tipova uključujući pripadajući morski pojas. Naselja plemenite periske (*Pinna nobilis,* Linnaeus 1758) u podmorju Lokruma zabilježena su u području stanišnih tipova Naselja posidonije (*Posidonion oceanicae)*, Grebeni i Preplavljene ili dijelom preplavljene morske špilje. U lokrumskom priobalju 2019. godine uočena je masovna smrtnost plemenitih periski koja je, slijedeći ovu pojavu u ostalim dijelovima Sredozemnog mora, zahvatila i hrvatsku obalu Jadrana. U sklopu projekta ˝Očuvanje plemenite periske (*Pinna nobilis*) u južnom dijelu Jadranskog mora˝ od 2021. godine provode se mjere očuvanja preostalih jedinki te se postavljaju kolektori za prikupljanje mlađi. Osim toga, nastoji se informirati javnost o ovom problemu, stoga je provođenjem stručne prakse studenata Primijenjene ekologije mora Sveučilišta u Dubrovniku razvijen edukativni program o važnosti očuvanja plemenite periske za sve uzraste.

Ključne riječi: plemenita periska; edukativni program; morska staništa

Conservation mesures of the Nobile pen shell *Pinna nobilis* Linnaeus 1758 on the Island of Lokrum

Marija Gardijan[1], Đivo Matović[1], Ozana Domijan[2], Tatjana Dobroslavić[1], Marijana Pećarević[1], Ana Bratoš Cetinić[1]

[1] University of Dubrovnik, Department for Applied Ecology; Branitelja Dubrovnika 29, Dubrovnik, Croatia
[2] Public institution ˝Special reserve of forest vegetation Island Lokrum˝, Put od Bosanke 4, Dubrovnik, Croatia
*Corresponding author: mgardijan@unidu.hr

Abstract: The island of Lokrum, which has been a special forest vegetation reserve since 1948, is also an area of the ecological network NATURA 2000 - a protected area important for a total of eight habitat types, including the associated marine area.
The settlement of noble pen shell (*Pinna nobilis*, Linnaeus 1758) in the underwater area of Lokrum has detected in the area of habitat types Posidonia beds (*Posidonion oceanicae),* Reefs and Submerged or partially submerged sea caves. In the littoral of Lokrum, mass mortality of noble pen shell was observed in 2019, which, following this phenomenon in other parts of the Mediterranean, also affected the Croatian Adriatic coast. As part of the project "Conservation of the noble pen shell (*Pinna nobilis*) in the southern part of the Adriatic", starting in 2021, measures will be taken to preserve the remaining individuals and collectors will be set up to collect juveniles. In addition, efforts will be made to inform and raise public awareness about this problem. As part of a professional internship of students of Applied Marine Ecology at the University of Dubrovnik, an educational program on the importance of preserving noble pen shells for all age groups was developed.

Keywords: noble pen shell; educational program; marine habitats

Fitoremedijacija zemljišta onečišćenog perzistentnim organskim polutantima

Erna Ibričić, Vedran Stuhli

Univerzitet u Tuzli, Tehnološki fakultet, Urfeta Vejzagića 8, Tuzla, Bosna i Hercegovina
*Dopisni autor: vedran.stuhli@gmail.com

Sažetak: Zemljište obuhvaća fizički prostor: tlo, klimu, hidrologiju, geologiju, vegetaciju u obimu koji utječe na mogućnost njegovog korištenja te rezultate prošle i sadašnje aktivnosti čovjeka, kao i društvenoekonomske parametre. Zemljište se ubraja u obnovljive prirodne resurse zajedno sa zrakom i vodom. Međutim, zemljište ima ograničenu ukupnu količinu, a i proces formiranja tla je jako dug. Čovjek svojim aktivnostima degradira zemljište što je razlog da je zemljište u stvarsnosti uvjetno obnovljiv prirodni resurs. Nasuprot dugotrajnom procesu nastanka zemljišta, proces onečišćenja i oštećenja istog (posebno pod utjecajem čovjeka) neusporedivo je brži. Zagađenost zemljišta utječe negativno i na zdravlje ljudi zbog čega je neophodno sanirati onečišćena zemljišta, a jedna od mjera za sanaciju je fitoremedijacija. Fitoremedijacija je ekološki prihvatljiva tzv. „zelena tehnologija“, koja se primjenjuje posljednjih godina i dugoročni je proces. Cilj ovog rada bio je istraživanje mehanizama djelovanja fitoremedijacije na tlo onečišćeno perzistentnim organskim polutantima te upoznavanje s primjenom istih uz pomoć biljaka, njihovih enzima te mikroorganizama iz zone korijena. Preliminarna istraživanja ukazuju na poboljšanu razgradnju atrazina, metolahlora i trifluralina u onečišćenim zemljištima pomoću simbioze biljke *Kochia sp*. i mikroorganizama. Također, u laboratorijskim ispitivanjima dokazano je da biljke s dubokim korijenjem postižu bolju fitoremedijaciju pri čemu apsorbiraju pesticide i transformiraju ih u organske molekule nužne za svoj razvoj.

Ključne riječi: zemljište, onečišćenje, perzistentni organski polutanti, remedijacija, fitoremedijacija, biljka, pesticide

Phytoremediation of soil contaminated with persistent organic pollutants

Erna Ibričić, Vedran Stuhli*

University of Tuzla, Faculty of Technology, Urfeta Vejzagića 8, Tuzla, Bosnia and Herzegovina
*Corresponding author: vedran.stuhli@gmail.com

Abstract: Land includes physical space: soil, climate, hydrology, geology, vegetation to the extent that affects the possibility of its use, and the results of past and present human activities, as well as socio-economic parameters. Land is considered to be a renewable natural resource along with air and water. However, the land has a limited total amount, and the process of soil formation is very long, so man is constantly degrading the land and it turns into conditionally renewable natural resources. In contrast to the long process of soil formation, the process of pollution and damage to the same (especially under the influence of man) is incomparably faster. Soil pollution also has a negative effect on human health, which is why it is necessary to repair the damage from pollution, and one of the measures for remediation is phytoremediation. Phytoremediation is an environmentally friendly so-called "Green technology", which has been applied in recent years and is a long-term process. The aim of this paper was to investigate the mechanisms of phytoremediation action on soil contaminated with persistent organic pollutants and to get acquainted with their application with the help of plants, their enzymes and microorganisms from the root zone. Accordingto basic research, improved degradation of atrazine, metolachlor and trifluralin in contaminated soils by the symbiosis of Kochia sp and microorganisms has been observed. Also, in laboratory tests,it has been proven that plants with deep roots achieve better phytoremediation by absorbing pesticides and transforming them into organic molecules necessary for their development.

Keywords: soil, pollution, persistent organic pollutants, remediation, phytoremediation, plant**,** pesticides

The outcome of moderate and severe drought on morpho-biochemical response in wheat

Maja Ižaković, Ivana Flanjak, Milica Cvijetić Stokanović, Latica Kučinac, Tihana Marček*

Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, 31000 Osijek, Croatia
*Corresponding author: tihana.marcek@ptfos.hr

Abstract: Drought is the most widespread abiotic stressor which restricts water availability for living organisms and endangers their survival through the destruction of their natural habitats. In plants, drought causes osmotic stress that usually results in growth reduction and agricultural productivity decline. In the present study, the impact of two drought treatments (10 and 20% PEG) in five wheat genotypes was explored by monitoring the germination, growth, endogenous putrescine (PUT), and spermidine (SPD) content after six days. Seedling water content (SWC), germination index (GI), shoot, and root length decreased with increasing the drought intensity while PUT and SPD content did not provide a unique response. Variations in drought response among genotypes were recorded. In Darija genotype mild drought stress (10% PEG) promoted the production of SPD, SWC values, and shoot growth but decreased PUT content. In Opsesija, both drought treatments caused increased SWC and PUT values. This genotype also showed a tissue-specific response. Namely, under 10% PEG, Opsesija had the highest GI and shoot growth but increased root length under severe drought (20% PEG). Under severe drought intensity, Anica showed the highest GI, shoot length, and increased SPD synthesis. The most sensitive genotype was Mandica with low GI, growth, and PUT accumulation. The results revealed that drought tolerance is a complex trait that relays on genetic properties. Moreover, the role of PUT and SPD in providing drought tolerance is still controversial.

Keywords: drought, growth, wheat, putrescine, spermidine

Trop od rajčice kao funkcionalni dodatak u proizvodnji hrane

Lea Lučić, Jasmina Zagorica, Anita Lalić*

Agronomski i prehrambeno-tehnološki fakultet sveučilišta u Mostaru, Biskupa Čule bb, Mostar, Bosna i Hercegovina
*Dopisni autor: anita.juric@aptf.sum.ba

Sažetak: Sok od rajčice je najčešće korišten sok od povrća čija proizvodnja se iz godine u godinu povećava. Tijekom industrijske prerade rajčica nastaje velika količina nusproizvoda, tropa od rajčice. U literaturi se navodi da količina nastalih nusproizvoda proizvoda predstavlja 3 do 7 % od ukupne količine rajčice za preradu. Trop od rajčice se sastoji od pokožice, sjemena i vaskularnog tkiva, kao i dijela pulpe. Njegov nutritivni sastav ima veoma značajnu ulogu u prevenciji mnogih bolesti, od kardiovaskularnih do tumorskih. Ono što rajčicu čini posebno dragocjenom je likopen koji se ubraja u sastojke hrane s potencijalnim funkcionalnim učincima. Cilj ovog rada je pokazati na koji način se može iskoristiti nusproizvod prerade rajčice (tropa) koji je izuzetno bogat vlaknima, kao polazne sirovine za proizvodnju funkcionalnih prehrambenih proizvoda.

Ključne riječi: rajčica, vlakna, nutritivni sastav, trop, funkcionalna hrana

Tomato pulp as a functional additive in food production

Lea Lučić, Jasmina Zagorica, Anita Lalić*

Faculty of Agriculture and Food Technology, University of Mostar, Biskupa Čule bb, Mostar, Bosnia and Herzegovina
*Corresponding author: anita.juric@aptf.sum.ba

Abstract: Tomato juice is the most commonly used vegetable juice, the production of which is increasing year by year. During the industrial processing of tomatoes, a large amount of by-products, tomato pulp, is produced. Scientific literature quotes that the amount of produced by-products represents 3 to 7% of the total amount of tomatoes for processing. Tomato pulp consists of skin, seeds and vascular tissue, as well as part of the pulp. Its nutritional composition plays a very important role in the prevention of many diseases, from cardiovascular to tumor. What makes tomatoes especially valuable is lycopene, which is considered a food ingredient with potential functional effects. The aim of this study is to show how the by-product of tomato processing (pulp), which is extremely rich in fiber, can be used as a raw material for the production of functional food products.

Keywords: tomato, fiber, nutritional composition, tropical, functional food

Alternativni sustavi proizvodnje svinja u Republici Hrvatskoj

Marko Oroz, Katarina Marić, Dorian Hamm, Tea Krajinović, Doris Gašpar, Melanie Imre, Kristina Gvozdanović*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet agrobiotehničkih znanosti Osijek, Vladimira Preloga 1, Osijek, Hrvatska
*Dopisni autor: kgvozdanovic@fazos.hr

Sažetak: Sve veći zahtjevi tržišta za svinjskim mesom i prerađevinama od svinjskog mesa stavila su veliki izazov pred uzgajivače svinja te prerađivače. Najveći dio svinjogojske proizvodnje odvija se u intenzivnim sustavima, no sve veća svijest potrošača o konzumaciji kvalitetnog i sigurnog mesa s naglaskom na uzgoj svinja u skladu s njihovom dobrobiti, dovela je do razvoja alternativnih sustava uzgoja. Teško je jednoznačno definirati alternativni sustav uzgoja svinja. Svinje se u ovim sustavima mogu uzgajati na dubokoj stelji, u silvo-pastoralnim sustavima koji se odnose na kombinirani uzgoj u šumi i na pašnjaku te u ekstenzivnom ili ekološkom uzgoju. Glavna razlika u odnosu na intenzivne sustave je u tome što se svinje ne uzgajaju u velikim zatvorenim farmama na rešetkastim podovima, već na otvorenim površinama gdje je uzgoj svinja u skladu s njihovom dobrobiti. Pasmine svinja pogodne za uzgoj u alternativnim sustavima su autohtone pasmine, kao što su primjerice Hrvatske autohtone pasmine, turopoljska svinja, crna slavonska ili banijska šara svinja. Tradicionalni proizvodi (kulen, kobasica, šunka, pršut) dobiveni od mesa autohtonih pasmina uzgojenih u nekom od ovih alternativnih sustava imaju dodatnu vrijednost te mogu nositi neku od zaštićenih oznaka (izvornosti, zemljopisnog podrijetla, zajamčeno tradicionalnog specijaliteta) što je od velikog tradicijskog značenja određene regije.

Ključne riječi: svinjogojstvo, autohtone pasmine svinja, tov na dubokoj stelji, silvo-pastoralni sustav

Alternative pig production in Republic Croatia

Marko Oroz, Katarina Marić, Dorian Hamm, Tea Krajinović, Doris Gašpar, Melanie Imre, Kristina Gvozdanović*

Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia
*Corresponding author: kgvozdanovic@fazos.hr

Abstract: The growing market for pork and pork products posed a major challenge to pig farmers and producers. Most of the pig production is placed in intensive systems, but the growing awareness of consumers about the consumption of quality and safe pork with an emphasis on breeding the pigs in accordance with their welfare has led to the development of alternative production systems. It is difficult to unambiguously define an alternative pig production system. Pigs can be bred in deep litter or in the silvo-pastoral systems which combine forest and pasture farming, also there is extensive or organic production systems. The main difference between intensive systems is that pigs are not reared in large farms but in open areas. Pig breeds suitable for these alternative systems are indigenous breeds, such as Croatian indigenous breeds, Turopolje pig, Black Slavonian or Banija Spotted pig breed. Traditional products (kulen, sausage, ham, prosciutto) obtained from meat of indigenous breeds have added value and can obtain some of the protected designations (originality, geographical origin, guaranteed traditional specialty) which have great importance for a specific region.

Keywords: pig breeding, indigenous pig breeds, fattening on deep litter, silvo-pastoral system

Svinjogojska proizvodnja u okviru Europskog zelenog plana

Mihaela Oroz, Tomislav Mićan, Karla Štefanec, Mia Škrobot, Eva Marija Benak, Kristina Gvozdanović*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet agrobiotehničkih znanosti Osijek, Vladimira Preloga 1, Osijek, Hrvatska
*Dopisni autor: kgvozdanovic@fazos.hr

Sažetak: Europski zeleni plan (*European green deal*) strategija je Europske Komisije koja za cilj ima razvoj i postizanje održivih gospodarstava uz smanjenje emisije stakleničkih plinova, zaštitu zdravlja i dobrobiti građana od rizika i utjecaja povezanih s okolišem. Glavne strategije kojima bi se ostvarili postavljeni ciljevi su: Strategija ''od polja do stola'', Strategija za očuvanje bioraznolikosti te Održiva uporaba pesticida. Primjenom ovih strategija poljoprivredni proizvođači će moći proizvesti kvalitetui nutritivno bogatu hranu istovremeno uz očuvanje okoliša i bioraznolikosti te smanjenog korištenja pesticida. Povezanost svinjogojske proizvodnje u Republici Hrvatskoj i ostalim članicama Europske Unije sa strategijama Europskog zelenog plana ogleda se kroz tržište svinjskog mesa, zdravlja i kvalitete proizvoda, svijesti potrošača, dobrobiti i zdravlja svinja te budućnosti proizvodnje. Prilike na svjetskom tržištu u pogledu Afričke svinjske kuge, svijest javnosti o dobrobiti svinja te konzumaciji zdravih i kvalitetnih proizvoda sve je izraženiji tijekom zadnjih godina. Razvoj sustava uzgoja svinja koji bi bili u skladu sa zahtjevima tržišta idu u smjeru razvoja alternativnih sustava koji svoje mjestoi implementaciju mogu pronaći i u svinjogojskoj proizvodnji Republike Hrvatske. Posebice se to odnosi na sustave uzgoja autohtonih pasmina svinja na malim obiteljskim gospodarstvima čime se izravno utječe i na demografsku sliku te razvoj ruralnih područja Republike Hrvatske.

Ključne riječi: autohtone pasmine svinja, Europski zeleni plan, kvaliteta i sigurna hrana

Pig production within the European Green Deal

Mihaela Oroz, Tomislav Mićan, Karla Štefanec, Mia Škrobot, Eva Marija Benak, Kristina Gvozdanović*

Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia
*Corresponding author: kgvozdanovic@fazos.hr

Abstract: The European green deal is a strategy of the European Commission that aims to develop and achieve sustainable economies while reducing greenhouse gas emissions, and protecting the health and well-being of citizens from environmental risks and impacts. The main strategies to achieve the set goals are: From farm to fork, Biodiversity Conservation Strategy and Sustainable Pesticide Use. By applying these strategies, farmers will be able to produce nutritionally rich food while preserving the environment and biodiversity as well as reducing the use of pesticides. The connection between pig production in the Republic of Croatia and other EU member states with mentioned strategies is reflected in the pork market, health and product quality, consumer awareness, welfare and health of pigs and the future of pig production. Situations in the world market regarding African swine fever, public awareness about pig welfare and consumption of quality products have become increasingly pronounced in recent years. The development of pig breeding systems that can satisfy the market requirements is moving in the direction of developing alternative systems that can find their place and implementation in pig production in the Republic of Croatia. This is important for the systems of breeding indigenous pig breeds on small family farms, which directly affects the demographic picture and the development of rural areas of the Republic of Croatia.

Keywords: indigenous pig breeds, European Green Deal, quality and safe food

Food waste management in restaurants

Zvonimir Paponja, Nika Jukić, Ivan Vučić, Maja Ergović Ravančić*, Valentina Obradović

Polytechic in Pozega, Vukovarska 17, Požega, Croatia
*Corresponding author: mergovic@vup.hr

Abstract: Food waste in restaurants is an important environmental issue because the amount of food waste is growing significantly. Globally, approximately 1.3 billion tons of food are dumped each year along the supply chain. In restaurants, food waste has two levels: food thrown away during preparation and food thrown away during consumption, which means that producers and consumers are directly responsible for throwing away large amounts of edible food. In the hospitality sector, the amount of food discarded by restaurants depends on the type of service or the type of restaurant. The largest amount of superfluous food is derived from buffet-style restaurants rather than à la carte restaurants. Post-consumer food waste is usually composed of side dishes like salads and starchy foods such as potato, rice, pasta and bread, while main dish leftovers are uncommon. In the process of food preparation, fruits and vegetables are the most commonly wasted foods. A pilot project "Reduce food waste, cook for your guests" has been launched in Croatia in 2021, with the aim of raising awareness of restaurant guests about reducing food waste. Restaurants around the world that have implemented strategies to prevent food waste have reduced their quantities by about 30%, thus reducing the negative impact on the environment, and have achieved significant financial savings due to more rational food handling. The aim of this paper is to provide an overview of the possibilities of using food waste in restaurants and ways to reduce it.

Keywords: food waste, restaurant, hospitality, waste management, gastronomy

Application of green technologies for sustainable use of grape pomace

Klara Pavić, Valentina Rožić, Anja Damjanović, Anita Pušek, Tea Sokač, Manuela Panić, Ivana Radojčić Redovniković*

University of Zagreb, Faculty of Food Technology and Biotechnology, Department of Biochemical Engineering, Pierottijeva ul. 6, Zagreb, Croatia
*Corresponding author: irredovnikovic@pbf.hr

Abstract: Grape pomace is a by-product of the wine industry that can be used to produce a variety of high-value products and its utilization can prevent environmental pollution that would occur by disposing of such waste. Two approaches for the use of grape pomace were considered: (i) silage and (ii) isolation of biologically active compounds using natural deep eutectic solvents (NADES). Silage is a method of preserving wet crops under anaerobic conditions where lactic acid bacteria convert water-soluble carbohydrates into lactic acid. The process of ensiling the grape pomace itself and with an inoculum of lactic acid bacteria and zeolite was carried out. Different silage parameters were monitored through time: pH, the content of water-soluble carbohydrates, lactic acid, polyphenols, and tannins. Conventional extraction techniques for plant phenolic are usually associated with high organic solvent consumption and long extraction times. In order to establish an environmentally friendly extraction method for grape pomace polyphenols, one of the food industry by-products that is extremely rich in these biologically active compounds, natural deep eutectic solvents (NADES) are used as a green alternative to conventional solvents. Extraction was performed using NADES betaine: sucrose (4:1). According to the obtained results in two tested approaches for grape pomace disposal, silage has proven to be effective and industrially suitable. The green technology of using NADES with a high polyphenol isolation capacity has proven to be effective in isolating various compounds and the production of a high-value product for human use.

Keywords: grape pomace; silage; NADES; green technology

Acknowledgments: The work was supported by the European Union through the European regional development fund, Competitiveness and Cohesion 2014-2020 (KK.01.1.1.07.0007.)

Investigation of pesticides interaction with UV-aged polypropylene microplastics: Mechanism and toxicity studies

Ana-Marija Pitner*, Matej Viljevac, Stefani Tonković, Anamarija Pulitika, Josipa Papac, Zlata Hrnjak Murgić, Ana Lončarić Božić

Faculty of Chemical Engineering and Technology, University of Zagreb, Marulićev trg 19, 10000 Zagreb, Croatia
*Corresponding author: apitner@fkit.hr

Abstract: Microplastics (MPs) are polymer particles smaller than 5 mm, and due to their potentially harmful effects on the environment are considered a global threat. MPs have a large specific surface area, and the most common sorption mechanism of organic pollutants is hydrophobic. The aim of this work was to establish the correlation between the properties of MPs and the adsorption capacity for the investigated pollutants as well as toxicity effects on tested organisms. For that purpose, we investigated the interactions of pristine and UV-aged polypropylene (PP) MPs with pesticide simazine (SMZ). The concentration of the pesticides was monitored by High-Performance Liquid Chromatography coupled with Photodiode Array Detector. Density functional theory (DFT) was applied for the investigation of the interaction energies in order to clarify the nature of the adsorption and the bonding types. Aquatic toxicity was assessed by exposing the MPs samples to crustacean *Daphnia magna* according to the standard procedure ISO 6341:2012. The adsorption isotherms of SMZ on PP showed the best fit for the Langmuir model which implies a monolayered adsorption process. Aquatic toxicity effects were enhanced in the case of UV-aged MPs, which is noticed as an increase in the dilution factor of such samples.

Keywords: microplastics; pesticides; DFT; adsorption; toxicity

Acknowledgment: This study has been fully supported by the Croatian Science Foundation under the project Microplastics in water; fate and behavior and removal ReMiCRO (IP-2020-02-6033)

Antibakterijsko djelovanje ekstrakta rosopasa (*Chelidonium majus*) na rast bakterija *Escherichia coli* i *Salmonella* spp.

Verda Zametica, Adel Salihović, Saud Hamidović*

Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Zmaja od Bosne 8, Sarajevo, Bosna i Hercegovina
*Dopisni autor: s.hamidovic@ppf.unsa.ba

Sažetak: Prevencija kvarenja svježeg voća i povrća i drugih prehrambenih proizvoda najčešće se postiže primjenom kemijskih konzervanasa. Međutim, neki od njih imaju nepovoljno djelovanje na ljudsko zdravlje, ulaze u lanac prehrane, a pojedini mikroorganizmi postaju otporni na korištene kemikalija. Zbog ovih zabrinutosti, povećava se potreba za pronalaženjem novih, učinkovitijih i sigurnijih alternativnih konzervanasa prirodnog porijekla. Imajući u vidu da su bakterije *Escherichia coli* i *Salmonella* spp. značajno zastupljene u infekcijama ljudi, mnoga istraživanja su usmjerena k otkrivanju novih biljnih ekstrakata koji imaju potencijal u redukciji rasta navedenih bakterija. Cilj ovog rada bio je ispitati antimikrobno djelovanje ekstrakta rosopasa (*Chelidonium majus*) na rast bakterija *Escherichia coli* i *Salmonella* spp. Ekstrakcija je provedena iz svježeg stabla rosopasa (*Chelidonium majus*), a antimikrobno djelovanje dobivenog ekstrakta određeno je test- difuzijskom metodom na podlozi Mueller–Hinton. Papirni diskovi promjera 6 mm impregnirani su ekstraktom i postavljeni na hranljivu podlogu. Čistim kulturama navedenih bakterija inokulirana je hranljiva podloga. Inkubacija je provedena na temperaturi od 37°C u trajanju od 24 h. U kontrolnoj varijanti, korištena je destilirana voda. Rezultati ukazuju na redukciju rasta ispitivanih bakterija nakon perioda inkubacije. Ovi rezultati potvrđuju potencijalnu primjenu ekstrakta rosopasa za redukciju rasta bakterija *Escherichia coli* i *Salmonella* spp.

Ključne riječi: ekstrakt rosopasa, test-difuzijska metoda i antimikrobna aktivnost

Antibacterial effect of Greater celandine extract (*Chelidonium majus*) on the growth of bacteria *Escherichia coli* and *Salmonella spp*.

Verda Zametica, Adel Salihović, Saud Hamidović*

University of Sarajevo, Faculty of Agricultural and Food Sciences, Zmaja od Bosne 8, Bosnia and Herzegovina
*Corresponding author: s.hamidovic@ppf.unsa.ba

Abstract: Prevention of spoilage of fresh fruits and vegetables and other food products is most often achieved by using chemical preservatives. However, some of them have an adverse effect on human health, enter the food chain, and some microorganisms become resistant to the chemicals used. Due to these concerns, there is an increasing need to find new, more effective and safer alternative preservatives of natural origin. Bearing in mind that the bacteria *Escherichia coli* and *Salmonella spp*. are significantly represented in human infections, many studies are aimed at discovering new plant extracts that have the potential to reduce the growth of the mentioned bacteria. The aim of this work was to test the antimicrobial effect of the extract of Greater celandine (*Chelidonium majus*) on the growth of bacteria *Escherichia coli* and *Salmonella spp*. The extraction was carried out from a fresh Greater celandine tree (*Chelidonium majus*), and the antimicrobial activity of the obtained extract was determined by the test-diffusion method on the Mueller- Hinton media. Paper discs with a diameter of 6 mm are impregnated with the extract and placed on a nutrient medium. The nutrient medium was inoculated with pure cultures of the mentioned bacteria. Incubation was carried out at a temperature of 37°C for 24 hours. In the control variant, distilled water was used. The results indicate a reduction in the growth of the tested bacteria after the incubation period. These results confirm the potential application of Greater celandine extract to reduce the growth of *Escherichia coli* and *Salmonella spp*.

Keywords: microplastics; pesticides; DFT; adsorption; toxicity

Društvene znanosti / *Social sciences*

Socijalnoekološka kriza i ljudska prava

Marta Keglević*, Hrvoje Lepeduš

Sveučilište Josipa Jurja Strossmayera, Filozofski fakultet Osijek, Lorenza Jägera 9, Osijek, Hrvatska
*Dopisni autor: marta.keglevic@gmail.com

Sažetak: Ekologija je znanstvena disciplina koja proučava odnose organizama i njihovog prirodnog okoliša koji se tom neprestanom interakcijom mijenja. Ekološka kriza označava narušavanje tog krhkog odnosa jer takve promjene potencijalno mogu predstavljati velike izazove. Ekološki problemi obuhvaćaju ne samo prava okoliša već i ljudska prava. Taj se uzajamni odnos temelji na nekoliko zakonskih odrednica koje su započele dijalog o pravima okoliša, ali i postavile agendu za poboljšanje kako prava okoliša, tako i ljudskih prava. Postoje oprečna mišljenja o tome ugrožavaju li ljudska pravai prava okoliša. „Zaslijepljenost" ljudskim pravima modernog društva često ugrožava i zanemaruje sve ono što nije ljudsko, bili to prirodni izvori, stambeni prostor ili životinjski svijet. Doduše, socijalna ekologija smatra da su prava okoliša, kao i ljudska prava, konstruirana i promjenjiva stoga suradnja *zelenih* i društvenih pokreta mogu biti na uzajamnu dobrobit. Ekološka ljudska prava dovode se u pitanje kada život ovisi o pravu na korištenje prirodnih resursa ili kada nema mogućnosti za dostojanstvenim životom. Opasnosti za okoliš korijen su kršenja ljudskih prava i predstavljaju glavnu prijetnju životima ljudi, kao i uzdržavanju opstanka sljedećih generacija.

Ključne riječi: ekološka kriza; prava okoliša; ljudska prava; socijalna ekologija

Socioecological Crisis and Human Rights

Marta Keglević*, Hrvoje Lepeduš

Josip Juraj Strossmayer University of Osijek, Faculty of Humanities and Social Sciences, 9 Lorenz Jäger St., Osijek, Croatia
*Corresponding author: marta.keglevic@gmail.com

Abstract: Ecology is a scientific discipline that studies the relationship between organisms and their natural environment that is changing in constant interaction. An ecological crisis denotes the disruption of this fragile relationship as any change could pose major challenges. Ecological problems include not only environmental rights but also human rights. This relationship is based on several legal determinants that have initiated a dialogue on environmental rights and set an agenda for improving environmental and human rights. There are conflicting opinions on whether human rights endanger environmental rights. The "obsession" with human rights in modern society often threatens and neglects everything that is not human, be it natural resources, housing, or wildlife. However, social ecology believes that environmental rights, like human rights, are construed and changeable, so the cooperation of the green and social movements can be for mutual benefit. Ecological human rights are at stake when life depends on the right to use natural resources or when there is no means for a dignified life. Environmental hazards are at the root of human rights violations and pose a threat to human lives as well as the maintenance of survival for the next generations.

Keywords: ecological crisis; environmental rights; human rights; social ecology

Otpad koji postaje glazba

Dunja Keža, Lana Čeko, Mirna Sabljar*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Akademija za umjetnost i kulturu u Osijeku, Kralja Petra Svačića 1/f, Osijek, Hrvatska
***Dopisni autor:** msabljar@aukos.hr

Sažetak: Poster prikazuje nastanak i glavne odrednice *The Recycled Orchestra* iz Paragvaja koji je nastao kao odgovor na veliko siromaštvo i slab kulturni život mladih koji žive na najvećem paragvajskom odlagalištu otpada u blizini glavnog grada, Asunciona. Zahvaljujući vizionarskoj ideji dirigenta orkestra i graditelja instrumenata od recikliranih materijala, i djeca, siromašni stanovnici s odlagališta otpada, dobili su priliku svirati. Glazbom na instrumentima potpuno izrađenima od recikliranih materijala skupljenim s odlagališta otpada aktivno muziciraju i sviraju na koncertima diljem svijeta ukazujući tako i na probleme velikih količina otpada te na egzistencijalne probleme stanovnika takvih područja. Ovaj poster je ujedno i s dodatnom porukom jer je prilagođen osobama s oštećenjima vida. Svi su slikovni i tekstualni podatci na posteru dostupni i u zvučnom opisu te s uputama na Brailleovom pismu. Cilj je bio prilagoditi poster osobama slabijeg vida ili slijepima kako bi pomoću uvećanog tiska i QR kodova sa zvučnim zapisima mogli pristupiti sadržajima postera. Autorice taktilnim i zvučnim posterom nastoje promovirati uključivost i potaknuti studente, a posebice studente s invaliditetom, na sudjelovanje u znanosti i umjetnosti, na obrazovanje te dodatni aktivitet u promociji ljudiskih prava i zaštiti okoliša. Mladi koji u teškim uvjetima i na instrumentima nastalim od otpada uče i stvaraju glazbu primjer su koji se može transferirati na sva područja života i biti izvor inspiracije za ostvarenje vlastitih ideja i zamisli bez obzira na kakve se životne datosti i prepreke nalazi u životu.

Ključne riječi: glazba; slijepi i slabovidni; glazbena pedagogija; otpad: zaštita okoliša

Waste that becomes music

Dunja Keža, Lana Čeko, Mirna Sabljar*

Josip Juraj Strossmayer University of Osijek, Academy of Arts and Culture in Osijek, Kralja Petra Svačića 1/f, Osijek, Croatia
*Corresponding author: msabljar@aukos.hr

Abstract: The poster depicts the emergence and main determinants of The Recycled Orchestra in Paraguay, which was created in response to the great poverty and poor cultural life of young people living in Paraguay's largest landfill near the capital, Asuncion. Thanks to the visionary idea of orchestra conductors, and instrument builders who made the instruments, children and poor residents from landfills were given the opportunity to play music. With music on instruments made entirely from recycled materials collected from landfills, they actively perform and play concerts around the world, thus pointing out the problems of large amounts of waste and the existential problems of residents of such areas. This poster also has an additional message because it is adapted for people with visual impairments and blindness. All image and textual data on the poster are available both in the audio description and with the instructions in Braille. The aim was to tailor theposter to people with poor eyesight or the blind so that they could access the poster's contents usingmagnified printing and QR codes with audio tracks. With a tactile and sound poster, the authors seekto promote inclusiveness and encourage students, especially students with disabilities, to participate in science and the arts, to receive education and additional activity in human rights andenvironmental–themed conversations. Young people who learn and make music in difficult conditions and on instruments created from waste are an example that can be transferred to all areas of life and be a source of inspiration for the realization of their own ideas and ideas regardlessof what life benefits and which obstacles it may bring.

Keywords: music; blind and visually impaired; music pedagogy; waste: environmental protection

Zašto je važna učionica održivog razvoja?

Marija Roksandić, Marija Sablić*

Sveučilište Josipa Jurja Strossmayera u Osijeku, Filozofski fakultet Osijek, Lorenza Jägera 9, Osijek, Hrvatska
*Dopisni autor: msablic@ffos.hr

Sažetak: Koncept održivog razvoja prvi je put definiran u Brundtlandovom izvješću „Naša zajednička budućnost“ kao razvoj kojemu je svrha sa sadašnjim potrebama generacija ne ugrožavati zadovoljenje potreba budućih generacija (Pramling Samuelsson, Kaga, Anđić, 2013). Studenti 3. godine preddiplomskog sveučilišnog studija Pedagogije posjetili su "Učionicu održivog razvoja" u sklopu Waldorfske škole u Osijeku. Učionica održivog razvoja ili „Zemljica“ nalazi se u prigradskom naselju Osijeka, Tvrđavici. Primarna uloga Učionice održivog razvoja je omogućiti iskustveno i doživljajno učenje kao najprirodniji način učenja, a da pri tome učenici mogu razvijati vlastite vrijednosne stavove o ekološkim, društvenim i gospodarskim temama održivog razvoja. Cilj terenske nastave bio je upoznati studente s osnovama Waldorfske pedagogije, igrama na otvorenome, a posebno s važnošću održivog razvoja te na koji način učionica njeguje održivi razvoj. Na terenskoj nastavi sudjelovalo je 20 studenata. Sa studentima je proveden nestrukturirani intervju o zadovoljstvu terenskom nastavom te je utvrđeno koje su dobrobiti za studente od terenske nastave. Rezultati pokazuju da kod studenata postoji potreba za terenskom nastavom kao oblikom učenja i primjenom teorijskog znanja, zadovoljni su sudjelovanjem u aktivnostima koje se provode s učenicima u Waldorfskoj školi kao što su primjerice igre na otvorenome. Postoje potrebe za druženjem među studentima, odnosno povezivanje na studentskoj godini putem odlaska na terensku nastavu.

Ključne riječi: održivi razvoj, terenska nastava, učionica održivog razvoja, pedagogija

Why is classroom of sustainable development important?

Marija Roksandić, Marija Sablić*

Josip Juraj Strossmayer University of Osijek, Faculty of Humanities and Social Sciences, Lorenz Jäger St. 9, Osijek, Croatia
*Corresponding author: msablic@ffos.hr

Abstract: The concept of sustainable development was defined for the first time in the Brundtland report "Our common future" as development whose purpose is not to jeopardize the satisfaction of the needs of future generations with the current needs of generations. Students of the 3rd year of the undergraduate university study of Pedagogy visited the "Sustainable Development Classroom" within the Waldorf School in Osijek. The Sustainable Development Classroom named "Zemljica" is located in Tvrđavica, a suburb of Osijek. The primary role of the Sustainable Development Classroom is to enable experiential and experiential learning as the most natural way of learning, while at the same time students can develop their own value attitudes about ecological, social and economic topics of sustainable development. The goal of the field lesson was to familiarize students with the basics of Waldorf pedagogy, outdoor games, and especially with the importance of sustainable development and how the classroom fosters sustainable development. Twenty students participated in the field lesson. An unstructured interview about satisfaction with field teaching was conducted with students, and it was determined what the benefits are for students from field teaching. The results show that the students have a need for field teaching as a form of learning and application of theoretical knowledge, they are satisfied with participating in activities that are carried out with students in the Waldorf school, such as outdoor games. There is a need for socializing among students, that is, connecting during the student year by going to field classes.

Keywords: sustainable development, field teaching, sustainable development classroom, pedagogy

Humanističke znanosti / *Humanities*

Analiza bioetičkog aktivizma nevladinih udruga na primjeru udruge Pobjede

Katja Kuhar, Ivica Kelam*

Sveučilište Josipa Jurja Strossmayera, Filozofski fakultet Osijek, Lorenza Jägera 9, Osijek, Hrvatska
*Dopisni autor: ikelam@foozos.hr

Sažetak: Udruga Pobjede, osnovana u Osijeku kao udruga za zaštitu i promicanje prava životinja, brigu o Skloništu za napuštene životinje u prigradskomu naselju Nemetin preuzima tijekom 2010. godine, a u prosincu 2011. ono postaje dvadeset i treće pri Ministarstvu poljoprivrede registrirano skloništе za napuštene životinje. Udruga Pobjede pretvorila je Azil za napuštene životinje u jedno od najbolje uređenih i vođenih skloništa za životinje u Hrvatskoj. Udruga Pobjede bavi se bioetičkim aktivizmom kroz sustavni rad na podizanju svijesti javnosti o potrebi etičkog odnosa prema životinjama koji se očituje kroz promociju zbrinjavanja napuštenih i nezbrinutih životinja, veganstvo kao održiv i suosjećajan način življenja i etički odnos prema okolišu. U radu ćemo prikazati povijest i djelovanje udruge Pobjede te istaknuti ključne bioetičke i edukativne aspekte njihovog djelovanja, te ulogu i utjecaj kojeg imaju u lokalnoj zajednici.

Ključne riječi: Udruga Pobjede, bioetički aktivizam, Azil za zapuštene životinje, veganstvo

Analysis of bioethical activism of NGOs on the example of the NGO Pobjede

Katja Kuhar, Ivica Kelam*

Josip Juraj Strossmayer University of Osijek, Faculty of Humanities and Social Sciences, 9 Lorenz Jäger St., Osijek, Croatia
*Corresponding author: ikelam@foozos.hr

Abstract: NGO Pobjede, founded in Osijek as an association for protecting and promoting animal rights, took care of the Shelter for Abandoned Animals in Nemetin in 2010. In December 2011, it became the 23rd shelter for abandoned animals registered with the Ministry of Agriculture. The NGO Pobjede has turned the Asylum for Abandoned Animals into one of Croatia's best arranged and managed animal shelters. NGO Pobjede deals with bioethical activism through systematic work on raising public awareness of the need for the ethical treatment of animals, manifested through the promotion of abandoned and neglected animals, veganism as a sustainable and compassionate way of life ethical attitude towards the environment. In this paper, we will present the history and activities of the NGO Pobjede and highlight the critical bioethical and educational aspects of their activities and the role and influence they have in the local community.

Keywords: NGO Pobjede, bioethical activism, Asylum for abandoned animals, veganism

Bioetički aspekti čovjekovog odnosa prema životinjama

Božica Ploskonka, Ivica Kelam*

Sveučilište Josipa Jurja Strossmayera, Filozofski fakultet Osijek, Lorenza Jägera 9, Osijek, Hrvatska
*Dopisni autor: ikelam@foozos.hr

Sažetak: Čovjek, već od najranijih dana, ovisi o životinjama i njihovim značajnim sposobnostima. Tako su mnoge divlje životinje postale domaće, a s razvojem civilizacije postaju i dio naših obitelji, poput kućnih ljubimaca. Prvo su korištene kao hrana i u svrhu prijevoza ili obrane ljudi, a kasnije nam počinju služiti kao zabava i "prijatelji". Iako su životinje u mnogo čemu razvijenije i sposobnije od ljudi, često ih se smatra podređenima ljudskoj vrsti. Tako se često uništavaju njihova staništa, ne razmišljajući o posljedicama. Iako nemaju razum niti mogu razmišljati poput ljudi, znanstveno je dokazano kako i životinje imaju osjećaje i određeni stupanj kognitivnoga razvoja. Bioetika kao znanost nam pomaže u orijentiranju oko mnogobrojnih etičkih dilema koje postoje u odnosu čovjeka i životinja. U radu će se objasniti bioetička kompleksnost odnosa čovjeka i životinja te istaknuti kako je važno brinuti o životinjama i što se događa kada se zanemari čovjekova urođena briga za prirodu i živa bića.

Ključne riječi: bioetika, čovjek, životinje, kućni ljubimci, odnos

Bioethical aspects of the human relationship to animals

Božica Ploskonka, Ivica Kelam*

Josip Juraj Strossmayer University of Osijek, Faculty of Humanities and Social Sciences, 9 Lorenz Jäger St., Osijek, Croatia

*Corresponding author: ikelam@foozos.hr

Abstract: From the earliest days, man has depended on animals and their significant abilities. Thus, many wild animals have become domestic, and with the development of civilization, they are becoming part of our families, like pets. They were first used as food and to transport or defend people, and later they began to serve us as entertainment and "friends". Although animals are more developed and capable than humans in many ways, they are often considered subordinate to the human species. So often, their habitats are destroyed without thinking about the consequences. Although they do not have a reason or can think like humans, it has been scientifically proven that animals also have feelings and cognitive development. Bioethics as a science helps us orient ourselves around the many ethical dilemmas in the relationship between man and animals. The paper will explain the bioethical complexity of the relationship between man and animals and emphasize the importance of caring for animals and what happens when man's natural care for nature and living beings is neglected.

Keywords: bioethics, man, animals, pets, relationship

Carlos Castaneda and ecocriticism as an old/ new/ necessary counterbalance to neoliberalism

Lara Škorvaga, Nebojša Lujanović*

Josip Juraj Strossmayer University of Osijek, Academy of Arts and Culture in Osijek, Kralja Petra Svačića 1/f, Osijek, Croatia
*Corresponding author: nlujanovic@hotmail.com

Abstract: This paper deals with insights of Carlos Castaneda which he explains in his book Journey to Ixtlan: The Lessons of Don Juan, and which was understood as an alternative concept of knowledge and cognition back in the seventies. Considering much worse ecological conditions in our times, the paper examines the possibility of combining Castaneda's 'old' teaching with the current poststructuralist perspective, ecocriticism, which questions predominant concepts of subject and freedom, coordinated with neoliberal ideology. It is the way to open new conflict points on a theoretical level, mostly considering our relation to nature, hence the concept of permanent growth also. Castaneda's teaching could be summarized as equalization of all living beings, stressing the importance of coexistence and harmony. In that context, Castaneda could be understood as necessary knowledge which we simply must understand in the time of the greatest ecological crisis in the history of civilization, caused by the neoliberal approach – the approach 'without alternative'.

Keywords: Carlos Castaneda; ecocriticism; neoliberalism; coexistence; freedom

Višedisciplinarno / *Interdisciplinary*

Toxicity of thiacloprid after biodegradation

Tea Horvat*, Gracia Vukorepa, Bruna Babić, Danijela Ašperger

University of Zagreb, Faculty of Chemical Engineering and Technology, Marulićev trg 19, Zagreb, Croatia
*Corresponding author: thorvat2@fkit.hr

Abstract: Numerous xenobiotics are being used more and more every day to alleviate and solve today's problems. Thus, their concentration in wastewater and the environment in which they accumulate over time increases and become potentially harmful to health. Since their impact on nature is not fully defined, they are called "new pollutants". In order to prevent bad impacts on the environment, it is necessary to develop daily bioanalytical methods that will monitor the impact on nature, but also predict the impact on plants, animals and ultimately on humans. The aim of this study was to investigate the toxicity of thiacloprid pesticides before and after the batch biodegradation method in an activated sludge bioreactor. The toxicity study was performed by measuring the bioluminescence of the luminescent bacterial species *Vibrio fischeri*, and the analysis of thiacloprid was performed on a chromatographic system with a diode array detector (HPLC-DAD). The original solution of thiacloprid causes great inhibition, which indicates the toxicity of the original active substance. The batch biodegradation process in activated sludge bioreactor after 48 hours did not inhibit bacterial culture and indicates that activated sludge is not toxic after biodegradation of thiacloprid, although new compounds were formed during biodegradation by thiacloprid biodegradation. In the example of this active substance, the biodegradation of xenobiotics is a successful method of their removal from wastewater.

Keywords: xenobiotics, toxicity, thiacloprid, *Vibrio fischeri*, biodegradation, HPLC-DAD

Acknowledgment: This paper was prepared as part of the project Advanced Water Treatment Technologies for Microplastics Removal (IP-2019-04-9661, AdWaTMiR)

Climate change, Poverty, Richness

Axel Justine[1], Jeanne Castigny[1], Elise Aglietta[1], Hugo Percevaux[1], Thomas-James Marceny[1], Mirna Habuda-Stanić[2*]

[1] ESAIP Graduate School of Engineering, 18 Rue du 8 Mai 1945, 49124 Saint-Barthélemy-d'Anjou, France
[2] Josip Juraj Strossmayer University of in Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: habudastanic@gmail.com

Abstract: The development of our civilization is strongly related to the development of technology, and every day we witness new inventions that make our lives easier and more pleasant. But, at the same time in some parts of our planet, people are still faced with a lack of water, food and basic sanitation. In this paper, we are presenting the absurdities of our civilization. As an example, we are presenting the street life of an average child in Manila after the Philippines was staked by Typhoon Vamco, the 21st typhoon that hit the Philippines in 2020. During those days, sounded by muddy floods, children were faced with destroyed houses and a lack of food. Many scientists confirmed that the Philippines is among the ten countries worst hit by climate change. As a total opposite example, we are presenting the seven stadiums of the World Cup in Qatar, all built within a distanceof 50 kilometers, and all connected with high-quality roads and subways in order for to spectators can attend more than one game per day. All seven new stadiums, called state of art, will have outdoor cooling systems. During their building phase, almost no one asked questions about reasonability, environmental impact, and needs of such investments made for sport (entertainment).

Keywords: civilization, absurd, poverty, richness, climate change

Synthesis of Amino Acid-Functionalized Carbon Quantum Dots from *Citrus clementina* Peel: Investigating the Antiradical Activity and Selectivity of Metal Ion Detection

Monika Kovačević[1], Kristina Janđel[1], Silvija Šafranko[2*], Anamarija Stanković[1], Stela Jokić[2]

[1] Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Ulica cara Hadrijana 8/A, Osijek, Croatia
[2] Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: silvija.safranko@ptfos.hr

Abstract: Carbon quantum dots as fluorescent nanoprobes have recently attracted tremendous attention due to their remarkable properties regarding chemical stability, biocompatibility/low toxicity, water solubility, and optical efficiency. In this study, N-doped carbon quantum dots from *Citrus clementina* peel and five different amino acids (Leu, Trp, Arg, Ala, His) have been prepared, and differences between the chemical, structural and biological properties have been studied. The nitrogen incorporation into the biomass-derived carbon quantum dots (CQDs) led to the increase in the quantum yield and to the improvement in performance and sensitivity of nanoprobes in general, compared to the blank system (without the addition of amino acids). The prepared N-doped CQDs exhibited good stability in aqueous media, and showed similar optical properties, while differences were observed regarding the biological activity and selectivity in metal ion detection. The samples CQD@Leu and CQD@Arg exhibited the highest antiradical activity by DPPH scavenging radical method of 99.48 ± 0.13% and 99.48 ± 0.46%, respectively. Furthermore, in order to evaluate selectivity and interference effects in ion sensing and detection using N-doped CQDs, different ions were tested, including Ca^{2+}, Cu^{2+}, Fe^{3+}, K^{+}, Hg^{2+}, Mg^{2+}, Al^{3+}, Mn^{2+}, and Na^{+}. This study may represent an innovative approach to the efficient utilization of waste for practical applications, including those in analytical chemistry and food technology.

Keywords: citrus waste, fluorescent nanomaterials, antioxidant activity, metal ion detection

Acknowledgment: This work has been supported by the Croatian Science Foundation under the project "Application of innovative techniques of the extraction of bioactive components from by-products of plant origin" (UIP-2017-05-9909).

Promjena tvrdoće drva ariša u ovisnosti o kutu između sile utiskivanja i smjera traheida

Dražen Pendić, Helena Lukšić*, Vera Rede

Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje, Ivana Lučića 5, Zagreb, Hrvastka
*Dopisni autor: hluksic@fsb.hr

Sažetak: Tvrdoća materijala je važno mehaničko svojstvo koje pokazuje otpornost materijala prema prodiranju tvrđeg tijela u njegovu površinu. Drvo je tehnički materijal s izrazito usmjerenom mikrostrukturom koju čine izdužene drvne stanice usmjerene, u najvećoj mjeri, aksijalno. Zbog usmjerene mikrostrukture, mehanička svojstva drva razlikuju se u tri karakteristična smjera: poprečnom, tangencijalnom i radijalnom. U ovome radu utvrđeno je kako se mijenja tvrdoća drva sibirskog ariša (*Larix sibirica*) prelaskom iz poprečnog presjeka u radijalni te iz poprečnog presjeka u tangencionalni, u sekvencama od po 15°. Mjerenje tvrdoće ponovljeno je po deset puta za svaki kut, zbog očekivanog značajnog rasipanja rezultata. Iz rezultata je vidljivo da tvrdoća drva značajno ovisi o usmjerenosti strukture. Najveća srednja vrijednost tvrdoće dobivena je u poprečnom presjeku i iznosi 52 HB. U tangencionalnom i radijalnom presjeku, izmjerene su najniže vrijednosti tvrdoće, podjednake su i iznose oko 32 HB.

Ključne riječi: ariš, usmjerenost strukture, tvrdoća

The change in hardness of larch wood as a function of the angle between the indentation force and the direction of the tracheid

Dražen Pendić, Helena Lukšić*, Vera Rede

University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Ivana Lučića 5, Zagreb, Croatia
*Corresponding author: hluksic@fsb.hr

Abstract: The hardness of the material is an important mechanical property that shows the resistance of the material to the penetration of a harder body into its surface. Wood is a technical material with a highly directed microstructure made up of elongated wood cells directed, to the greatest extent, axially. Due to the directional microstructure, the mechanical properties of wood differ in three characteristic directions: transverse, tangential and radial. In this paper, it was found that the hardness of Siberian larch wood (*Larix sibirica*) is changing by moving from cross-section to radial and from cross-section to tangential, in sequences of 15° each. The hardness measurement was repeated ten times for each angle, due to the expected significant scattering of results. From the results, it is evident that the hardness of wood significantly depends on the orientation of the structure. The maximum mean hardness value was obtained in the cross-section and is 52 HB. In tangential and radial sections, the lowest hardness values were measured, they are similar and amount to about 32 HB.

Keywords: larch, structure orientation, hardness

Green foods in the nutrition of younger school-age children

Marija Rastija[1], Ivana Popović[2], Irella Bogut[1], Željko Popović[1]*

[1] Josip Juraj Strossmayer University of Osijek, Faculty of Education, Cara Hadrijana 10, Osijek, Croatia
[2] Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 18, Osijek, Croatia
*Corresponding author: popovic@foozos.hr

Abstract: Children's nutrition includes a variety of fruits and vegetables, preferably of different colors. The aim of this research was to determine the nourishment of early school-age children, the amount of food they eat and do they like fruits and vegetables and what are their experiences and knowledge about green foods. Data for this research was collected using an online survey for the parents in which 698 pupils of 1st to 4th grade of primary school were included from all over the Republic of Croatia. The questionnaire consisted of 15 questions divided into four groups which were related to daily meals, fast food, sweets and fruits and vegetables. The results showed that the majority of pupils (47%) eat four times a day, while others eat more times a day. Among other results, children generally considered (52%) that green vegetables are healthy food they like to eat, while 37% (259 students) eat only certain green vegetables. Children mostly prefer apples (96%) and pears (83%). Pupils and parents are aware of the importance of green fruits and vegetables in their nutrition which are sufficiently represented in their diet. The majority of parents (92%) believe that they themselves have the greatest influence on the diet of their child. Parents should have a healthy and balanced diet and thus be a role models for their children because in this way they transmit proper eating habits to their children.

Keywords: green foods; healthy diet; younger school-age children; nutrition

Zelena pedagogija studenata na FOOZOS-u

Dora Repinac, Ljubica Nedić*, Nikolina Milanović, Irella Bogut

Sveučilište Josipa Jurja Strossmayera, Fakultet za odgojne i obrazovne znanosti, Cara Hadrijana 10, Osijek, Hrvatska
*Dopisni autor: ljnedic@foozos.hr

Sažetak: Najveći dio svoga radnoga dana učitelji provode u interakciji s djecom. Stoga su oni najbolji edukatori kada govorimo o pitanjima ekologije i održivoga razvoja. Predmet proučavanja ekološke zelene pedagogije je ekološki odgoj pojedinca, ali i cjelovitoga društva. Ekološki odgoj, razvoj ekološke svijesti te razumijevanje čovjeka i prirode ciljevi su kojima studenti na programu Integriranog preddiplomskog i diplomskog sveučilišnog Učiteljskog studija usvajaju znanja iz odgoja za okoliš koji je potreban školskom učitelju. Kao budući učitelji, studenti stječu znanja i kompetencije za shvaćanje i primjenjivanje ekoloških zakonitosti koje će interdisciplinarnim pristupom moći primjenjivati u razrednoj nastavi. Rad donosi istraživanje koje je provedeno metodom fokus grupe među studentima Učiteljskoga studija u Osijeku. Cilj rada je buditi svijest i stvarati nove spoznaje kako je edukacija o ekologiji i održivom razvoju važna već od malih nogu što pokazuju brojna istraživanja. Budući učitelji takvom edukacijom imaju kompetencije za opće i prirodne zakonitosti koje postaju standardom i načinom njihova života.

Ključne riječi: ekologija, održivi razvoj, studenti, učitelji, zelena pedagogija

Green pedagogy on Faculty of Education

Dora Repinac, Ljubica Nedić*, Nikolina Milanović, Irella Bogut

Josip Juraj Strossmayer University of Osijek, Faculty of Education, Cara Hadrijana 10, Osijek, Croatia
*Corresponding author: ljnedic@foozos.hr

Abstract: The biggest part of their workday the teachers spent interacting with children. That is why they are the best educators when we are talking about ecology and sustainable development. The subject of study of Green Pedagogy is the ecological education of an individual but also the society. Ecological education, the development of environmental awareness as well as the understanding of humans and nature are goals through which the students of the Integrated undergraduate and graduate university Class teacher study program adopt the knowledge from environmental education which is needed by a school teacher. As future teachers, the students acquire knowledge and become competent to understand and apply environmental laws which they will, through an interdisciplinary approach, be able to use in primary education. This study shows research that was conducted by the Focus group method with the students of the Faculty of Education in Osijek. The goal of this study was to create greater awareness of how education about ecology and sustainable development is important form an early age as many researchers show. Future teachers with that kind of education are competent for general and environmental laws that are becoming thestandard and their way of life.

Keywords: ecology, sustainable development, students, teachers, green pedagogy

Povezanost tjelesne aktivnosti i mikrobiote

Nikolina Užnik, Marin Marinović *

Sveučilište Josipa Jurja Strossmayera u Osijeku, Kineziološki fakultet Osijek, Drinska ul. 16A, Osijek, Hrvatska
***Dopisni autor:** marin.marinovic@hotmail.com

Sažetak: Ljudska mikrobiota postaje sve češća tema istraživanja različitih znanstvenih grana zbog svoje raširenosti i uloge u organizmu. Među sportašima i rekreativcima trening i prehrana imaju najvažniju ulogu te je bitno istražiti kako navedeni čimbenici utječu na mikrobiotu. S druge strane novi dokazi pokazali su povezanost između sastava crijevne mikrobiote i tjelesne aktivnosti, sugerirajući da modifikacije u sastavu crijevne mikrobiote mogu pridonijeti fizičkoj izvedbi domaćina. U ovom preglednom radu objašnjena je razlika između mikrobioma i mikrobiote te gdje se mogu naći u ljudskom organizmu. Nadalje, objašnjeno je na što sve mikrobiota utječe i što se događa ako dođe do njezinog poremećaja te koji i na koji način čimbenici utječu na razvijanje mikrobiote od najranijih trenutaka bebina života. Također, opisana je povezanost pretilosti s mikrobiotom te kako udio određenih baterija zapravo utječe na smanjenje tjelesne mase.

Ključne riječi: mikrobiota, pretilost, tjelesna aktivnost

Correlation between physical activity and microbiota

Nikolina Užnik, Marin Marinović*

Josip Juraj Strossmayer University of in Osijek Faculty of Kinesiology Osijek, Drinska ul. 16A, Osijek, Croatia
*Corresponding author: marin.marinovic@hotmail.com

Abstract: The human microbiota is rapidly becoming one of the most frequent research subjects because of its outspread and functions in the human organism. Throughout athletes and recreationists emphasis is being put on nutrition, so it is necessary to see further into the factors that have an effect on the microbiota. On the other hand, new resources have proven that there is a connection between the composition of the gut microbiota and physical activity, suggesting that modifications in the composition of the gut microbiota can contribute positively to one's performance. The goal of this review paper is to explain the difference between microbiota and microbiome and their locations in the human organism. Furthermore, this paper will review the effects of, what happens when there is a disorder of the microbiota and the way each factor contributes to the development of the microbiota from the earliest moments of a baby's life. The relationship between obesity and microbiota is also described and the effect of a certain type of bacteria actually effect on reduction of body mass.

Keywords: microbiota, obesity, physical activity

PISANI KONCEPTI I UMJETNIČKI RADOVI STUDENATA

WRITTEN CONCEPTS AND STUDENTS 'ART WORKS

PISANI KONCEPTI I UMJETNIČKI RADOVI STUDENATA

Sveučilište Josipa Jurja Strossmayera u Osijeku, Akademija za umjetnost i kulturu u Osijeku, Kralja Petra Svačića 1/f, Osijek, Hrvatska

Mentori: Saša Došen*, Ivana Živković
*Dopisni autor: saadosen@gmail.com

- **Ivana Bašić**: **PolarX**

utjecaj novih tehnologija na prirodnu ravnotežu – koncept, artefakt

- **Ivona Čačulović: KNJIGA O PEURI: PUT U UNELMU**

snoviđenje iskonskog odnosa čovjeka i prirode kroz bajkovitu priču o putovanju u paralelnu dimenziju šamanice Perue – koncept, artefakti, fotografije, kratki film

- **Petra Mađarić: BHOPAL 1984.**

katastrofalne posljedice industrijske nesreće u Bhopalu (Indija), bez odgovornosti, s ogromnom cijenom — koncept, ilustracije

- **Bruno Osmanagić: DETOX / 2041.**

postapokaliptična vizija svijeta nakon nuklearne katastrofe — koncept, artefakt, fotografije

- **Anamarija Šerbetar: MIRKO I KOLICA**

povratak prirodi, održivi razvoj i briga za okoliš — koncept, artefakti

- **Aleksandra Vukićević: [...]**

upozorenje na destruktivne učinke čovjekovih sebičnih pokušaja ovladavanja prirodom — koncept, artefakt, fotografija

WRITTEN CONCEPTS AND STUDENTS 'ART WORKS

Josip Juraj Strossmayer University of Osijek, Academy of Arts and Culture in Osijek, Kralja Petra Svačića 1/f, Osijek, Croatia

Supervisors: Saša Došen, Ivana Živković
*Corresponding author: saadosen@gmail.com

- **Ivana Bašić**: **PolarX**

impact of new technologies on natural balance - concept, artefacts

- **Ivona Čačulović: BOOK ABOUT PEURA: THE WAY TO UNELM**

dreaming of the primordial relationship between man and nature through a fairy-tale story about a trip to the parallel dimension of a Peruvian shaman - concept, artifacts, photos, short film

- **Petra Mađarić: BHOPAL 1984.**

catastrophic consequences of an industrial accident in Bhopal (India), without responsibility, with a huge price — concept, illustrations

- **Bruno Osmanagić: DETOX / 2041.**

a post-apocalyptic vision of the world after a nuclear disaster — concept, artifact, photos

- **Anamarija Šerbetar: MIRKO AND WHEEL**

return to nature, sustainable development and care for the environment — concept, artefacts

- **Aleksandra Vukićević: [...]**

a warning about the destructive effects of man's selfish attempts to master nature — concept, artifact, photo

Knjiga sažetaka / *Book of abstracts*

Kazalo / *Author index*

Knjiga sažetaka / *Book of abstracts*
Kazalo / *Author index*

Potpora | *Sponsors*

HRVATSKE ŠUME

KEFO® SINCE 1949

AGROPROTEINKA

OSJEČKO pivo

Jamnica ~1828~

MIHOLJAČKI VODOVOD d.o.o.

2nd International Students Conference

ISC GREEN 2022

2-3 June 2022 Osijek - Croatia

IZDAVAČ | *PUBLISHER*

Sveučilište Josipa Jurja Strossmayera u Osijeku
Prehrambeno-tehnološki fakultet Osijek

Josip Juraj Strossmayer University of Osijek
Faculty of Food Tehnology Osijek

Osijek, 2022