Hranom do zdravlja : knjiga sažetaka s 12. međunarodnog znanstveno-stručnog skupa

12 hranom do zdravlja with food to health

Book of Abstracts of the 12th International Scientific and Professional Conference WITH FOOD TO HEALTH

Knjiga sažetaka s 12. međunarodnog znanstveno-stručnog skupa HRANOM DO ZDRAVLJA

Faculty of Food Technology Osijek (University of Osijek, Croatia)	/	Prehrambeno-tehnološki fakultet Sveučilišta u Osijeku
Faculty of Technology (University of Tuzla, B&H)	/	Tehnološki fakultet Univerziteta u Tuzli (BiH)
Faculty of Pharmacy (University of Tuzla, B&H)	/	Farmaceutski fakultet Univerziteta u Tuzli (BiH)
Association for Nutrition and Dietetics (B&H)	/	Udruženje za nutricionizam i dijetetiku (BiH)
Croatian Association of Nutritionists	/	Hrvatski zbor nutricionista
Faculty of Chemistry and Technology (University of Split, Croatia)	/	Kemijsko-tehnološki fakultet Sveučilišta u Splitu
Faculty of Food Technology and Biotechnology (University of Zagreb, Croatia)	/	Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu
Faculty of Agrobiotechnical Sciences Osijek (University of Osijek, Croatia)	/	Fakultet agrobiotehničkih znanosti Sveučilišta u Osijeku
Polytechnic in Požega (Croatia)	/	Veleučilište u Požegi
European Hygienic Engineering & Design Group – EHEDG (Germany)	/	European Hygienic Engineering & Design Group – EHEDG (Njemačka)
ISEKI – Food Association (IFA) (Austria)	/	ISEKI – Food Association (IFA) (Austrija)
Croatian Agency for Agriculture and Food	/	Hrvatska agencija za poljoprivredu i hranu
Faculty of Agriculture and Food Technology (University of Mostar, B&H)	/	Agronomski i prehrambeno-tehnološki fakultet Sveučilišta u Mostaru (BiH)
Department of Biology (University of Osijek, Croatia)	/	Odjel za Biologiju Sveučilišta u Osijeku
Faculty of Tourism and Hospitality Management Opatija (University of Rijeka, Croatia)	/	Fakultet za menadžment u turizmu i ugostiteljstvu Opatija
Croatian Society of Nutritionists and Dietitians	/	Hrvatsko društvo nutricionista i dijetetičara
Chamber of Pharmacists of Tuzla Canton (Tuzla, B&H)	/	Komora magistara farmacije Tuzlanskog kantona (BiH)
Andrija Štampar – Association of People's Health	/	Udruga narodnog zdravlja Andrija Štampar

BOOK OF ABSTRACTS / KNJIGA SAŽETAKA

12th International Scientific and Professional Conference

WITH FOOD TO HEALTH

October 24th and 25th 2019, Osijek, Croatia

12. međunarodni znanstveno-stručni skup

HRANOM DO ZDRAVLJA

24. i 25. listopada 2019., Osijek, Hrvatska

12 hranom do zdravlja with food to health

Osijek and / i Tuzla, 2019.

BOOK OF ABSTRACTS	*12th International Scientific and Professional Conference WITH FOOD TO HEALTH*
KNJIGA SAŽETAKA	12. međunarodni znanstveno-stručni skup HRANOM DO ZDRAVLJA
Published by / **Izdavači**	*Faculty of Food Technology Osijek (University of Osijek) and Faculty of Technology (University of Tuzla)* Prehrambeno-tehnološki fakultet Sveučilišta u Osijeku i Tehnološki fakultet Univerziteta u Tuzli
Editors / **Urednici**	Jurislav Babić, Drago Šubarić, Midhat Jašić
Executive Editor / **Izvršni urednik**	Antun Jozinović
Technical Editors / **Tehnički urednici**	Ana-Marija Cikoš, Ante Lončarić, Silvija Šafranko, Antonija Šarić
Cover page design / **Dizajn naslovnice** ***Printing and Binding*** / **Tisak i uvez**	Studio HS internet d.o.o., Osijek, *Croatia* / Hrvatska
Number of Copies / **Naklada**	250
Organising Committee / **Organizacijski odbor**	Jurislav Babić (*chairman* / predsjednik), Drago Šubarić (*vice-chairman* / zamjenik predsjednika), Midhat Jašić (*vice-chairman* / zamjenik predsjednika), Đurđica Ačkar, Damir Alihodžić, Almir Azabagić, Ana-Marija Cikoš, Aneda Cipurković, Daniela Čačić Kenjerić, Jelena Đugum, Ivana Flanjak, Ljubica Glavaš-Obrovac, Artur Gryszkin, Igor Jerković, Damir Ježek, Stela Jokić, Antun Jozinović (*secretary* / tajnik), Vlatko Kopić, Tihomir Kovač, Greta Krešić, Ante Lončarić, Jelka Pleadin, Ivana Rukavina, Miralem Smajić, Martina Smolić, Marizela Šabanović, Silvija Šafranko, Antonija Šarić, Krunoslav Zmaić, Silva Wendling
Scientific Committee / **Znanstveni odbor**	Daniela Čačić Kenjerić (*chairman* / predsjednica), Krunoslav Aladić, Ines Banjari, Sabina Begić, Marijana Blažić, Dora Bučan Nenadić, Ines Drenjančević, Lidija Jakobek Barron, Irena Keser, Mirela Kopjar, Olivera Koprivnjak, Blaženka Kos, Ljiljana Krstin, Kiril Lisichkov, Borislav Miličević, Maja Miškulin, Tihomir Moslavac, Benjamin Muhamedbegović, Mario Panjičko, Eva Pavić, Valentina Pavić, Anita Pichler, Vesna Rastija, Darja Sokolić, Anamarija Stanković, Aleksandra Tepić Horecki, Andrijana Včeva, Senka Vidović, Dubravka Vitali Čepo, Darija Vranešić Bender
Honorary Committee / **Počasni odbor**	Vladimir Andročec, Ivan Anušić, Sead Ćatić, Krunoslav Dugalić, Josip Galić, Vlado Guberac, Boris Habrun, Nebojša Kojić, Helga Medić, Jure Mirat, Ivan Ostojić, Biljana Pajin, Dora Smolčić Jurdana, Mario Škrivanko, Marija Vučković, Ivan Vukoja, Željko Zubčić

The Conference will be credited according to the ordinance of Croatian medical chamber.
Skup će biti bodovan sukladno pravilnicima Hrvatske liječničke komore.

A CIP catalogue record of this publication is available from the City and University Library Osijek under the number 141212060.
CIP zapis dostupan u računalnom katalogu Gradske i sveučilišne knjižnice Osijek pod brojem 141212060.

ISBN (Osijek): 978-953-7005-66-5
EAN (Osijek): 9789537005665
ISSN (Tuzla): 2232-9536

Osijek and / i Tuzla, 2019.

Supported by:	**Uz potporu:**	
President of the Republic of Croatia Kolinda Grabar-Kitarović	Predsjednica Republike Hrvatske Kolinda Grabar-Kitarović	
Ministry of Science and Education of the Republic of Croatia	Ministarstvo znanosti i obrazovanja Republike Hrvatske	
Ministry of Agriculture of the Republic of Croatia	Ministarstvo poljoprivrede Republike Hrvatske	
Ministry of Economy, Entrepreneurship and Crafts of the Republic of Croatia	Ministarstvo gospodarstva, poduzetništva i obrta Republike Hrvatske	
Ministry of Health of the Republic of Croatia	Ministarstvo zdravstva Republike Hrvatske	
Josip Juraj Strossmayer University of Osijek	Sveučilište Josipa Jurja Strossmayera u Osijeku	
Croatian Academy of Engineering	Akademija tehničkih znanosti Hrvatske	
Croatian Chamber of Economy	Hrvatska gospodarska komora	
Osijek-Baranja County	Osječko-baranjska županija	
City of Osijek	Grad Osijek	

SUPPORTING PUBLICATIONS

Croatian Journal of Food Science and Technology (CJFST)
Food in Health and Disease: Scientific-Professional Journal of Nutrition and Dietetics
Southeastern European Medical Journal (SEEMEDJ)

PODUPIRUJUĆI ČASOPISI

Croatian Journal of Food Science and Technology (CJFST)
Hrana u zdravlju i bolesti: znanstveno-stručni časopis za nutricionizam i dijetetiku
Southeastern European Medical Journal (SEEMEDJ)

SPONSORS

GOLDEN

AlphaChrom d.o.o., Croatia

SILVER

Shimadzu d.o.o., Croatia
Croatian Veterinary Institute Zagreb, Croatia
CROTEH d.o.o., Croatia

BRONZE

Ledo d.d., Croatia
Ljekarne srce, Croatia
Vita Lab Nova d.o.o., Croatia
Kemolab d.o.o., Croatia
Labena d.o.o., Croatia
V.I.A. – lab d.o.o., Croatia

OTHER SPONSORS AND DONORS

Kobis d.o.o., Croatia
Croatian Chamber of Economy, Croatia
Croatia osiguranje d.d., Croatia
Belje d.d., Croatia
Studenac d.o.o., Croatia
Pivovara Osijek d.o.o., Croatia
Polytechnic in Požega, Croatia
Karolina d.o.o., Croatia
Kandit d.o.o., Croatia
Vupik plus d.o.o., Croatia
Misna vina d.o.o., Croatia
TRS winery Ilok, Croatia
Tourist Board of Osijek-Baranja County, Croatia
Wine shop Vinita, Croatia

SPONZORI

ZLATNI

AlphaChrom d.o.o., Hrvatska

SREBRNI

Shimadzu d.o.o., Hrvatska
Hrvatski veterinarski institut Zagreb, Hrvatska
CROTEH d.o.o., Hrvatska

BRONČANI

Ledo d.d., Hrvatska
Ljekarne srce, Hrvatska
Vita Lab Nova d.o.o., Hrvatska
Kemolab d.o.o., Hrvatska
Labena d.o.o., Hrvatska
V.I.A. – lab d.o.o., Hrvatska

OSTALI SPONZORI I DONATORI

Kobis d.o.o., Hrvatska
Hrvatska gospodarska komora, Hrvatska
Croatia osiguranje d.d., Hrvatska
Belje d.d., Hrvatska
Studenac d.o.o., Hrvatska
Pivovara Osijek d.o.o., Hrvatska
Veleučilište u Požegi, Hrvatska
Karolina d.o.o., Hrvatska
Kandit d.o.o., Hrvatska
Vupik plus d.o.o., Hrvatska
Misna vina d.o.o., Hrvatska
TRS vinarija Ilok, Hrvatska
Turistička zajednica Osječko-baranjske županije, Hrvatska
Vinoteka Vinita, Hrvatska

EXHIBITORS

AlphaChrom d.o.o., Croatia
Shimadzu d.o.o., Croatia
Croatian Veterinary Institute Zagreb, Croatia
CROTEH d.o.o., Croatia
Ledo d.d., Croatia
Ljekarne srce, Croatia
Vita Lab Nova d.o.o., Croatia
Kemolab d.o.o., Croatia
Labena d.o.o., Croatia
V.I.A. – lab d.o.o., Croatia
Kobis d.o.o., Croatia
Croatian Chamber of Economy, Croatia
Primalab d.o.o., Croatia
Kefo d.o.o., Croatia
Ru-Ve d.o.o., Croatia
KFC Gida A.S., Turkey
OGI d.o.o., Croatia

IZLAGAČI

AlphaChrom d.o.o., Hrvatska
Shimadzu d.o.o., Hrvatska
Hrvatski veterinarski institut Zagreb, Hrvatska
CROTEH d.o.o., Hrvatska
Ledo d.d., Hrvatska
Ljekarne srce, Hrvatska
Vita Lab Nova d.o.o., Hrvatska
Kemolab d.o.o., Hrvatska
Labena d.o.o., Hrvatska
V.I.A. – lab d.o.o., Hrvatska
Kobis d.o.o., Hrvatska
Hrvatska gospodarska komora, Hrvatska
Primalab d.o.o., Hrvatska
Kefo d.o.o., Hrvatska
Ru-Ve d.o.o., Hrvatska
KFC Gida A.S., Turska
OGI d.o.o., Hrvatska

Reviewers **/ Recenzenti**: Đurđica Ačkar, Ines Banjari, Blanka Bilić Rajs, Ana-Marija Cikoš, Ivana Flanjak, Antun Jozinović, Mirela Kopjar, Greta Krešić, Ante Lončarić, Anita Pichler, Marizela Šabanović, Silvija Šafranko, Lidija Šoher, Ivana Tomac

Table of Contents / Sadržaj

SCIENTIFIC PROGRAMME /
PROGRAM SKUPA

SCIENTIFIC PROGRAMME / PROGRAM SKUPA

Thursday, October 24th 2019 / Četvrtak, 24. listopada 2019.

8:30 – 9:30	***Registration of participants, setting up a posters for Day 1*** **Prijava i registracija sudionika, postavljanje postera za 1. dan**
9:30 – 10:10	***Conference opening Ceremony*** **Otvorenje Skupa**
10:10 – 10:40	***Coffee Break, Poster Session*** **Pauza za kavu, razgledavanje postera**

***Plenary lectures and Invited lecture* /**
Plenarna predavanja i Pozvano predavanje
***Moderators* / Moderatori:**
Daniela Čačić Kenjerić, Stela Jokić, Dubravka Vitali Čepo

10:40 – 11:50

***Plenary lectures* / Plenarna predavanja**

DIET AND VERTIGO
Andrijana Včeva, Tihana Mendeš, Željko Zubčić, Hrvoje Mihalj, Josip Maleš, Stjepan Grga Milanković, Vjeran Bogović

CLINICAL IMPORTANCE OF MALNUTRITION IN PATIENTS WITH PARKINSON`S DISEASE
Svetlana Tomić

***Invited lecture* / Pozvano predavanje**

A LIFE WITH CHRONIC PAIN – CAN DIET HELP?
Ines Banjari

11:50 – 12:15	***Coffee Break, Poster Session*** **Pauza za kavu, razgledavanje postera**

Oral presentations and Sponsor presentation /
Usmena priopćenja i Sponzorsko predavanje
***Moderators* / Moderatori:**
Đurđica Ačkar, Artur Gryszkin, Andrijana Včeva

***Oral presentations* / Usmena priopćenja**

FUNCTIONAL FOOD IN CARDIOVASCULAR PROTECTION – EFFECTS OF *n-3* POLYUNSATURATED FATTY ACIDS
Ines Drenjančević, Martina Mihalj, Ana Stupin, Anita Matić, Zrinka Mihaljević, Ivana Jukić, Nataša Kozina, Lidija Rašić, Luka Kolar, Nikolina Kolobarić, Petar Šušnjara, Marko Stupin, Aleksandar Kibel, Kristina Selthofer-Relatić, Ana Marija Lukinac, Željka Breškić, Brankica Juranić

DIET AND ORAL HEALTH
Vlatko Kopić, Sanjin Petrović

NUTRITIONAL HABITS AND INTAKE OF DIETARY SUPPLEMENTS IN DIET OF PREGNANCY
12:15 – 13:20 *Lejla Mešalić, Fejzo Begović*

USAGE OF NUTRITIONAL SUPPLEMENTS FOR INDIVIDUALS WITH DOWN SYNDROME – A REVIEW
Maja Ergović Ravančić, Valentina Obradović

COMPARATIVE STUDY OF ICE CREAM WITH AND WITHOUT ADDITION OF STEVIA, EMULSIFIER AND MILK POWDER
Erhan Sulejmani, Mersel Demiri

***Sponsor presentation /* Sponzorsko predavanje**

COMPLETE AND SMART SOLUTIONS FOR YOUR FATTY ACIDS, FAMES & OILS ANALYSIS
Ingrid Stojko, Matea Kovač, AlphaChrom d.o.o.

13:20 – 14:45 ***Lunch break, Poster Session***
Pauza za ručak, razgledavanje postera

Invited lecture, Oral presentations and Sponsor presentation /
Pozvano predavanje, Usmena priopćenja i Sponzorsko predavanje
***Moderators* / Moderatori:**
Antun Jozinović, Ante Lončarić, Valentina Pavić

***Invited lecture* / Pozvano predavanje**

TRUTHS AND MYTHS ABOUT GLUTEN
Ivan Vukoja, Anamarija Jurić, Goran Zukanović, Filip Njavro, Jakov Ivković, Danko Relić

***Oral presentations* / Usmena priopćenja**

14:45 – 15:45

IMMOBILIZATION IN WINE MAKING FOR IMPROVED QUALITY
Panagiotis Kandylis

MEDITERRANEAN AGRICULTURE – CORNER STONE OF THE MEDITERRANEAN DIET
Vedran Poljak, Eva Pavić

CIRCULAR ECONOMY IN FOOD AND BEVERAGE INDUSTRY, HIGH ADDED VALUE PRODUCTS, MATERIAL AND ENERGY UTILISATION OF BYPRODUCTS AND WASTE
Gregor Drago Zupančič, Goran Lukić, Anamarija Havliček, Mario Panjičko

***Sponsor presentation /* Sponzorsko predavanje**

CROATIAN VETERINARY INSTITUTE IN FOOD ANALYSIS
Boris Habrun, Nina Bilandžić, Jelka Pleadin, Andrea Humski, Croatian Veterinary Institute

15:45 – 16:10 ***Coffee Break, Poster Session***
Pauza za kavu, razgledavanje postera

Oral presentations / **Usmena priopćenja**
Moderators **/ Moderatori:**
Ivana Flanjak, Lidija Jakobek Barron, Jelka Pleadin

Oral presentations **/ Usmena priopćenja**

THE OCCURRENCE OF BIOGENIC AMINES IN SELECTED FOOD OF ANIMAL ORIGIN FROM THE CROATIAN RETAIL MARKET
Tanja Bogdanović, Sandra Petričević, Mia Brkljača, Irena Listeš, Jelka Pleadin

FOOD CONTAMINATION BY PESTICIDES. SHOULD WE WORRY?
Vezirka Jankuloska, Ilija Karov, Gorica Pavlovska

STRENGTHENING SCIENTIFIC COOPERATION BETWEEN THE EUROPEAN FOOD SAFETY AGENCY (EFSA) AND MEMBER STATES
16:10 – 17:00 *Sanja Miloš, Vlatka Buzjak*

PRELIMINARIY QUANTIFICATION OF MICROPLASTIC IN FARMED OYSTERS (*OSTREA EDULIS* LINNAEUS, 1758) IN THE ADRIATIC SEA
Zvjezdana Popović Perković, Ema Vranjić, Vida Šimat, Ivana Generalić Mekinić, Danijela Skroza

CYCLOPIAZONIC ACID PRODUCERS IN DRY-FERMENTED SAUSAGES
Manuela Zadravec, Željko Jakopović, Tina Lešić, Maja Kiš, Irena Perković, Jelka Pleadin

HOW DID CROATIA WIN IN THE BATTLE FOR – CROATIAN HONEY?
Dražen Lušić

20:00 ***Conference dinner***
Zajednička večera

Friday, October 25th 2019 / Petak, 25. listopada 2019.

8:30 – 9:30	***Registration of participants, setting up a posters for Day 2*** **Prijava i registracija sudionika, postavljanje postera za 2. dan**
	***Plenary lectures and Invited lecture* /** **Plenarna predavanja i Pozvano predavanje** ***Moderators* / Moderatori:** *Ines Banjari, Darja Sokolić, Irena Keser*
09:30 – 10:45	***Plenary lectures* / Plenarna predavanja** **HEALTH EFFECTS AND BIOAVAILABILITY OF CURCUMIN** *Viljemka Bučević Popović* **THE ROLE OF FOOD IN THE TOURIST EXPERIENCE** *Greta Krešić* ***Invited lecture* / Pozvano predavanje** **WEIGHT LOSS BIOCHEMISTRY** *Ivica Strelec, Darja Sokolić*
10:45 – 11:10	***Coffee Break, Poster Session*** **Pauza za kavu, razgledavanje postera**

Sponsor presentation and Oral presentations /
Sponzorsko predavanje i Usmena priopćenja
***Moderators* / Moderatori:**
Greta Krešić, Ljiljana Krstin, Eva Pavić

***Sponsor presentation /* Sponzorsko predavanje**

EVOLUTION OF ELEMENTAL ANALYSIS IN FOOD AND ANIMAL FEED
Liliana Krotz, Vesna Brezovečki-Biđin, Kobis d.o.o.

***Oral presentations* / Usmena priopćenja**

11:10 – 12:15

ANTIMICROBIAL RESISTANCE – PUBLIC HEALTH IMPLICATIONS
Sead Karakaš, Senad Huseinagić, Majda Mulić

EXCISE ON SUGAR-SWEETENED BEVERAGES ON THE PREVENTION AND CONTROL OF OBESITY
Rajko Odobaša

CHILDREN'S BASE ADEQUATE NUTRITION FOR A FURTHER QUALITY LIFE
Amela Pašić, Fuad Pašić, Midhat Jašić

FUNCTIONAL GASTROINTESTINAL DISORDERS AS MANIFESTATIONS OF INSULIN RESISTANCE: A POTENTIAL FOR NUTRITIVE PREVENTIVE INTERVENTIONS
Nizama Salihefendić, Muharem Zildžić, Dženita Salihefendić, Midhat Jašić, Emilija Spaseska Aleksovska, Sabit Begić

THE CONTENT OF ERUCIC ACID IN THE OIL FROM MUSTARD SEEDS AFTER DIFFERENT EXTRACTION TECHNIQUE AND ITS GASTROINTESTINAL STABILITY
Ivana Vrca, Stela Jokić, Barbara Soldo, Tea Bilušić

12:15 – 12:40 ***Coffee Break, Poster Session***
Pauza za kavu, razgledavanje postera

Invited lecture, Oral presentations and Sponsor presentation /
Pozvano predavanje, Usmena priopćenja i Sponzorsko predavanje
***Moderators* / Moderatori:**
Mirela Kopjar, Anita Pichler, Blaženka Kos

***Invited lecture* / Pozvano predavanje**

THE QUEST FOR NEW FUNCTIONAL PRODUCTS: BEER WITH THE ADDITION OF MEDICINAL MUSHROOM *Trametes versicolor* EXTRACT
Natalija Velić, Janez Gorenšek, Karla Špehar, Martina Medvidović-Kosanović, Darko Velić, Hrvoje Pavlović, Indira Kosović

***Oral presentations* / Usmena priopćenja**

12:40 – 13:30

ATOPIC DERMATITIS, NUTRIRION PROFILE, GUIDELINES AND SUPPLEMENTATION
Asmira Husić Mulabećirović, Neda Jokić, Jasna Frljak, Asja Sirbubalo, Aida Mulić

WORK OF THE NUTRITIONAL COUNSELING CENTER OF THE CLINICAL HOSPITAL CENTER ZAGREB
Zrinka Šmuljić, Eva Pavić

***Sponsor presentation /* Sponzorsko predavanje**

EXPERIENCE NEW BENCHMARKS – NEW NEXERA SERIES
Matea Potkrajčić, Shimadzu d.o.o.

13:30 ***Conclusions and Conference closing***
Zaključci i zatvaranje Skupa

POSTER PRESENTATIONS /
POSTER PREZENTACIJE

POSTER PRESENTATIONS / POSTER PREZENTACIJE

Thursday, October 24th 2019 / Četvrtak, 24. listopada 2019.

NUTRITION / NUTRICIONIZAM

DIETETICS AND DIET THERAPY / DIJETETIKA I DIJETOTERAPIJA

FUNCTIONAL FOOD AND DIETARY SUPPLEMENTS / FUNKCIONALNA HRANA I DODACI PREHRANI

POSTER PRESENTATIONS / POSTER PREZENTACIJE

Friday, October 25th 2019 / Petak, 25. listopada 2019.

FOOD SAFETY / ZDRAVSTVENA SIGURNOST HRANE

P-01 **ANALYSIS OF RASFF NOTIFICATIONS ON FOOD PRODUCTS CONTAMINATED WITH *Salmonella* spp. INVOLVING CROATIA**
Emilija Friganović, Nikolina Tokmakčija, Mladenka Šarolić, Boris Dorbić, Domagoj Friganović

P-02 **IZLOŽENOST ODRASLE POPULACIJE U RH AKRILAMIDU IZ HRANE**
EXPOSURE OF ADULT POPULATION IN CROATIA TO ACRYLAMIDE
Danijela Stražanac, Jelka Pleadin, Sanja Miloš, Brigita Hengl, Helga Medić, Jasna Bošnir, Tomislav Klapec, Nino Dimitrov, Andrea Gross-Bošković

P-03 **MIKROBIOLOŠKI STATUS TRADICIONALNIH SIREVA NA OBITELJSKIM POLJOPRIVREDNIM GOSPODARSTVIMA**
MICROBIOLOGICAL STATUS OF TRADITIONAL CHEESES PRODUCED ON FAMILY FARMS
Maja Kiš, Sanja Furmeg, Vesna Jaki Tkalec, Jadranka Sokolović, Željko Cvetnić

P-04 **MERCURY CONTENT IN OLIVE OIL**
Ilija Klarić, Daniela Amidžić Klarić, Ana Mornar

P-05 **POJAVNOST CIKLIČKIH IMINA U DAGNJAMA (*Mytilus galloprovincialis*) PODRIJETLOM IZ SJEVERNOG JADRANA**
OCCURRENCE OF CYCLIC IMINES IN MEDITERRANEAN MUSSELS (*Mytilus galloprovincialis*) ORIGINATING FROM NORTHERN ADRIATIC SEA
Kristina Kvrgić, Dijana Mišetić Ostojić, Natalija Džafić, Jelka Pleadin

P-06 **DETECTION OF OCHRATOXIGENIC MOULDS IN TRADITIONAL CROATIAN SAUSAGES**
Tina Lešić, Manuela Zadravec, Dragan Brnić, Željko Jakopović, Maja Kiš, Jelka Pleadin

P-07 **SCREENING OF PESTICIDE CONTENT IN A TRADITIONAL APPLE CULTIVARS FROM CROATIAN MARKET**
Tihomir Kovač, Marija Kovač, Ante Nevistić, Maja Crkvenac, Goran Fruk, Martina Skendrović Babojelić, Jurislav Babić, Bojan Šarkanj, Ante Lončarić

FOOD ANALYSIS / ANALIZA HRANE

PRODUCTION OF SAFE FOOD AND FOOD WITH ADDED NUTRITIONAL VALUE / PROIZVODNJA ZDRAVSTVENO SIGURNE I NUTRITIVNO VRIJEDNE HRANE

P-46 **RECYCLING OF FOOD INDUSTRY BY-PRODUCTS: PRODUCTION OF COCOA BEAN SHELL POWDER USING SPRAY DRYING TECHNIQUE**
Jelena Vladić, Senka Vidović, Ivana Flanjak, Mojca Škerget, Stela Jokić

P-47 **POTENTIAL APPLICATION OF LYOPHILIZED TOMATO POMACE IN THE PRODUCTION OF DIRECTLY EXPANDED CORN SNACK PRODUCTS**
Antun Jozinović, Tanja Cvetković, Jasmina Ranilović, Irena Vađunec Bajrić, Nela Nedić Tiban, Antonija Jozinović Lešić, Đurđica Ačkar, Jurislav Babić, Drago Šubarić

P-48 **EVALUATION OF ANTIOXIDANT CAPACITY AND PHYSICOCHEMICAL CHARACTERISTICS OF WINES BASED ON POMEGRANATE JUICE**
Evangelos Kokkinomagoulos, Panagiotis Kandylis, Costas G. Biliaderis

P-49 **EFFECT OF MODIFIED ATMOSPHERE PACKAGING AND HEMP SEED POWDER ADDITION ON *SKUTA* QUALITY AND SHELF LIFE**
Elizabeta Kralj, Marijana Blažić, Irena Perković

P-50 **GASTROINTESTINALNA STABILNOST FENOLNIH SPOJEVA SVJEŽE I LIOFILIZIRANE BOROVNICE (*V. corymbosum* L.)**
GASTROINTESTINAL STABILITY OF PHENOLIC COMPOUNDS OF FRESH AND LYOPHILIZED BLUEBERRIES (*V. corymbosum* L.)
Nikolina Liović, Greta Krešić, Verica Dragović-Uzelac, Zoran Zorić, Gordana Kenđel Jovanović, Sandra Pavičić Žeželj, Tea Bilušić

P-51 **PRODUCTION OF FETA CHEESE WITH A REDUCED SALT CONTENT**
Katarina Lisak Jakopović, Irena Barukčić, Angela Božić, Rajka Božanić

P-52 **INFLUENCE OF BLANCHING TIME ON PHYSICAL PROPERTIES AND PPO ACTIVITY OF BIOFORTIFIED POTATO**
Ante Lončarić, Tihomir Kovač, Ante Blažević, Zdenko Lončarić, Jurislav Babić

P-53 **PRODUCTION OF A FUNCTIONAL WHEY CHEESE WITH PHYTOSTEROLS**
Janine Wagner, Prodromos Prodromidis, Panagiotis Kandylis, Eugenios Katsanidis, Costas G. Biliaderis, Thomas Moschakis

P-54 **PRODUCTION OF A NOVEL WHEY CHEESE BY USING COMPLEX COACERVATION**
Janine Wagner, Athanasios Maras, Prodromos Prodromidis, Panagiotis Kandylis, Athina Lazaridou, Costas G. Biliaderis, Thomas Moschakis

P-55 **OKSIDACIJSKA STABILNOST HLADNO PREŠANOG ULJA KOŠTICA GROŽĐA**
OXIDATION STABILITY OF COLD-PRESSED GRAPE SEED OIL
Tihomir Moslavac, Martina Šaravanja, Stela Jokić, Drago Šubarić, Antun Jozinović, Mario Jakobović

PLENARY LECTURES /
PLENARNA PREDAVANJA

HEALTH EFFECTS AND BIOAVAILABILITY OF CURCUMIN

Viljemka Bučević Popović*

Universtiy of Split, Faculty of Science, Department of Chemistry,
R. Boškovića 22, 21000 Split, Croatia
**viljemka@pmfst.hr*

plenary lecture

Turmeric (or *Curcuma longa* L.) has been used in diet as a spice, as well as a component of traditional remedies for centuries. Its main active component is curcumin, a hydrophobic polyphenol isolated from plant rhizomes responsible for the wide range of biological activities, such as antinflammatory, antioxidant, antibacterial, hypolipidemic, wound-healing etc. A considerable amount of research has been performed to elucidate the mechanisms by which curcumin may exert its medicinal effects, leading to a number of health claims. However, one of the major obstacles for medical application of curcumin is its poor bioavailability: curcumin is characterised by low water solubility, chemical instability, poor absorption and short-half life. In recent years, many different approaches have been developed to overcome this issue. The lecture will present the molecular properties of curcumin, its medical potential and the new strategies used to improve the oral bioavailability of curcumin. A systematic overview of randomised controlled trials, where curcumin was used as an intervention for various medical conditions, will be given. The therapeutic potential of novel curcumin formulations with improved bioavailability (nanocarriers, liposomes, adjuvants etc.) will be discussed.

Keywords: curcumin, bioavailability, health claim, polyphenol, randomised controlled trial

THE ROLE OF FOOD IN THE TOURIST EXPERIENCE

Greta Krešić*

University of Rijeka, Faculty of Tourism and Hospitality Management, Department of Food and Nutrition, Primorska 42, 51410 Opatija, Croatia
**gretak@fthm.hr*

plenary lecture

Recent years have seen a continuous increase in the number of tourists for whom enjoying food is a major travel motivation. Within today's experience economy, gastronomy tourism is developing as a special form of tourism. Although centred on the consumption of food and beverages, gastronomy tourism is also about visiting food or beverage producers, attending events and travelling theme roads while gaining a learning experience and enjoying the company of others. While wine tourism and gastronomy tourism have been recognised as tourism products with a very promising outlook for development, at the regional level they can also be drivers of economic growth and a platform for branding. Among modern tourists who are constantly in search of experiences and are willing to pay more for value added that is above-standard and exceeds expectations, a special niche stands out of so-called *foodies* who have a huge interest in food and whose travels are motivated by that interest. Interest in food can play a role in all stages of tourism travel. Food-related activities can be a driver of and motivation for travel planning, as well as a source of experiences during a trip and memories from a trip. Buying food souvenirs during a trip is a way for tourists to get in touch with the customs and culture of a given destination, and upon returning home those products will help tourists evoke memories and experiences, thus becoming tangible proof of an intangible experience.

Keywords: foodies, food souvenir, gastronomy tourism, tourist experience

CLINICAL IMPORTANCE OF MALNUTRITION IN PATIENTS WITH PARKINSON`S DISEASE

Svetlana Tomić[1,2*]

[1]Clinical Hospital Center Osijek, Clinic for Neurology, J. Huttlera 4, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine Osijek, J. Huttlera 4, 31000 Osijek, Croatia
[*]svetlana.tomic@vip.hr

plenary lecture

Neurodegenerative disorders are group of neurological diseases characterised with pathological proteine accumulation in neurons with cell death as consequence. The second most common neurodegenerative disorder is Parkinson`s disease with pathological accumulation of alpha synuclein and formation of Lewy bodies. Due to neuron death there are loss of neurotransmitters, especially dopamine, but also, noradrenaline, serotonine and acethylcholine leading to typical clinical presentation. Malnutrition is one of the symptoms of Parkinson`s disease with still unknown etiology. There are reported many risk factors causing malnutrition, such as age, gender, influence of therapy and motor symptoms, depression, halucinations and dementia. Papers about etiology of malnutrition in Parkinson`s disease reported possible influence of alpha synuclein, ghrelin, leptin, hypocretin/orexyn, dysfunction of hypothalamus and locus corelues and hyperhomocisteinemia. Due to malnutrition there are negative impact on patients quality of life and increased number of complications related to Parkinson`s disease. That`s why is malnutrition important clinical problem in patients with Parkinson`s disease that should be recognised and treated. For this purpose there are many scales that are used in clinical practice and that are usefull in this patients also.

Keywords: Parkinson disease, malnutrition, malnutrition scales

PREHRANA I VRTOGLAVICA

DIET AND VERTIGO

Andrijana Včeva[1,2*], Tihana Mendeš[1,2], Željko Zubčić[1,2], Hrvoje Mihalj[1,2], Josip Maleš[1,2], Stjepan Grga Milanković[2], Vjeran Bogović[2]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Medicinski fakultet Osijek, Katedra za otorinolaringologiju i maksilofacijalnu kirurgiju, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[2]KBC Osijek, Klinika za otorinolaringologiju i kirurgiju glave i vrata, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[*]andrijana.vceva@gmail.com

plenary lecture / plenarno predavanje

Benigna paroksizmalna pozicijska vrtoglavica (BPPV) je najčešći uzrok vrtoglavice u općoj populaciji koji dovodi do znatnog narušavanja i prekida svakodnevnih životnih aktivnosti i smanjenja kvalitete života. BPPV nastaje pokretanjem sitnih kristala kalcijeva karbonata, tzv. otokonija ili otolita, koji otkidanjem iz otolitičke mrlje utrikulusa labirinta unutrašnjeg uha djelovanjem sile teže dospijevaju u jedan od polukružnih kanala labirinta, najčešće stražnji, gdje podražuju kupularno osjetilo. Obilježena je kratkotrajnim napadom jake vrtoglavice koji se javlja pri određenim položajima glave, osobito pri ležanju i okretanju u postelji kao i pri pomicanju glave prema gore. Napadaj najčešće traje pet do deset sekundi, nikada duže od trideset sekundi. Najčešće je praćena mučninom, povraćanjem, nistagmusom koji je vertikalno-rotatorni, dok je sluh očuvan. Bolest je samoograničavajuća i umiruje se unutar nekoliko tjedana ili mjeseci, ali može prijeći i u kronični oblik ili u rekurentni oblik. BPPV može biti prouzročen raznim čimbenicima, ali se najčešće radi o idiopatskom ili primarnome, čiji se udio penje do 70 %. Metabolizam kalcija ima primarnu ulogu u sintezi i apsorbciji otokonija i može biti čimbenik u pojavi BPPV. U nekoliko istraživanja je opisana povezanost BPPV s osteoporozom i deficitom vitamina D iz čega se može zaključiti da poremećaj metabolizma kalcija može biti uzrokom BPPV.

Ključne riječi: vrtoglavica, BPPV, kalcij, vitamin D

Keywords: vertigo, BPPV, calcium, vitamin D

NUTRITION /
NUTRICIONIZAM

PARENTAL WILLINGNESS TO PARTICIPATE IN A NUTRITION-HEALTH SURVEY IN RELATION TO CHILD'S NUTRITIONAL STATUS

Vesna Bilić-Kirin[1,2*], Vesna Buljan[1], Ružica Lovrić[1], Ines Banjari[3]

[1]Institute of Public Health Osijek-Baranja County, Department of School Health, Drinska 8, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine Osijek, Josipa Huttlera 4, 31000 Osijek, Croatia
[3]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]vesna.bilic.kirin@gmail.com

poster presentation

An observational study was conducted on parents of 226 children (114 boys, 112 girls) who were asked whether they are willing to participate in a nutrition-health survey focused on children. Child's state of nourishment was assess by using IOTF cut-off values, and Cardio-Metabolic Risk (CMR; waist-to-height ratio). Total of 102 parents (45.1%) agreed to participate in the survey.
More girls were underweight (17.9% vs 11.5%) and overweight (14.3% vs 8.8%) in comparison to boys, with the same obesity rates (9.8% of obese girls vs 9.7% boys). Parents who have obese children were more likely to refuse to participate (p=0.019) in comparison to parents of underweight children. Parents of boys were more likely to refuse to participate (p=0.017). Significantly higher CMR have children of parents who refused to participate (p=0.017). Unemployment (p<0.001) and high-school diploma, especially for mothers were indicators of refusal to participate in the survey. Interestingly, parents with primary school and those with PhDs refused to participate in 100%.
The results clearly show the distortion of the data regarding child's nutritional status. In order to get representative data, both researches and clinicians need to imply techniques to encourage parents to participate in nutrition-health surveys.

Keywords: parental behavior, child's state of nourishment, survey participation, parental education, parental employment status

PROCJENA NUTRITIVNOG STATUSA STARIJIH OSOBA S OBZIROM NA MNA TEST, KOMORBIDITET I KRONIČNU TERAPIJU

ASSESSMENT OF NUTRITIONAL STATUS OF ELDERY PEOPLE IN A PRACTICE OF FAMILY MEDICINE IN RELATION TO MNA TEST, COMORBIDITY AND CHRONIC THERAPY

Zvonimir Bosnić[1*], Marko Miškić[2], Karolina Veselski[3], Domagoj Vučić[3], Ljiljana Trtica Majnarić[2]

[1]Dom zdravlja Slavonski Brod, Borovska 7, 35000 Slavonski Brod, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Medicinski fakultet Osijek, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[3]Opća Bolnica Dr. Josip Benčević, Andrije Štampara 42, 35000 Slavonski Brod, Hrvatska
[*]zbosnic191@gmail.com

poster presentation / postersko priopćenje

Procjena stanja uhranjenosti jedan je od najvećih izazova u ambulantnom radu s obzirom na sve veći broj osoba starije životne dobi, veći broj komorbiditeta i kronične terapije. MNA test (engl. *Minie Nutritional Test*) se pokazao kao najosjetljiviji i najspecifičniji alat. Cilj ovog istraživanja bio je procijeniti postoji li razlika u stanju uhranjenosti starijih osoba iznad 65 godina s obzirom na sociodemografske značajke, broj i vrstu kroničnih bolesti, broj lijekova u kroničnoj terapiji s postignućem na MNA testu.
U istraživanje je uključeno 207 pacijenata u dobi od 65 god. i više, u Domu zdravlja Slavonski Brod, tijekom razdoblja od 3 mjeseca. Prilikom posjete ispitalo se stanje uhranjenosti putem MNA testa, a podaci o kroničnim bolestima i broju lijekova korišteni su iz računalnog program Medicus. Prema rezultatu MNA testa, 62 ispitanika (30 %) pokazala su rizik za pothranjenost, medijan ispitanika je 72 godine, medijan rezultata MNA testa je 25,50. U 64,73 % ispitanika prisutan je multimorbiditet, 42 % uzima više od tri lijeka u kroničnoj terapiji. Nije pronađena statistički značajna razlika s obzirom na broj kroničnih bolesti (p=0,89), broj lijekova (p=0,87) s obzirom na rezultat MNA testa. Važno je redovito pratiti stanje uhranjenosti, kako bi se prevenirala progresija bolesti i smanjili dodatni troškovi liječenja.

Ključne riječi: MNA test, komorbiditet, kronična terapija

Keywords: MNA test, comorbidity, chronic therapy

OMEGA-3 - MULTIDISCIPLINARY PERSPECTIVES

Jelena Cvejić*

University of Novi Sad, Faculty of Medicine, Department of Pharmacy,
Veljka Petrovića 3, 21000 Novi Sad, Serbia
**jelena.cvejic@mf.uns.ac.rs*

poster presentation

Scientific evidence points out that an appropriate intake of *n*-3 LCPUFA, widely known as 'omega-3', exhibits protective effect on human health. It is recognized that regular consumption of marine omega-3, eicosapentaenoic acid (20:5 *n-3*; EPA) and docosahexaenoic acid (22:6 *n-3*; DHA) reduces risk of chronic and inflammatory diseases. The use of fish and fish oil, as main sources of omega-3 is increasingly becoming under pressure due to serious public health and ecological concerns. From sustainability perspective, there is a growing interest related to the alternative sources of omega-3. Positive health impact of omega-3 ranges from being essential in neuronal development, to impacting on immunological reactions. An 'inflammation-suppressive' effect appears to be the common denominator of the beneficial effects of omega-3. DHA and EPA are known for being essential in neuronal/brain functioning in close connection to its immunomodulatory properties, thus strongly influencing development of non-communicable diseases (NCD), also including neurological and psychological disorders developing as a consequence of neuro-inflammation.

Keywords: omega-3, sustainable sources, inflammation, immune system, neuro

Acknowledgment

This transnational project is part of the ERA-Net SUSFOOD2 co-funding by the European Union´s Horizon 2020 research and innovation programme and of the National Project of Technological Development - Ministry of Science and Protection of Natural Environment of Serbia, no TP31020.

ANEMIA IN PATIENTS WITH DIABETES MELLITUS TYPE 2

Lejla Dedić[1*], Midhat Jašić[1], Daniela Kenjerić[2], Ines Banjari[2], Nejra Hodžić[3]

[1]University of Tuzla, Faculty of Pharmacy, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[3]Medical Center Plava Poliklinika, 3. Tuzlanske Brigade 7, 75000 Tuzla, Bosnia and Herzegovina
[*]dedicc_lejla@outlook.com

poster presentation

People with type 2 diabetes mellitus carry the risk of anemia as a result of malnutrition associated with nutrient absorption. In patients with diabetes, anemia is often not recognized because it does not belong to the mandatory procedures for monitoring diabetes.
The aim of the paper was to collect and analyze data indicating an association between lifestyle, diabetes and anemia.
Diagnozed anemia ranges from 20 – 30% in people with diabetes. Anemia is estimated to remain undiagnozed in 5 – 10% of people. It often occurs in patients with diabetic nephropathy that results in low hemoglobin levels. The hemoglobin concentration is closely related to the diabetic profile, especially to the kidney damage. In addition, some types of medicines that can be used in the treatment of diabetes, such as metformin, may reduce cyanocobalamin utilization and iron bioavailability. In addition to metabolic syndrome, microalbuminuria and anemia can often occur. Supplementation with vitamins and iron preparations reduces the possible consequences of the disease.
There are claims with diabetes not to cause anemia directly but indirectly to participate in its development. Therefore anemia testing should be performed in patients with diabetes.

Keywords: anemia, diabetes

THE EFFECT OF NUTRITIONIST EDUCATIONAL INTERVENTION IN ADULTS WITH OBESITY: A NON-CONTROLLED CLINICAL STUDY

Maja Gradinjan Centner[1,2*], Hrvoje Centner[1], Ivana Kučinac Zubac[3], Anja Radin Major[4]

[1]Nutrition Balance, Š.P. Preradovića 7, 31000 Osijek, Croatia
[2]Clinic for the Internal Diseases, KBC Osijek, J. Hutlera 4, 31000 Osijek, Croatia
[3]Đakovo Hospital, Ul. P. Preradovića 2, 31400 Đakovo, Croatia
[4]Clinic Department for the Transfusion medicine of the Clinic Centre in Osijek, J. Hutlera 4, 31000 Osijek, Croatia
[*]nutricionizam.os@gmail.com

poster presentation

We tested the effect of education as an intervention for adults with obesity in a non-controlled clinical study. The education consisted of an individual nutrition plan based on nutrition habits estimated by the Food frequency questionnaire (FFQ) and the 24 h dietary recall interview method together with anthropometric analysis which included measuring body mass (BM), height, body mass index (BMI), %fat, %muscle tissue, visceral fat and the basal metabolic rate (BMR). All the participants had to go through the individual nutrition counselling. Body mass reduction was monitored in the period of 3 months. Participants were divided in subgroups according to sex and we used Mann-Whitney U test, t-test and Pearson correlation coefficient to analyse the differences. Participants were asked do they conduct some sort of physical exercise and 48.8% of men and 38.3% women stated that they attend fitness centers. The study included 41 men (min BM=69 kg; max BM=139 kg; min BMI=22.2; max BMI=42.1) and 180 women (min BM=57 kg; max BM=134 kg; min BMI=20.8; max BMI=50.2). After 3 months from baseline, average body mass decreased 6.86% in women and 7.1% in men. There were 92% of participants whose body mass was lower after 3 months (range of body mass decrease in men was 2 – 18.2% and in women 0 – 21.3%). The results indicated positive correlation (p=0.48) between number of counselling sessions attended in all participants (p<0.05) meaning that the higher rate of attendance lead to the higher loss of body mass. However, the same association was not found in subgroups based on sex (women p=0.43; men p=0.58). At the beginning of the study adipose tissue (AT) and muscle tissue (MT) percentage was measured (men AT 31.49%, MT 32.3%), (women AT 44.15%, MT 24.72%) so as at the end of the study (men AT 28.21%, MT 34.37%), (woman AT 41.01%, MT 26.24%) and body composition change was in men AT -2.2%, MT +1.26% and in woman AT -3.23%, MT +1.53%. In conclusion, our study indicates that education provided by a nutritionists may play a significant role in body mass regulation since the study noted higher rate of success in weight loss among patients with repeated occurrence of nutrition counselling sessions.

Keywords: overweight, counselling, nutritionist, weight loss

FOOD INGREDIENTS WITH AN EFFECT ON AGE-RELATED MACULAR DEGENERATION

Nejra Hodžić[1*], Midhat Jašić[2], Drago Šubarić[3], Daniela Kenjerić[3], Ines Banjari[3], Lejla Dedić[2]

[1]Medical Center Plava Poliklinika, 3. Tuzlanske Brigade 7, 75000 Tuzla, Bosnia and Herzegovina
[2]University of Tuzla, Faculty of Pharmacy, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
[3]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]nejrahod88@gmail.com

poster presentation

Age-related macular degeneration – AMD is a medical condition affecting the macular area of the eye, and represents the most common cause of irreversible vision loss in people aged older then 50 years. The objectives of the work were to gather the data on how food ingredients towards slowing down the process of age-related macular degeneration and early loss of central vision. Certain food ingredients can affect vision improvement. Recommended daily doses of beta carotene, vitamin C, vitamin E and zinc can reduce the risk of early to advanced progression of AMD by 25%. Lutein and Zeaxanthin (belong to the group of carotenoids, and are most abundant in green leafy vegetables) have a protective effect to some extent towards preventing macular degeneration, and that in the early phase, but they do not have a meaningful effect towards preventing it in its advanced stages. Greater fat intake in diets is connected with the increased prevalence of early and advanced AMD in many studies, while greater intake of fish meat and omega-3 fatty acids is connected with the lower rates of AMD. Consuming polyphenols (subgroup of flavonoids, mostly present in berry type fruits) which also have a high antioxidant effect can be preventive towards the emergence and progression of AMD. It is proven that Mediterranean diet has a protective role in terms of the development of advanced AMD. Proper diet rich with antioxidants, minerals, vitamins and polyphenols has a correspondingly positive effect in the prevention and delay in eye related illness' development, especially in the case of AMD, hence during the ophthalmic examination of persons who are in the risk groups it is important to emphasize and council them on the importance of a proper diet.

Keywords: age-related macular degeneration, vision, nutrition

VALIDATION OF THE QUESTIONNAIRE FOR DETERMINING THE INFLUENCE OF NUTRITION IN PERSONS WITH THYROID FUNCTION DISORDER

Dalila Imširpašić[1*], Midhat Jašić[1], Brižita Đorđević[2], Dubravka Vitali Čepo[3], Senada Selmanović[4], Slađana Šobajić[2]

[1]University of Tuzla, Faculty of Pharmacy, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
[2]University of Belgrade, Faculty of Pharmacy, Vojvode Stepe 450, Beograd 11221, Serbia
[3]University of Zagreb, Faculty of Pharmacy and Biochemistry, Ante Kovačića 1, 10000 Zagreb, Croatia
[4]University of Tuzla, Faculty of Medicine, Univerzitetska 1, 75000 Tuzla, Bosnia and Herzegovina
[*]dalilaimeliha@hotmail.com

poster presentation

A special questionnaire has been developed for the purpose of investigating the impact of iodine intake and other food ingredients on thyroid dysfunction, which has been standardized and developed on the basis of nutritional recommendations and guidelines for people with thyroid disease. In order to conduct further research, it was necessary to validate the questionnaire. The aim of the paper was to develop a validation method based on checking the conformity of the questions in the questionnaire and comparing the obtained data with the laboratory data for the tested and controlled group. Prior to the start of the main study, data were collected on individuals with thyroid dysfunction and healthy subjects. To validate the questionnaire containing 23 questions classified into eight groups, a pilot controlled and questioned group of respondents was used. Using a Likert scale, with the significance factors for each question, a total nutritional status and lifestyle score were obtained for both groups of respondents. In addition, differences in nutritional status were identified for each group of foods that have an effect on thyroid dysfunction. Ten relevant questions were answered from the complete questionnaire and the average score for the controlled group was 2.48 and for the tested group 2.17. Finally, it could be concluded that there are significant differences in eating and eating habits between control and study subjects.

Keywords: questionnaire, thyroid dysfunction, validation

STAVOVI POTROŠAČA O PREDNOSTIMA I NEDOSTACIMA KONZUMACIJE JAJA

CONSUMER ATTITUDES ON THE ADVANTAGES AND DISADVANTAGES OF EGG CONSUMPTION

Igor Kralik[1], Ana Zelić[2], Jelena Kristić[1], Sanja Jelić Milković[1*], Ana Crnčan[1]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet agrobiotehničkih znanosti Osijek, Vladimira Preloga 1, 31000 Osijek, Hrvatska
[2]AGRO-KOVAČEVIĆ, Vijenac Dinare 2, 31000 Osijek, Hrvatska
[*]sanja.jelic@fazos.hr

poster presentation / postersko priopćenje

Jaja su ekonomični izvor nutrijenata, posebice su značajna za rast i razvoj djece i mladih osoba. Istraživanje je provedeno na potrošačima u dobi do 30 godina. Za potrebe istraživanja provedena je anketa na uzorku od 200 ispitanika (M, n=100) i (Ž, n=100). Anketni upitnik je sadržavao tri skupine pitanja: pojam kvalitete jaja, prednosti konzumacije jaja u odnosu na druge animalne namirnice i nepovoljni učinci konzumacije jaja. Izgled i težina jaja (M 4,8; Ž 4,01; p>0,05), rok uporabe (M 4,21; Ž 4,31; p>0,05), čistoća ljuske kao i zdravstvena ispravnost (M 4,11; Ž 4,50; p<0,01) ocjenjeni su od strane ispitanika sa prosječnim ocjenama iznad 4 što znači da su izrazito bitni pokazatelji kvalitete. Visokom ocjenom ispitanici su ocijenili prednost pripremanja obroka u odnosu na druge animalne proizvode
(M 4,11; Ž 4,20; p>0,05) a posebno su zadovoljni s mogućnošću više namjenske uporabe jaja (M 4,07; Ž 4,29; p>0,05). Nedostatci kao što su mogućnost zaraze (M 3,60; Ž 3,42 p>0,05) unos masti i kolesterola (M 2,86; Ž 2,93; p>0,05) i odbojnost prema jajima u prehrani (M 2,22; Ž 2,12 p>0,05) ne predstavljaju ograničavajuće čimbenike za ispitanike. Nedostatkom smatraju oštećenja ljuske tijekom transporta i rukovanja jajima (M 2,99; Ž 3,31; p<0,01).

Ključne riječi: kvaliteta jaja, konzumacija jaja, preferencije, potrošači

Keywords: egg quality, egg consumption, preferences, consumers

ANTIMIKROBNA REZISTENCIJA – IMPLIKACIJE NA JAVNO ZDRAVLJE

ANTIMICROBIAL RESISTANCE – PUBLIC HEALTH IMPLICATIONS

Sead Karakaš[1,2*], Senad Huseinagić[3], Majda Mulić[4]

[1]Univerzitet u Zenici, Medicinski fakultet, Travnička cesta 1, 72000 Zenica, Bosna i Hercegovina
[2]Zavod za javno zdravstvo Srednjobosanskog kantona, Bolnička 1, 72270 Travnik, Bosna i Hercegovina
[3]Institut za zdravlje i sigurnost hrane, Fra Ivana Franje Jukića 2, Zenica 72000, Bosna i Hercegovina
[4]Zavod za javno zdravstvo Tuzlanskog kantona, Tuzlanskog odreda 6, Tuzla 75000, Bosna i Hercegovina
[*]tr.zavod@bih.net.ba

oral presentation / usmeno priopćenje

Antimikrobna rezistencija (AMR) je sposobnost mikroorganizama da razviju otpornost na antimikrobne lijekove koji su se do tada koristili u liječenju infekcija koje takvi mikroorganizmi uzrokuju. Cilj i zadatak rada je bio prikupiti i analizirati podatke o antimikrobnoj rezistenciji i njihove implikacije na javno zdravlje. Od ukupno proizvedenih antibiotika na svjetskoj razini, gotovo 50 % ih se primjenjuje u prevenciji, liječenju i promicanju rasta domaćih životinja. Raširena ovisnost o upotrebi antimikrobnih sredstava (AMU) kod životinja rezultira selektivnim pritiskom pod kojim bakterije mogu razviti mutacije koje stvaraju otpornost ili steći gene otpornosti. Prisutnost rezistentnih patogenih sojeva u prehrambenom sustavu stvara direktan rizik za javno zdravlje. Životinje namijenjene ljudskoj prehrani primarni su rezervoar zoonotskih patogena. Otporni patogeni sojevi koji se najčešće susreću u namirnicama životinjskog podrijetla su *Staphylococcus aureus*, *Escherichia coli*, *Listeria monocytogenes*, *Salmonella* spp. itd. Bakterijska se rezistencija iz životinja može proširiti na ljude putem hrane, vode i okolišnih uzoraka i izravnog kontakta sa životinjama. Upotreba antibiotika u nemedicinske ili neterapeutske svrhe u poljoprivrednim okruženjima koja su na podterapeutskom nivou tijekom dužeg razdoblja promatra se kao glavni put za pojavu rezistencije na antibiotike, a potvrđeno je i da su geni rezistentnosti preneseni na čovjeka. Strategije za smanjenje ili ograničavanje terapijske upotrebe antibiotika u životinjama putem poboljšane ishrane životinja, poboljšanih životnih uvjeta i upravljanja otpadom, mjera biološke sigurnosti i poboljšanja prirodnog imuniteta životinja mogu rezultirati prevencijom i kontrolom infekcija.

Ključne riječi: otpornost, antibiotici, subterapijske doze, veterinarska medicina

Keywords: resistance, antibiotics, subtherapy doses, veterinary medicine

ENERGY AND NUTRITIVE VALUE OF MEALS IN KINDERGARTENS IN VARAŽDIN

Petra Lončarić, Irena Keser*

University of Zagreb, Faculty of Food Technology and Biotechnology,
Pierottijeva 6, 10000 Zagreb, Croatia
**ikeser@pbf.hr*

poster presentation

Healthy diet is particularly important in the stages of intense growth and development. Considering that children attending kindergartens spend there 8-10 hours daily, diet quality should be adequate. The aim of this study was to determine energy and nutritive value of the menus in public and private kindergartens, and to evaluate their consistency with the recommendations. The energy, macro- and micronutrients content mostly satisfied the needs of children aged 1-3 years, while for children aged 4-6 years was unsatisfactory. The significant difference between public and private kindergartens was established in the content of carbohydrates (p=0.003), dietary fibers (p=0.002), phosphorus (p=0.033), iron (p<0.001), vitamin B_1 (p=0.071) and vitamin B_3 (p=0.008). The amount of fruit, meat, milk and dairy products, and cereals and cereal products was significantly different between public and private kindergarten. The amount of cereals and cereal products was higher in a public kindergarten, and the amount of fruit, meat and milk and diary products was higher in a private kindergarten. The menus corrections are required to be appropriate for children aged 4-6 years, by increasing the amount of existing foods and by introducing some new foods such as nuts, seeds and some types of legumes.

Keywords: kindergarten, energy and nutritive value, macro- and micronutrients, kindergarten menus

PREHRAMBENE NAVIKE I STAVOVI O PREHRANI UČENIKA ČETVRTIH RAZREDA OSNOVNIH ŠKOLA GRADA VARAŽDINA

DIETARY HABITS AND ATTITUDES TOWARDS NUTRITION OF FOURTH GRADE PRIMARY SCHOOL PUPILS IN THE CITY OF VARAŽDIN

Karmen Kokot[1*], Daniela Kenjerić[2]

[1]Graditeljska, prirodoslovna i rudarska škola, Hallerova aleja 3, 42000 Varaždin, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[*]karmenkokot@net.hr

poster presentation / postersko priopćenje

Prehrambene navike stečene u dječjoj dobi najčešće ostaju nepromijenjene i u odrasloj dobi te su važan čimbenik dobrog zdravlja kroz cijeli život. Cilj istraživanja bio je ispitati prehrambene navike i stavove o prehrani učenika četvrtih razreda varaždinskih osnovnih škola, te provjeriti njihovo znanje o pravilnoj prehrani. U istraživanju je sudjelovalo 78 djevojčica i 85 dječaka s prebivalištem u gradu Varaždinu. Istraživanje je provedeno ispunjavanjem anonimnog upitnika, prilagođenog uzrastu, u trajanju od 15 – 20 minuta, u sklopu edukativnih radionica održanih od veljače do svibnja 2018. godine. Rezultati su pokazali da 60,3 % dječaka i 58,8 % djevojčica ima 4 – 5 obroka dnevno, voće više puta na dan jede 65,4 % dječaka i 67,1 % djevojčica. Topli kuhani obrok zastupljen je svakodnevno kod 59,0 % dječaka i 72,9 % djevojčica. Prehrambene navike uglavnom su zadovoljavajuće, osim konzumacije zajutraka koji redovito ima samo 33,3 % dječaka i 51,8 % djevojčica te učestale konzumacije slatkiša kod dječaka (48,7 % svakodnevno). I djevojčice i dječaci imaju dobro znanje o pravilnoj prehrani što je rezultat kontinuiranih edukacija. Sveukupno gledano prehrambene navike djevojčica bolje su nego dječaka, iako većina djevojčica smatra da bi mogla poboljšati svoje prehrambene navike, za razliku od dječaka koji uglavnom smatraju da imaju dobre prehrambene navike, što pokazuje veću spoznajnu zrelost djevojčica u toj dobi.

Ključne riječi: učenici četvrtih razreda, prehrambene navike, stavovi o prehrani, znanje o prehrani

Keywords: fourth grade pupils, dietary habits, attitudes towards nutrition , nutrition knowledge

KNOWLEDGE OF THE OSIJEK UNIVERSITY STUDENTS ABOUT THE INFLUENCE OF NUTRITION ON HUMAN HEALTH

Maja Miškulin*, Sara Klasan, Ivan Miškulin, Nika Pavlović, Matea Matić Ličanin, Albina Dumić

Josip Juraj Strossmayer University of Osijek, Faculty of Medicine Osijek, Josipa Huttlera 4, 31000 Osijek, Croatia
**maja.miskulin@mefos.hr*

poster presentation

Nutritional knowledge is one of the factors that affect the nutritional habits of individuals, families and communities. The aim of this study was to determine the nutritional habits of Osijek university students and their knowledge about the influence of the nutrition on human health. A cross-sectional questionnaire study included 412 graduate students, median age 23.0 years, 78.9% females and 21.1% males, and was conducted through an online anonymous questionnaire during May and June 2019. Study revealed that only 56.3% of students eat breakfast each day and only 48.5% of them consume fruit and vegetables each day. It was established that females more frequently eat breakfast each day (p=0.040) and more frequently consume fruit and vegetables each day (p=0.020). Considering the knowledge about the influence of the nutrition on human health it was established that students from the faculties that belong to the biomedicine and biotechnical fields of science had showed significantly better knowledge about the influence of the nutrition on human health in comparison to the students from the faculties that belong to other scientific fields (p=0.010). Additional education is needed in order to improve nutritional habits and thus also the general health of the studied population.

Keywords: health, nutritional habits, nutritional knowledge, Osijek, university students

EXCISE ON SUGAR-SWEETENED BEVERAGES ON THE PREVENTION AND CONTROL OF OBESITY

Rajko Odobaša*

Josip Juraj Strossmayer University of Osijek, Faculty of Law, Department of Economic Sciences, Stjepana Radića 13, 31000 Osijek, Croatia
**rodobasa@pravos.hr*

oral presentation

Excise duty on sugar-sweetened beverages is a tax policy instrument that gained a lot of interest in recent years as a mean to try to prevent and control pandemic proportions of obesity. Obesity is a very serious clinical and public health disease that affects over 600 million people globaly with immense economic burden. Since the introduction of excise duties on sugar-sweetened beverages, but also on other "nutritionally empty" foods, positive changes are expected in consumer's behavior and relation towards the structure of their own diet and personal health. Calories from sugar-sweetened beverages represent significant source of excessive calories in the diet of a modern man on a global scale which can result with obesity. Higher sale prices of taxed sugar-sweetened beverages should decrease their consumption, consequently lowering caloric intake, and the drop in obesity is expected. Additionally, tax revenues can be used for huge health care spendings for obese individuals, to subsidize the diet of the poorest population groups, or to be used in research and development in food industry i.e. for the production of highly nutritious food. If excise caused a drop in demand for such beverages, the drop could force the producers of sugar-sweetened beverages to improve the quality of their products and change assortments. The introduction of the excise tax on sugar-sweetened beverages has been disputed, and those against question the effects on dietary, health, financial and social sector. Contradictory results of the efficiency of these excises contribute to a burning debate over their introduction.

Keywords: fiscal policies, the effects of excise, obesity, sugar-sweetened beverages

POTREBNE KOLIČINE MAKRONUTRIJENATA PRIJE I NAKON TENISKIH SUSRETA

REQUIRED AMOUNTS OF MACRONUTRIENTS BEFORE AND AFTER THE TENNIS MATCHES

Mario Oršolić[1*], Petar Barbaros Tudor[2], Antonija Šarić[1]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[2]Sveučilište u Zagrebu, Kineziološki fakultet, Horvaćanski zavoj 15, 10000 Zagreb, Hrvatska
[*]mario.orsolic@ptfos.hr

poster presentation / postersko priopćenje

Tenis je jedan od najpopularnijih sportova koji se igra tijekom cijele godine. Procjenjuje se da je gotovo 60 milijuna ljudi uključeno u neku vrstu teniske igre i natjecanja. Trajanje teniskog susreta na profesionalnoj razini može biti i duže od pet sati, pa se u tenisu, kao i u drugim sportovima koji mogu duže potrajati, prehrana smatra izuzetno bitnim čimbenikom za osiguranje potrebne energije tijekom susreta te oporavak nakon navedene aktivnosti. Svrha je ovoga rada istražiti područje potrebnoga unosa ugljikohidrata, proteina i masti prije i nakon susreta kako bi se upoznali s poželjnim vrijednostima koje će osigurati potrebnu energiju i ubrzati oporavak tenisača/ica tijekom i nakon susreta. Budući tenisači/ice koriste aerobni i anaerobni sustav energije tijekom igre, ugljikohidrati se navode kao glavni izvor energije prije i poslije susreta, dok se proteini smatraju izuzetno važnim čimbenikom kod oporavka nakon aktivnosti. Za razliku od navedenih sastojaka hrane unos masti nije toliko istražen s aspekta potrebne količine unosa prije i nakon susreta, ali su vrlo dobro poznate preporuke potrebnog dnevnog unosa od 1,0 do 1,5 g/kg. Istraživanjem je utvrđeno da su preporučene vrijednosti za unos ugljikohidrata prije susreta 6 g/kg do 12 g/kg te poslije susreta 8 do 10 g/kg. Poželjni unos proteina neposredno prije susreta iznosi 0,3 g/kg te isto toliko i nakon susreta (unutar 2 sata nakon aktivnosti). Pregledom istraživanja također je utvrđeno da unosi nisu jedinstveni i da oni mogu ovisiti o brojnim faktorima, kao što su npr. spol, dob, tjelesna masa, vrijeme odigravanja meča, dužina trajanja meča, temperatura, podloga, loptice i sl.

Ključne riječi: tenis, ugljikohidrati, proteini, masti, oporavak

Keywords: tennis, carbohydrates, proteins, fats, recovery

POVEZANOST PREHRAMBENIH I ŽIVOTNIH NAVIKA SA SMANJENOM GUSTOĆOM KOSTIJU KOD ŽENA U POSTMENOPAUZI NA PROSTORU OPĆINE TRAVNIK

RELATION BETWEEN NUTRITIONAL AND LIFE HABITS AMONG WOMEN AT POSTMENOPAUSAL PERIOD WITH REDUCED BONE DENSITY IN THE MUNICIPALITY OF TRAVNIK

Mateja Paklarčić[1*], Ermina Kukić[1], Sead Karakaš[1], Marija Brnada-Butorac[2]

[1]Zavod za javno zdravstvo SBK/KSB, Bolnička 1, 72270 Travnik, Bosna i Hercegovina
[2]JU Dom zdravlja Travnik, Vezirska 1, 72270 Travnik, Bosna i Hercegovina
[*]matejapaklarcic987@gmail.com

poster presentation / postersko priopćenje

Osteoporoza se definira kao sistemska skeletna bolest koju karakterizira smanjenje koštane mase i poremećaj mikroarhitekture koštanog tkiva što povećava fragilnost kosti i rizik od njene frakture. Cilj ovoga rada bio je utvrditi utjecaj pojedinih faktora rizika u nastanku osteoporoze. Istraživanjem su obuhvaćene 204 žene životne dobi od 38 do 85 godina s područja općine Travnik. Periferna gustoća petne kosti mjerena je pomoću ultrazvučnog aparata OsteoSys sonost 3000, a prehrambene i životne navike pomoću anketnog upitnika specijalno dizajniranog za potrebe istraživanja, koji se sastojao od 21 pitanja. Za izračun ITM korištene su vaga s točnošću ± 0,1 kg i visinomjer ± 0,5 cm.
Od ukupnog broja ispitanica (n=204), 31 žena (15,20 %) ima T vrijednost koja defininira stanje osteoporoze, 123 (60,29 %) osteopenije, a ostatak 50 (24,51 %) je s urednom T vrijednosti. Sve ispitanice s osteoporozom konzumiraju cigarete, dok sa stanjem osteopenije konzumira 102 (82,92 %). Kada je u pitanju konzumiranje kave i mliječnih proizvoda, među onima sa stanjem osteoporoze najveći je udio onih koji piju više od 5 šalica kave dnevno 19 (61,29 %), dok je svakodnevna zastupljenost mliječnih proizvoda izražena samo kod 3 (9,6 %). Od ukupnog broja onih sa stanjem osteoporoze 8 (25,8 %) vježba više od 90 minuta dnevno, dok 82 (66,66 %) sa stanjem osteopenije vježba više od 30 minuta dnevno. Prema tome može se zaključiti da postoji povezanost između životnih navika i gustoće kostiju u ispitivanoj populaciji.

Ključne riječi: prehrambene i životne navike, T vrijednost, osteoporoza, postmenopauza

Keywords: nutritional and life habits, t score, osteoporosis, postmenopausal period

CHILDREN'S BASE ADEQUATE NUTRITION FOR A FURTHER QUALITY LIFE

Amela Pašić[1*], Fuad Pašić[2], Midhat Jašić[3]

[1]University Clinical Center Tuzla, Clinic for Pediatric Diseases, Ulica prof. dr. Ibre Pašića, 75000 Tuzla, Bosnia and Herzegovina
[2]University Clinical Center Tuzla, Surgery Clinic, Ulica prof. dr. Ibre Pašića, 75000 Tuzla, Bosnia and Herzegovina
[3]University of Tuzla, Faculty of Technology, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
[*]dr.pasicamela@gmail.com

oral presentation

Caring for a healthy diet is one of the most important areas of pediatrics. The age of the most sensible and intense growth and development must be accompanied by the intake of healthy foods and the promotion of healthy lifestyles. Nutrition in children is based on the same principles as adult nutrition. They all need vitamins, minerals, carbohydrates, proteins and fats. However, children need different amounts of specific nutrients at different ages when growing up. Quantitatively and qualitatively balanced nutrition enables the normal growth and development of a child and protects it from many maladies related to malnutrition. The energy requirements for physical activity are very variable, as is the activity of a child. Early childhood is critical to the development of obesity. It is well known and accepted that natural nutrition contributes to the health of infants and children, and that the occurrence of some diseases can be reduced by promoting natural nutrition. Adolescence is the second period of increased propensity to develop obesity. In younger children, if one parent is obese, their chance of being obese in adulthood is three times higher, and if both parents are obese, 10 times higher than in children whose parents are not obese. The paper presents the original thinking of the clinician pediatrician regarding the causal relationship between proper or incorrect nutrition and their association with multiorgan repercussions. Developing proper eating habits, ie developing healthy lifestyles from childhood, has undoubtedly positive effects on future health and quality of life.

Keywords: eating habits, promoting healthy lifestyles, children

NUTRITIONAL INTERVENTION AS A TOOL FOR THE IMPROVEMENT OF FUNCTIONAL INDEPENDENCE AND NUTRITION KNOWLEDGE IN INDIVIDUALS WITH SERIOUS MENTAL ILLNESSES: A STUDY CONCEPT

Ivana Pavičić*, Tamara Sorić

Psychiatric Hospital Ugljan, Otočkih dragovoljaca 42, 23275 Ugljan, Croatia
**ivanapavicic92@gmail.com*

poster presentation

Individuals with serious mental illnesses (SMI) usually have lower functional capability and poorer dietary habits when compared to the general population. The aim of the present study is to examine the impact of nutritional intervention on functional independence and nutrition knowledge in individuals with SMI. The study will include 40 hospitalized individuals with SMI, aged 18 – 65. All participants with provided informed consent, will be assigned to four interactive nutritional workshops (5 – 8 participants per group) conducted by an occupational therapist and a nutritionist during the one month period. Workshops will include educative and practical parts primarily focused on the preparation of meals according to dietary guidelines. At the beginning of the intervention period, all relevant socio-demographic data will be gathered in the form of a face-to-face interview. Prior to and immediately after the intervention, functional independence will be evaluated using the Occupational Self-Assessment (OSA) Version 2.1, while the nutrition knowledge will be assessed using the General Nutrition Knowledge Questionnaire (GNKQ). All the study data will be analyzed using descriptive and inferential statistics. The results are expected to show the amelioration in participants' overall nutrition knowledge and increase in their functional ability and independence.

Keywords: serious mental illnesses, nutritional intervention, functional independence, nutrition knowledge

ASTAXANTIN AND SKIN PROTECTION

Diana Podvorac*, Marizela Šabanović

University of Tuzla, Faculty of Technology, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
**diana.podvorac7@gmail.com*

poster presentation

Astaxanthin, xanthophil carotenoid, is naturally synthesized in numerous bacteria, microalgae and yeast. The commercial production of this pigment is traditionally carried out by chemical synthesis, but the microalgae Haematococcus pluvialis is the most promising source for industrial biological production. There is an increasing number of evidence that astaxanthin has different health benefits and important nutritional applications in the field of dermatology. Among the main mechanisms of action are: antioxidant, photoprotective, anti-inflammatory, anti-carcinogenic and protective. Based on current literature, astaxanthin has shown potential biological activity in in vitro and in vivo models. These studies highlight the effects of astaxanthin and its beneficial effects on the skin. Astaxanthin products are used for commercial purposes in dosage forms such as tablets, capsules, syrups, oils, soft gels, creams, biomasses and granulated powders. Patent applications for astaxanthin are available in food, animal feed, and dietary applications.

Keywords: astaxantin, skin, antioxdant, protection

ANIMAL AND PLANT PROTEIN INTAKE IN CROATIAN TODDLERS AND DIFFERENCES BETWEEN SOCIO-ECONOMIC STATUS

Ana Ilić[1], Darja Sokolić[2], Irena Keser[1], Dragica Šakić[3], Irena Colić Barić[1], Ivana Rumbak[1*]

[1]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[2]Croatian Agency for Agriculture and Food, Vinkivačka cesta 63c, 31000 Osijek, Croatia
[3]Specialistic Paediatric Office, Anina 96, 10000 Zagreb, Croatia
[*]icecic@pbf.hr

poster presentation

Early in life particular importance should be given to proteins in the diet since healthy growth and development relies on them. For a long time, the focus was on the meeting the requirements for protein intake and this still remain the problem in developing economies. In western world where insufficient intake of proteins in children is rarely a problem, new evidence emerges regarding the association of high protein consumption and childhood health i.e. later risk for non-communicable diseases. Furthermore, it has been suggested to assess animal and plant/vegetable protein separately since their effect to health outcomes could be different.
Dietary records for two non-consecutive days were collected from 103 toddlers average aged 23.1 ± 0.8 months. The nutritional value of dietary records was calculated using Croatian National Food Composition Tables and nutrition declaration of food products. Kruskal-Wallis test was used to investigate the differences between toddlers grouped considering to their socio-economic status (SES). The energy from total protein contributed for 15.2% ± 0.3% to daily energy intake. Toddlers' daily intake of total protein was on average 3.6 ± 0.1 g/kg. The animal to plant protein ratio was 2.2 ± 0.1 (2.4 ± 0.1 g/kg animal protein vs. 1.2 ± 0.1 g/kg plant protein). Across three SES groups the energy derived from total protein was significant different (p=0.046). Also, the significant difference (p=0.011) was observed in plant protein intake and it increased with higher SES (1.1 ± 0.1, 1.2 ± 0.1 and 1.6 ± 0.1, respectively). Overall results show that the toddlers' daily intake of total protein was higher than the recommendations and the majority of protein intake came from animal protein. Socio-economic status seems to play a role in the intake of plant proteins since the intake of plant protein increases in the groups with higher socio-economic status.

Keywords: toddlers, protein intake, animal protein, plant protein, socio-economic status

THREE CRITICAL POINTS IN NUTRITION PROCESS FOR HEALTH CARE AND DISEASE PREVENTION

Nizama Salihefendić[1*], Muharem Zildžić[2], Dženita Salihefendić[2], Midhat Jašić[3]

[1]University of Tuzla, Faculty of Medicine, Univerzitetska 1, 75000 Tuzla, Bosnia and Herzegovina
[2]Medicus A Gračanica, Mustafe Rešidbegovića 2, 75320 Gračanica, Bosnia and Herzegovina
[3]University of Tuzla, Faculty of Pharmacy, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
[*]medicus.ord@bih.net.ba

poster presentation

The current science and results of epidemiological studies are increasingly actualizing the impact of nutrition on health, prevention and treatment of diseases. The first goal of the paper was to evaluate and summarize new findings on the whole complex process of food pathways from production to nutrient entry into the cells of all human organs and the final impact on health and disease prevention. The second objective was to assess where the most common nutritional errors occur that prevent positive health effects. Data from relevant studies, scientific and professional papers on different segments of food impact to human health were collected and analyzed. Nutritional value and food safety is a basic segment on achieving the goal of health. In addition to the achieved condition of the quality food produced, there are critical points for proper effect of food to health, namely: the choice of foods, the way of food intake and behavior in the diet process, and the dissimilarity in the individual absorption of food in the digestive tract. Food choices are a key point in maintaining health. Unfortunately, the general guidelines for the selection of foods do not work in practice, due to each individual requires a specific approach. Wrong eating habits and behaviors can direct the entire digestion process in the wrong direction, hindering adequate control of the brain and gastrointestinal hormones. It is crucial for absorption in the small intestine with the coordination of the brain, nervous and immune systems of the gastrointestinal tract, visceral adipose tissue and the liver. Impaired function at this level can lead to the development of a large number of autoimmune diseases and insulin resistance, which are linked to diabetes, pathological obesity and chronic cardiovascular disease. In addition to food production, there are three key and critical points in achieving full health. Only properly ingested, digested, transported and metabolized nutrients from food can lead to compliant functions and achieve targeted health effects by entering cells. By controlling the critical points in this process, it is possible to avoid errors with preventing the implementation of the "food to health" postulate.

Keywords: food to health, critical points

FUNCTIONAL GASTROINTESTINAL DISORDERS AS MANIFESTATIONS OF INSULIN RESISTANCE: A POTENTIAL FOR NUTRITIVE PREVENTIVE INTERVENTIONS

Nizama Salihefendić[1*], Muharem Zildžić[2], Dženita Salihefendić[2], Midhat Jašić[3], Emilija Spaseska Aleksovska[4], Sabit Begić[2]

[1]University of Tuzla, Faculty of Medicine, Univerzitetska 1, 75000 Tuzla, Bosnia and Herzegovina
[2]Medicus A Gračanica, Mustafe Rešidbegovića 2, 75320 Gračanica, Bosnia and Herzegovina
[3]University of Tuzla, Faculty of Pharmacy, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
[4]ZADA pharmaceuticals, Bistarac donji bb, 75300 Lukavac, Bosnia and Herzegovina
[*]medicus.ord@bih.net.ba

oral presentation

Symptoms such as nausea, bloating, fatigue, pain, belching, and more are among the most common causes of visiting the doctor. Functional gastrointestinal disorders (FGIP), such as: dyspepsia and irritable bowel syndrom according to ROMA IV international criteria, are demonstrated in most patients with these conditions. The aim of this paper is to show the connection between FGIP, obesity and insulin resistance (IR). In the outpatient clinics Gračanica and Doboj Jug, for 2 years, 40 patients with proven FGIP according to ROMA IV international criteria were randomly selected. In all patients of this group (24 women and 16 men with an average age of 52 years) the anthropometric parameters and structure of the body with a computer device "InBody" were collected and analyzed. Laboratory testing for IR was performed by the glucose tolerance test (OGTT) with insulinemia and calculated for IR (according to HOMA1-IR and HOMA2-IR). The type and intensity of functional problems were measured according to the early detection of insulin resistance questionnaire. Over 85% of subjects were overweight and pathologically obese. 80% of the subjects had IR. In patients with proven IR, average laboratory test values were: GUK 5.72 mmol/L, HOMA1-IR was 3.8, and HOMA2-IR was 3.2. Following nutritional interventions with lifestyle changes, these values were reduced, with an average of GUK 4.8 mmol/L, HOMA1-IR was 2.9 and HOMA2-IR was 2.5. There is an association between gastrointestinal functional problems with IR and obesity. Nutritional interventions with lifestyle changes and eating habits with appropriate physical activity may be the first choice in the treatment of FGIP. Early detection of IR with appropriate nutritional interventions and lifestyle changes, can alleviate or completely eliminate the symptoms of FGIP.

Keywords: functional gastrointestinal disorders, insulin resistance, nutritional interventions

UNOS PREHRAMBENIH VLAKANA I KONSTIPACIJA U TRUDNOĆI

INTAKE OF DIETARY FIBRES AND CONSTIPATION IN PREGNANCY

Lada Škoko Vukušić[1,2*], Ariana Penava[3], Daniela Kenjerić[4]

[1]Z.U. Ljekarna Škoko, Matije Gupca 21, 34000 Požega, Hrvatska
[2]Studentica Poslijediplomskog specijalističkog studija Nutricionizam, Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[3]Zavod za javno zdravstvo Požeško-slavonske županije, Županijska 9, 34000 Požega, Hrvatska
[4]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[*]mamalada81@gmail.com

poster presentation / postersko priopćenje

Prehrambena vlakna doprinose normalizaciji probave kroz povećavanje volumena i omekšavanje sadržaja stolice što smanjuje pojavu konstipacije. Prehrambene navike vezane uz unos prehrambenih vlakana variraju od dnevno preporučenog unosa prehrambenih vlakana nutritivno bogatim namirnicama do minimalnog unosa i to isključivo rafiniranim žitaricama. Cilj je bio utvrditi unos prehrambenih vlakana i učestalost stolica kod trudnica te utvrditi postoji li poveznica između ova dva parametra. Podaci su prikupljeni anonimnim upitnikom tijekom lipnja 2019. u Z.U. Intermed. Ispitivanjem su obuhvaćene trudnice u različitim fazama trudnoće, dobi 18 – 45 godina. Hipoteza istraživanja je da trudnice koje redovito unose više prehrambenih vlakana imaju redovitiju stolicu, te rijetko konstipaciju.

Ključne riječi: trudnice, prehrambena vlakna, konstipacija

Keywords: pregnant women, dietary fibres, constipation

CONSUMPTION OF ENERGY AND SOFT DRINKS AMONG HIGH SCHOOL STUDENTS

Lidija Šoher[1*], Ariana Penava[2], Lada Škoko Vukušić[1], Daniela Kenjerić[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Institute of Public Health in Požega - Slavonia County, Županijska ulica 9, 34000 Požega, Croatia
[*]lidija.soher@ptfos.hr

poster presentation

Consumption of energy and soft drinks, including juices and sodas, among adolesents and young adults has become a hot topic in recent decades. The aim of present study was to assess weekly frequency, reasons behind consumption and most often place of energy and soft drinks consumption among high school students. 504 students filled out the questionnaire, average age was 16.76 (14 to 20, 89.3% male) and 62.79% of the participants came from rural area. 97.91 % of participants as they stated, consume water and 72.79% consume both energy and soft drinks. On the weekly basis water is consumed most frequently, few times a day (n=322), juice and sodas were consumed most often two or three times a week (n=124; n=127) and energy drinks were consumed less than once a week (n=142). Depending on the choice of drink reasons behind consumption varied. The most often reason for water consumption was thirst, for juices and sodas was taste and for energy drinks energy boost. For all types of drinks most often place of consumption was at home. The focus of future research should be the amount of drinks that are consumed and tools which could provide a better knowledge for healthy diet and lifestyle, not only for students but for the parents as well.

Keywords: soft drinks, energy drinks, consumption, high school students

THE RELATIONSHIP BETWEEN PROCESSED FOOD DIETARY PATTERN AND DEPRESSION IN ADULTS

Tamara Sorić[1,2*], Dunja Molnar[2], Ivan Dolanc[3], Luka Bočkor[3], Jelena Šarac[3], Miran Čoklo[3]

[1]Psychiatric Hospital Ugljan, Otočkih dragovoljaca 42, 23275 Ugljan, Croatia
[2]PhD candidate at the University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[3]Institute for Anthropological Research, Ljudevita Gaja 32, 10000 Zagreb, Croatia
[*]tamara.novoselic@pbu.hr

poster presentation

Depression, an increasing public health problem, is often related to unhealthy dietary habits. The aim of this study was to examine the association between processed food dietary pattern and depression in adults. A cross-sectional study was conducted among 132 adult participants, aged 18 – 65. The intake of processed food was assessed using a validated semi-quantitative food frequency questionnaire, while depressive symptoms were evaluated using the Center for Epidemiologic Studies – Depression scale. Depression was determined in 14 participants (10.6%) with no significant differences regarding age (p=0.378), sex (p=0.602), body mass index (p=0.114), educational level (p=0.311), number of people in the household (p=0.753), and physical activity (p=0.689) between participants with and without depression. On the other hand, there were significantly more current smokers among the participants with depression (p=0.004). Pastries (p=0.003), French fries (p=0.033), half-fat cheese (p=0.037), and cream cheese (p=0.025) were consumed more frequently among the participants without depression. There were no significant differences between the studied groups in consumption frequencies of other processed food items. Although the results of the present study did not show significantly increased consumption of processed food among depressed participants, for better understanding of potential relationship between these two factors, further prospective studies with larger sample sizes are needed.

Keywords: processed food, depression, adults

WEIGHT LOSS BIOCHEMISTRY

Ivica Strelec[1*], Darja Sokolić[2]

[1]Josip Juraj Strossmayer Universitiy of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000, Osijek, Croatia
[2]Croatian Agency for Agriculture and Food – Center for Food Safety, Ivana Gundulića 36b, 31000, Osijek, Croatia
[*]ivica.strelec@ptfos.hr

invited lecture

Throught the evolution human body has been programed to store the excess of energy in two different pools, glycogen and triacylglicerols. While the first one is less prone to the changes in the evolutionary programmed storage capability, the latter one has almost unlimited capability to be stored, not only to the evolutionary created safe storage "warehouse" (adipocytes), but also to other cells of the human body when fatty acid spillover occurs. While this evolutionary inheritance worked more or less well during the ages, where the excess of available foods has been stored in metabolic pools in periods of food abudance, and than used for energy input in times of food shortages, the develepoment of modern human societies, characterized with the high level of industrialization and automatization led to the disruption of this equlibrium toward the former one. Nowdays, modern human societies has been chalenged with the continuous excess of available foods and decreased physical activity, what subequently leads to the increased level of owerweight and obesity among population. Therefore, the need for social programming of human societies toward healthy lifestyle, including increase in physical activity and changes in dietary habits, is inevitable. In this respect, the present lecture will give owerview of the current knowledge of the effect of physical activity, ofently used reduction diets, and their combined effects on weight loss from the biochemical point of view.

Keywords: biochemistry, diets, obesity, owerweight, weight loss

UNHEALTHY EATING HABITS AMONG STUDENTS IN NOVI SAD

Branislava Teofilović[1*], Dušica Rakić[1], Nevena Grujić Letić[1], Emilia Gligorić[1], Aleksandar Takači[2], Daniela Kenjerić[3]

[1]University of Novi Sad, Faculty of Medicine, Hajduk Veljkova 3, 21000 Novi Sad, Serbia
[2]University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia
[3]Josip Juraj Strossmayera University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]branislava.teofilovic@mf.uns.ac.rs

poster presentation

Unhealthy eating habits among adolescents are reflected through frequent meal skipping, fad dieting, take-out meals and consumption of fast food, sweets and sweetened beverages. The aim of this study was to estimate unhealthy eating habits among students of the University of Novi Sad. Cross-sectional study was conducted in May 2018 on 4 faculties, which have at least one course on food and dietary habits and encompassed 514 participant (133 males and 381 females). More male students (7.5%) are constantly eating throughout the day compared to females (5.5%). 4.5% of males and 3.7% of females do not consume breakfast regularly. A small number of students have lunch in a bakery, a pizzeria or a fast-food restaurant. 4.5% of boys and 2.8% of girls eat fast food every day. 35% of male students and 28% of female students consume fast food almost daily or several times a week. About 5% of students do not eat fruit and vegetables at all. Altogether, obtained results indicated that unhealthy eating habits among student population is strongly represented, and the need for healthy lifestyles promotion with emphasis on the promotion of balanced nutrition is necessary.

Keywords: students, fast food, unhealthy eating habits

SEZONSKA EVALUACIJA VEGANSKIH JELOVNIKA DJECE VRTIĆKE DOBI

SEASONAL EVALUATION OF CHILDREN`S KINDERGARDEN VEGAN MEALS

Kristina Tušek[1*], Ivana Bečić[2], Jasenka Gajdoš Kljusović[2]

[1]Dom zdravlja Krapinsko-zagorske županije, Dr. Mirka Crkvenca 1, 49000 Krapina, Hrvatska
[2]Sveučilište u Zagrebu, Prehrambeno-biotehnološki fakultet, Pierottijeva 6, 10000 Zagreb, Hrvatska
[*]tusek.kristina@gmail.com

poster presentation / postersko priopćenje

Različiti stilovi prehrane imaju svoje prednosti i mane te je cilj ovog rada prikazati objektivno, veganski način prehrane djece (3 – 6 godina) u vrtičkim ustanovama, kroz dvije sezone proljeće/ljeto, jesen/zima. Veganstvo, zbog isključivanja namjernica životinjskog podrijetla, može rezultirati deficitom i/ili suficitom što je bitno u očuvanju dobrog zdravlja i prevenciji bolesti. Korišteni su tjedni jelovnici (po svakoj sezoni), koji su sadržavali ponudu doručka, ručka i dvije užine (prijepodnevna i poslijepodnevna). Sastavnice jela (namirnice) su korištene u izračunu energetsko nutritivnog sastava ponude svakog dana zasebno. Korištena je hrvatska baza o kemijskom sastavu namirnica te preporuke za planiranje prehrane djece u dječjem vrtiću. Rezultatipokazuju da prosječni dnevni unos proteina, masti i ugljkohidrata ne varira značajno ovisno o sezoni. Za razliku od makronutrijenata, u praćenju unosa mikronutrijenata, bilježi se povećan unos natrija, kalija, kalcija, magnezija, fosfora, željeza, cinka i bakra u sezoni jesen/zima, jednako kao i svih vitamina uz najveću razliku u prosječnom unosu vitamina C od približno 51 % u odnosu na sezonu proljeće/ljeto. Iako se radi o rezultatima koji se temelje na tjednim ponudama, jasno je kako svaku vrstualternativne prehrane treba pratiti redovita edukacija osoblja i roditelja jer nestručno planiranje jelovnika može imati negativne posljedice na rast i razvoj djeteta.

Ključne riječi: veganski jelovnici, sezonska evaluacija, dječji vrtići

Keywords: vegan meals, seasonal evaluation, kindergarden

TRUTHS AND MYTHS ABOUT GLUTEN

Ivan Vukoja[1,2*], Anamarija Jurić[1], Goran Zukanović[1], Filip Njavro[2], Jakov Ivković[2], Danko Relić[2,3]

[1]County Hospital Požega, Osječka 107, 34000 Požega, Croatia
[2]Andrija Štampar – Association of people's health, Rockefellerova 4, 10000 Zagreb, Croatia
[3]Andrija Štampar School of Public Health, University of Zagreb School of Medicine, Rockefellerova 4, 10000 Zagreb, Croatia
[*]iv.vukoja@gmail.com

invited lecture

Gluten is the complex of water-insoluble proteins, gliadin (prolamin) and glutenin (glutelin) fraction from wheat, rye, and barley. Because of its properties (water binding and viscosity yielding) is widely used food additive. Gliadin is very important in the context of coeliac disease (CD), non-coeliac gluten sensitivity (NCGS), gluten ataxia (GA) and dermatitis herpetiformis (DH). CD is characterized by villus atrophy of the small intestinal mucosa caused by the interaction of the gliadin and the mucosa of the small intestine in susceptible persons as an immune disorder. NCGS presents patients whose symptoms have disappeared with gluten withdrawal who do not have typical CD antibodies and do not suffer from lesions in the duodenal mucosa. GA occurs later in life with or without enteropathy and is associated with cerebellum affection by CD antibodies causing clinical features of gait and limb ataxia, ocular signs of cerebellar dysfunction. DH is uncommon cutaneous eruption associated with gluten sensitivity it is diagnosed after biopsy by immunofluorescence of granular or speckled IgA deposits in an area of perilesional skin. The gluten-free diet leads to complete regression of symptoms in all this entities. Despite the fact that self-reported gluten sensitivity (GS) is increasing over the past years there is no scientific evidence of benefits of gluten withdrawal in gluten non associated diseases. Researches show that the public perception of gluten is causing increase in the number of people who erroneously believe they are sensitive to it.

Keywords: gluten, gliadin, coeliac disease, self-reported gluten sensitivity

REZISTENTNI ŠKROB U HRANI I UTJECAJ NA ZDRAVLJE

RESISTANT STARCH IN FOOD AND INFLUENCE ON HEALTH

Marko Zec*, Vida Subotić, Aida Mulić

Univerzitet u Tuzli, Tehnološki fakultet, Univerzitetska 8,7500 Tuzla, Bosna i Hercegovina
**marko.zec@gmail.com*

poster presentation / postersko priopćenje

Namirnice bogate ugljikohidratima uglavnom su okrivljene za izazivanje ili pogoršanje dijabetesa i debljanje. Prisustvo rezistentnog škroba u hrani bogatoj ugljikohidratima čini ih prikladnima za zdravlje ljudi, zbog svojeg pozitivnog utjecaja na zdravlje. Cilj ovog rada je pretraživanjem literature prikupiti i analizirati podatke o utjecaju rezistentnog škroba na zdravlje, oblicima u hrani te primjeni. Pretragom znanstvene baze *Pub.med* prikupljeni su i analizirani radovi o rezistentnom škrobu, izvorima, dobivanju i njegovom djelovanju na zdravlje ljudi.
Izvorna kvaliteta škroba, tehnike prerade i temperature skladištenja utječu na otpornost sadržaja škroba u hrani. Komercijalni pripravci rezistentnog škroba dostupni su na tržištu. U prehrambenoj industriji koristi se kao sastojak za snižavanje kalorijske vrijednost prehrambenih proizvoda i poboljšanje teksturalnih i organoleptičkih obilježja hrane. Rezistentni škrob, kao prebiotik, biva fermetniran od strane crijevne mikroflore pri čemu nastaju masne kiseline kratkih lanaca. Ima pozitivan utjecaj na glikemiju jer doprinosi nižem glikemijskog indeksu hrane. Na taj način smanjuje rizik za dijabetes tipa 2, kardiovaskularne bolesti, pretilost te karcinom debelog crijeva. Učestalost kroničnih nezaraznih bolesti u stalnom je porastu. Osnovni način prevencije je korekcija prehrane uz dobar izbor ugljikohidratne hrane, između ostalog, bogate rezistentnim škrobom. Zbog toga primjena rezistentnog škroba u vidu funkcionalne hrane stalno raste.

Ključne riječi: rezistentni škrob, ugljikohidrati, zdravlje, prebiotici

Keywords: resistant starch, carbohydrates, health, prebiotics

DIETETICS AND DIET THERAPY /
DIJETETIKA I DIJETOTERAPIJA

ENTERAL NUTRITION INDICATORS IN NON-METASTATIC COLORECTAL CANCER PATIENTS

Marina Kunac[1], Jelena Balkić[2], Ilijan Tomaš[3], Ines Banjari[1*]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Clinical Hospital Center Osijek, Department for Dietetics and Nutrition, J. Huttlera 4, 31000 Osijek, Croatia
[3]Clinical Hospital Center Osijek, Department of Oncology, J. Huttlera 4, 31000 Osijek, Croatia
[*]ibanjari@ptfos.hr

poster presentation

Colorectal cancer (CRC), as the second cause of death globally due to cancers is distinctive for its remarkably high correlation with the diet. Enteral nutrition (EN) is introduced in patients with poorer condition and prognosis. Logistic regression was used to assess which anthropometric, dietary, lifestyle and psychosocial characteristics are indicative for EN. An observational study on 60 patients with non-metastatic CRC participated in the study (35.0% received EN). Lower Body Mass Index (p=0.026) and shorter time from the diagnosis (p=0.041) were identified as important indicators for EN. Identified dietary characteristics were higher alcohol consumption (p=0.029), intake of dietary calcium <700 mg (p=0.031) and intake of vitamin B12 below the recommendation (p=0.007). Patients who reported lower physical activity level now (p=0.004) and in comparison to prior the diagnosis (p=0.030) were more likely to receive EN. They were also more likely to assess their overall health (p<0.001), social life (p=0.002) and psychosocial condition (p=0.017) as poor. The results confirm that patients with worse physical condition are candidates for EN. EN is introduced to prevent muscle loss i.e. reduce the risk for cachexia, speed-up the recovery and improve quality of life. However, EN patients reported worsening of their life quality and identified dietary characteristics should be given more attention because of their potentially negative effect on patient's recovery.

Keywords: colorectal cancer patients, non-metastatic, dietary characteristics, lifestyle, enteral nutrition

PROFESSIONAL ADVICES NEEDED TO IMPROVE DIETARY PRACTICES IN PATIENTS WITH AUTOIMMUNE THYROID DISEASE

Anamarija Nožica[1], Jadranka Karuza[2], Nevena Ćorić[3], Jelena Balkić[4], Ines Banjari[1*]

[1]Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Private Family Physician Office affiliated to University of Rijeka, School of Medicine, Brig bb, 51000 Rijeka, Croatia
[3]University Clinical Hospital Mostar, Service for Patient Food and Nutrition - Nutrition Counseling Center, Petra Rizza bb, 88000 Mostar, Bosnia and Herzegovina
[4]Clinical Hospital Center Osijek, Department for Dietetics and Nutrition, J. Huttlera 4, 31000 Osijek, Croatia
[*]ibanjari@ptfos.hr

poster presentation

Two most common, often coexisting autoimmune endocrine diseases are Type 1 Diabetes Mellitus (DMT1) and Hashimoto's Thyroiditis (HT). Dietary recommendations for DMT1 are well known and estabiliched in the practice, but not for thyroid disorders. The lack of professional recommendations leaves room for self-proclaimed nutrition "experts" to share unverified advices without thinking about the consequences.
Dietary practices of DMT1 patients with (DMT1+HT, N=23) and without HT (control group, DMT1, N=31) were assessed with anonymous, study-specific questionnaire. Two DMT1+HT patients excluded milk from their diet after reading about it on the Internet. Gluten-free diet is praciticized by 13.6% of DMT1+HT patients also as a result of the information found online. One DMT1+HT patient reported practicizing "autoimmune" protocol, again found on the Internet. Coexistence of coeliac disease in DMT1 is relatively low, but non-coeliac gluten/wheat sensitivity also increases the risk of autoimmune disease, mainly HT. However, besides shared autoimmune etiology, asymptomatic individuals should not practicize gluten-free diet because it poses a significant risk on individual's long-term nutritional status. DMT1+HT patients eat more vegetables, especially green leafy vegetables which are important sources of goitrogens. They also tend to add salt to a meal even before tying it (17.4% *vs* 16.1%; p=0.008), and kitchen salt is important source of iodine (due to mandatory fortification in Croatia).
Professional nutritional advices are much needed to improve knowledge of goitrogens, sources of iodine and point out potentially detrimental dietary practices that can worsen patient's condition.

Keywords: autoimmune thyroid disease, dietary practices, dietary iodine, unverified information

A LIFE WITH CHRONIC PAIN – CAN DIET HELP?

Ines Banjari*

Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
**ibanjari@ptfos.hr*

invited lecture

Chronic pain is a complex entity which has been recognized as a separate, distinctive health issue with immense individual and societal burden. It is estimated that about one in five people suffer from chronic pain globally, with prevalence increasing with age. The financial burden in direct healthcare costs and indirect costs due to loss of productivity exceed bilions of US$. In Croatia, an average of 54,128 employees are absent from work on a daily basis due to chronic pain. Severe physical, psychological and social impairments, increased consumption of opiates and analgesics deteriorate individual's quality of life which is even lower than of patients hospitalised after ischemic stroke. Modern medicine still has no efficient treatment to deal with chronic pain. Chronic pain self-management is considered as best-practice because of an individual aproach to a more rational use of opiates/analgesics and encouraging engagement in regular phyisical activity. Even though the role of nutrition is chronic pain is still argued, nutrition is an important part of the self-management process. Obesity management, avoiding meal-skipping, regular consumtion of foods rich in antiinflammatory bioactives (like green leafy vegetables, fatty fish, olive oil, nuts, fruits) while limiting the consumption of foods rich in simple carbohydrates and saturated fats have shown promising results in chonic pain management.

Keywords: chronic pain, quality of life, nutrition, self-management

ATOPIC DERMATITIS, NUTRIRION PROFILE, GUIDELINES AND SUPPLEMENTATION

Asmira Husić Mulabećirović[1*], Neda Jokić[2], Jasna Frljak[1], Asja Sirbubalo[3], Aida Mulić[1]

[1]University of Tuzla, Faculty of Technology, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
[2]Thalassotherapia Opatija, Maršala Tita 188/1, 51410 Opatija, Croatia
[3]Nobel Ilac, Hasiba Brankovića 9, 71 000 Sarajevo, Bosnia and Herzegovina
[*]asmirahusicmulabecirovic@gmail.com

oral presentation

Atopic Dermatitis (AD) is a repetitive skin disease, characterised by chronic skin inflammation, epidermis damage and immune system disorders. Due to an increasing prevalence of the disease, the main treatment focus has been on the risk factors (inadequate nutrition, food additives, allergens, air pollutants, cosmetic products, etc.). Aim of the research was to collect, analyse and discuss theories and literature findings on dietetics and supplementation recommendations for AD. Fundamental recommendation in diet therapy of AD patients is IgE test; patients need to avoid the ingredients that have been shown positive on the IgE test. According to the literature it was found that so far researched food supplements contain bioactive components necessary for the AD treatment and have pharmacological effects important for the immune system function and reduction of the symptoms. Evaluation of the AD among the children (<5) depends on the allergens and whether AD is: A) long-term or B) if there were the previous reaction after the consumption of specific food. This study summarises the literature and recommendations regarding the nutritional therapy of AD and is focusing on the elimination diet, probiotic consumption, supplementation with fatty acids, vitamin D3 and zinc and the avoidance of specific additives in close relation to AD.

Keywords: atopic dermatitis, supplementation, diet therapy, food additives

VAŽNOST DIJABETIČKE DIJETE I EDUKACIJE BOLESNIKA I OBITELJI O PREHRANI U MULTIDISCIPLINARNOM PRISTUPU LIJEČENJA TIPA 2 ŠEĆERNE BOLESTI: PRIKAZ SLUČAJA

IMPORTANCE OF DIABETIC NUTRITION AND EDUCATION OF PATIENTS AND THEIR FAMILIES ABOUT DIET IN MULTIDISCIPLINARY APROACH IN DIABETES TYPE 2 TREATMENT: CASE STUDY

Ivan Lekić[1*], Barbara Bačun[2], Marija Tripolski[3], Dunja Degmečić[1,4], Tatjana Bačun[1,3]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Medicinski fakultet Osijek, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet dentalne medicine i zdravstva, Crkvena ulica 21, 31000 Osijek, Hrvatska
[3]Klinički bolnički centar Osijek, Zavod za endokrinologiju, Klinika za internu medicinu, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[4]Klinički bolnički centar Osijek, Zavod za integrativnu psihijatriju, Klinika za psihijatriju, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[*]ilekic@mefos.hr

poster presentation / postersko priopćenje

Šećerna bolest tipa 2 je multifaktorijalni metabolički poremećaj povezan s genetskom sklonošću, nepravilnom prehranom i lošim životnim navikama. Prikazan je 69-godišnji bolesnik koji je tri godine na inzulinskoj terapiji (predmiješani inzulinski analozi). Bio je u stanju hiperglikemije (glikirani hemoglobin 15,3 %), ima mikro i makro vaskularne komplikacije šećerne bolesti te niz komorbiditeta (debljina, dislipidemija, hiperuricemija, arterijska hipertenzija, kardiomiopatija, kronična opstruktivna plućna bolest i bubrežna insuficijencija). Žalio se na pojačano žeđanje, češće mokrenje, malaksalost i otežano kretanje. Prije dva mjeseca umrla mu je majka, s kojom je živio. Nije se pridržavao dijabetičke dijete, jeo je neredovito, obroci su bili veći i nepravilni, te je jeo kasno navečer. Spavao je i do 17 sati dnevno. Malo se kretao. Tijekom bolničkog liječenja intenzivirana je inzulinska terapija (glargin U300 navečer i aspart uz tri glavna obroka) i provedena je edukacija bolesnika i kćeri s kojom živi o dijabetičkoj dijeti, samokontroli i određivanju doze inzulina. U terapiju su uključeni antidepresivi i anksiolitici, i korigirana je ostala terapija. Nakon 4 mjeseca vrijednosti glikemije bile su uredne (glikirani hemoglobin 6,8 %) i bolesnik je bio značajno boljeg općeg stanja. Samo multidisciplinarni pristup u liječenju šećerne bolesti može dovesti do ciljnih vrijednosti glikemije.

Ključne riječi: šećerna bolest tip 2, kontrola glikemije, dijabetička dijeta, intenzivirana inzulinska terapija, samokontrola

Keywords: diabetes type 2, glycemia, diabetic diet, insulin therapy, self-monitoring

PREHRAMBENE NAVIKE DJECE S LARINGOFARINGEALNIM REFLUKSOM I HIPERTROFIJOM ADENOTONZILARNOG LIMFATIČNOG TKIVA

FOOD HABITS IN CHILDREN WITH LARYNGOPHARINGEAL REFLUX DISEASE AND ADENOTONSILLAR HYPERTROPHY

Tihana Mendeš[1,2*], Andrijana Včeva[1,2], Željko Zubčić[1,2], Hrvoje Mihalj[1,2], Josip Maleš[1,2], Vjeran Bogović[1,2], Stjepan Grga Milanković[1,2]

[1]Klinički bolnički centar Osijek, Klinika za otorinolaringologiju i kirurgiju glave i vrata, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[2]Medicinski fakultet Osijek, Katedra za otorinolaringologiju i maksilofacijalnu kirurgiju, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[*]tihanamendes811@gmail.com

poster presentation / postersko priopćenje

Laringofaringelani reflux (LPR) u djece često se pojavljuje u svakodnevnoj pedijatrijskoj i otorinolaringološkoj praksi. Točna prevalencija LPR-a dječje dobi nije poznata, ali se smatra kako jedno od petero djece ima izražene simptome ove bolesti. Ovaj klinički entitet predstavlja ekstraezofagealnu manifestaciju odnosno povrat želučanog sadržaja, koji sadrži pepsin, iz želuca kroz jednjak u grkljan, ždrijelo, usnu šupljinu i područje nosnog ždrijela, ostvarujući kontakt s tkivom gornjeg dišnog sustava te može rezultirati nizom respiratornih simptoma. Nesumnjivo je kako su upalne bolesti kao što su kronični laringitis, faringitis, kronični rinosinuitis te posebno u dječjoj dobi hiperplazija tonzila i sekretorni otitis upravo povezani s LPR-om. Istraživanja su pokazala kako je povećan stupanj hipertrofije adenoida povezan s povećanjem stupnja ekspresije razine pepsina. Značajan komorbiditet astme, subglotičnog laringitisa, sekretornog otitisa i pretilosti daje LPR-u dodatnu važnost, ujedno komplicirajući pravilno postavljanje dijagnoze. Liječenje LPR-a započinje promjenom prehrambenih navika, a dokazano mogu rezultirati potpunim izlječenjem.
Osnovne promjene načina života podrazumijevaju smanjenje prekomjerne tjelesne težine, veći broj manjih obroka uz izbjegavanje konzumacije hrane pred spavanje, identificiranje namirnica koje potiču smetnje, u dječjoj dobi najčešće su to slatkiši, gazirani i zaslađeni sokovi. Strogo pridržavanje i promjena životnog stila mogu dovesti do potpunog izlječenja.

Ključne riječi: prehrambene navike, laringofaringelani refluks, hipertrofija adenoida, hipertrofija tonzila

Keywords: Food habits, Laryngopharyngeal reflux, Adenoid hypertrophy, Tonsillar hypertrophy

DIETARY HABITS AND USE OF DIETARY SUPPLEMENTS AMONG FEMALE CANCER PATIENTS

Ivana Rumora Samarin[1*], Nives Pačić[1], Morana Novak[1], Margareta Benković[3], Ines Panjkota Krbavčić[1]

[1]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb,Croatia
[2]Association of women affected by cancer EVERYTHING for HER, Kneza Mislava 10, 10000 Zagreb, Croatia
[*]irumora@pbf.hr

poster presentation

Cancer is one of the leading causes of death globally. Breast cancer has the highest incidence and mortality rate in the world and in Croatia. There are many factors believed to affect cancer prevention and development, with lifestyle factors, including diet, assumed to have the major relevance.
Aim of this work was to determine dietary habits and dietary supplements intake among cancer patients. For this purpose, dietary questionnaire was designed and conducted among 190 women, cancer patients, members of the Association of women affected by cancer EVERYTHING for HER. Most patients had breast cancer (86%), average age was 52.93 ± 0.89. Adequate body mass had 48.9% of patients, 40.5% were overweight, 8.4% obese, and 2.1% undernourished. 85.3% of surveyed patients stated that they improved their dietary habits after cancer diagnosis. This specially referred to fruit, vegetable and red meat intake. After diagnosis 77.9% patients consume fruits and 98.4% vegetables every day, with 41.9% consuming more than 2 servings of fruits and 72.1% more than 2 servings of vegetables per day. Red meat was consumed by 22.6% of patients consuming meat. Dietary supplements were used by 76.3% of patients, mainly probiotics, vitamin D and C, with boosting of the immune system as main reason for using.

Keywords: carcinoma, dietary habits, dietary supplements

SENILNA MAKULARNA DEGENERACIJA (ARMD) – HRANA I ANTI-ARMD DIJETA

AGE RELATED MACULAR DEGENERATION (ARMD) – FOOD AND ANTI-ARMD DIET

Suzana Nikolić-Pavljašević[1], Marizela Šabanović[2*]

[1]Univerzitet u Tuzli, Medicinski fakultet, Katedra za oftalmologiju, Univerzitetska 1, 75000 Tuzla, Bosna i i Hercegovina
[2]Univerzitet u Tuzli, Tehnološki fakultet, Univerzitetska 8, 75000 Tuzla, Bosna i Hercegovina
[*]marizela_sabanovic@yahoo.com

poster presentation / postersko priopćenje

Senilna makularna degeneracija makule (ARMD) progresivna je kronična bolest koja se nalazi u središnjoj mrežnici. Do 2040. broj pojedinaca u Europi s ranim tipom ARMD-om kretat će se između 14,9 i 21,5 milijuna, a za kasni između 3,9 i 4,8 milijuna. Postoje dvije vrste ARMD-a: sicca tip s boljom prognozom i mokri tip s neovaskularizacijom i lošijom prognozom. Tretman je fokusiran na sprječavanje ili usporavanje progresije ARMD-a s farmakološkom intervencijom poput aVGF (anti-vaskularni endotelni faktor rasta), ali postoje mnoge studije s prijedlozima anti-ARMD dijeta. Proveden je pregled literature s procjenom uloge i utjecaja prehrane kod ARMD-a. Glavni faktori rizika uključuju: pušenje, prehrambene faktore, kardiovaskularne bolesti i genetske markere, uključujući gene koji reguliraju put komplementa, lipidni, angiogeni i vanćelijski matriks. Neke studije sugeriraju opadajuću prevalenciju makularne degeneracije povezane sa dobi, zbog smanjene izloženosti faktorima rizika. Trenutni dokazi govore da bi svi bolesnici s ARMD-om, bez obzira na ozbiljnost njihove bolesti, trebali povećati konzumaciju tamnozelenog lisnatog povrća, hrane niskog glikemijskog indeksa (GI) i ribe najmanje dva puta tjedno. Promjene načina prehrane predstavljaju jedno od osnovnih sredstava za sprečavanje razvoja ARMD-a kao i usporavanje napredovanja bolesti. Uočene su neovisne obrnute veze između prehrambenih čimbenika i rizika razvoja i napredovanja ARMD-a.

Ključne riječi: ARMD-dobna degeneracija makule, anti-ARMD dijeta, hrana

Keywords: age related macular degeneration, ARMD, anti-ARMD diet

RAD NUTRICIONISTIČKOG SAVJETOVALIŠTA KLINIČKOG BOLNIČKOG CENTRA ZAGREB

WORK OF THE NUTRITIONAL COUNSELING CENTER OF THE CLINICAL HOSPITAL CENTER ZAGREB

Zrinka Šmuljić*, Eva Pavić

Klinički bolnički centar Zagreb, Kišpatićeva 12, 10000 Zagreb, Hrvatska
**zrinka.smuljic@kbc-zagreb.hr*

oral presentation / usmeno priopćenje

Jedna od sastavnica Kliničkog bolničkog centra Zagreb je i Služba za prehranu i dijetetiku. Uz svakodnevnu brigu o organizaciji više od 5500 obroka prilagođenih zdravstvenom stanju pacijenta prema Standardu prehrane bolesnika u bolnicama, unutar Službe djeluje i nutricionističko savjetovalište koje je s radom započelo 2010. godine. U savjetovalištu radi pet magistra nutricionizma čija je zadaća educirati bolesnike o odgovarajućoj dijetoterapiji. Temeljem postavljene dijagnoze liječnik upućuje pacijenta na edukaciju o prehrani, a nerijetko pacijenti dolaze i na vlastiti zahtjev. Uz rad u savjetovalištu nutricionisti rade i u dnevnim bolnicma, obavljaju konzilijarne preglede, na zahtjev individualno prilagođavaju te izrađuju jelovnike pacijentima. Pristup svakom pacijentu je individualan, a po završetku edukacije nutricionist daje svoje mišljenje/nalaz. Alati korišteni u radu jesu računalni program Dijetetičar, edukativne brošure, prezentacije i najnovije smjernice vodećih svjetskih društava za liječenje kroničnih nezaraznih bolesti. Od 1. srpnja 2017. godine rad nutricionista u zdravstvenom sustavu vrednuje se od strane Hrvatskog zavoda za zdravstveno osiguranje putem zasebne šifre djelatnosti, dok su s početkom 2019. godine nutricionisti koji obavljaju zdravstvenu djelatnost u procesu dijagnostike i liječenja priznati kao zdravstveni djelatnici.

Ključne riječi: dijetetika, zdravstvo, uloga nutricionista, usluge

Keywords: dietetics, health care, role of nutritionist, services

ZNAČAJ DIJABETIČKE PREHRANE I EDUKACIJE BOLESNIKA O DIJETI I PRILAGODBI DOZE INZULINA SASTAVU OBROKA U LIJEČENJU ŠEĆERNE BOLESTI TIPA 1: PRIKAZ SLUČAJA

IMPORTANCE OF DIABETIC NUTRITION AND PATIENT EDUCATION ABOUT DIET AND INSULIN DOSAGE ADJUSTEMENT ACCORDING TO MEAL COMPOSITION IN TREATMENT OF DIABETES TYPE 1: CASE REPORT

Marija Tripolski[1*], Daniel Tripolski[2], Tatjana Bačun[1,3]

[1]Klinički bolnički centar Osijek, Zavod za endokrinologiju, Klinika za internu medicinu, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[2]Farmaceutski fakultet Novi Sad, Trg mladenaca 5, 21000 Novi Sad, Srbija
[3]Sveučilište Josipa Jurja Strossmayera u Osijeku, Medicinski fakultet Osijek, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[*]tripolski.marija@kbco.hr

poster presentation / postersko priopćenje

Šećerna bolest tipa 1 obilježena je imunološki posredovanim nestankom beta-stanica gušterače s posljedičnom hiperglikemijom, sklonošću ketoacidozi i doživotnom potrebom terapije egzogenim inzulinom.
Prikazan je slučaj 34-godišnje bolesnice sa šećernom bolešću tipa 1 dijagnosticiranom s dvanaest godina života, koja je od početka bolesti na inzulinskoj terapiji u bazal-bolus režimu, s utvrđenim znacima kroničnih komplikacija bolesti - dijabetičke neproliferativne retinopatije i polineuropatije. Liječena je detemir i glargin inzulinom, tijekom pet godina primjenom inzulinske pumpe, a u posljednje vrijeme primala je degludek uz aspart inzulin prije obroka. Unatoč promjenama vrste inzulina u terapiji šećerna je bolest bila nezadovoljavajuće regulirana, s razinom glikiranog hemoglobina 9,4 % i učestalim hipoglikemijama u poslijepodnevnim i noćnim satima. U sklopu prekoncepcijske obrade radi postizanja bolje regulacije glikemije u bolesnice je provedena dodatna edukacija o dijabetičkoj prehrani i sastavu obroka, prilagodbi doza prandijalnoga inzulina ovisno o količini ugljikohidrata u obroku, te o samokontroli. Time se postigla bolja regulacija glikemije, bez izraženijih oscilacija, sa značajno manje hipoglikemija i razinom glikiranog hemoglobina 6,9 %. Samo sveobuhvatni terapijski pristup s naglaskom na individualnoj edukaciji bolesnika može dovesti do postizanja ciljnih vrijednosti u regulaciji šećerne bolesti.

Ključne riječi: šećerna bolest tip 1, bazal-bolus inzulinska terapija, dijabetička dijeta, edukacija

Keywords: diabetes mellitus type 1, basal-bolus therapy, diabetic diet, education

FUNCTIONAL FOOD AND DIETARY SUPPLEMENTS / FUNKCIONALNA HRANA I DODACI PREHRANI

IMPORTANCE OF ANTIOXIDANT ENZYMES IN PREVENTING CELL DAMAGE

Amra Bratovčić*

University of Tuzla, Faculty of Technology, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina
**amra.bratovcic@untz.ba*

poster presentation

Reactive oxygen species (ROS), such as superoxide anion ($O_2•^-$), nitric oxide (NO•) hydrogen peroxide (H_2O_2), and hydroxyl radical (HO•), consist of radical and non-radical oxygen species formed by the partial reduction of oxygen. The accumulation of ROS in cells may cause damage of nucleic acids, proteins, and lipids, and may cause cell death and trigger oxidative stress which result in the development and progression of several diseases. Furthermore, ROS may promote tumor metastasis through gene activation. It is important to emphasize that equilibrium between the production and elimination of toxic levels of ROS is sustained by enzymatic and nonenzymatic antioxidants. When oxidative stress arises as a consequence of high level of ROS, a defense system promotes the regulation and expression of several nonenzymatic and enzymatic antioxidant. To cope with potentially damaging ROS, aerobic tissues contain endogenously produced antioxidant enzymes such as superoxide dismutase (SOD), glutathione peroxidase (GPx), and catalase and several exogenously acquired radical-scavenging substances such as vitamins E and C, carotenoids and tocopherols. Afterward, both zinc and selenium are intimately involved in protecting the body against oxidant stress. In addition, it was reveal that supplementation with exogenous antioxidants or boosting of endogenous antioxidants is a promising method of countering the undesirable effects of oxidative stress on the human body.

Keywords: reactive oxygen species, antioxidant enzymes, cell damage

APPLICATION OF LIPASE IN FOOD INDUSTRY

Sandra Budžaki[1*], Marta Ostojčić[1], Andreja Kovačević[2], Ivica Strelec[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Agricultural company Orahovica, Pustara 1, 33513 Zdenci, Croatia
[*]sandra.budzaki@ptfos.hr

poster presentation

Lipases are versatile biocatalysts that besides hydrolysis of triacylglycerols, catalyse the reactions of esterification, interesterification, acidolysis and aminolysis under suitable reaction conditions. Due to their versatility, lipases have been widely used in the industry of leather and textile, oil and grease, paper and cosmetic, and also in pharmaceutical and food. Lipases are used in free form as an active supplement to food products such as bakery and pasta, cheeses and dairy products, which affect the quality and flavour enhancement of the final product, or in immobilized form they are used in production of substitutes for human milk and cocoa butter, for the production of specific flavours as food additives, or for the production of ω-3 and ω-6 fatty acids from fish and other oils. While the share of lipases in current industrial production is about 10% of all industrial enzymes, it is expected that their use will be increased due to their versatility. The aim of this paper is to give overview of the current knowledge of industrial use of lipases in the food industry, both as an integral part of the product, and as biocatalysts to obtain food products or alternatives for certain products that can be used as a food or food supplements.

Keywords: lipase, food industry, food supplements

APPLICATION OF EXOPOLYSACCHARIDES (EPSS) PRODUCER STRAIN, *Lactobacillus fermentum* D12, AS PROBIOTIC STARTER CULTURE

Katarina Butorac[1*], Martina Banić[1], Andreja Leboš Pavunc[1], Jasna Novak[1], Paola Cesutti[2], Barbara Bellich[2], Katarina Tonković[3], Ljerka Gregurek[3], Slaven Zjalić[4], Jagoda Šušković[1], Blaženka Kos[1]

[1]University of Zagreb, Faculty of Food Technology and Biotechnology, Laboratory for Antibiotic, Enzyme, Probiotic and Starter Cultures Technology, Pierottijeva 6, 10000 Zagreb, Croatia
[2]Department of Life Sciences, University of Trieste, Via Licio Giorgieri 1 Ed. C11 – 34127 Trieste, Italy
[3]Probiotik d.o.o., Ulica Grada Gospića 3, 10000 Zagreb, Croatia
[4]Department of Ecology, Agronomy and Aquaculture, University of Zadar, Trg Kneza Višeslava 9, 23000 Zadar, Croatia
[*]kbutorac@pbf.hr

poster presentation

Exopolysaccharides (EPSs) producer strain, *Lactobacillus fermentum* D12, was isolated from artisanal fresh smoked cheese. Three different types of EPSs were characterized using HPSEC, GC, GC-MS, ^{1}H-NMR and 2D-NMR. One of the produced EPS is a homopolysaccharide with molecular weight of 400 kDa and is composed of repeating units of D-glucose linked by an α-1,4-glycosidic bond, where 20% of the glucose subunits is acetylated at C-3. There are also identified two different heteropolysaccharides with molecular weight lower than 2 kDa, composed of Man:Glu:Gal in these molar ratios, 1.78:0.87:1 and 6.38:1.6:1. Because of the numerous potential positive physiological responses in the frame of probiotic concept and potential impact on sensory properties of fermented milk products, this strain was applied as probiotic starter culture for fresh dried cheese production, together with another three autochthonous strains well characterized as probiotics trough already performed investigations: S-layer carrying *Lactobacillus brevis* D6, bacteriocin expressing strain *Lactobacillus plantarum* D13, and *Lactoccocus lactis* ZG7-10, with well characterized proteolytic activity. Identification of all added probiotic strains in the produced fresh dried cheese was performed using RAPD and DGGE genetic methods, while their quantification and identification of autochthonous microbiota was performed using Illumina MiSeq sequencing.

Keywords: exopolysaccharides, probiotic, fresh dried cheese, lactic acid bacteria

FUNCTIONAL FOOD IN CARDIOVASCULAR PROTECTION – EFFECTS OF *n-3* POLYUNSATURATED FATTY ACIDS

Ines Drenjančević[1,2*], Martina Mihalj[1,2,3], Ana Stupin[1,2,3,4], Anita Matić[1,2], Zrinka Mihaljević[1,2], Ivana Jukić[1,2], Nataša Kozina[1], Lidija Rašić[1], Luka Kolar[1], Nikolina Kolobarić[1,2], Petar Šušnjara[1], Marko Stupin[1,2,3], Aleksandar Kibel[1,2,3], Kristina Selthofer-Relatić[1,2,3], Ana Marija Lukinac[3], Željka Breškić[3], Brankica Juranić[3]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine Osijek, Josipa Huttlera 4, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Scientific Center of Excellence for Personalized Health Care, Trg Sv. Trojstva 3, 31000 Osijek, Croatia
[3]Clinical Hospital Center Osijek, Josipa Huttlera 4, 31000 Osijek, Croatia
[4]Josip Juraj Strossmayer University of Osijek, Faculty of Dental Medicine and Health, Cara Hadrijana 10a, 31000 Osijek, Croatia
[*]ines.drenjancevic@mefos.hr

oral presentation

Potential beneficial effects of dietary daily intake of *n-3* polyunsaturated fatty acids (*n-3* PUFAs) on various cardiovascular parameters are currently intensively investigated, particularly their role in vasoreactivity in macrocirculation and hemorrheological characteristic of the blood (for possible antithrombotic and atherosclerotic effects) and microcirculation (such as coronary and systemic microcirculation), investigating molecular targets related to endothelial function, e.g. endothelial or vascular smooth muscle cell ion channels, components of cellular and systemic oxidative stress/antioxidative system and the vasoactive effects of eicosanoids-metabolites of *n-3* PUFAs and arachidonic acid. Inflammation underlies all cardiometabolic diseases. It has been suggested that *n-3* PUFAs dietary intake can significantly attenuate inflammatory processes, contributing to maintaining healthy vascular function. Integrating the knowledge on molecular and physiological mechanisms potentially involved in vascular function is important for understanding etiopathogenesis of cardiovascular diseases and translation of research to clinical settings, to obtain medical treatment based on evidences. Hereby, the recent data on the effects of dietary *n-3* PUFAs intake in form of enriched eggs on vascular function and immune system in healthy persons and cardiovascular patients is going to be presented.

Keywords: n-3 PUFAs, enriched eggs, cardiovascular, eicosanoids

Acknowledgement
Supported by European Structural and Investment Funds, grant for the Croatian National Scientific Center of Excellence for Personalized Health Care, University Josip Juraj Strossmayer Osijek #KK.01.1.1.01.0010.

BIOLOŠKI AKTIVNE KOMPONENTE ODABRANIH MEDICINSKIH GLJIVA

BIOLOGICAL ACTIVE COMPONENTS OF SELECTED MEDICAL MUSHROOMS

Jasna Frljak[1*], Asmira Husić Mulabećirović[1], Asja Sirbubalo[2], Aida Mulić[1], Enver Karahmet[3]

[1]Univerzitet u Tuzli, Tehnološki fakultet, Univerzitetska 8, 75000 Tuzla, Bosna i Hercegovina
[2]Nobel Ilac, Predstavništvo u BiH, Hasiba Brankovića 9, 71000 Sarajevo, Bosna i Hercegovina
[3]Univerzitet u Sarajevu, Poljoprivreno-prehrambeni fakultet, Zmaja od Bosne 8, 71000 Sarajevo, Bosna i Hercegovina
[*]jasna.frljak@gmail.com

poster presentation / postersko priopćenje

Prema zvaničnim podacima oko 2000 gljiva pripada kategoriji medicinskih gljiva dok preko 600 ima već potvrđena medicinska svojstva. Cilj i zadatak rada je bio prikupljanje, analiza i obrada naučnih i stručnih podataka bioloških aktivnih komponenti odabranih *Basidiomycetes* gljiva: *Letinula edodes, Ganoderma Lucidum*, *Grifola frondosa*, *Trametes versicolor* i *Inonotus obliquus*. Područja fungiterapije i potraga za novim imunomodulatorskim agensima daleko od toga da su ograničena samo na ove vrste, međutim, ovih pet mogu poslužiti kao tipični predstavnici široko rasprostranjenih ljekovitih gljiva koje se koriste i u tradicionalnoj medicini i u savremenim biomedicinskim istraživanjima. Njihove biološki aktivne komponente imaju različite faramakološke efekte, a od posebnog su značaja polisaharidi (PS) beta-glukani koji se prepoznaju kao imunomodulatori. Mnogi ispitivani betaglukani iz gljiva prešli su u farmaceutske proizvode kao što su Lentinan, Sonifilan, Krestin i GanoPoly što govori o njihovom farmakološkom i istraživačkom potencijalu. Navodeći rezultate naučnih dostignuća u poslednje dvije decenije, rezultate pretkliničkih testova i ishoda kliničkih studija može se potvrditi da dopuna medicinskim gljivama može povećati uspjeh liječenja ili ublažiti negativne nus pojave različitih terapija. Dugotrajno oslabljen imunološki sistem predstavlja riziko faktor malignim bolestima pa se može zaključiti da je prevencija bolesti korisna za svakog pojedinca i zaslužuje istu pažnju koja se posvećuje liječenju bolesti.

Ključne riječi: ljekovite gljive, Basidiomycota, beta-glukani, imunitet

Keywords: medical mushrooms, Basidiomycota, beta-glucans, immunity

OPTIMIZATION OF ETHANOL/WATER SOLVENT EXTRACTION OF BIOACTIVE COMPONENTS ORIGINATING FROM INDUSTRIAL HEMP (*Cannabis sativa* L.)

Adela Šain, Nikolina Matešić, Tamara Jurina*, Ana Jurinjak Tušek, Maja Benković, Davor Valinger, Jasenka Gajdoš Kljusurić

University of Zagreb, Faculty of Food Technology and Biotechnology,
Pierottijeva 6, 10000 Zagreb, Croatia
**tlekic@pbf.hr*

poster presentation

Hemp (*Cannabis sativa* L.) contains a wide range of biocompounds with different beneficial properties such as anti-inflammatory, antithrombotic, antiarrhythmic, hypolipidemic and antioxidative.
Response Surface Methodology (RSM) coupled with Box-Behnken design (BBD) was applied to determine the influence of extraction temperature, solid to liquid ratio, extraction time, rotational speed and ethanol/water solvent ratios at three levels on the solid-liquid extraction of the bioactives from the hemp. Based on the obtained results, solid to liquid ratio, temperature and ethanol/water solvent ratio had statistically significant effects on the total polyphenolic content (TPC), while extraction time and rotational speed had no influence on the TPC extraction. Regarding antioxidant activity (AOX) determined by the DPPH method, only solid to liquid ratio had a statistically significant effect. Solid to liquid ratio, ethanol/water solvent ratio, temperature and rotational speed significantly influenced AOX determined by the FRAP method. According to BBD, the optimum extraction conditions were as follows: extraction temperature 45 °C, solid to liquid ratio 30 mL g^{-1}, extraction time 25 min, rotational speed 500 rpm, ethanol/water solvent ratio 25%. RSM coupled with a BBD model was shown to be effective for optimization the solid-liquid extraction of hemp.

Keywords: hemp (*Cannabis sativa* L.), solid-liquid extraction, optimization, bioactives

THE RED BEETROOT PEEL EXTRACT – CHARACTERIZATION OF BIOACTIVE COMPOSITION AND BIOLOGICAL ACTIVITY *in vitro*

Danijela Šeremet, Ana Huđek, Ksenija Durgo, Ana Mandura, Aleksandra Vojvodić Cebin, Arijana Martinić, Božidar Šantek, Draženka Komes*

University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
**dkomes@pbf.hr*

poster presentation

The inedible part of the red beetroot-peel (RBP) is considered as an agro-industrial waste, athough it also could be a great source of valuable bioactive compounds. Therefore, the aim of this study was to investigate the utilization possibilities of RBP in the production of value added compounds through the characterization of bioactive composition and *in vitro* biological properties of its extract (RBPE). Total phenolic (15.43 ± 0.34 mg GAE/g dw) and betacyanins (9.80 ± 0.14 mg betanin/g dw) content, as well as antioxidant capacity using DPPH and ABTS assays (0.0190 ± 0.00 and 0.0561 ± 0.00 mmol Trolox/g dw, respectively) of RBPE was determined. The biological effect of RBPE on the human hepatic (HepG2), tongue (CAL27) and colon (Caco2) cancer cell lines was conducted. Cell survival was determined by Neutral red test and free radicals determination with 2',7'-dichlorofluorescein-diacetate method. The protective effect of RBPE against oxidative DNA damage was detected on supercoiled plasmid ΦX174 RF1. RBPE did not cause a cytotoxic effect on evaluated cell lines. On colon cancer cells it showed antioxidative properties, but its higher concentration during a prolonged time of incubation showed a slight prooxidative effect on liver cells. Compared to RBPE without polysaccharides, extract with polysaccharides showed a higher protective effect against oxidative damage of DNA. Results confirmed the red beetroot peel as a great source of bioactive compounds which synergistic effect has an important contribution to the cellular macromolecules protection.

Keywords: red beetroot peel, cytotoxicity, hepatic, tongue and colon cancer cell lines, oxidative DNA damage, antioxidant

Acknowledgement
This study was conducted in the framework of research project "Sustainable production of biochemicals from waste lignocellulose containing feedstock" (OPB-SLS, 9717), funded by the Croatian Science Foundation.

PREHRANA I ORALNO ZDRAVLJE

DIET AND ORAL HEALTH

Vlatko Kopić[1,2*], Sanjin Petrović[1,2]

[1]Klinički bolnički centar Osijek, Zavod za maksilofacijalnu i oralnu kirurgiju, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Medicinski fakultet Osijek, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[*]kopicv@gmail.com

oral presentation / usmeno priopćenje

Prema definiciji koju daje Svjetska udruga dentalne medicine (FDI), oralno zdravlje ne predstavlja samo stanje odsustva bolesti zuba i okonih struktura u usnoj šupljini, već uključuje sposobnost nesmetanog govora, osmijeha, mirisa, okusa, dodira, žvakanja, gutanja i prenošenja niza emocija kroz izraze lica bez boli, nelagode i bolesti kraniofacijalnog kompleksa. U postizanju stanja potpunog oralnog zdravlja prehrana ima značajnu ulogu. Iako ograničenog opsega, znanstvena su istraživanja dokazala, među ostalim, korelaciju prehrane i nastanka karijesa, dentalne erozije, razvoja cakline te stanja zdravlja parodonta i sluznice usne šupljine. Već intrauterino, nutricijski disbalans može pogodovati nastanku malformacija i drugih patoloških promjena na zubima i ostalim komponenatama stomatognatog sustava. Razvoj karijesa izravno je povezan s prehranom bogatom lako razgradivim ugljikohidratima iz kojih djelovanjem kariogenih bakterija nastaju kiseli metaboliti koji izravno sudjeluju u procesu demineralizacije tvrdih zubnih tkiva. Poznato je da bolesti parodonta imaju rapidniji tijek u pothranjenoj populaciji. Konzumacija pojedinih namirnica može, s druge strane, imati kariostatski učinak, baziran na stimulaciji sekrecije sline, smanjenju apsorpcije šećera sadržanih u hrani i sadržaju kemijskih elemenata poput fluorida, koji sudeluju u remineralizaciji cakline. Napredak u razumijevanju djelovanja makro- i mikronutrijenata na fiziološke i patološke procese u oralnoj sredini pomaže razvoju preventivnih mjera kojima je cilj unaprijeđenje oralnog zdravlja.

Ključne riječi: oralno zdravlje, prehrana, prevencija karijesa

Keywords: oral health, diet, caries prevention

ANTIOXIDANT ACTIVITY OF PROTEIN/GLUCOSYL-HESPERIDIN COMPLEXES

Vanja Kelemen[1], Josip Šimunović[2], Anita Pichler[3], Mirela Kopjar[3*]

[1]Institute of Public Health for the Osijek-Baranja County, Franje Krežme 1, 31000 Osijek, Croatia
[2]North Carolina State University, Department of Food, Bioprocessing and Nutrition Sciences, 400 Dan Allen Drive, Raleigh, North Carolina, USA
[3]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]mirela.kopjar@ptfos.hr

poster presentation

Glucosyl-hesperidin (GH) is a water-soluble derivate of hesperidin, well known for its antioxidant potential. The purpose of this work was preparation of dry complexes of proteins and GH. Two types of proteins were used, milk proteins (80% of caseins) and brown rice proteins, both at different percentage levels (2, 5, 10 and 15%). Milk proteins showed a higher affinity for GH, but in both cases adsorption of GH onto proteins decreased with increased content of proteins. Antioxidant activity was evaluated by DPPH, ABTS, FRAP and CUPRAC methods. Antioxidant activity evaluated with DPPH and ABTS methods, showed a slight increase with increased protein content, while there was no significant difference between the two proteins. On the contrary, FRAP and CUPARC methods showed a higher antioxidant potential of milk protein complexes. Additionally, both methods of analysis indicated a decrease of antioxidant activity with increasing protein content. Structural changes of proteins upon adsorption of GH were evaluated by FTIR and DSC analyses. FTIR spectra of loaded proteins differed from the pure protein spectra, confirming that upon formation of complexes structural changes occurred. DSC analysis showed that protein/glucosyl-hesperidin complexes had a slightly lower temperature of denaturation. Obtained complexes can be used in preparation of functional food ingredients since they can enrich foods with GH and proteins.

Keywords: glucosyl-hesperidin, milk proteins, brown rice proteins, antioxidant activity

Acknowledgement
Research was supported by ESF and HRZZ under the project PZS-2019-02-1595.

THE INFLUENCE OF CARBOHYDRATES ON ADSORPTION OF BLACKBERRY PHENOLICS ON APPLE FIBERS

Mario Nosić[1], Anita Pichler[1], Josip Šimunović[2], Mirela Kopjar[1*]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]North Carolina State University, Department of Food, Bioprocessing and Nutrition Sciences, 400 Dan Allen Drive, Raleigh, North Carolina, USA
[*]mirela.kopjar@ptfos.hr

poster presentation

Apple fibers, due to their health benefits, have been selected as adsorption material for blackberry phenolics. Additionally, the influence of carbohydrates (sucrose and trehalose) on adsorption of phenolics on apple fibers was investigated. Complexation of blackberry juice was performed either with fibers or with fibers and carbohydrates (fibers to carbohydrate ratios were at 1:0.5, 1:1 and 1:2). Obtained samples were evaluated for phenolics, anthocyanins and antioxidant activity. Addition of carbohydrates enhanced the adsorption of phenolics, compared to pure fibers. However, with the increase of carbohydrate content, a decrease in adsorption of phenolics occurred. Samples with trehalose had a higher phenolic content in comparison to sucrose samples. Anthocyanin adsorption behavior was different. Pure fiber exhibited the highest adsorption of anthocyanins. For carbohydrate samples, the highest adsorption of anthocyanins was observed when fibers to carbohydrate ratio was at 1:1. Antioxidant activity was evaluated by DPPH, ABTS, FRAP and CUPRAC methods. Results of antioxidant activity by DPPH, ABTS and FRAP methods followed the trend of phenolics. Results of this study demonstrated that carbohydrates, especially trehalose, can be used to enhance the adsorption of phenolics onto apple fibers, but also that the ratio between fibers and carbohydrates was a crucial factor. Obtained formulations can be used in preparation of dairy, fruit and bakery products in order to improve their health benefits, antioxidant potential and color profiles.

Keywords: apple fibers, carbohydrates, blackberry phenolics, antioxidant activity

Acknowledgement
Research was supported by ESF and HRZZ under the project PZS-2019-02-1595.

APPLE FIBERS AS DELIVERY SYSTEM OF CHOKEBERRY PHENOLICS

Josipa Vukoja[1], Anita Pichler[1], Josip Šimunović[2], Mirela Kopjar[1*]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]North Carolina State University, Department of Food, Bioprocessing and Nutrition Sciences, 400 Dan Allen Drive, Raleigh, North Carolina, USA
[*]mirela.kopjar@ptfos.hr

poster presentation

Dietary fibers are well known for their health benefits, therefore the potential for their use as delivery systems of chokeberry phenolics was investigated in this study. Particularly, adsorption of chokeberry phenolics on apple fibers was tested. For preparation of freeze-dried matrices, the content of chokeberry juice was constant and apple fiber content varied (2, 4, 6, 8 and 10%). Adsorption capacities of apple fibers for phenolics and anthocyanins were determined and expressed as mg of compound per g of fiber (mg/g). Adsorption capacity of fibers for phenolics decreased with the increase in fiber content, following a logarithmic trend (24.7, 11.5, 6.4, 4.6 and 3.7 mg/g, respectively for various fiber contents). With the increase in apple fiber content, the adsorption capacity for anthocyanins also decreased (1.85, 1.28, 1.00, 0.81 and 0.66 mg/g respectively). Color parameters of obtained freeze-dried matrices were also evaluated. The highest color change in comparison to fiber was obtained for 2% of fibers and with increasing fibers content, the associated color change decreased. Structural changes on fibers upon adsorption of phenolics were confirmed by FTIR and DSC analyses. FTIR spectra of loaded fibers had a peak at 1517 cm^{-1} while the spectra of fibers were missing it. Additional changes in FTIR spectra of loaded fibers were observed in the range of 1650 - 1600 cm^{-1} and at 1020 – 980 cm^{-1}. In addition, DSC analyses indicated a slight increase in the melting point of loaded fibers.

Keywords: apple fibers, chokeberry phenolics, color

Acknowledgement
Research was supported by ESF and HRZZ under the project PZS-2019-02-1595.

EFFECT OF DIETARY MARIGOLD FLOWER EXTRACT ON TABLE EGGS LUTEIN CONTENT

Gordana Kralik[1,2*], Manuela Grčević[2,3], Danica Hanžek[2,3], Polonca Margeta[2,3], Olivera Galović[2,4], Zlata Kralik[2,3]

[1]Nutricin j.d.o.o. Darda, Đ. Đakovića 6, 31326 Darda, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Scientific Center of Excellence for Personalized Health Care, Trg sv. Trojstva 3, 31000 Osijek, Croatia
[3]Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotehnical Sciences Osijek, V. Preloga 1, 31000 Osijek, Croatia
[4]Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8/A, 31000 Osijek, Croatia
[*]gkralik@fazos.hr

poster presentation

The research explores the possibility of enriching table eggs with lutein, which is important in macular degeneration preventing in humans. For this purpose, the marigold flower extract (*Tagetes erecta* L.), rich in lutein, was used for the enrichment of eggs. Two groups of laying hens were formed, control (C) and experimental (E), that were fed mixtures without and with 300 mg/kg of marigold flower extract. Feeding and watering of hens were *ad libitum*. The experiment lasted for 31 days, and then the egg quality indicators and lutein content in egg yolks were explored. From egg quality indicators, shape index, mass of eggs and the basic parts of the egg, strength and thickness of the egg shell, Haugh units, the albumen height, the egg yolk color, pH of the albumen and pH of the egg yolk and the content of the functional ingredient - lutein were examined. The research showed that the added marigold flower extract has a negative impact on the quality of the shell (thickness, weight and proportion of the shell, $p<0.01$ and shell strength, $p<0.014$). It also reduces HU values and increases the proportion of albumen in eggs ($p<0.01$), as well as the egg yolk color ($p<0.001$). The lutein content in egg yolks of E group was 7.14 mg/100 g compared to control, where it was 0.72 mg/100 g ($p<0.001$). The research results have shown that the marigold flower extract is suitable for the enrichment of table eggs with lutein. Their consumption, according to the results of clinical trials, can prevent occurrence of macular degeneration, especially in the elderly.

Keywords: marigold flower extract, lutein, table eggs quality, yolk color

Acknowledgement
This study is supported by the European Structural and Investment Funds grant for the Croatian National Scientific Center of Excellence for Personalized Health Care (grant #KK.01.1.1.01.0010) and by Ministry of Science and Education of the Republic of Croatia.

BIOACTIVE COMPOUNDS IN NETTLE LEAVES INFLUENCED BY PRESSURIZED LIQUID EXTRACTION

Valentina Kruk[1*], Maja Repajić[1], Firat Cinar[2], Sanja Radman[3], Verica Dragović-Uzelac[1]

[1]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[2]University of Mersin, Faculty of Engineering, 33 343 Ciftlikkov, Mersin, Turkey
[3]University of Zagreb, Faculty of Agriculture, Svetošimunska cesta 25, 10000 Zagreb, Croatia
[*]vkruk@pbf.hr

poster presentation

Nettle leaves possess valuable bioactive compounds with potential application in food and pharmaceutical industries. Various extraction techniques are used for the bioactive compounds isolation, among which pressurized liquid extraction (PLE) represent very effective and eco-friendly technique. Hence, this study aimed to determine the conditions for the highest yield of total phenols and total pigments from nettle leaves (*Urtica dioica* L.) during PLE with 96% ethanol as solvent. Parameters varied during the experiment were: extraction temperature (20, 50, 80 and 110 °C), static extraction time (5, 10 min) and number of extraction cycles (1, 2, 3 and 4). Obtained extracts were spectrophotometrically analyzed for content of total phenols, total chlorophylls and total carotenoids. Furthermore, all obtained data were statistically analyzed (MANOVA). Results showed that total phenols content in nettle leaves ranged from 106.44 – 1199.70 mg GAE/100 g of dry material, total chlorophylls were determined in the range of 161.31 – 936.43 mg GAE/100 g of dry material, while total carotenoids content ranged from 38.62 – 154.89 mg GAE/100 g of dry material. Statistical analysis showed that the highest content of total phenols and total pigments from nettle leaves extracted by PLE were achieved at 110 °C/10 min/4 cycles.

Keywords: nettle leaves, pressurized liquid extraction, bioactive compounds, total phenols, total pigments

GASTROPROTECTIVE EFFECT OF GARLIC EXTRACTS (*Allium sativum*) ON AMELIORATING DAMAGE CAUSED BY SODIUM TAUROCHOLATE IN A CELL MODEL OF ULCER DISEASE

Lucija Kuna[1], Tomislav Kizivat[2], Robert Smolić[1,2], Tea Omanović Kolarić[1,2], Vjera Ninčević[1,2], Aleksandar Včev[1,2], Martina Smolić[1,2*]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Dental Medicine and Health Osijek, Crkvena 21, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine Osijek, Josipa Huttlera 4, 31000 Osijek, Croatia
[*]msmolic@mefos.hr

poster presentation

Garlic (*Allium sativum*) is one of the oldest cultivated plants with significant dietary and medicinal role. It has been used as a spice, food, and herbal medicine for over 4000 years. Numerous studies have shown the gastroprotective effect of garlic extracts (GE). Therefore, the aim was to establish a cell culture model of ulcer disease using bile salts such as sodium taurocholate (NaT) and to determine inhibition of NaT caused oxidative stress by antioxidant treatment of GE. Human gastric cell line (AGS) was used as a cellular model of ulcer disease. Cells were co-treated with different concentrations of garlic extracts (GE). The cytotoxicity of NaT against AGS cells was determined by cell counting. The oxidative stress was evaluated by expression of superoxide dismutase (SOD) by RT PCR.
NaT caused a significant reduction in the viability of AGS. It was demonstrated that cells treated with NaT and co-treated with GE showed significant increase in viability, compared to the cells treated solely with NaT. It has been demonstrated a positive correlation of SOD with antioxidant treatment.
Garlic extracts co-treatment showed gastroprotective effect on AGS cell culture model of ulcer disease. Nevertheless, further experiments are needed to confirm protective role of garlic extracts in gastric ulcer disease.

Keywords: garlic extracts, herbal medicine, ulcer disease, sodium taurocholate, AGS cell line

INFLUENCE OF ELECTROTECHNOLOGIES ON THE RECOVERY OF POLYPHENOLS FROM BLUEBERRY BY-PRODUCT

Ante Lončarić[1*], María Celeiro[2], Antun Jozinović[1], Tihomir Kovač[1], Stela Jokić[1], Jurislav Babić[1], Perla Ferrer[2], Marta Lores[2], Nebojša Kojić[3], Drago Šubarić[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Faculty of Chemistry, Laboratory of Research and Development of Analytical Solutions (LIDSA), Department of Analytical Chemistry, Nutrition and Food Science, Santiago de Compostela, Spain
[3]Vupik plus d.o.o., Sajmište 113c, 32000 Vukovar, Croatia
[*]ante.loncaric@ptfos.hr

poster presentation

There has been a growing interest to reuse food waste and by-products as a prime source for the recovery of polyphenolic compounds. Furthermore, extraction of these compounds is considered as the best approach for the valorization of such by-products. In many cases, conventional extraction techniques, maceration, digestion, infusion, Soxhlet extraction etc. are considered as non-green since they tend to be, time consuming, involve large amounts of solvents, cause degradation of some of the desired compounds. For that reason, new pre-treatment technologies that can replace conventional methods partially or completely, thus reducing the solvent consumption, temperature and/or the extraction time, can be a useful tool to get more efficient and sustainable processes. The use of electrotechnologies, especially pulsed electric fields and high voltage electrical discharges, may be a promising tool to achieve the above mentioned purposes; thus improving extraction processes in the upgrading of by-products. The objective of this study was to compare the efficiency of pulsed electric field and high voltage electrical discharge on the blueberry pomace extract characteristics. All extractions were performed with methanol and ethanol based solvents (50%, v/v). Significant effect between studied extraction methods (p<0.005) on the yield of total polyphenols was obtained. The results showed that the highest extraction yield (10.51 mg GAE/L) of polyphenols was obtained by pulsed electric field in ethanol based extraction solvent with 100 pulses at 20 kV/cm. Under the same conditions, the highest antioxidant activity of extract was achieved (0.83 mmol Trolox/L).

Keywords: pulsed electric fields and high voltage electrical discharges, polyphenols, antioxidants, blueberry pomace

APPLICATION OF BANANA PEEL EXTRACT IN THE FORMULATION OF FUNCTIONAL EDIBLE FILMS

Ana Mandura, Danijela Šeremet, Aleksandra Vojvodić Cebin, Arijana Bušić, Božidar Šantek, Draženka Komes*

University of Zagreb, Faculty of Food Technology and Biotechnology,
Pierottijeva 6, 10000 Zagreb, Croatia
**dkomes@pbf.hr*

poster presentation

A large global industry of banana (*Musa* spp.) generates the high quantity of byproduct- banana peel, representing approximately 30% of the fruit. Potential applications of banana peel depend on its chemical composition. Due to the valuable bioactive content of banana peel, the objective of this study was to develop alginate-pectin- and alginate/pectin- based edible films containing banana peel extracts and to characterize their physical (colour, solubility, thickness, dry matter) and mechanical (firmness and elasticity) properties, bioactive potential and release kinetics of bioactives from films in simulated gastrointestinal conditions. Among differently prepared banana peel extracts (conventional and ultrasound assisted extraction, acid hydrolysis, decoction and maceration), conventionally prepared extract (30 min, 80 ºC) was used in the formulation of edible films due to the highest total phenolic content (TPC) (19.08±0.35 mg GAE/g dw) and antioxidant capacity (AC) determined by ABTS assay (0.11 ± 0.00 mmol TE/g dw). According to the values of physical- mechanical properties and determined prolonged release of TPC and AC in simulated gastrointestinal conditions, alginate- based edible film was the best evaluated. The obtained results indicate the promising application of banana peel extract in the formulation of bioactive enriched delivery systems.

Keywords: edible film, banana peel, extraction, bioactive compounds

Acknowledgement
This study was conducted in the framework of research project "Sustainable production of biochemicals from secondary lignocellulose containing feedstocks" (OPB-SLS, 9717), funded by the Croatian Science Foundation.

MICROWAVE-ASSISTED EXTRACTION OF ANTIOXIDANTS FROM CAROB FLOUR – OPTIMIZATION TOWARDS IMPROVED YIELD AND BIOACTIVITY

Branimir Pavlić[1], Olga Nadlački[1], Dragana Šoronja-Simović[1], Zita Šereš[1], Nebojša Stilinović[2], Nikola Martić[2], Nikola Maravić[1*]

[1]University of Novi Sad, Faculty of Technology Novi Sad, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia
[2]University of Novi Sad, Faculty of Medecine Novi Sad, Hajduk Veljkova 3, 21000 Novi Sad, Serbia
[*]maravic@tf.uns.ac.rs

poster presentation

Carob (*Ceratonia siliqua* L.) flour has been commonly used ingredient in different food products due to its chemical profile and specific sensory properties. The aim of this work was application of microwave-assisted extraction (MAE) for recovery of polyphenols from carob flour in order to obtain concentrated antioxidant-rich extracts. Box-Behnken experimental design using three variables at three levels was applied in order to maximize total extraction, polyphenols and flavonoids yield, as well as *in vitro* antioxidant activity determined in DPPH, ABTS and FRAP model systems. Irradiation power (400 – 800 W), aqueous ethanol concentration (0 – 40%) and extraction time (5 – 25 min) were applied as independent variables. Results were fitted with quadratic polynomial model and regression analysis. Influence of process parameters on each response was evaluated. ANOVA suggested excellent fit between model and experimental results. Ethanol concentration exhibited the most prominent effect due to changes in physico-chemical properties by microwave irradiation. Multi-response optimization was performed in order to maximize all responses simultaneously and the optimized MAE conditions were irradiation of 600 W, 40% ethanol as solvent and 25 min of extraction time. Finally, it is important to emphasise that further experiments should be carried out towards production of powdered extracts which could be efficiently used in various food products.

Keywords: *Ceratonia siliqua* L., microwave-assisted extraction, polyphenols, antioxidant activity

POSITIVE EFFECT OF *n-3* PUFA ON THE LEVEL OF OXIDATIVE STRESS AND INFLAMMATORY RESPONSE

Anita Matić[1,2*], Nikolina Kolobarić[1,2], Ana Stupin[1,2], Zrinka Mihaljević[1,2], Marko Stupin[1,2,3], Luka Kolar[1], Lidija Barić[1], Martina Mihalj[1,2,4], Ivana Jukić[1,2], Ines Drenjančević[1,2]

[1]Josip Juraj Strosssmayer University of Osijek, Faculty of Medicine Osijek, Institute and Department of Physiology and Immunology, Josipa Huttlera 4, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Scientific Center of Excellence for Personalized Health Care, Trg Sv. Trojstva 3, 31000 Osijek, Croatia
[3]Clinical Hospital Center Osijek, Department for Cardiovascular Disease, Josipa Huttlera 4, 31000 Osijek, Croatia
[4]Clinical Hospital Center Osijek, Department of Dermatology, Josipa Huttlera 4, 31000 Osijek, Croatia
[*]acosic@mefos.hr

poster presentation

Inflammation and oxidative stress are now recognized as major factors involved in the pathogenesis of different diseases, like cardiovascular diseases or overweight/obesity. Increased consumption of omega-3 polyunsaturated fatty acids *(n*-3 PUFAs) is associated with decreased level of oxidative stress and anti-inflammatory effects possibly due to reduced arachidonic acid (AA)-derived eicosanoids reduced triglyceride levels, and inhibition of platelet aggregation. Most studies on the effect of *n*-3 PUFAs were performed on chronic patients and with the use of *n*-3 PUFAs in the form of supplements (capsules). The relationship between human health and food and the way in which food can affect the maintenance and improvement of human health is increasingly in the focus of the researchers. Currently, Scientific Center of Excellence for Personalized Health Care Osijek investigates the influence of *n*-3 PUFA enriched eggs on the endothelial function of the blood vessels and the change of the level of oxidative stress in cardiovascular patients and in healthy, young people and athletes. These studies have so far shown that *n*-3 PUFAs lowers the level of oxidative stress in healthy young people and have a positive effect on the microcirculation even in people with normal endothelial function, suggesting their protective effects in cardiovascular diseases.

Keywords: endothelial function, functional foods, inflammation, *n-3* PUFA, oxidative stress

Acknowledgement
This work was supported by European Structural and Investment Funds, grant for the Croatian National Scientific Center of Excellence for Personalized Health Care, University Josip Juraj Strossmayer Osijek, #KK.01.1.1.01.0010.

PREHRAMBENE NAVIKE I ZASTUPLJENOST PRIMJENE SUPLEMENATA U PREHRANI TRUDNICA

NUTRITIONAL HABITS AND INTAKE OF DIETARY SUPPLEMENTS IN DIET OF PREGNANCY

Lejla Mešalić[1], Fejzo Begović[2]

[1]JZNU Dom zdravlja Tuzla, Služba za zdravstvenu zaštitu žena i trudnica, Albina Herljevića 1, 75000 Tuzla, Bosna i Hercegovina
[2]JU Gimnazija "Mustafa Novalić" Gradačac, Sarajevska bb, 76250 Gradačac, Bosna i Hercegovina
[*]mesaliclejla@gmail.com

oral presentation / usmeno priopćenje

Zdrava prehrana majke tijekom trudnoće povećava vjerojatnost za rođenje terminskog, dobro razvijenog novorođenčeta, trudnoću i porođaj bez komplikacija. Nadalje, smanjuje rizik od prekomjerne težine majke poslije porođaja i osigurava dovoljne količine nutrijenata i zaliha energije za laktaciju i osiguravanje dugotrajnog dobrog zdravlja majke uključujući i pripremu za sljedeće trudnoće. Dijetetski suplementi mogu biti obećavajuća strategija za smanjenje negativnih ishoda u trudnoći, kao i poboljšanje nutritivnog i imunološkog statusa kod trudnica. Ciljevi istraživanja su bili utvrditi razlike u kvaliteti prehrane, analizirati primjenu suplemenata u prehrani trudnica i utvrditi potrebu za edukacijom trudnica o načinu prehrane i zdravim stilovima života. Ovo istraživanje je provedeno anketiranjem na uzorku od 500 ispitanica, koje su klasificirane prema radnom statusu, paritetu, godinama starosti i stupnju obrazovanja. Prehrana prvorotki je kvalitetnija u odnosu na višerotke zbog veće informiranosti o nutritivnim potrebama tijekom trudnoće. Trudnice s većim stupnjem obrazovanja imaju bolje prehrambene navike u odnosu na one s nižim stupnjem obrazovanja. Većina trudnica u ispitivanoj grupi su navele da je uz pravilnu prehranu potrebno uzimati vitamine i minerale kao dodatke prehrani. Trudnice mlađe od 30 godina su češće od starijih koristile ove dodatke. Ispitanice su najčešće koristile multivitamine, navodeći da konzumacija ovih preparata utječe na pravilan razvoj i ishod trudnoće. Trudnice uglavnom ne poznaju neželjena djelovanja dijetetskih suplemenata, a oko polovine njih smatra da dijetetski suplementi ne mogu imati štetan utjecaj na zdravlje. Postoji potreba da zdravstveni radnici educiraju javnost, posebno korisnike dijetetskih suplemenata što bi doprinijelo adekvatnoj suplementaciji i smanjenju neželjenih djelovanja i oštećenja zdravlja među korisnicima dijetetskih suplemenata, naročito u populaciji trudnica.

Ključne riječi: prehrana, trudnice, suplementi

Keywords: diet, pregnant women, supplements

EVALUATION OF ANTIOXIDANT CAPACITY IN FRESH WHEATGRASS JUICE *in vitro*

Katarina Mišković Špoljarić[1*], Petra Medač[1], Marija Kristić[2], Miroslav Lisjak[2], Sanja Grubišić[2], Andrijana Rebekić[2]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine, Josipa Huttlera 4, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia
[*]kmiskovic@mefos.hr

poster presentation

Wheat grass juice (*Triticum aestivum*) is rich in active components. Fresh wheatgrass juice (WGJ) has been shown to possess a wide variety of biological activities. It has been argued that wheat grass helps general detoxification of the body due to its antioxidant potential.
The aim of this research was to evaluate antioxidant activity and capacity of fresh WGJ obtained from nine wheat cultivars of different origin grown in controlled conditions. The IC50 (determined by DPPH assay) in the examined samples ranged from 66.05 ± 1.03 to 106.41 ± 1.43 mg mL^{-1}. The antioxidant capacity was evaluated on two Croatian cultivars (Felix and Ružica). Capacity was also tested on SW620 and CaCo-2 cells briefly exposed to UV radiation. Estimated relative concentrations are: SW620 1.62 mM (cv. Felix) and 1.76 mM (cv. Ružica) respectively to 1.57 mM and 1.55 mM in CaCo-2. Untreated cells show no difference in antioxidative capacity while results in exposed cells point to mild antioxidative protection. The effect on SW620 cells is 12%, and 15% to 23% on CaCo-2 cell line for cv. Ružica and cv. Felix, respectively. Obatined results point to differences between cultivars in antioxidant activity and capacity, but further analyses are necessary.

Keywords: wheatgrass, ROS, cell culture, UV radiation

POTENTIAL OF CAFFEINE TREATMENT ON OXIDATIVE STRESS AND CRYSTALLIZATION INHIBITION IN CELL CULTURE MODEL OF OXALATE UROLITHIASIS

Vjera Ninčević[1,2], Tomislav Kizivat[2], Anita Cindrić[2], Tea Omanović Kolarić[1,2], Lucija Kuna[1], Robert Smolić[1,2], Ines Bilić Ćurčić[2], Martina Smolić[1,2*]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Dental Medicine and Health Osijek, Crkvena 21, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine Osijek, Josipa Huttlera 4, 31000 Osijek, Croatia
[*]msmolic@mefos.hr

poster presentation

Caffeine is a naturally occurring central nervous system stimulant and it is found in around sixty plant species. Most common sources are the beans of *Coffea arabica* and *Coffea canephora*. Recently it has been shown that caffeine possesses antioxidant properties as well. Further, urolithiasis is a disease defined by formation of solid deposits and most of the stones inside the urinary tract are predominantly composed of calcium oxalate monohydrate (COM) which can produce free radicals. The used cell culture as in vitro model of urolithiasis was the Lilly Laboratories Cell Porcine Kidney (LLC-PK type I). Oxidative stress was caused by exposing cells to COM crystals. Cells were treated with various concentrations of caffeine. Effects of caffeine on crystallization and oxidative stress was evaluated by COM crystallization assay and total glutathione assay, respectively. Caffeine treatment blocked the crystallization of COM in *in vitro* model of proximal kidney tubules urolithiasis. Total number of COM crystals was decreasing in correlation with increasing concentrations of caffeine up to 60% and with the duration of treatment with caffeine. However, concentrations of total glutathione altered up to 1.8% only after caffeine treatment. Caffeine inhibits crystallization of COM, however its antioxidant potential in the cellular model of oxalate urolithiasis of proximal kidney tubules LLC-PK type I remains elusive.

Keywords: caffeine, calcium oxalate, LLC-PK1, urolithiasis, glutathione

USAGE OF NUTRITIONAL SUPPLEMENTS FOR INDIVIDUALS WITH DOWN SYNDROME – A REVIEW

Maja Ergović Ravančić, Valentina Obradović*

Polytechnic in Požega, Vukovarska 17, 34000 Požega, Croatia
**vobradovic@vup.hr*

oral presentation

Down syndrome (DS), as one of the most common genetic disorders, is associated with numerus issues regarding physical and mental development. Introduction of nutritional supplementation in extremely high doses to everyday routine of individuals with DS is one of the most controversial ideas proposed for improvement of their physical and intellectual life. Internet development made information availability extremely high, but the main problem for common users is to select relevant scientific information from the popular ones. Although nutritional supplementation for DS was first proposed in 1940s, it gained high popularity during 1990s. Ever since, an enormous number of researches became available on the internet to support this claims, even explain biochemical pathways relevant for sustainability of the theory. Thereby, some advocates run very aggressive campaign to spread the supplementation usage. At the same time numerous papers which beat this theory and worn of potential risks are published, but many of them are not available for wide population since access in scientific databases is often locked. So, parents and caregivers of individuals with DS are left without access to information relevant for decision on usage. In this paper, review of the newest researches and conclusions regarding nutritional supplementation in Down syndrome is presented.

Keywords: Down syndrome, trisomy 21, nutritional supplementation, targeted nutritional intervention

KLINIČKI ZNAČAJNE INTERAKCIJE HRANE I LIJEKOVA

CLINICALLY IMPORTANT FOOD-DRUG INTERACTIONS

Tea Omanović Kolarić[1,2], Vjera Ninčević[1,2], Lucija Kuna[1,2], Tomislav Kizivat[2], Aleksandar Včev[1,2], Martina Smolić[1,2*]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet za dentalnu medicinu i zdravstvo, Crkvena 21, 31000 Osijek, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Medicinski fakultet Osijek, Josipa Huttlera 4, 31000 Osijek, Hrvatska
[*]msmolic@mefos.hr

poster presentation / postersko priopćenje

Hrana koju konzumiramo gotovo svakodnevno ima potencijal ulaska u interakciju s različitim lijekovima. Kao posljedica tih interakcija može se dogoditi sljedeće: smanjenje ili potpuno sprječavanje učinkovitosti lijeka, pretjerana učinkovitost-toksičnost lijeka, pogoršanje nuspojava lijekova ili izazivanje novih nuspojava. Među hranom koja se češće konzumira, a ulazi u interakcije s lijekovima izdvajaju se: sir, maslac, mlijeko, vitaminom K bogata hrana (kelj, špinat, kupus), kalijem bogata hrana (banane, avokado, rajčica), kofeinski napitci, sok od grejpa itd. Interakcija hrane s lijekovima mogu biti farmakokinetske (interferiranje s apsorpcijom, distribucijom, metabolizmom ili eliminacijom lijeka), farmakodinamske interakcije (sinergistički aditivni ili antagonistički učinak) i kombinirane. Značajne interakcije u praksi su one na razini metabolizma lijekova, i to prvenstveno djelovanjem hrane na sustav enzima citokrom P450 u jetri. Induciranjem tih enzima (npr. Gospina trava) povećava se metabolizam lijekova koji su supstrati tih enzima, te smanjuje koncentracija, a time i učinkovitost lijekova. Obrnuto, inhibiranjem enzima (npr. sok od grejpa) povećava se koncetracija lijeka, što može dovesti do nastanka toksičnosti i nuspojava određenog lijeka. Svjesnost i poznavanje ovih interakcija važno je za liječnike kako bi bili u mogućnosti spriječiti nastanak nuspojava. Također, bitno je da se i sami pacijenti informiraju o hrani i biljnim pripravcima koje konzumiraju, te o tome pravodobno obavijeste liječnika.

Ključne riječi: hrana, lijekovi, interakcije, nuspojave

Keywords: food, drugs, interactions, side effects

UTJECAJ ZASLAĐIVAČA I SIROVINSKOG SASTAVA NA GLIKEMIJSKI INDEKS I PRIHVATLJIVOST RAZLIČITIH VRSTA KEKSA

THE EFFECT OF SWEETENER AND RAW MATERIALS IN THE GLYCAEMIC INDEX AND THE ACCEPTABILITY OF THE DIFFERENT TYPES OF BISCUITS

Melisa Oraščanin*, Edina Šertović, Emina Omeragić, Lejla Dervišević

Univerzitet u Bihaću, Biotehnički fakultet, Luke Marjanovića bb, 77000 Bihać, Bosna i Hercegovina
**melissa.bajramovic@gmail.com*

poster presentation / postersko priopćenje

Posljednjih godina u suvremenom svijetu dominira visoko prerađena i osiromašena hrana čija prekomjerna konzumacija može utjecati na zdravlje potrošača. Prehrambena industrija prilagođava se prehrambenim navikama i potrebama potrošača proizvodnjom funkcionalnih proizvoda u cilju prihvatljivosti i očuvanja senzorskih svojstava. Za potrebe ovog istraživanja kao dodatak za obogaćivanje keksa u cilju dobivanja funkcionalnog proizvoda koristili su se različiti zaslađivači (med, kokosov šećer i šećer) i bezglutenska brašna (heljda, rogač, suncokretovo i kokosovo brašno) u cilju razvoja keksa nižeg glikemijskog indeksa prihvatljivih senzorskih karakteristika. U istraživanju je dobrovoljno sudjelovalo 6 zdravih ispitanika, oba spola, starosti od 22 do 24 godine. Rezultati mjerenja šećera u krvi pokazali su značajno smanjenje glikemijskog indeksa upotrebom meda i kokosovog šećera kao zaslađivača. Pored zaslađivača utjecaj na glikemijski indeks imao je i keks sa dodatkom kokosovog i suncokretovog brašna. Svi uzorci s dodatkom šećera slabije su senzorski ocijenjeni u odnosu na uzorke s dodatkom meda i kokosovog šećera kao zasalađivača. Dobiveni funkcionalni proizvodi, uz pozitivni utjecaj na smanjenje glikemijskog indeksa različitih vrsta keksa, imaju zbog jednostavne proizvodnje potencijal za komercijalizaciju, kao i prihvatljivost širem krugu potrošača.

Ključne riječi: keks, med, kokosov šećer, bezglutenska brašna

Keywords: biscuits, honey, coconut sugar, gluten-free flour

POLYPHENOL PROFILE OF ENRICHED GRAPE JUICES

Željka Peršurić*, Lara Saftić, Andrea Kurelac, Tomislav Pavlešić, Sandra Kraljević Pavelić

University of Rijeka, Department of Biotechnology, Radmile Matejčić 2, 51000 Rijeka, Croatia
**zpersuric@biotech.uniri.hr*

poster presentation

Grape is a fruit with an exceptional composition of polyphenols. However, after juice processing, most of the phenolic compounds remain in the grape pomace, and only a minor part passes to the juice. The aim of this research was to determine the potential of enrichment of grape juices with polyphenols extracted from grape pomace. The autochthonous white grape varieties of Kastav were used for the juice production. The
polyphenol extracts from grape pomace were obtained by extraction with 70% ethanol enhanced with ultrasound. The polyphenol profile of enriched juices was determined by liquid chromatography coupled to mass spectrometry (LC-MS/MS). Additionally, total phenols were analysed with spectrophotometric Folin-Ciocalteu method. The obtained results show that the grape variety significantly influences the polyphenol profile of the juice, but it has also been observed that the variety of pomace affects the overall polyphenolic profile both qualitatively and quantitatively. The phenolic-enriched grape juices proved to be a good source of bioactive compounds and an interesting product with potential grape-derived health benefits.

Keywords: grape juice, grape pomace, polyphenols, LC-MS/MS

NUTRITIONAL VALUE OF COOKIES SUPPLEMENTED WITH EXTRUDED SUGAR BEET PULP

Jovana Petrović[1*], Biljana Pajin[1], Ivana Lončarević[1], Aleksandar Fišteš[1], Antun Jozinović[2], Sonja Simić[1], Đurđica Ačkar[2]

[1]University of Novi Sad, Faculty of Technology, Bulevar Cara Lazara 1, 21000 Novi Sad, Serbia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]jovana@tf.uns.ac.rs

poster presentation

The aim of this study was to examine the possibility of improving the nutritional value of the cookies using sugar beet pulp, the by-product of the sugar industry. Sugar beet pulp has a high content of dietary fiber, with a perfect balance of 2/3 of insoluble fibers – it has a high content in cellulose (21%), hemicellulose (27%) and pectin (23%). The pressed sugar beet pulp is rich in potassium, sodium, calcium and magnesium. The pulp raw proteins have a digestibility of 75% and contain essential amino acids - lysine, methionine, cysteine and threonine. In this work, in the cookies, wheat flour is replaced with extruded sugar beet pulp (ratio of corn grits and sugar beet pulp in extrudates was 55:45) in the amount of 5, 10 and 15%. Chemical analysis of cookies showed that with the increase in the percentage of substitution of wheat flour with extruded sugar beet pulp during the production of cookie samples, there has been a significant increase in the content of dietary fibers from 2.02% to 6.28%, proteins from 5.50% to 7.15% and minerals from 0.45% to 0.72%, compared to the control sample.

Keywords: cookies, nutritional profile, sugar beet pulp, extrusion, by-product

Acknowledgement
The authors highly appreciate the financial support of the Provincial Secretariat for High Education and Scientific Research of the Government of Autonomous Province of Vojvodina, Republic of Serbia, project: Valorization of by-products of the food industry through the development of nutritionally enriched cookies and crackers (142-451-2134/2019).

ANTIOXIDANT ACTIVITY AND PHYTOCHEMICAL CHARACTERIZATION OF *CORNUS MAS* FRUIT AND ITS PRODUCTS

Lara Saftić*, Željka Peršurić, Andrea Kurelac, Sandra Kraljević Pavelić

University of Rijeka, Department of Biotechnology, Radmile Matejčić 2, 51000 Rijeka, Croatia
**lara.saftic@biotech.uniri.hr*

poster presentation

Cornus mas fruits, called cornelian cherries, are usually used in cuisine or in a traditional medicine. The aim of this research was to determine its potential as a source of bioactive phytochemicals for enrichment of food products. Two different local *Cornus mas* fruit samples, as well as three plum jams with different ratios of plum/cornelian cherry fruits (v/v 90/10, 80/20 and 50/50), and the honey macerated with fruits were analysed with DPPH and Folin Ciocalteu total phenol assays. Additionally, phytochemical profile was determined by direct injection quadrupole-time of flight mass spectrometry (Q-TOF MS). In raw *Cornus mas* fruits several anthocyanins (pelargonidin, delphinidin and cyanindin glycosides) and two iridoids (cornuside and loganic acid) were identified. Results revealed that addition of *Cornus mas* fruits to the plum jam highly influence its total phenolic content and antioxidant capacity, whereas the highest results were obtained for the jam with the highest share of *Cornus mas* fruits (total phenols 2108.68 mg GAE/kg, antioxidant capacity 6.30 mmol trolox/kg). Additionally, this jam had specific phenols such as pelargonidin-3-*O*-glucoside, cyanindin-3-*O*-galactoside and cyanidin-3-*O*-rutinoside. The present research confirmed the potential of the *Cornus mas* fruits as a source of bioactive compounds for production of functional foods.

Keywords: *Cornus mas*, antioxidant capacity, chemical profiling, functional food

DODACI PREHRANI S POSEBNIM UTJECAJEM NA CIRKADIJALNI RITAM

FOOD SUPPLEMENTS WITH SPECIAL EFFECT ON CIRCADIAN RHYTHM

Nataša Todorović[1], Marizela Šabanović[2], Safija Softić Namas[2], Asja Sirbubalo[2*], Ajla Bilal[2]

[1]Univerzitet u Tuzli, Farmaceutski fakutet, Univerzitetska 7, 75000 Tuzla, Bosna i Hercegovina
[2]Univerzitet u Tuzli, Tehnološki fakultet, Univerzitetska 8, 75000 Tuzla, Bosna i Hercegovina
[*]asja.sirbubalo@nobel.com.ba

poster presentation / postersko priopćenje

Cirkadijalni ritam predstavlja ciklične promjene u fizičkom, psihičkom i mentalnom funkcioniranju, koje se ponavljaju svaka 24 sata i reguliran je glavnim satom tzv. *master clock*. Hormoni koji kontroliraju rad glavnog sata su hormon rasta i melatonin. Cilj ovog rada je bio istražiti upotrebu dodataka prehrani s posebnim utjecajem na cirkadijalni ritam. Istraživanje je provedeno upotrebom posebno kreiranog Upitnika u ljekarnama na širem području Tuzle. Pacijenti iznad 50 godina često koriste dodatke prehrani s posebnim utjecajem na cirkadijalni ritam. Najčešća preporuka magistara farmacije su preparati koji sadrže melatonin, valerijanu, pasifloru, magnezijum, cink i vitamine B kompleksa. Za kupovinu dodataka prehrani se odlučuju na osnovu preporuke ljekara i farmaceuta, a prednost se daje preparatima koji sadrže jedan sastojak. Kada je u pitanju cirkadijalni ritam, pacijenti najčešće koriste dodatke prehrani koji utječu na poboljšanje sna.

Ključne riječi: cirkadijalni ritam, dodaci prehrani, melatonin, valerijana, pasiflora

Keywords: circadian rhythm, food supplements, melatonin, valerian, passion flower

COMPARATIVE STUDY OF ICE CREAM WITH AND WITHOUT ADDITION OF STEVIA, EMULSIFIER AND MILK POWDER

Erhan Sulejmani*, Mersel Demiri

University of Tetova, Faculty of Food Technology and Nutrition, Department of Food Technology, Str. Ilinden, nn. 1200 Tetova, Republic of North Macedonia
**erhan.sulejmani@unite.edu.mk*

oral presentation

The purpose of this study is to investigate the production process by following the factors that affect the textural and sensory changes, as well as the need of consumers to consume dietary products. Nowadays, production and consumption of milk and dairy products like ice creams, are still under development in Republic of North Macedonia. Although great progress has been made in the dairy technology and industry, and also in the ice cream industry as a result of non-standardized technological processes and economic factors. Four types of ice creams were manufactured using stevia (S), milk powder (PP), emulsifier (PS), and UHT whole milk (C) and investigated for physical, chemical and sensory characteristics of ice-creams. The pH degrees of ice cream samples were around 5.82 and 6.62. The hardness values from textural analyze were around 3.40 and 598.61 N. The highest overrun ratio (29.27%) was found in (PP) ice cream during the first week of storage. This investigation showed that incorporation of stevia into ice creams is a good alternative in order to reduce the application of sugar to the products. Moreover, the texture evaluations of the ice creams confirmed the importance of stevia to obtain a product with longer stability.

Keywords: ice cream, hardness, melting rate, sensory analysis

MIKROALGE U SLUŽBI ZDRAVLJA – IZVOR PRIRODNIH ANTIOKSIDANSA

MICROALGAE FOR HEALTH – SOURCE OF NATURAL ANTIOXIDANTS

Denis Vadlja[1,2*], Lara Čižmek[1,2], Maja Galić[1,2], Sanja Babić[1,2], Natalija Topić Popović[1,2], Ivančica Strunjak-Perović[1,2], Rozelindra Čož-Rakovac[1,2]

[1]Institut Ruđer Bošković, Zavod za kemiju materijala, Laboratorij za biotehnologiju u akvakulturi, Bijenička cesta 54, 10000 Zagreb, Hrvatska
[2]Znanstveni centar izvrsnosti za bioprospecting mora – BioProCro, Bijenička cesta 54, 10000 Zagreb, Hrvatska
[*]denis.vadlja@irb.hr

poster presentation / postersko priopćenje

Mikroalge su prokariotski ili eukariotski fotosintetski mikroorganizmi jednostavne stanične građe koji predstavljaju bogat izvor karotenoida, vitamina i fenola. Dobre karakteristike mikroalgi, poput brzog rasta uz korištenje ugljičnog dioksida, visokih prinosa biomase, sposobnosti skladištenja esencijalnih hranjivih tvari i mogućnosti primjene genetskih modifikacija, osnova su njihove široke primjene u različitim granama industrije. Mikroalge mogu sintetizirati antioksidativne molekule (npr. polifenoli) koje sprječavaju peroksidaciju lipida i time produljuju rok trajanja prehrambenih proizvoda. Nedovoljno literaturnih podataka o antioksidativnoj aktivnosti polifenola iz ekstrakata mikroalgi predstavlja prepreku njihove uporabe u prehrambenoj industriji. Glavni cilj ovog istraživanja bio je utvrditi antioksidativnu aktivnost ekstrakata morske mikroalge *Dunaliella tertiolecta* ovisno o načinu sušenja, predtretmanu i vrsti ekstrakcije. Za svaki od ekstrakata određen je ukupan udio polifenola i njihova antioksidativna aktivnost. Prema rezultatima, udio polifenola i kapacitet antioksidativne aktivnosti zabilježen na uzorcima liofilizirane biomase mikroalge *D. tertiolecta* veći je u odnosu na uzorke komercijalno dostupnih slatkovodnih mikroalgi (*Chlorella vulgaris*). Dobiveni rezultati dali su uvid u optimalne uvjete ekstrakcije mikroalge *D. tertiolecta* i ukazali na njezin potencijal primjene u prehrambenoj industriji. Istraživanja su pomogla u razumijevanju postupaka ekstrakcije i iskoristivosti dobivenih ekstrakata mikroalgi u stvaranju ekonomski održivog i isplativog proizvodnog postupka sinteze prirodnih antioksidansa.

Ključne riječi: *Dunaliella tertiolecta*, ekstrakcija mikroalgi, polifenoli, kapacitet antioksidativne aktivnosti

Keywords: *Dunaliella tertiolecta*, microalgae extraction, polifenols, antioxidant activity capacitiy

THE QUEST FOR NEW FUNCTIONAL PRODUCTS: BEER WITH THE ADDITION OF MEDICINAL MUSHROOM *Trametes versicolor* EXTRACT

Natalija Velić[1*], Janez Gorenšek[2], Karla Špehar[1], Martina Medvidović-Kosanović[3], Darko Velić[1], Hrvoje Pavlović[1], Indira Kosović[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Institute for Applied Mycology and Biotechnology, Vegova 26, 3000 Celje, Slovenia
[3]Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8/A, 31000 Osijek, Croatia
[*]natalija.velic@ptfos.hr

invited lecture

The food market is in constant demand for new products with a high added value associated with health, i.e. functional products. Even though the beneficial health properties of moderate beer consumption have been documented, the quest for functional beer additives is still ongoing. The study aimed to investigate how the addition of medicinal mushroom *Trametes versicolor* extract to the wort affects the yeast fermentation activity, as well as the physico-chemical properties of the final product. Microfermentations of wort with the addition of 1 mL mushroom ethanol extract (750 mL wort), and 10 and 20 mL of the mushroom water extract (1750 mL wort) were carried at 18 °C for 12 days. Commercially available top-fermenting dry yeast was used as inoculum, and the fermentation process was monitored by CO_2 evolution. Basic standard beer analyses, as well as total polyphenol content and antioxidant activity (DPPH), were performed in all beer samples, including the control samples (without the mushroom extract addition). The obtained results suggest that the addition of medicinal mushroom *T. versicolor* extract to wort did not significantly affect the fermentation activity of yeast or the basic beer quality indicators. In comparison to control samples, somewhat higher concentrations of total polyphenols were recorded in all beer samples with the addition of extracts.

Keywords: beer, medicinal mushrooms, *Trametes versicolor*, fermentation activity, total polyphenols

APPLICATION OF DIFFERENT DRYING TECHNIQUES ON PUMPKIN (*Cucurbita pepo*): MICROMETRIC AND STRUCTURAL CHARACTERIZATION

Senka Vidović[1*], Rita Ambrus[2], Anita Vakula[1], Csilla Bartos[2], Zdravko Šumić[1], Jelena Vladić[1]

[1]University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia
[2]University of Szeged, Faculty of Pharmacy, Institute of Pharmaceutical Technology and Regulatory Affairs, Eotvos 6, 6720, Szeged, Hungary
[*]senka.curcin@yahoo.com

poster presentation

In the framework of this research pumpkin was dried with vacuum, convective and freeze drying in order to compare micrometric and structural characteristics of milled dried pumpkin samples. Milling, as a disintegration technology is environmentally and economically advantageous because it is organic solvent free, simple and well reproducible. In this case, microparticles could be produced. Furthermore, based on these characteristics, use of milled dried pumpkin as a functional instant food-product was investigated. Fresh pumpkin samples were first dried by vacuum drying (20 mbar; 50, 55, 60, 65 and 70 °C), convective drying (1000 mbar; 70 °C) and freeze drying (0.01 mbar; -30 °C). Dried pumpkin samples were than exposed to milling (1 h and 400 rpm) and the main micrometric and structural analysis, such as particle size analysis, scanning electron microscopic analysis and powder wettability, were observed. The structure of pumpkin powder was also investigated by thermoanalytical method and X-ray powder diffraction.

Keywords: pumpkin, drying, micrometric and structural characteristics, powder flow properties

Acknowledgement
Bilateral collaboration between Hungary and Serbia (grant number: HU-SERB bilateral cooperation, TÉT_16-1-2016-0167).

MICROWAVE-ASSISTED EXTRACTION OF BIOACTIVE COMPOUNDS FROM POMEGRANATE PEEL

Jelena Vladić[1*], Senka Vidović[1], Katarina Šavikin[2], Jelena Živković[2], Gordana Zdunić[2], Teodora Janković[2]

[1]University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia,
[2]Institute for Medicinal Plants Research Dr. Josif Pančić, Tadeuša Koćuška 1, 11000 Belgrade, Serbia
[*]vladicjelena@gmail.com

poster presentation

The most important use of pomegranate in the food industry is in the juice production where after its use, a great amount of waste such as pomegranate peel is generated. The peel is mostly treated as waste and/or animal feed. However, recent studies have been focused on estimating the potential of this waste as a source of bioactive components. It has been determined that pomegranate peel contains numerous biologically active compounds including natural antioxidants such as polyphenols. Having in mind the multifaceted benefits of its bioactive components, it is of interest to determine the most adequate ways of valorization of pomegranate waste.

The aim of this study was to explore the possibility of utilizing pomegranate peel as a source of bioactive components by using a green technology, the microwave-assisted extraction. The adequacy of applying this technology in the production of high-value extracts of pomegranate peel was examined by using water and 50% ethanol as a solvent, and irradiation power 470 and 800 W with constant extraction time of 20 minutes.

By applying HPLC analysis, it was determined that obtained extracts contain bioactive components such as gallic acid, pinicalin, punicalagin α+β, and ellagic acid. It was determined that 50 % ethanol is more suitable solvent than water for the extraction of bioactive compounds from pomegranate peel at both lower and higher irradiation power levels. The combination of 50% ethanol and lower irradiation power is the most adequate for the extraction of gallic acid, punicalin, punicalagin α+β (535.44, 7478.95 and 2183.18 μg/mL, respectively), while higher irradiation power is the most adequate for the extraction of ellagic acid (966.93 μg/mL).

Keywords: pomegranate, microwave-assisted extraction, phenolics

INFLUENCE OF NATURAL ANTIOXIDANTS ON COLOR AND FAT STABILITY IN SYSTEM OF NITRITE LOW ORGANIC COOKED SAUSAGES

Dragan Vujadinović[1], Milan Vukić[1*], Marko Ivanović[1], Vladimir Tomović[2], Jelena Tomić[3]

[1]University of East Sarajevo, Faculty of Technology, Karakaj 34a, 75400 Zvornik, Republic of Srpska, Bosnia and Herzegovina
[2]University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Republic of Serbia
[3]University of Novi Sad, Institute of Food Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Republic of Serbia
[*]milan.vukic@tfzv.ues.rs.ba

poster presentation

Vegetables are an important natural source of nitrate salts, which can be reduced to nitrite salt in combination with a nitrate reductive starter strain under controlled conditions, while fruits, spices and their derivatives are a good source of natural antioxidant substances. Consequently, the goal of this paper is to stabilize the system of organic cooked sausages with natural sources of nitrate salts and antioxidants in the presence of unsaturated fat and reduced nitrite salt content. The tested models of organic cooked sausages were sliced and stored at 4 °C for a period of 15 days. Changes of color parameters (CIELab), pH, TBARS values, nitrate and residual nitrite salt content were tested. For models in which celery powder and "liquid supplements" were used, which were incubated for 12 h; 20 °C, significant higher value ($p \leq 0.05$) of the color parameter a^* was measured. Significant lowest TBARS values ($p \leq 0.05$) were achieved with models in which the essential oils were used.

Keywords: organic cooked sausages, natural nitrate, nitrite, natural antioxidants

FUNCTIONAL TAGLIATELLE WITH ENCAPSULATED ZEAXANTHIN ISOLATED FROM SWEET CORN WASTE

Vanja Šeregelj, Jelena Vulić*, Gordana Ćetković, Jasna Čanadanović-Brunet, Vesna Tumbas Šaponjac, Slađana Stajčić, Manuela Sovilj

University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia
**jvulic@uns.ac.rs*

poster presentation

The encapsulation of sweet corn waste extract (SC) by freeze-drying was studied as a strategy to protect zeaxanthin for improving nutritional and functional properties of wheat-based tagliatelle. It is well known that the used wall material affects various physicochemical characteristics of encapsulates, which might affect their stability during processing or storage period. In this study, four wall materials (soy proteins, pea proteins, maltodextrin, and inulin) were compared, evaluating the water activity, moisture content, hygroscopicity, solubility, flowing properties, color and encapsulation efficiency. For all samples, results of water activity, moisture content and hygroscopicity indicate the range of microbiological safety. Encapsulates with carbohydrates showed high solubility (>85%) and poor flow properties, while proteins exhibited low solubility (<20%) and very poor flowing, but better color properties. Pea proteins showed the highest encapsulation efficiency of zeaxanthin (93%), as well as their retention during cooking of tagliatelle (67%). In conclusion, the encapsulation of SC extract with pea proteins as wall material by freeze-drying represents an effective approach to produce new value-added pasta with stable zeaxanthin. This approach also takes a step forward to waste reduction and offers new ways for the development of innovative and healthy foods.

Keywords: sweet corn waste, zeaxanthin, encapsulation, freeze-drying, enriched tagliatelle

ESENCIJALNE I NEESENCIJALNE AMINOKISELINE U ISPITANIKA S TUMOROM TESTISA

ESSENTIAL AND NON-ESSENTIAL AMINO ACIDS IN MEN WITH TESTICULAR CANCER

Tanja Živković Semren[1*], Blanka Tariba Lovaković[1], Stela Jokić[2], Krunoslav Aladić[3], Marija Gamulin[4], Alica Pizent[1]

[1]Institut za medicinska istraživanja i medicinu rada, Ksaverska cesta 2, 10000 Zagreb, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[3]Hrvatski veterinarski institut, Veterinarski zavod Vinkovci, Josipa Kozarca 24, 32100 Vinkovci, Hrvatska
[4]KBC Zagreb, Klinika za onkologiju, Kišpatićeva 9, 10000 Zagreb, Hrvatska
[*]tzivkovic@imi.hr

poster presentation / postersko priopćenje

Nastanak i razvoj raka povezan je s promjenama u staničnom metabolizmu koje nisu samo posljedica nastanka bolesti, već pridonose i njenom napredovanju. Nastale promjene mogu se pratiti analizom metabolita u biološkim uzorcima oboljelih ispitanika. Rezultati takvih analiza mogu pridonijeti identificiranju novih bioloških biljega i terapijskih ciljeva. Među metabolitima, slobodne aminokiseline su jedne od najprikladnijih kandidata. Mogu se unositi hranom (esencijalne aminokiseline) ili ih organizam može sam sintetizirati te njihov dodatak nije potreban za funkcioniranje zdravog organizma (neesencijalne aminokiseline). Stanice raka utječu na metabolizam aminokiselina kako bi kompenzirale veće strukturne i energetske potrebe što pridonosi mjerljivoj promjeni njihove koncentracije u biološkim uzorcima. Mnogi tumori pokazuju povećane potrebe za neesencijalnim aminokiselinama. Kako bi se ispitao dijagnostički i/ili terapijski potencijal slobodnih aminokiselina, izmjerene su koncentracije devet esencijalnih i devet neesencijalnih aminokiselina u uzorcima urina oboljelih od tumora testisa i kontrolnih ispitanika pomoću vezanog sustava GC-MS primjenom Phenomenex komercijalnog paketa. Ispitanici s tumorom testisa imali su značajno niže koncentracije neesencijalnog serina i esencijalnih treonina i histidina te značajno više koncentracije neesencijalne asparaginske kiseline od kontrolnih ispitanika. Navedeni preliminarni rezultati ukazuju na dijagnostički i terapijski potencijal navedenih aminokiselina što je potrebno potvrditi analizom većeg broja uzoraka i uključivanjem dodatnih analiza aminokiselina u krvnoj plazmi.

Ključne riječi: metabolizam stanica raka, aminokiseline, tumor testisa, GC-MS

Keywords: cancer cell metabolism, aminoacids, testicular tumour, GC-MS

SAMONIKLO BILJE U TRADICIONALNOJ MEDICINI NAŠIČKOG PODRUČJA

WILD PLANTS IN TRADITIONAL MEDICINE OF THE NAŠICE AREA

Tanja Žuna Pfeiffer*, Marija Hmura, Ljiljana Krstin, Ivana Eržić, Dubravka Špoljarić Maronić, Zorana Katanić, Nikolina Bek

Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za biologiju, Ulica cara Hadrijana 8/A, 31000 Osijek, Hrvatska
**tzuna@biologija.unios.hr*

poster presentation / postersko priopćenje

Hrvatska je bogata različitim biljnim vrstama među kojima su mnoge još od davnina korištene za prehranu ili u narodnoj medicini za liječenje različitih oboljenja. Istraživanje tradicionalne upotrebe samoniklog bilja provedeno je u ukupno 7 naselja na području Našica putem anketnog upitnika u razdoblju od prosinca 2016. do svibnja 2017. godine. Ispitano je 28 ispitanika pretežno ženskog spola, srednjoškolskog obrazovanja i prosječne starosti 56 godina. Utvrđeno je da ispitanici koriste ukupno 33 vrste samoniklog bilja iz 22 biljne porodice. Najveći broj zabilježenih vrsta pripada porodicama *Asteraceae*, *Rosaceae* i *Lamiaceae*. Među zabilježenim vrstama ispitanici najčešće prikupljaju kamilicu, koprivu, pasju ružu (šipak) i maslačak. Od prikupljenog biljnog materijala izrađuju različite pripravke (npr. čajeve, tinkture, obloge), a najčešće ih koriste za liječenje oboljenja probavnog, dermatološkog i respiratornog sustava. U svrhu očuvanja vrijednih znanja o tradicionalnoj upotrebi samoniklog bilja na području Našica, potrebno je provesti daljnja istraživanja.

Ključne riječi: etnobotanika, ljekovito bilje, tradicionalno znanje

Keywords: ethnobotany, medicinal plants, traditional knowledge

***FOOD SAFETY* /**
ZDRAVSTVENA SIGURNOST HRANE

THE OCCURRENCE OF BIOGENIC AMINES IN SELECTED FOOD OF ANIMAL ORIGIN FROM THE CROATIAN RETAIL MARKET

Tanja Bogdanović[1*], Sandra Petričević[1], Mia Brkljača[2], Irena Listeš[1], Jelka Pleadin[3]

[1]Croatian Veterinary Institute, Veterinary Institute Split, Poljička cesta 33, 21000 Split, Croatia
[2]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[3]Croatian Veterinary Institute,Laboratory for Analytical Chemistry, Savska cesta 143, 10000 Zagreb, Croatia
[*]t.bogdanovic.vzs@veinst.hr

oral presentation

This study aims to characterise the presence of eight biogenic amines (BAs) tryptamine (TRY), phenylethylamine (PHE), putrescine (PUT), cadaverine (CAD), histamine (HIS), tyramine (TYR), spermidine (SPD) and spermine (SPM) in cheese, fish and fishery products and meat and meat products. A selective and robust method for the determination BAs in a total of 90 samples using high performance liquid chromatography (HPLC) with diode array detection (DAD) was applied in accordance with performance criteria outlined in European legislation. Among groups of food and within each group there is variability in amounts of BAs detected. In the analyzed samples the most represented amines were TYR, HIS, CAD, and PUT. Based on the highest content of the most toxic BA (HIS and TYR) the food safety relevance of the considered food categories can be ranked in the following decreasing order cheese (HIS up to 106.4 mg/kg; TYR up to 206.6 mg/kg), fish and fishery products (HIS up to 98.8 mg/kg; TYR up to 47.9 mg/kg) and meat and meat products (HIS up to 20.0 mg/kg; TYR up to 117.5 mg/kg). Total content of BAs was statistically significantly higher ($p<0.05$) in fermented samples of all food groups. Further research still has to be done regarding monitoring of BAs concentrations in selected food of animal origin during the production process and along the food chain to minimize the contents of BAs.

Keywords: biogenic amines, food of animal origin, food safety

ANALYSIS OF RASFF NOTIFICATIONS ON FOOD PRODUCTS CONTAMINATED WITH *Salmonella* spp. INVOLVING CROATIA

Emilija Friganović[1*], Nikolina Tokmakčija[1], Mladenka Šarolić[1], Boris Dorbić[1], Domagoj Friganović[2]

[1]Marko Marulić Polytechnic of Knin, Petra Krešimira IV 30, 22300 Knin, Croatia
[2]Veterinary Infirmary Gardijan d.o.o., Kralja Zvonimira 143, 22000 Šibenik, Croatia
[*]efriganovic@veleknin.hr

poster presentation

The Rapid Alert System for Food and Feed (RASFF) enables a fast exchange of information between bodies and institutions involved in the system in order to respond promptly to the health risks associated with food and feed. *Salmonella* is an important cause of EU foodborne outbreaks, most frequently reported pathogenic microorganism in food in the last few years. The aim of this study was to analyze RASFF notifications on food products contaminated with *Salmonella* spp. involving Croatia in the period from 01/01/2014 to 31/12/2018. All data were downloaded from the RASFF portal and processed in MS Excel 2010. The collected data provided information on the: country(ies) of origin and distribution of the contaminated product, notifying country, product and product category, notification type, risk decision, action taken, distribution status and, for some incidents, a *Salmonella* spp. serovar. Notifications mainly concerned "poultry meat and poultry meat products". Majority of the reported food products originated from Poland, Brazil and Italy. Almost half of the notifications were notified by Croatia. Majority of the notifications were classified as alert notifications and of serious risk. Most of the *Salmonella* spp. notifications were based on official controls on the market and on company's own check.

Keywords: RASFF, notifications, *Salmonella* spp., food, Croatia

IZLOŽENOST ODRASLE POPULACIJE U RH AKRILAMIDU IZ HRANE

EXPOSURE OF ADULT POPULATION IN CROATIA TO ACRYLAMIDE

Danijela Stražanac[1], Jelka Pleadin[2], Sanja Miloš[1], Brigita Hengl[1], Helga Medić[3], Jasna Bošnir[4], Tomislav Klapec[5], Nino Dimitrov[6], Andrea Gross-Bošković[1*]

[1]Hrvatska agencija za poljoprivredu i hranu, Centar za sigurnost hrane, I. Gundulića 36b, 31000 Osijek, Hrvatska
[2]Hrvatski veterinarski institut, Savska cesta 143, 10000 Zagreb, Hrvatska
[3]Sveučilište u Zagrebu, Prehrambeno-biotehnološki fakultet, Pierottijeva 6, 10000 Zagreb, Hrvatska
[4]Nastavni zavod za javno zdravstvo "Dr. Andija Štampar", Mirogojska 16, 10000 Zagreb, Hrvatska
[5]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[6]Hrvatski zavod za javno zdravstvo, Rockefellerova 7, 10000 Zagreb, Hrvatska
[*]andrea.gross-boskovic@hapih.hr

poster presentation / postersko priopćenje

Akrilamid nastaje kao prirodni nusproizvod prilikom pečenja ili prženja hrane, spajanjem bjelančevina i šećera pod utjecajem visoke temperature u novu molekulu, pri čemu nastaju pigmenti i aromatične tvari (tamna boja i specifičan okus pečenih proizvoda, hrskavost). U hranu koja najviše doprinosi unosu akrilamida ubrajaju se proizvodi od krumpira, kava te pekarski i ostali proizvodi od žitarica.
Zbog male molekularne mase, akrilamid se brzo i lako apsorbira u crijevima te se putem krvožilnog sustava distribuira po organizmu. Zbog svega navedenog, količina akrilamida u hrani treba biti što je niže moguća.
Za procjenu izloženosti koristili su se podaci monitoringa hrane za tri godine (2014. – 2016.) te podaci o potrošnji hrane u Hrvatskoj dobiveni iz istraživanja koje je provela Hrvatska agencija za hranu tijekom 2011. i 2012. godine. Kako je akrilamid kontaminant koji ima kancerogen i genotoksičan učinak, koristio se MOE pristup (eng. *margin of exposure*) pri kojem se uzela u obzir vrijednost kronične izloženosti odrasle populacije RH. Uzimajući u obzir dobivene rezultate može se zaključiti kako se zabrinutost zbog unosa akrilamida ne može isključiti, te da ukupnoj izloženosti unosu akrilamida najviše doprinosi pomfrit (23,94 %), turska kava (13,95 %), kruh i peciva (12,83 %), čips (12,28 %), keksi (10,74 %), grickalice (8,98 %) te žitarice (5,18 %).

Ključne riječi: akrilamid, hrana, MOE, izloženost, rizik

Keywords: acrylamide, food, MOE, exposure, risk

FOOD CONTAMINATION BY PESTICIDES. SHOULD WE WORRY?

Vezirka Jankuloska[1*], Ilija Karov[2], Gorica Pavlovska[1]

[1]University St. Kliment Ohridski Bitola, Faculty of Technology and Technical Sciences Veles, Dimitar Vlahov 57, 1400 Veles, Republic of North Macedonia
[2]University Goce Delcev Shtip, Agricultural Faculty, Krste Misirkov 10-A, 2000 Shtip, Republic of North Macedonia
[*]vezirka.jankuloska@uklo.edu.mk

oral presentation

Food contamination is a global challenge that is largely addressed attention. The nutritional, healthy and medicinal properties are effective when the food does not contain contaminants. Pesticides are a chemical group of contaminants that originate from agricultural production with many benefits and hazards. The use of multi-residue methods is detected pesticides from different groups in apples *(Malus domestica).* A total of 224 pesticides were analyzed by UPLC-TQ/MS and 25 pesticides were detected. A total of 75% of samples contained chlorpyrifos residue with above maximum residue levels (MRLs). The obtained results of the analysis were not only used to check the compliance of apple samples with MRLs but also for the assessment of consumers' risk resulting from exposure to pesticide residues via apple consumation. The acute risk assessment is based on the acute reference dose (ARfD). Acute risk assessment is 22% ARfD/ADI for children and 6% for adults. The calculation is based on the large portion of the most critical consumer group. Results of chronic risk assessment for the differents diet is in range of 0.3 – 12% of acceptable daily intake (ADI). The long-term intake of residues of chlorpyrifos is unlikely to present a public health concern.

Keywords: pesticides, residues, food safety, risk assessment

MIKROBIOLOŠKI STATUS TRADICIONALNIH SIREVA NA OBITELJSKIM POLJOPRIVREDNIM GOSPODARSTVIMA

MICROBIOLOGICAL STATUS OF TRADITIONAL CHEESES PRODUCED ON FAMILY FARMS

Maja Kiš*, Sanja Furmeg, Vesna Jaki Tkalec, Jadranka Sokolović, Željko Cvetnić

Hrvatski veterinarski institut, Veterinarski zavod Križevci, Zakmardijeva 10, 48260 Križevci, Hrvatska
**kis.vzk@veinst.hr*

poster presentation / postersko priopćenje

Proizvodnja autohtonih sireva na seoskim domaćinstvima u Hrvatskoj ima dugu tradiciju, uz sve značajniji interes potrošača za domaćim proizvedenim sirom. Kiseljak i svježi (meki) sir autohtoni su proizvodi koji se tradicionalno proizvode na području sjeverozapadne Hrvatske. Nepasterizirano mlijeko, kao osnovna sirovina za njihovu proizvodnju, idealan je supstrat za rast i razmnožavanje brojnih mikroorganizama koji potom mogu uzrokovati mikrobiološku kontaminaciju sira.
Cilj ovog rada bilo je istraživanje mikrobiološke kakvoće uzoraka tradicionalnih sireva od nepasteriziranog kravljeg mlijeka koji se prodaju na tržnicama sjeverozapadne Hrvatske, a proizvedeni su na obiteljskim poljoprivrednim gospodarstvima. Mikrobiološka analiza provedena je u skladu s odredbama Vodiča za mikrobiološke kriterije za hranu (2011.) na sljedeće parametre: *Listeria monocytogenes, Salmonella* spp., *Escherichia coli, Staphylococcus aureus*, kvasce i plijesni.
Rezultati su pokazali kako od ukupno 40 analiziranih uzoraka, 32,50 % (13 uzoraka) nije zadovoljilo kriterije mikrobiološke ispravnosti zbog povećanog broja *E. coli, S. aureus*, kvasaca i plijesni. Kontaminacija bakterijama *Salmonella* spp. i *L. monocytogenes* nije utvrđena ni u jednom uzorku.

Ključne riječi: svježi sir, sir kiseljak, mikrobiološka kontaminacija, sigurnost hrane

Keywords: fresh cheese, pickled cheese, microbiological contamination, food safety

MERCURY CONTENT IN OLIVE OIL

Ilija Klarić[1*], Daniela Amidžić Klarić[2], Ana Mornar[2]

[1]Public Health Brčko DC, Department of Health Ecology, R. Dž. Čauševića 1, 76000 Brčko DC, Bosnia and Herzegovina
[2]Faculty of Pharmacy and Biochemistry, Department of Pharmaceutical Analysis, Ante Kovačića 1, 10000 Zagreb, Croatia
[*]klaric67@gmail.com

poster presentation

Mercury is a toxic heavy metal even at very low concentrations and it has no known nutritional function in humans. Little is known about mercury contamination in olive oil. On the other side, this metal is recognized as a problem element analytically. For all the reasons mentioned above, the aim of this work was to evaluate total mercury content in 34 samples of Croatian olive oil and to compare to maximum allowed value.
The mercury content in the investigated olive oil samples was analyzed by using advanced mercury analyzer AMA-254 with HS cuvette (Leco, Czech Republic) under the following conditions: wavelength 253.6 nm, drying time 60 s, decomposition time 150 s, cuvette clear time 45 s and typical sample mass 100 mg. LOD and LOQ values was found to be 18.2 and 30.3 ng/kg, respectively.
The presence of mercury, a non-essential heavy metal, was detected in all samples and the values of the total mercury content in olive oils were in the range of 45.4 – 210.7 ng/kg; mean value 100.2 ng/kg (RSD: 0.9 – 9.9%).
It is noteworthy that all analysed olive oil samples had the total mercury content below the internationally established maximum allowed value (100 µg/kg).

Keywords: mercury, olive oil, metal contamination, regulatory challenge

POJAVNOST CIKLIČKIH IMINA U DAGNJAMA (M*ytilus galloprovincialis*) PODRIJETLOM IZ SJEVERNOG JADRANA

OCCURRENCE OF CYCLIC IMINES IN MEDITERRANEAN MUSSELS (*Mytilus galloprovincialis*) ORIGINATING FROM NORTHERN ADRIATIC SEA

Kristina Kvrgić[1*], Dijana Mišetić Ostojić[1], Natalija Džafić[1], Jelka Pleadin[2]

[1]Hrvatski Veterinarski Institut, Veterinarski zavod Rijeka, Podmurvice 29, 51000 Rijeka, Hrvatska
[2]Hrvatski Veterinarski Institut, Laboratorij za analitičku kemiju, Savska cesta 143, 10000 Zagreb, Hrvatska
[*]kvrgic.vzr@veinst.hr

poster presentation / postersko priopćenje

Ciklički imini (CI) su skupina lipofilnih fikotoksina poznatih kao brzodjelujući neurotoksini, koji izazivaju smrt pokusnih životinja u vrlo kratkom vremenu nakon intraperitonealne aplikacije. Poput ostalih fikotoksina bioakumuliraju se u školjkašima koji postaju njihovi vektori u prehrambenom lancu. Cilj ovog istraživanja bio je utvrditi pojavnost i maseni udio 13-desmetil C spirolida (desMeC), gimnodimina (GYM) i pinatoksina-G (PnTX-G) u 82 uzorka dagnji prikupljenih tijekom srpnja i kolovoza 2018. godine iz uzgojnih područja istarskog poluotoka, primjenom tekućinske kromatografije s masenom detekcijom (LC-MS/MS). Njihovo prisustvo utvrđeno je u 50 % uzoraka s rasponom masenih udjela 3,01 – 19,1 μg/kg za GYM, koji je ujedno imao najveću pojavnost (34 %), te 3,03 – 5,90 μg/kg za desMeC, čija pojavnost je bila nešto manja u odnosu na GYM (29 %). PnTX-G je detektiran u svega tri uzorka, međutim, prema našim saznanjima po prvi puta u školjkašima podrijetlom iz hrvatskog dijela sjevernog Jadrana. Budući su CI fikotoksini otkriveni među posljednjima te o njima nedostaju istraživanja s područja Jadrana, ovo istraživanje će uvelike doprinijeti utvrđivanju njihove geografske distribucije te dati podatke koji će uz epidemiološka i toksikološka istraživanja poslužiti za procjenu rizika za potrošače i utvrđivanje najveće dopuštene količine, koja još uvijek nije određena legislativom Europske unije.

Ključne riječi: ciklički imini, fikotoksini, LC-MS/MS, pojavnost, geografska distribucija

Keywords: cyclic imines, phycotoxins, LC-MS/MS, occurrence, geographic distribution

DETECTION OF OCHRATOXIGENIC MOULDS IN TRADITIONAL CROATIAN SAUSAGES

Tina Lešić[1*], Manuela Zadravec[2], Dragan Brnić[3], Željko Jakopović[4], Maja Kiš[5], Jelka Pleadin[1]

[1]Croatian Veterinary Institute, Laboratory for Analytical Chemistry, Savska Cesta 143, 10000 Zagreb, Croatia
[2]Croatian Veterinary Institute, Laboratory for Feed Microbiology,Savska Cesta 143, 10000 Zagreb, Croatia
[3]Croatian Veterinary Institute, Laboratory for Serological Diagnostics of Viral Diseases,Savska Cesta 143, 10000 Zagreb, Croatia
[4]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[5]Croatian Veterinary Institute, Veterinary Centre Križevci, Laboratory for Analytical Chemistry and Residues, Ivana Z. Dijankovečkog 10, 48260 Križevci, Croatia
[*]lesic@veinst.hr

poster presentation

During ripening of traditional meat products, their surface can be overgrown by moulds, mainly of the *Penicillium*, *Aspergillus* and *Eurotium* genera, some of which mayhave beneficial effects on product quality, but also cause mycotoxin contamination. This study was performed on dry-fermented Kulenova Seka (n=10) and Slavonian domestic sausage (n=10) produced in households seated in Slavonia and Baranja. Surface moulds were isolated and identified using traditional mycological and molecular (polymerase chain reaction, PCR) methods. From the surface of these sausages, a total of 41 isolates (8 *Penicillium* and 3 *Aspergillus* species) were recovered, among which *A. niger*, known as an ochratoxin A (OTA) – producing fungus, recovered from a sample of Slavonian domestic sausage. DNA isolation and detection of OTA biosynthetic genes by PCR method were performed in OTA-positive sausages (n=5), previously analysed by liquid chromatography with tandem mass spectrometry (LC-MS/MS) and resulted with OTA concentrations of up to 0.48 μg/kg. OTA non-ribosomal peptide synthetase gene was detected in two samples of Slavonian domestic sausage. OTA contamination of samples in which mould genes were not identified can be explained by the carryover from contaminated feed or the use of contaminated spices, such as red pepper.

Keywords: traditional meat products, mould identification, mycotoxins, ochratoxin A, biosynthetic genes

SCREENING OF PESTICIDE CONTENT IN A TRADITIONAL APPLE CULTIVARS FROM CROATIAN MARKET

Tihomir Kovač[1], Marija Kovač[2], Ante Nevistić[2], Maja Crkvenac[1], Goran Fruk[3], Martina Skendrović Babojelić[3], Jurislav Babić[1], Bojan Šarkanj[4], Ante Lončarić[1*]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Inspecto Ltd., Vukovarska cesta 239b, Industrijska zona Nemetin, 31000 Osijek, Croatia
[3]University of Zagreb, Faculty of Agriculture, Svetošimunska cesta 25, 10000 Zagreb, Croatia
[4]University North, Department of Food Technology, Trg dr. Žarka Dolinara 1, 48000 Koprivnica, Croatia
[*]ante.loncaric@ptfos.hr

poster presentation

Apples and apple-based products are among the most popular foods around the world. However, such products are susceptible to infection with the fungi or different plant diseases. To avoid apple quality reduction caused by abovementioned factors, the various pesticides are applied during the growth in the orchards. Traditional apple cultivars grown in local areas have so far been largely unexplored considering pesticides concentrations. In this study, the pesticide concentrations of traditional apple cultivars from Croatian extensively orchads were determined and quantified by LC-MS/MS. Results showed presence of azoxystrobin fungicide in seven of 13 examined cultivars. Detected concentration are in the range from 1.50 (‘Božićnica’) up to 1.70 µg/kg (‘Kraljevčica’, ‘Bobovac’ and ‘Adamčica’). Such low detected concentrations, usually applied for protecting plants and food crops from foliar and soil-borne fungal diseases (wheat septoria, septoria leaf spot, wheat leaf rust (*Puccinia recondita*), rye leafrust (*Puccinia triticina*), powdery mildew, downy mildew, stripe rust, haustorium, *Pyrenophora teres*, etc.), imply that these traditional cultivars are grown nearby crops or vineyard of the orchard of commercially cultivated apple cultivars. However, based on the apparent absence of a great need for pesticide application, these cultivars seem to be an important source of bioactive compounds and to form the basis for further cultivation; but all after further research has been carried out.

Keywords: pesticide, apple peel, traditional apples, LC-MS/MS

KAKO JE HRVATSKA POBIJEDILA U BITCI ZA – HRVATSKI MED?

HOW DID CROATIA WIN IN THE BATTLE FOR – CROATIAN HONEY?

Dražen Lušić*

Sveučilište u Rijeci, Medicinski fakultet, Katedra za zdravstvenu ekologiju, Braće Branchetta 20, 51000 Rijeka, Hrvatska
**drazen.lusic@medri.uniri.hr*

oral presentation / usmeno priopćenje

U ovom radu opisan je postupak kojim je ostvareno pravo hrvatskih potrošača na potpunu informaciju o podrijetlu meda. Hrvatska je svojim novim zakonskim standardom (*Izmjene i dopune Pravilnika o medu, NN 47/2017*) uvela obvezatno označavanje zemlje (ili zemalja) podrijetla svih medova koji na svojem tržištu. Taj se akt bazira na udovoljavanju odredbama više EU uredbi, posebice *Uredbe (EU) br. 1169/2011 o informiranju potrošača o hrani*. Hrvatski pčelari, potpomognuti snažnom potporom hrvatskog potrošačkog sektora, preuzeli su inicijativu i argumentirano uvjerili hrvatskog zakonodavca da uzme u obzir jedan od osnovnih ustavnih prava četiri milijuna hrvatskih građana (i potrošača) – pravo na poznavanje potpune informacije u podrijetlu svoje hrane. Inicijativa se temeljila na konceptu potrošačkog suvereniteta te, u zadnje vrijeme popularnim konceptom prehrambenog suvereniteta. Na temelju svijetlih primjera tri EU članice koje su u praksi primijenile sličnu mjeru (Italija, Grčka, Cipar), Hrvatska se odlučila osigurati povećanje sigurnosti hrvatskih potrošača. Dodatno, osiguran je prikladniji naziv za kategoriju "pekarski med" – "med za industrijsku uporabu". Ovaj rad će prikazati polazišta, stavove i argumentaciju različitih dionika uključenih u ovaj proces. Predstavit će se argumentacija koja je, nakon zahtjevnog postupka, osigurala da se u svibnju 2017. postupak pravno okonča i da se stavi na snagu od prvog dana 2019.

Ključne riječi: med, zemlja podrijetla meda, sigurnost potrošača

Keywords: honey, country of origin, consumer safety

JAČANJE ZNANSTVENE SURADNJE IZMEĐU EUROPSKE AGENCIJE ZA SIGURNOST HRANE (EFSA) I DRŽAVA ČLANICA

STRENGTHENING SCIENTIFIC COOPERATION BETWEEN THE EUROPEAN FOOD SAFETY AGENCY (EFSA) AND MEMBER STATES

Sanja Miloš*, Vlatka Buzjak

Hrvatska agencija za poljoprivredu i hranu, Centar za sigurnost hrane,
I. Gundulića 36b, 31000 Osijek, Hrvatska
**sanja.milos@hapih.hr*

oral presentation / usmeno priopćenje

Temeljem odrednica Uredbe (EU) 178/2002 Europskog parlamenta i Vijeća, EFSA-i je od samog osnutka izuzetno važna suradnja s partnerima u zemljama članicama i inozemstvu, te potpora nacionalnih tijela u području sigurnosti hrane i procjene rizika. Zemlje članice EFSA-i pružaju svoje nacionalne planove rada, prioritete u procjeni rizika, različite podatke i aktivnosti vezane za sigurnost hrane. EFSA s druge strane osigurava planove i sredstva za dodatne zajedničke programe, učinkovitu razmjenu informacija, ekspertiza i osoblja unutar i izvan granica EU. Da bi to bilo moguće tijekom godina je razvijeno nekoliko aktivnosti i mreža unutar EFSA-e koje su omogućile učinkovito umrežavanje i znanstvenu suradnju s institucijama zemalja članica. Putem Savjetodavnog vijeća (*Advisory Forum*) i nacionalnih kontakt točaka (EFSA *Focal Point*) surađuje s 375 kompetentnih organizacija, uključujući i institucije javne vlasti, sveučilišta i istraživačke organizacije. EFSA koordinira 16 znanstvenih mreža s predstavnicima svih država članica.
Cilj je ovog rada predstaviti EFSA-ine znastvene prioritete i smjernice iz područja procjene rizika i komunikacije do 2030 godine, predstaviti baze i platforme koje omogućuju razmjenu znastvenih i stručnih informacija, te najznačajnija postignuća u desetogodišnjem radu EFSA *Focal Point* mreže.

Ključne riječi: EFSA, Focal Point, umrežavanje, znanost

Keywords: EFSA, Focal Point, networking, science

UNOS SOLI PUTEM MESNIH PROIZVODA ODRASLE POPULACIJE U REPUBLICI HRVATSKOJ

DIETARY SALT INTAKE THROUGH MEAT PRODUCTS IN CROATIAN ADULT POPULATION

Darja Sokolić, Andrea Gross-Bošković, Martina Jurković, Danijela Stražanac, Martina Pavlić*

Hrvatska agencija za poljoprivredu i hranu, Centar za sigurnost hrane, I. Gundulića 36 b, 31000 Osijek, Hrvatska
**martina.pavlic@hapih.hr*

poster presentation / postersko priopćenje

Značajan udio soli u prehrani dolazi iz procesirane hrane. Poznato je kako se meso i proizvodi od mesa nalaze se na drugom mjestu izvora soli u prehrani odrasle populacije, odmah nakon žitarica i proizvoda na bazi žitarica. Sol u mesnim proizvodima ima kako senzorsku, tako i tehnološku ulogu te njezina redukcija predstavlja kompleksno pitanje. Cilj ovog istraživanja bio je utvrditi unos soli kroz mesne proizvode u Republici Hrvatskoj (RH). Istraživanje je provedeno na 1670 konzumenata mesnih proizvoda odrasle populacije RH prema kategorijama Pravilnika o mesnim proizvodima (NN 62/2018). Prosječan unos soli kroz mesne proizvode u populaciji konzumenata iznosi 2,19 g/dan. Povećan unos soli kroz mesne proizvode zabilježen je u seoskoj populaciji u odnosu na gradsku kao i u muškoj populaciji u odnosu na žensku. Promatrano na regije RH, uočen je povećan unos soli kroz mesne proizvode u Lici i Banovini te Slavoniji u odnosu na ostatak RH. Najznačajniji doprinos unosu soli s obzirom na promatrane namirnice dolazi iz raznih polutrajnih salama i trajnih kobasica.

Ključne riječi: mesni proizvodi, sol, odrasla populacija

Keywords: meat products, salt, adult population

PLIJESNI S POVRŠINE TRADICIONALNIH FERMENTIRANIH KOBASICA PROIZVEDENIH NA PODRUČJU SLAVONIJE

MOULDS ON THE SURFACE OF TRADITIONAL FERMENTED SAUSAGES PRODUCED IN SLAVONIA REGION

Irena Perković[1*], Dragan Kovačević[2], Manuela Zadravec[3], Marija Agičić[1], Mario Škrivanko[1], Jelka Pleadin[3]

[1]Hrvatski veterinarski institut, Veterinarski zavod Vinkovci, Josipa Kozarca 24, 32100 Vinkovci, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[3]Hrvatski veterinarski institut, Savska cesta 143, 10000 Zagreb, Hrvatska
[*]perkovicirena1512@gmail.com

poster presentation / postersko priopćenje

Slavonski kulen i Slavonska kobasica trajne su fermentirane kobasice koje se proizvode tradicionalnim tehnološkim postupcima te predstavljaju najprepoznatljivije prehrambene brandove istočne Hrvatske. Tehnološki parametri tipični za fermentaciju i zrenje u tradicionalnim komorama za zrenje pogoduju rastu plijesni na površini ovih proizvoda. Površinska plijesan ima pozitivnu tehnološku ulogu tijekom zrenja, osobito radi sprječavanja površinskog isušivanja proizvoda, ali s druge strane uzrokuje neugodan miris i okus te može producirati mikotoksine. Cilj ovog rada bio je tradicionalnom i molekularnom metodom identificirati vrste plijesni koje spontano obrastaju površinu Slavonskog kulena (n=30) i Slavonske kobasice (n=15) podrijetlom s različitih mikrolokaliteta s područja Slavonije te odrediti dominantni rod i vrstu plijesni za pojedinu tradicionalnu fermentiranu kobasicu. Ukupno je na oba proizvoda identificirano 18 različitih vrsta plijesni, među kojima je dominirao rod *Penicillium*. Osim 11 *Penicillium* vrsta, izolirane su po dvije vrste iz roda *Mucor* i *Aspergillus* te po jedna vrsta iz rodova *Alternaria*, *Cladosporium* i *Eurotium.* Na uzorcima Slavonskog kulena dominantna vrsta plijesni bila je *Penicillium commune*, dok je na uzorcima Slavonske kobasice *Penicillium polonicum*. Na obje vrste kobasica identificirane su i plijesni *Penicillium verrucosum* i *Aspergillus flavus* koje predstavljaju moguće producente izrazito toksičnih mikotoksina, okratoksina A i aflatoksina B_1.

Ključne riječi: plijesni, Slavonski kulen, Slavonska kobasica, PCR, mikotoksini

Keywords: moulds, „Slavonian kulen", „Slavonian sausage", PCR, mycotoxins

PRELIMINARIY QUANTIFICATION OF MICROPLASTIC IN FARMED OYSTERS (*OSTREA EDULIS* LINNAEUS, 1758) IN THE ADRIATIC SEA

Zvjezdana Popović Perković[1*], Ema Vranjić[1], Vida Šimat[1], Ivana Generalić Mekinić[2], Danijela Skroza[2]

[1]University of Split, Department of Marine Studies, R. Boškovića 37, 21000 Split, Croatia
[2]University of Split, Faculty of Chemistry and Technology, R. Boškovića 35, 21000 Split, Croatia
[*]zvjezdana.popovic@unist.hr

oral presentation

Commercially important shellfish species such as oysters (*Ostrea edulis* Linnaeus, 1758) accumulate and ingest microplastic particles what can pose a risk for the final consumers. Farmed populations of oysters were sampled from three shellfish farming sites in the eastern Adriatic Sea (north, middle and south) for the quantification of microplastics items. The analysis showed multiple types of microplastic including fragments (0.58 MP/g), fibers (0.7 MP/g) and other items (0.04 MP/g). The number of total microplastic varied from 0.33 to 5.43 items/individual. The mean sizes of the diferent categories of microplastic particles were 20.55 μm, 31.88 μm and 456.57 μm. More comprehensive research should be condacted on microplastic in seafood.

Keywords: microplastic, Adriatic Sea, *Ostrea edulis*, seafood

QUORUM SENSING AND QUORUM QUENCHING IN *Campylobacter jejuni* – OPTIMIZATION OF THE REPORTER STRAINS OF *Vibrio harveyi*

Dina Ramić, Sonja Smole Možina*

University in Ljubljana, Biotechnical Faculty, Department of Food Science and Technology, Jamnikarjeva 101, 1000 Ljubljana, Slovenia
**sonja.smole@bf.uni-lj.si*

poster presentation

Recently, bacterial communication and coordinative behavior gained high attention in microbiology, including food related environments. Sending, receiving and processing the information, in the form of signal molecules enables bacteria to function as a multicellular entity, resulting in better survival, especially in biofilms. *Campylobacter jejuni,* the most commonly reported bacterial cause of gastroenteritis and usually transmitted by food, contains quorum sensing (QS) mechanism, which is regulated via AI-2 signals. Measuring the bioluminiscence of the reporter strain *Vibrio harveyi* BB170 (mutation in *luxN*, AHL receptor) is the most commonly used model for studying QS in *C. jejuni*. We studied QS of *C. jejuni* with different reporter strains of *V. harveyi*. We optimized the method and found more appropriate strain for further study of QS and quorum quenching (QQ), which is in *C. jejuni* triggered by inhibitory compounds in plant extracts in/from agro-food by-products. We used the wild type of *V. harveyi* (BB120), as well as three different mutants of *V. harveyi*: BB152 (mutation in *luxM*, AHL synthase), MM30 (mutation in *luxS*, AI-2 synthase) and BB170. We showed that *V. harveyi* MM30 has the best response to spent media of *C. jejuni*. Further applications will be presented.

Keywords: quorum sensing, quorum quenching, *Campylobacter jejuni,* biofilm control, food safety

CYCLOPIAZONIC ACID PRODUCERS IN DRY-FERMENTED SAUSAGES

Manuela Zadravec[1*], Željko Jakopović[2], Tina Lešić[1], Maja Kiš[3], Irena Perković[4], Jelka Pleadin[1]

[1]Croatian Veterinary Institute, Savska 143, 10000 Zagreb, Croatia
[2]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottieva 6, 10000 Zagreb, Croatia
[3]Croatian Veterinary Institute, Veterinary Centre Križevci, Ivana Z. Dijankovečkog 10, 48260 Križevci, Croatia
[4]Croatian Veterinary Institute, Veterinary Centre Vinkovci, Josipa Kozarca 24, 32100 Vinkovci, Croatia
[*]zadravec@veinst.hr

oral presentation

Cyclopiazonic acid (CPA) is a potent mycotoxin that, if present in high concentrations, causes focal necrosis of most vertebrate visceral organs, as well as central nervous system-related symptoms. CPA is an unstable molecule that can be degraded both chemically and physically and is therefore hard to be analytically detected. Hence, early detection of CPA-producing moulds during food processing would allow for the prevention of food contamination. Different *Penicillium* and *Aspergillus* species overgrowing the surface of dry-cured products can produce CPA. In this study, 8 samples of Slavonian sausages and 9 samples of Kulenova Seka (i.e. Croatian traditional dry-fermented sausages) were studied for the presence of CPA-producing moulds. Moulds isolated from their surfaces were identified using both traditional and molecular methods. In total, 14 *Penicillium* and 3 *Aspergillus* species were isolated, including *Penicillum commune, Penicillium camemberti* and *Aspergillus flavus,* which are CPA producers, while the percentage of contaminated Slavonian sausages equalled to 56% and that of Kulenova Seka to 50%. Given such a high level of CPA contamination, preventive actions have to be taken so as to reduce mould overgrowth and to control CPA concentration in final meat products.

Keywords: cyclopiazonic acid, mycotoxins, producing moulds, dry-fermented sausages

FOOD ANALYSIS /
ANALIZA HRANE

COMPARATIVE ANALYSIS OF CONJUGATED LINOLEIC ACID (CLA) CONTENT IN COW, SHEEP AND GOAT MILK

Mila Arapcheska[1*], Jovanka Tuteska[2], Zehra Hajrulai-Musliu[3], Risto Uzunov[3]

[1]University "St. Kliment Ohridski", Faculty of Biotechnical Sciences – Bitola, Republic of North Macedonia
[2]University "St. Kliment Ohridski", High Medical School – Bitola, Republic of North Macedonia
[3]University "Ss. Cyril and Methodius", Faculty of Veterinary Medicine – Skopje, Republic of North Macedonia
[*]arapceska@yahoo.com

poster presentation

In recent years there is increasing research interest towards conjugated linoleic acid (CLA) and its potential health benefits: anticarcinogenic, antiatherogenic, antidiabetic and immunomodulatory effects. Term CLA describes a group of positional and geometric isomers of linoleic acid characterized by conjugated system of double bonds, separated by one single bond.
The objective of study was to analyze the differences in fatty acid profile with emphasis of CLA content in cow, sheep and goat milk. Milk samples were collected from conventional cow, sheep and goat farms, and grouped in three groups. FA profiles were analyzed by gas chromatography, using Agilent 7890 gas chromatograph with FID detector, and capillary column HP88 (60 m x 0.250 mm x 0.20 μm). FA were analyzed as methyl esters (FAMEs), and identified by comparison with methyl esters of standards (Sigma-Aldrich). According to obtained results significant difference ($p<0.05$) in CLA content was noted between three groups of samples, and also considerable individual variations in CLA content were noted inside each of group. Sheep milk samples were richer in CLA than goat and cow's milk samples.
Milk fat is the richest natural dietary source of CLA, and its content can be increased by manipulation of feeding regimes and genetic selection of dairy animals.

Keywords: CLA, fatty acids, GC-FID

MINERAL CONTENT IN HONEY FROM SOUTHEAST EUROPE

Drago Bešlo[1*], Darko Kerovec[1], Dražen Vikić-Topić[2], Bono Lučić[2]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Agribiotechnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia
[2]Ruđer Bošković Institute, NMR Centre, Bijenička c. 54, 10000 Zagreb, Croatia
[*]dbeslo@fazos.hr

poster presentation

The mineral content of different types of honey reflects the botanical origin of samples. The amount of major and trace minerals present in honey could be related to their arrangement into the soil. Many types of minerals in floral plants first enter into the roots and reached to nectar and finally get into the honey. The increased concentration of trace elements in honey sampled near industrial areas was observed in most cases. Therefore, the quantification of trace toxic mineral elements in honey samples becomes important due to their effects on human health, control of honey quality/safety, as well as because of environmental biomonitoring. We measured mineral contents of 99 floral honey samples taken from Croatia and surrounding countries (Hungary, Serbia and Italy). In all samples, K was identified as the predominant mineral, followed by Ca, Na, Mg, Fe, Mn and Zn. We didn't detect toxic metals (Co, Cr, Pb, Cd and Hg) in our samples.

Keywords: floral honey, minerals, trace elements, toxic metals

DETERMINATION OF TRACE ELEMENTS IN CROATIAN UNIFLORAL HONEYS

Blanka Bilić Rajs[1*], Jelena Mutić[2], Dušanka Milojković Opsenica[2], Ivana Flanjak[1], Katarina Gal[1], Ljiljana Primorac[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]University of Belgrade, Faculty of Chemistry, Studentski trg 12-16, 11000 Belgrade, Serbia
[*]bbilic@ptfos.hr

poster presentation

Honey mineral content is affected by its botanical origin (nutrients absorbed by the plant) and bioavailability of nutrients in the soil. Mineral elements are divided into the group of more represented macro and microelements in honey and trace elements, which are present in small quantities. Determination of some trace elements content in honey can be used as indicator for environmental pollution since they are present in the soil mainly due to industrial pollution and usage of agrochemicals. Because of that, evaluation of trace element content is used in determination of honey geographical origin. Some of them could be connected with inappropriate honey storage.
This work presents the results of determination the trace elements content (Al, As, Cd, Co, Cr, Hg, Ni, Pb) by Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES) in six unifloral honey types from Croatia (black locust, chestnut, lime, rape, sage and winter savory honey). Their values were mainly very low or under the limit of detection and Al content stood out with the highest average value in lime honey (11.356 mg/kg). Al, As and Hg content has proven to be important for determination of regional origin of lime honey.

Keywords: honey, mineral elements, trace elements, contamination indicator, ICP-OES

UDIO ERUKA KISELINE U ULJIMA IZ SJEMENKI GORUŠICA NAKON PRIMJENA RAZLIČITIH TEHNIKA EKSTRAKCIJE TE NJEZINA GASTROINTESTINALNA STABILNOST

THE CONTENT OF ERUCIC ACID IN THE OIL FROM MUSTARD SEEDS AFTER DIFFERENT EXTRACTION TECHNIQUE AND ITS GASTROINTESTINAL STABILITY

Ivana Vrca[1], Stela Jokić[2], Barbara Soldo[3], Tea Bilušić[1*]

[1]Sveučilište u Splitu, Kemijsko-tehnološki fakultet, Ruđera Boškovića 35, 21000 Split, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[3]Sveučilište u Splitu, Prirodoslovno-matematički fakultet, Odjela za kemiju, Ruđera Boškovića 33, 21000 Split, Hrvatska
[*]tea@ktf-split.hr

oral presentation / usmeno priopćenje

Gorušica spada u porodicu *Brassiceae* te se u prehrambenoj industriji najviše koristi za proizvodnju senfa iz sjemenki gorušice. Osim prehrambene namjene, gorušica je poznata i po svojoj biološkoj vrijednosti budući je izvor biološki aktivnih spojeva iz skupine glukozinolata koji imaju antitumorsko, antioksidacijsko, antimikrobno djelovanje. Sjemenke gorušice sadrže u prosjeku od 36 do 46 % ulja. U ovom istraživanju ciljevi su bili sljedeći: a) odrediti iscrpak ulja iz sjemenki crne, bijele, smeđe i divlje gorušice primjenom superkritične CO_2 i Soxhlet estrakcije, b) analizirati sastav masnih kiselina s posebnim osvrtom na udio eruka kiseline u uljima primjenom GC-FID tehnike, c) odrediti oksidacijsku stabilnost ulja iz sjemenki gorušica Rancimat metodom d) odrediti gastrointestinalnu stabilnost eruka kiseline nakon simuliranog dvofaznog modela probave koristeći ljudske probavne sokove (želudac i tanko crijevo). U uljima iz sjemenki svih odabranih vrsta gorušica prevladava eruka kiselina (21 – 48 %) kao glavna masna kiselina. Ipak, njezin je udio nešto manji (u prosjeku 35 %) nakon primjene superkritične CO_2 ekstrakcije u odnosu na Soxhlet ekstrakciju. Najveći udio eruka kiseline imao je uzorak sjemenki crne gorušice (48 %).

Ključne riječi: gorušica, superkritična CO_2 ekstrakcija, Soxhlet ekstrakcija, eruka kiselina, gastrointestinalna stabilnost

Keywords: mustard, supercritical CO_2 extraction, Soxhlet extraction, erucic acid, gastrointestinal stability

ANTIMICROBIAL ACTIVITY OF *VACCINIUM OXYCOCCOS* AND *ARCTOSTAPHYLOS UVA-URSI* TEA

Berina Borovac*, Anera Kazlagić, Ajla Berhamović, Josip Jurković, Enisa Omanović-Mikličanin, Lejla Čengić, Saud Hamidović

University of Sarajevo, Faculty of Agriculture and Food Sciences, Zmaja od Bosne 8, 71000 Sarajevo, Bosnia and Herzegovina
**b.borovac@ppf.unsa.ba*

poster presentation

Medicinal herbs have been used in traditional medicine since prehistoric times. They include plants that contain biologicaly active phtyochemicals, which can be used therapeutically and in chemical synthesis of pharmaceutical compounds. Many medicinal plants have antimicrobial activity against several types of microbes. In this paper, impact of *Vaccinium oxycoccos* and *Arctostaphylos uva-ursi* tea was determined using two human pathogens, *Escherichia coli* and *Salmonella* spp., as test organisms. Antimicrobial activity was analyzed using the disc diffusion method. Mueller-Hinton agar was the experimental medium and inoculation of Petri plates was done using the streak plate method. Antimicrobial activity was assessed by the measurement of discs inhibition zones which were impregnated with 10 µl of herbal tea. The results showed that *A. uva-ursi* tea had significantly stronger antimicrobial activity on both bacterial species than *V. oxycoccos*. *A. uva-ursi* tea was much more effective against *Escherichia coli* compared to *Salmonella* spp. The results of this study demonstrate the potential antimicrobial activity of herbal teas against human pathogens as a possible substitution for synthetic medicaments in mild infections.

Keywords: antimicrobial activity, disc diffusion, herbal tea, human pathogens

EVOLUTION OF ELEMENTAL ANALYSIS IN FOOD AND ANIMAL FEED

Liliana Krotz[1], Vesna Brezovečki-Biđin[2*]

[1]Thermo Fisher Scientific, Strada Rivoltana KM 6/7, 20090 Rodano (Milano), Italy
[2]Kobis d.o.o., E. Murtića 7, 10000 Zagreb, Croatia
[*]vesna.brezovecki@kobis.hr

sponsor presentation

Understanding the nutritional composition of food and animal feed plays a very important role in industry for research and quality control purposes. Official regulations establish protein content and labelling requirements, which enable consumers to define price and make quality comparisons. This means that protein analysis is an issue of significant economic and social interest because of the legal, nutritional, health, safety and economic implications for the food and animal feed industries. A common test used in the production process to determine the protein content is nitrogen analysis. Therefore, it is very important to have an accurate and precise analytical technique, ideally with full automation, which allows fast analysis with excellent reproducibility. The technique must be robust and capable of analyzing fresh and processed products in various physical states (powders, slurries, dilute liquids, emulsions, gels, pastes) and deal effectively with products from either animal or plant sources. An alternative to the classical Kjeldahl method, which is comparatively quicker, cheaper, easier to perform, safer and more environment friendly. The Dumas method is approved by different associations (AOAC, AACC, AOCS, ASBC, ISO and IFFO). The Thermo Scientific FlashSmart Analyzer, based on the dynamic combustion method, provides rapid and automatic nitrogen determination with high accuracy and precision, without use of hazardous chemicals. The FlashSmart Analyzer allows you to analyze high and low nitrogen amounts. Sample protein content is calculated automatically using a conversion factor in the Thermo Scientific EagerSmart Data Handling Software.

Keywords: nutritional composition of food, protein content, FlashSmart Analyzer, the dynamic combustion method

ADSORPTION OF GALLIC ACID ONTO BARLEY *β*-GLUCAN

Ivana Buljeta*, Jozo Ištuk, Ivana Tomac, Lidija Jakobek

Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
**ibuljeta@ptfos.hr*

poster presentation

Polyphenols are a group of secondary plant metabolites, usually present in human nutrition with reported potentially positive bioactivities. These compounds can interact with dietary fibers such as *β*-glucans which can affect their bioactivities. Gallic acid belongs to polyphenolic group, subclass of phenolic acids. The aim of this work was to study interactions between gallic acid and *β*-glucan from barley trough investigating adsorption processes. Adsorption was conducted on three pH values (1.5, 5.5 and 10, temperature 37 °C) for 16 hours until adsorption reached equilibrium. The amount of gallic acid adsorbed per g of barley *β*-glucan (q_e, mol/g) was calculated. The q_e values and the amount of un-adsorbed gallic acid at equilibrium (c_e) were modelled with nonlinear adsorption isotherm equations (Langmuir, Dubinin-Radushkevich and Hill). At pH 1.5 and 5.5, adsorption was similar while at pH 10 gallic acid adsorbed in a higher amount. Experimental results were fitted well with all three isotherm models, gave similar values for q_e and helped us to suggest physical bonds (like H bonds) between gallic acid and barley *β*-glucan.

Keywords: *β*-glucan, gallic acid, adsorption

CHEMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY OF HOME-MADE APPLE JUICE AND QUINCE JUICE

Huska Jukić[1], Samira Dedić[2*], Aida Džaferović[2], Miloš Rodić[3]

[1]University of Bihać, Faculty of Health Studies, Nositelja hrvatskog trolista 4, 77000 Bihać, Bosnia and Herzegovina
[2]University of Bihać, Faculty of Biotechnology, Kulina Bana 2, 77000 Bihać, Bosnia and Herzegovina
[3]Public institution "Veterinary Institute" Bihać, Omera Novljanina 6, 77000 Bihać, Bosnia and Herzegovina,
[*]samira.dedic@yahoo.com

poster presentation

Many scientific studies point to a positive correlation between fruit consumption and prevention of the development of various diseases. It is well known that, in addition to nutrients, fruit also contains a significant amount of polyphenolic compounds. Biological activity of polyphenols is primarily expressed by their antioxidant capacity, and is of great interest for both nutritionists and dietetic technicians due to their ability to be used as ingredients for the production of functional foods.
The aim of this study was to investigate the chemical composition and antioxidant activity of home-made apple juice and quince juice. The following analyzes were conducted: determining Vitamin C content by iodometric titration method, total acidity, reduced sugars, ash, dry matter, total polyphenol content, flavonoid content, anthocyanin content as well as antioxidant capacity using DPPH method.
Ultimately, it was found that the examined apple and quince juice showed significant antioxidant activity. The obtained results of the total phenol content were 757.4 mg/L, flavonoid 283.3 μg Q/mL and the value of antioxidant activity measured by DPPH 137.76 mg Trolox/100 mL.

Keywords: antioxidant activity, quince, apple, juice

FATTY ACID COMPOSITION OF DIFFERENT CHOCOLATE TYPES

Veronika Barišić[1], Ivana Flanjak[1*], Antun Jozinović[1], Drago Šubarić[1], Jurislav Babić[1], Borislav Miličević[1], Ante Lončarić[1], Kristina Doko[2], Dorotea Fišer[1], Đurđica Ačkar[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Federal Agro-Mediterranean Institute, Biskupa Čule 10, 88000 Mostar, Bosnia and Herzegovina
[*]ivana.flanjak@ptfos.hr

poster presentation

Chocolate contains up to 40% of lipids that are responsible for sensory and rheological properties as well as stability during storage. Five dark chocolates and eight milk chocolates with different cocoa butter equivalents (coconut and palm oil), milk ingredients (milk powder, condensed milk and whey powder) and emulsifiers (PGPR and lecithin) were produced in laboratory ball mill. The aim of this study was to determine total lipid content and fatty acid composition of different chocolate types. Fatty acid composition was determined by gas chromatography with flame-ionisation detector. Prior to GC analysis, total lipids were extracted using Folch method. The fatty acids in the lipid fraction were transesterified into methyl esters under alkaline conditions. The results showed a great difference in both total lipid content and fatty acid composition depending on chocolate type. Dark chocolate contains significantly higher total lipid content (average 37.31 ± 0.64%) compared to milk chocolate (average 29.99 ± 0.57%). Regarding fatty acid composition, the main fatty acids were stearic, palmitic and oleic acids with total average content of 83.62 ± 5.21%. Milk chocolate samples had higher short and medium chain fatty acids (up to C12) than dark chocolates, with exception of dark chocolate with coconut oil. Chocolate samples containing coconut oil showed significantly higher content of lauric acid than other analysed chocolate types while chocolate with palm oil contained higher linoleic acid content.

Keywords: chocolate, fatty acids, gas chromatography

Acknowledgement
This work has been supported in part by Croatian Science Foundation under the project UIP 2017-05-8709.

THE INFLUENCE OF DRYING TEMPERATURES ON VOLATILE COMPOUNDS OF SWISS CHARD LEAVES (*Beta vulgaris* L. ssp. *cicla*)

Emilija Friganović[1*], Mladenka Šarolić[1], Boris Dorbić[1], Marko Šuste[1], Tomislav Svalina[1], Zvonimir Marijanović[2], Duška Ćurić[3], Tajana Krička[4]

[1]Marko Marulić Polytechnic of Knin, Petra Krešimira IV 30, 22300 Knin, Croatia
[2]University of Split, Faculty of Chemistry and Technology, Ruđera Boškovića 35, 21000 Split, Croatia
[3]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[4]University of Zagreb, Faculty of Agriculture, Svetošimunska cesta 25, 10000 Zagreb, Croatia
[*]efriganovic@veleknin.hr

poster presentation

This work deals with the influence of convective drying on different temperatures on aroma profile of Swiss chard leaves as a part of a pasta enrichment plant. The Swiss chard (*Beta vulgaris* L. ssp. *cicla*) belongs to the *Chenopodiaceae* family and is commonly used in diet as leafy green vegetable, raw or cooked (in salads, soups, pastas, etc.), as food supplement in dehydrated pulverized form or in food industry as natural food colorant or pasta stuffing. Swiss chard leaves were collected in the anthropogenized areas (gardens, orchards and pastures) of Šibenik-Knin County. Plant material was dried at three temperature levels (20 °C – ventilation only, 40 °C and 60 °C) in convective dryer. Volatile compounds were isolated by headspace solid-phase microextraction (HS-SPME) using fibre coated with polydimethylsiloxane/ divinylbenzene/ carboxene (DVB/CAR/PDMS) and analyzed by gas chromatography-mass spectrometry (GC-MS). The dominant volatile compound identified was *trans*-2-hexenal present both in fresh plant material and in dried samples. Other identified volatile compounds belong to aldehydes, alcohols and ketones. Drying temperatures influence concentrations and formation or degradation of volatile compounds.

Keywords: Swiss chard, *Beta vulgaris*, convective drying, volatile compounds, HS-SPME/GC-MS

POTENTIAL OF MARINE MICROALGAE ISOLATED FROM ADRIATIC SEA AND FRESHWATER MICROALGAE ISOLATED FROM GACKA AS SOURCE OF PUFAs

Marina Grubišić[1,2*], Mirela Ivančić Šantek[1,2], Rozelindra Čož-Rakovac[2,3], Božidar Šantek[1,2]

[1]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[2]BioProCro Centre of Excellence, Bijenička cesta 54, 10000 Zagreb, Croatia
[3]Ruđer Bošković Institute, Bijenička cesta 54, 10000 Zagreb, Croatia
[*]mgrubisic@pbf.hr

poster presentation

In recent years microalgae have attracted considerable attention due to relatively fast growth coupled with high lipid, carbohydrate, protein and valuable nutrients contents. While freshwater microalgae are already used as food supplements, marine microalgae especially diatoms (*Bacillariophyceae*) have recently attracted considerable attention due to favourable fatty acids (FAs) profile abundant in long polyunsaturated omega-3 and omega-6 fatty acids (EPA, 20:5 *n*-3, DHA, 22:6 *n*-3, ARA, 20:4 *n*-6). They are considered as alternative to fish oil as a source of these essential omega-3 FAs but also as a source of numerous other bioactive molecules of interest such as carotenoids (*β*-carotene, fucoxanthin and astaxanthin) that also provide wide range of health benefits along with PUFAs. Omega-3 fatty acids are thought to have a role in reducing risk of coronary heart disease and improving cholesterol level. Several strains of microalgae isolated from Adriatic Sea were cultivated under phototrophic conditions and their fatty acid profile was determined and compered to the one obtained with green microalgae isolated from river Gacka. The analysis revealed the predominance of C14:0 (11 – 21%) and C16:0 (30 – 42%) and C16:1 cis 9 (13 – 43%) fatty acids in all marine microalgae strains and polyunsaturated fatty acids 20:5 *n*-3 (EPA) and 20:4 *n*-3 (ARA) comprised a significant proportion of total fatty acid. In freshwater microalgae strains dominant fatty acids were C16:0 (8.76 – 29.44%), C17:0 (3.57 – 36.20%) and unsaturated fatty acids C18:2 cis 9, 12 (6.48 – 35.27%) and C18:3 cis 9, 12, 15 (8.82 – 33.37%).

Keywords: marine microalgae, freshwater microaglae, PUFAs, EPA, ARA

PRODUCTION OF RESISTANT STARCH THROUGH RETROGRADED STARCH ROASTING WITH APPLE DISTILLERY WASTEWATER

Tomasz Zięba[1], Dominika Solińska[1], Małgorzata Kapelko-Żeberska[1], Artur Gryszkin[1*], Đurđica Ačkar[2], Ante Lončarić[2], Jurislav Babić[2], Antun Jozinović[2]

[1]Wroclaw University of Environmental and Life Sciences, Faculty of Biotechnology and Food Technology, Chelmonskiego Street 37, 51630 Wroclaw, Poland
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]artur.gryszkin@upwr.edu.pl

poster presentation

This study aimed to produce starch esters by roasting retrograded potato starch with apple distillery wastewater under various temperatures and to determine the effect of esterification conditions on selected properties of the modified preparations. Apple distillery wastewater was concentrated, mixed (30 g dry matter / 100 g starch) with retrograded starch (obtained via freezing and defrosting of a 10% starch paste), dried, and roasted at temperatures of: 70, 90, 110 or 130 °C for 3 hours. Preparations produced were rinsed 30 times with a 60% ethanol solution, dried, and ground. After that the following analyses were peroformed: the content of substituted acids (after acidic deesterification); pasting parameters; swelling power and solubility in water; color changes; rheology of the pastes; and the pastes resistance to amyloglucosidase. Retrograded starch roasted with apple distillery wastewater at temperatures of 70, 90 or 110 °C was substituted with malic acid residues in the range from 0.21 to 0.25 g of acid residues per 100 g of preparation and with trace amounts of maleic acid. Starch roasted at 130 °C was substituted with residues of malic acid (0.40 g/100 g), citric acid (0.11 g/100 g), and formic acid (0.11 g/100 g) as well as with trace amounts of maleic acid. Starch esters produced were characterized by a lower swelling power, higher heat of pasting, darker color, and higher resistance to amylases than the starch roasted without apple distillery wastewater. Pastes made of the starch esters produced by roasting at 70 or 90 °C had a higher, while these made of esters roasted at 110 or 130 °C had lower viscosity compared to the pastes made of starch roasted without apple distillery wastewater. The roasting of retrograded starch with apple distillery wastewater allowed producing RS preparations highly resistant to amylolysis (30 – 36%).

Keywords: retrograded potato starch, esterification, apple distillery wastewater, roasting, resistant starch

Acknowledgement
This work has been supported by the Josip Juraj Strossmayer University of Osijek under the project UNIOS-ZUP 2018-26.

EARTH ELEMENTS (REEs) IN ENVIRONMENTS OF EASTERN CROATIA

Dinko Puntarić[1], Vlatka Gvozdić[2*], Domagoj Vidosavljević[3], Ada Puntarić[4], Iva Pukleš[2]

[1]Universitas Studiorum Catholica Croatia, Ilica 242, 10000 Zagreb, Croatia
[2]Josip Juraj Strossmayer University Osijek, Department of Chemistry, Cara Hadrijana 8/A, 31000 Osijek, Croatia
[3]Vinkovci, General Hospital, Zvonarska 57, 32100 Vinkovci, Croatia
[4]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[*]vgvozdic@kemija.unios.hr

poster presentation

Introduction of catalytic converters in cars plays a vital role in the reduction of harmful emissions (VOCs, CO, NO_x) but lead to a new environmental problem since catalysts emit several other elements (Pt, Pd, La, Ce, Nd, etc). In recent years, the utilization of REEs has been widely applied not only in industry and medicine but also in agriculture and forestry. A systematic study on the reaction of plants to PGE and REEs in this part of Croatia has not yet been presented. Using ICP-MS, PGE elements: Ru, Pt, Pd, Ir and REEs elements: Ce, La and Nd have been determined in *Taraxacum officinale* (dandelion) samples collected along highways, streets and agricultural lands in eastern Croatia. Rare-earth element concentrations in the leaves of dandelion from 28 sites in eastern Croatia showed higher concentrations in the plants from agricultural locations compared to those from nonagricultural. The median concentration of PGEs and REEs in dandelion samples (nonagricultural /agricultural locations) is as follows: Pt < 0.020 μg kg^{-1}/< 0.020 μg kg^{-1}; Pd < 0.020 μg kg^{-1}/< 0.020 μg kg^{-1}; Ru < 0.020 μg kg^{-1}/< 0.020 μg kg^{-1}; Rh < 0.020 μg kg^{-1}/< 0.764 μg kg^{-1}; Ir < 0.020 μg kg^{-1}/< 0.020 μg kg^{-1}; La = 87.60 μg kg^{-1}/1017.80 μg kg^{-1}; Ce = 87.60 μg kg^{-1}/1017.80 μg kg^{-1}; Nd = 84.90 μg kg^{-1}/1601.20 μg kg^{-1}.

Keywords: dandelion, rare earth elements, platinum group metals

HRVATSKI VETERINARSKI INSTITUT U ANALITICI HRANE

CROATIAN VETERINARY INSTITUTE IN FOOD ANALYSIS

Boris Habrun*, Nina Bilandžić, Jelka Pleadin, Andrea Humski

Hrvatski veterinarski institut, Savska cesta 143, 10000 Zagreb, Hrvatska
**habrun@veinst.hr*

sponsor presentation / sponzorsko predavanje

Hrvatski veterinarski institut nalazi se u Zagrebu, ali ima četiri podružnice (veterinarski zavodi) koji djeluju u Splitu, Rijeci, Križevcima i Vinkovcima. Institut, provodi analitiku hrane životinjskog podrijetla i hrane za životinje. Područje analitike hrane u Institutu obuhvaća mikrobiološke pretrage, kemijsku analitiku i određivanje rezidua. Institut ima 241 akreditiranu metodu s fleksibilnim područjem u određivanju rezidua.

Portfelj mikrobioloških ispitivanja uključuje bakterijske zoonotske patogene i mikroorganizme koji ukazuju na lošu higijenu ili na kontaminaciju. Razvijene su metode brze analitike (PCR, ELFA, EIA).

U području određivanja rezidua provodi se kontrola ostataka zabranjenih tvari, veterinarskih lijekova i kontaminanata odnosno kemijskih elemenata (metala) i pesticida u hrani životinjskog podrijetla, medu i hrani za životinje. Primjenjuju se orijentacijske i potvrdne metode induktivno spregnute plazme s optičkom emisijom i masenom spektrometrijom, tekućinske i plinske kromatografije s masenom detekcijom, te visokoučinkovite tekućinske kromatografije–tandemske spektrometrije masa.

Kemijska analitika obuhvaća oko stotinu tvari koje predstavljaju kvalitetu i sigurnost hrane. Primjenjuju se klasične i suvremene metode plinske i tekućinske kromatografije u kombinaciji s masenom spektrometrijom i ostalim tehnikama detekcije. Najzastupljenije su analize nutritivnog sastava i deklariranja proizvoda te ispitivanja brojnih aditiva, mikotoksina, alergena i hormona.

Rezultatima postignutim najsuvremenijim analitičkim metodama nastojimo ispitanu hranu učiniti sigurnijom i zaštititi zdravlje ljudi. Institut je od Ministarstva poljoprivrede ovlašten kao nacionalni referalni laboratorij za navedenu analitiku.

Ključne riječi: Hrvatski veterinarski institut, mikrobiologija hrane, kemijska analitika, određivanje rezidua

Keywords: Croatian Veterinary Institute, Food microbiology, Chemical analysis, Residua determination

MICROBIOLOGICAL CONTAMINATION OF CHEESE IN SLICE

Senita Isaković*, Enver Karahmet

University of Sarajevo, Agriculture and Food Sciences Faculty, Zmaja od Bosne 8, 71000 Sarajevo, Bosnia and Herzegovina
**senita.ciklas@hotmail.com*

poster presentation

Dairy products have an important place in the diet of people of any age, due to its composition and the medium for the growth of various microorganisms. Given that the production of indigenous cheeses is based on the processing of raw, thermally unprocessed milk, it is very important to produce high-hygienic quality cheese. The microflora present in milk in a certain number during cheese making is not static, but gradually changes.

In this study, microbiological analysis of brined cheese in slice. The test was performed on 4 samples of Travnik and 2 samples of Sjenica cheese in three replicates, and samples were purchased at the Sarajevo market. In the analyzed samples, the highest number of aerobic mesophilic bacteria and their number ranged from 73 · 10^3 CFU / mL do1453 · 10^3 CFU / mL. After aerobic mesophilic bacteria, yeasts and molds were most prevalent, with the highest colony counts being 197 · 10^3 CFU / mL and the smallest 32.3 · 10^3 CFU / mL. In 3 samples, the presence of enterobacteria was determined, and in 2 samples their number was higher than allowed. It can be concluded that the microbiological safety of a very large number of samples on the market does not meet the microbiological quality criteria.

Keywords: cheese, contamination, Travnik cheese, Sjenica cheese

CHARACTERIZATION OF ANTHOCYANINS IN CHOKEBERRY AND ELDERBERRY BY USING RP-HPLC METHOD

Jozo Ištuk*, Ivana Buljeta, Ivana Tomac, Lidija Jakobek

Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
**jozo.istuk@ptfos.hr*

poster presentation

Anthocyanins are polyphenolic compounds with many positive bioactivities, found in high amounts in fruits, especially in fruits like elderberries and chokeberries. The aim of this study was to develop and validate reversed phase high-performance liquid chromatography method (RP-HPLC) and to characterize anthocyanins in chokeberry and elderberry. A gradient was developed by using 0.5% phosphoric acid and 100% acetonitril, an RP-HPLC method was validated by determining linearity, limit of detection (LOD), limit of quantification (LOQ), sensitivity, precision and accuracy of the method. Anthocyanins were extracted from chokeberry and elderberry by using ultrasonic assisted extraction and 0.1% hydrochloric acid in methanol as a solvent. The identification of anthocyanins was carried out by comparing UV/Vis spectrum and retention times with authentic standards or speaking extracts with authentic standards. Anthocyanins were quantified by using developed RP-HPLC method. Three anthocyanins were identified and quantified in elderberry (cyanidin-3-sambubioside-5-glucoside, cyanidin-3-sambubioside, and cyanidin-3-glucoside, 3203, 10163, 3981 mg/kg of fresh fruit weight, respectively) and four in chokeberry (cyanidin-3-galactoside, cyanidin-3-glucoside, cyanidin-3-arabinoside and cyanidin-3-xyloside, 8221, 474, 3773, 691 mg/kg of fresh fruit weight, respectively). The amounts of anthocyanins show that elderberry and chokeberry are rich sources of anthocyanins.

Keywords: RP-HPLC, anthocyanins, chokeberry, elderberry

THE INFLUENCE OF PROCESSING PARAMETERS ON RETENTION OF PHENOLIC COMPOUNDS IN RED WINE CONCENTRATED BY NANOFILTRATION

Ivana Ivić[1*], Vladimir Jukić[2], Mirela Kopjar[1], Anita Pichler[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia
[*]iivic@ptfos.hr

poster presentation

Many studies suggest that moderate consumption of red wine has beneficial effects on our health, due to its polyphenol content and antioxidant activity. Concentration of red wine by nanofiltration process can be used to lower its ethanol content, but it can also alter its levels of phenolic compounds, depending on processing parameters. Therefore, the aim of this study was to determine the influence of processing parameters of nanofiltration process on retention of phenolic compounds in Cabernet Sauvignon red wine variety. Concentration was carried out on a laboratory plate and frame filter equipped with Alfa Laval NF M20 membranes. Four different operating pressures (25, 35, 45 and 55 bar) and two temperature regimes (with cooling and without cooling) were applied. Total polyphenols, anthocyanins, polymeric colour and antioxidant activity were analyzed in obtained retentates and permeates. The nanofiltration membranes had the ability to retain over 97% of phenolic compounds in retentate. The increase of operating pressure resulted in higher retention of phenolic compounds, but the increase of temperature had opposite effect. Hence, the retentate obtained by nanofiltration at 55 bar with cooling had the highest polyphenol content, and the highest loss of those compounds occurred during concentration at 25 bar without cooling.

Keywords: red wine, phenolic compounds, nanofiltration, concentration, retention

DIETARY FIBRES AND WATER BINDING CAPACITY OF HIGH VOLTAGE ELECTRICAL DISCHARGE TREATED COCOA SHELL

Veronika Barišić[1], Ivana Flanjak[1], Antun Jozinović[1*], Drago Šubarić[1], Jurislav Babić[1], Borislav Miličević[1], Stela Jokić[1], Kristina Doko[2], Đurđica Ačkar[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Federal Agro-Mediterranean Institute, Biskupa Čule 10, 88000 Mostar, Bosnia and Herzegovina
[*]ajozinovic@ptfos.hr

poster presentation

The chocolate industry, like most other food industries, has a problem with solving the by-product utilisation. The main by-product of the chocolate industry is cocoa shell. It is very rich in fibres and other bioactive components that can be used for other purposes. In the last few years, the process that is increasingly used and tested to treat by-products is high voltage electrical discharge (HVED). HVED is performed between two electrodes submerged in water. Electrical breakdown is spreading from positively to negatively charged electrode, resulting in non-thermal processing of food.
Cocoa shell separated from the cotyledon was treated in two concentrations of 1.5 and 3%. Control samples were treated only in water for 15, 30 and 45 min. HVED treatment was performed in same concentrations for the same time with frequencies of 40 and 80 Hz. After the treatment, particle size of grinded samples was determined on analytical sieve shaker with sieve sizes of 50, 71, 100, 125, 200 and 315 μm. Water binding capacity (WBC) was determined by AACC Method 88-04 (1983), and dietary fibres were determined by AOAC method 991.43.
All treatments had a significant effect on particle sizes of samples. Treated samples had higher percentage of particles larger than 315 μm, probably because they were harder to grind due to higher content of moisture in treated samples. Insoluble and soluble dietary fibres increased in treated samples, both in water and HVED treated cocoa shell.

Keywords: dietary fibres, cocoa shell, HVED, water binding capacity

Acknowledgement
This work has been supported in part by Croatian Science Foundation under the project UIP 2017-05-8709.

SENSORY AND MICROBIOLOGICAL ASSESSMENT OF FISH

Enver Karahmet*, Senita Isaković

University of Sarajevo, Agriculture and Food Sciences Faculty, Zmaja od Bosne 8, 71000 Sarajevo, Bosnia and Herzegovina
**enverkarahmet@yahoo.com*

poster presentation

Fish spoilage is a complex process involving chemical, microbiological and physical mechanisms. These mechanisms, immediately after catching the fish, cause changes in its freshness, quality and safety. Enzymatic and chemical activities are most responsible for the initial loss of fish freshness, while the activity of microorganisms causes deterioration and depends on the viability of the fish.
The aim of the study was to determine the microbiological safety of rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trout m. Fario* L.). Furthermore, to review and control of written procedures of good hygiene practices, and to commit freshness rating of fish in different time periods and storage conditions from the moment of the catch.
The number of aerobic mesophilic bacteria ranged from 0.21 x 10^3 cfu / mL to 0.75 x 10^3 cfu / mL for rainbow trout and from 0.21 x 10^3 cfu / ml to brown trout up to 0.90 x 10^3 cfu / mL. Yeast and mold abundance ranged from 1.46 x 10^3 cfu / mL to 8.70 x 10^3 cfu / mL for rainbow trout, while for brown trout for all samples the value ranged from 1.26 x 10^3 cfu / mL to 8.6 x 10^3 cfu / mL. The results indicate that the quality of fresh fish is at a satisfactory level, since the bacterial count is within the limits of the Regulations in Bosnia and Herzegovina.

Keywords: fish spoilage, sensory analysis, microbiological analysis, hygiene

INFLUENCE OF SILVER NANOPARTICLES ON MICROBIOLOGICAL QUALITY OF HARD CHEESE

Anera Kazlagić*, Berina Borovac, Ajna Serdarević, Enisa Omanović-Mikličanin, Josip Jurković, Saud Hamidović

University of Sarajevo, Agriculture and Food Sciences Faculty, Zmaja od Bosne 8, 71000 Sarajevo, Bosnia and Herzegovina
**a.kazlagic@ppf.unsa.ba*

poster presentation

On the territory of Balkan, especially in Bosnia and Herzegovina, hard cheese is used as an everyday meal. This type of cheese is considered as a traditional product of Bosnia and Herzegovina. Because of the large amount of water in cheese, it spoils easier in comparison to other products of similar composition. In this research we questioned the influence of silver nanoparticles on the microbiological quality of hard cheese. For this research, five different types of cheeses from different manufacturers were used. The water activity of the cheese has been tested and the microbiological sample analysis has been done, before and after nanoparticles treatment. Used silver nanoparticles were synthesized using chemical reduction method, on the green way, using garlic. Results showed that with the help of the nanoparticles water activity has decreased, as well as the number of microorganisms. Based on the results, we can assume that silver nanoparticles can be used in microbiological preservation of hard cheeses.

Keywords: water activity, cheese, silver nanoparticles, microbiological assay

LC-(HESI)-MS/MS STUDY OF THE POLYPHENOLIC PROFILE OF PEEL OF 'BOBOVAC' - A TRADITIONAL APPLE CULTIVAR FROM CROATIA

Ante Lončarić[1*], Perla Ferrer[2], Tihomir Kovač[1], Antun Jozinović[1], Drago Šubarić[1], Jurislav Babić[1], María Celeiro[2], Marta Lores[2]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Laboratory of Research and Development of Analytical Solutions (LIDSA), Department of Analytical Chemistry, Nutrition and Food Science, Faculty of Chemistry. E-15782, Santiago de Compostela, Spain
[*]ante.loncaric@ptfos.hr

poster presentation

There has been an increasing interest in the food industry and a growing trend in consumer preferences for natural antioxidant sources. Apple by-products, especially apple peel, are an excellent source of natural antioxidants, such as catechins, procyanidins, caffeic acid, phloridzin, phloretin glycosides, quercetin glycosides, and chlorogenic acid, among others. It has been suggested that a valuable food ingredient can be obtained by using the apple peel and the addition of such ingredient in various food products can promote human health. Traditional apple varieties grown in local areas have so far been largely unexplored considering polyphenolic profile. Moreover, they might represent an important source of bioactive compounds and constitute the basis for further breeding. Accordingly, this study is aimed at determination and quantification of the apple peel polyphenolic profile by LC-(SESI)-MS/MS. Results are confirming that the peel of traditional apple cultivar 'Bobovac' is rich in polyphenols. More than 20 individual polyphenols were detected, while procyanidins and chlorogenic acid were the most abundant. Due to such polyphenols diversity, it is important to preserve traditional apple varieties as a source of genetic variability as well as a factor of biodiversity of the area where they grow.

Keywords: apple peel, polyphenolic compounds, LC-(SESI)-MS/MS

KARAKTERIZACIJA HLAPLJIVIH SPOJEVA IZ TRAJNE KOBASICE *BOSANSKI SUDŽUK*

CHARACTERIZATION OF VOLATILE COMPOUNDS FROM DRY FERMENTED SAUSAGE *BOSANSKI SUDŽUK*

Zvonimir Marijanović[1*], Josipa Pupačić[1], Mladenka Šarolić[2], Tomislav Svalina[2], Marko Šuste[2]

[1]Sveučilište u Splitu, Kemijsko-tehnološki fakultet, Ruđera Boškovića 35, 21000 Split, Hrvatska
[2]Veleučilište "Marko Marulić" u Kninu, Krešimirova 30, 22300 Knin, Hrvatska
[*]zmarijanovic@ktf-split.hr

poster presentation / postersko priopćenje

Bosanski sudžuk, suha fermentirana kobasica, proizvodi se u većini dijelova Bosne i Hercegovine, jedna je od tradicionalnihh kobasica na tom području. Tijekom procesiranja fermentiranih proizvoda odvijaju se brojne enzimatske i neenzimatske reakcije koje dovode do povećanja koncentracije hlapljivih komponenata aroma. Te komponente su odgovorne za specifične okusne i mirisne osobine ovog proizvoda. Za ekstrakciju tih spojeva iz uzoraka korištena je mikroekstrakcija na čvrstoj fazi iz para iznad otopine (HS-SPME). Svi uzorci hlapljivih spojeva su analizirani plinskom kromatografijom spektrometrijom masa (GC-MS). U sva tri uzorka terpeni su skupina sa najvećim postotkom i to: limonen (21,36 – 27,05 %) i *δ*-3-karen (16,25 – 16,73 %).

Ključne riječi: Bosanski sudžuk, HS-SPME, GC-MS, hlapljivi spojevi, arome

Keywords: Bosanski sudžuk, HS-SPME, GC-MS, volatile compounds, aroma

ELECTROCHEMICAL DETECTION OF VITAMIN C IN REAL SAMPLES

Jelena Blažević[1], Anamarija Stanković[1], Silvija Šafranko[2], Stela Jokić[2], Martina Medvidović-Kosanović[1*]

[1]Josip Juraj Strossmayer University of Osijek, Department of Chemistry, Cara Hadrijana 8/A, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]mmkosano@kemija.unios.hr

poster presentation

Vitamin C (ascorbic acid) is an essential, water-soluble vitamin which can`t be produced by human body. It can be found in various fruits and vegetables (e.g. lemon, orange, broccoli etc.) and food supplements. The recommended daily intake is 75 mg for women and 90 mg for men. The intake of higher amounts of vitamin C can lead to health problems (gastric irritation, excessive oxidative stress, liver disease etc.). Therefore it is important to monitor daily intake of vitamin C from different sources. The aim of this study was to detect vitamin C in real samples (fruit juices and food supplements) by cyclic voltammetry. Electrochemical measurements were conducted in a three electrode voltammetric cell where glassy carbon electrode was used as a working electrode, Ag/AgCl as a reference electrode and a platinum wire as a counter electrode. The system was purged with high purity argon, Ar5 (ϕ_{Ar}=99.999%) before each measurement.
Vitamin C was detected in model systems where a linear response was obtained in a concentration range from 0.4 mg/L to 440.0 mg/L. It was also found in real samples where its quantity varied from 2 mg/L till 64 mg/L.

Keywords: vitamin C, detection, cyclic voltammetry, fruit juices

NUTRITIONAL AND AROMATIC CHARACTERIZATION OF CAROB LIQUEUR

Karla Hanousek Čiča[1], Jasna Mrvčić[1*], Siniša Srečec[2], Vlatka Petravić Tominac[1], Damir Stanzer[1]

[1]University of Zagreb, Faculty of Food Technology and Biotechnology, Pierottijeva 6, 10000 Zagreb, Croatia
[2]Križevci College of Agriculture, M. Demerca 1, 48260 Križevci, Croatia
[*]jmrvcic@pbf.hr

poster presentation

In recent years, carob's health benefits and nutritional value are being highlighted and therefore various carob-based food products are produced. Carob liqueur is a strong alcoholic drink typical for the Mediterranean countries. In current work carob liqueur produced by maceration of carob pods in hydro-alcoholic base at different maceration conditions was characterized based on its aroma compounds/profile, physicochemical parameters and chromatic characteristics. The results confirm migration process and bioactive compounds, aroma compounds and sugars flow from the carob pod to the alcoholic base. Changes in ethanol concentration modify the physical properties of the solvent and influence the sugars, phenolics and aroma compounds extraction, colour and acidity of the obtained samples. The higher content of phenolic compounds was determinate in the samples obtained in the darkness. The amounts of phenols were in the range of some red fruit liqueurs or walnut liqueurs, and sugars (mostly sucrose) ranging between 96 – 107 g/L. Twenty-six (out of total 94) aroma compounds were detected in all samples of which 17 esters, 3 alcohols, 4 ketones and 2 acids. Low molecular weight ethyl esters: ethyl hexanoate, ethyl 2-methylpropanoate, ethyl octanoate, ethyl benzoate, ethyl butanoate and ethyl cinnamate were the most abundant.

Keywords: carob, liqueur, aroma, macerate, phenolic compounds, sugars

ANTIBACTERIAL AND ANTIOXIDATIVE EFFECTS OF ORANGE PEEL (*Citrus sinensis* Osbeck cv. Washington navel) EXTRACTS OBTAINED BY ULTRASOUND ASSISTED EXTRACTION

Valentina Pavić[1*], Katarina Batrnek[1], Maja Molnar[2], Martina Jakovljević[2], Stela Jokić[2]

[1]Josip Juraj Strossmayer University of Osijek, Department of Biology, Cara Hadrijana 8/A, Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, Osijek, Croatia
[*]vpavic@biologija.unios.hr

poster presentation

Orange peel has been extensively studied due to its rich phytochemicals content such as triterpenes, glycosides and flavonoids most of which are considered as very strong antioxidants that can have a beneficial effect on human health. Ultrasound-assisted extraction is ecologically acceptable extraction technique for obtaining such polar compounds. The aim of this study was to determine how different conditions of ultrasonic extraction affects total concentration of phenolic compounds, antioxidative and antibacterial activity on Gram-positive and Gram-negative human pathogens. The results showed that the higher solvent-solid ratio results in higher yields of total phenolic compounds, but higher ultrasound extraction temperature leads to an increased total antioxidant activity. The decrease in antibacterial activity was observed with higher ethanol:water ratio. The highest total phenolic content was recorded in the extract obtained at 70 °C, 50 mL/g solvent-solid ratio, ethanol:water ratio 50% v/v and for 30 min. The strongest antibacterial activity was recorded in the extract obtained at 30 °C, 50 mL/g solvent-solid ratio, ethanol:water ratio 50% v/v and for 30 min.

Keywords: orange peel, ultrasound-assisted extraction, antioxidative activity, antibacterial activity

Acknowledgement
This work has been supported in part by 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).

NUTRITIVE AND SENSORIAL QUALITY OF ISTRIAN AND SLAVONIAN DRY-FERMENTED SAUSAGES

Jelka Pleadin[1*], Greta Krešić[2], Tina Lešić[1], Ana Vulić[1], Nina Kudumija[1], Tanja Bogdanović[3], Mladenka Malenica Staver[4], Ivica Kos[5], Blanka Sinčić Puljić[6], Nada Vahčić[7]

[1]Croatian Veterinary Institute, Laboratory for Analytical Chemistry, Savska Cesta 143, 10000 Zagreb, Croatia
[2]Faculty of Tourism and Hospitality Management, Department of Food and Nutrition, University of Rijeka, Primorska 42, 51410 Opatija, Croatia
[3]Croatian Veterinary Institute, Regional Veterinary Institute Split, Poljička cesta 33, 21000 Split, Croatia
[4]Department of Biotechnology University of Rijeka, Radmile Matejčić 2, 51000 Rijeka, Croatia
[5]Faculty of Agriculture University of Zagreb, Department of Animal Science and Technology, Svetošimunska cesta 25, 10000 Zagreb, Croatia
[6]Administrative Department of Agriculture, Forestry, Hunting, Fishery and Water Management, Šetalište Pazinske Gimnazije 1, 52000 Pazin, Croatia
[7]Faculty of Food Technology and Biotechnology, University of Zagreb, Pierottijeva 6, 10000 Zagreb, Croatia
[*]pleadin@veinst.hr

poster presentation

As traditional dry-fermented sausages are highly appreciated food delicacies, further research is needed to improve their quality and safety, so as to ensure a higher product added value and meet quality standards and consumer requirements. The aim of this study was to investigate into the nutritive and sensorial quality of Croatian traditional dry-fermented Istrian and Slavonian sausages (n=52) produced by different households during the 2018 – 2019 timeframe. Sensorial analysis resulted in statistically significant differences (p<0.05) between these products in 11 out of a total of 20 sensorial parameters analysed, which was attributed to the use of different ingredients and spices across individual manufacturers.

As for the basic nutritive properties, significantly higher protein content was determined in Istrian (30.66 ± 5.05 g/100 g) in comparison with Slavonian sausage (26.68 ± 3.57 g/100 g), although the latter content significantly varied across the production households. No significant differences in fatty acid esters and groups of saturated (SFA), monounsaturated (MUFA) and polyunsaturated (PUFA) fatty acids were obtained, revealing these sausages to have the fatty acid profile of a typical pork meat product, with small composition variations attributable to the differences in the amount of added fatback and the stuffing fatness.

Keywords: traditional sausages, dry-fermented sausages, Croatian households, sensorial properties, nutritive properties

EXPERIENCE NEW BENCHMARKS – NEW NEXERA SERIES

Matea Potkrajčić*

Shimadzu d.o.o., Zavrtnica 17, 10000 Zagreb, Croatia
**matea.potkrajcic@shimadzu.hr*

sponsor presentation

For more than 40 years, Shimadzu Corporation has refined the technological capabilities of high-speed and ultra-high performance liquid chromatograph, and has provided products with outstanding performance, such as autosamplers with low carryover and detectors which support stable signal intensity during ambient temperature fluctuations. The new Nexera series aims to set new standards for high performance liquid chromatography in the world of analysis, combining a solid foundation of technological know-how with new functions involving M2M system managment, Internet of Things and Analytical intelligence, a new benchmark of intelligence, efficiency and design. A variety of sensors update operating status and instrument configuration to cloud servers in real time, including data related to consumable parts such as columns and UV lamps, guaranteeing data integrity and traceability. Sensor data is also used to predict problems such as mobile phase depletion and wear-and-tear of consumable parts. Pumping issues that can be caused by air bubbles are automatically detected and resolved via the autopurge function. The integration of these technologies allows users to generate accurate and reliable analysis data.

Keywords: Nexera, new benchmarks, intelligence, efficiency, design

COMPARISON OF TWO *IN VITRO* DIGESTION METHODS FOR EVALUATION OF BIOACCESIBILITY OF MINERALS IN FRESH WHEATGRASS JUICE

Andrijana Rebekić[1*], Sanja Grubišić[1], Marija Kristić[1], Miroslav Lisjak[1], Zdenko Lončarić[1], Katarina Mišković Špoljarić[2]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine, Josipa Huttlera 4, 31000 Osijek, Croatia
[*]arebekic@fazos.hr

poster presentation

Minerals are essential nutrients that support a wide variety of bodily functions. Food is the main source of minerals for humans, and some foods are better sources of minerals than others.
The aim of this research was to compare two static *in vitro* digestion methods (Kiers *et al*. (2000) and Minekus *et al*. (2014)) for determination of bioaccessibility of K, Ca, Mg, Mn, Fe, and Zn in fresh wheatgrass juice.
The experiment was carried out on a 25 wheat cultivars, grown in controlled conditions for 12 days. Higher mean concentrations of Ca (24%), Mg (7 %), K (10%), and Mn (37%) were determined (ICP-OES technique) after simulation of *in vitro* digestion by Kiers *et al*. (2000), while higher Fe (38%) and Zn (65%) concentrations were determined after simulation of *in vitro* digestion by Minekus *et al*. (2014). Correlation of mineral concentrations between two methods was significant (p<0.001) for all elements, and varied between r=0.56 for Zn to r=0.92 for Fe. In conclusion, it is not clear which method is better, so further research on a larger sample and with more replicates should be carried out.

Keywords: wheatgrass, bioavailability, biofortification, CaCo-2

VOLATILE COMPOUNDS OF ANISE – FLAVOURED SPIRIT „*ANIŽETA*“

Mladenka Šarolić[1*], Nikolina Bosnić[1], Emilija Friganović[1], Žana Delić[1], Marko Šuste[1], Tomislav Svalina[1], Boris Dorbić[1], Zvonimir Marijanović[2]

[1]Marko Marulić Polytechnic of Knin, Petra Krešimira IV. 30, 22300 Knin, Croatia
[2]University of Split, Faculty of Chemistry and Technology, Ruđera Boškovića 35, 21000, Split, Croatia
[*]msarolic@veleknin.hr

poster presentation

Aniseed spirits are produced by distillation of pressed and fermented grapes after vinification. They are flavoured using *Pimpinella anisum* L. and *Foeniculum vulgare* Mill. seeds and some other plant materials as an aromatic agents. „Anižeta” is traditional distilled alcoholic spirit mainly produced on the island of Korčula, Croatia. It´s consumption is a part of the people´s culture. All over the Mediterranean area beverages of the same family are drunk under the names: „Ouzo” in Greece, „Raki” in Turkey, „Pastis” in France, „Sambuca” in Italy, etc. In most cases the alcohol content of „Anižeta” varies in the range between 35 – 40%. The aim of this work was to find the major volatile compounds responsible for the aromatic quality of „Anižeta”. Volatile compounds were isolated by headspace solid-phase microextraction (HS-SPME) using fibre coated with polydimethylsiloxane/divinylbenzene/carboxene (PDMS/DVB/CAR) and analysed by gas chromatography and mass spectrometry (GC-MS). The main identified compounds were *trans*-anethole, *cis*-anethole, ethyl caprate, ethyl caprylate and isoamylalcohol. *Trans*-anethole and *cis*-anethole are the main volatile compounds which are responsible for aroma properties of this traditional aniseed distillate.

Keywords: *„Anižeta”*, volatile compounds, HS-SPME, GC-MS

COMPLETE AND SMART SOLUTIONS FOR YOUR FATTY ACIDS, FAMES & OILS ANALYSIS

Ingrid Stojko*, Matea Kovač

AlphaChrom d.o.o., Karlovačka cesta 24, 10000 Zagreb, Croatia
**ingrid.stojko@alphachrom.hr*

sponsor presentation

The new Agilent 8890 enables you to work smarter – not longer and harder. Its built-in intelligence features help you avoid unplanned downtime and minimize costly operational surprises. A new breed of instrument that monitors system health, tracks injections, and alerts you to leaks. That means you can plan your work – including maintenance – rather than react to unexpected downtime. Perfect for a broad range of routine GC applications, the 8890 GC delivers consistent, repeatable results – day after day. Considering that the heart of the instrument is the column, we believe that choosing the right column enhances lab productivity. Speed up Your analysis and confidence in Your results with new Agilent GC columns for FAME and fatty acid analysis.

Keywords: Agilent 8890, new Agilent GC columns, complete and smart solutions

THE INFLUENCE OF *ORIGANUM VULGARE* ON THE VOLATILE COMPOUNDS OF BEATEN GOAT CHEESE

Erhan Sulejmani*, Hava Miftari, Gafur Xhabir, Xhezair Idrizi, Xhabir Abdullahi

University of Tetova, Faculty of Food Technology and Nutrition, Department of Food Technology, Str. Ilinden, nn. 1200 Tetova, Republic of North Macedonia
**erhan.sulejmani@unite.edu.mk*

poster presentation

The objective of this study was to determine the volatile profiles during ripening of beaten cheese (BG) and origanum beaten cheese (BO), cheeses made by using goat's milk. The profiles of volatile compounds of Goat Beaten cheese were analyzed by GC–MS using a solid-phase microextraction (SPME). A total of 140 volatile compounds were identified and were consisted of 18 terpenes, 11 aldehydes, 28 esters, 18 ketones, 24 hydrocarbons, 10 acids, 28 alcohols and 3 miscellaneous. Alcohols are more quantitatively represented in BG cheese in the first month of ripening with a concentration of 160.2 μg/100 g. The highest amount of esters were in BO cheeses during the first month of ripening with ethyl capronate (133.73 μg/100 g) being in the highest concentration, while in the third month most pronounced was ethyl phthalate (41.03 μg/100 g). Methyl acetate was found to be in the lowest amount during the first month (1.48 μg/100 g), while during the third month of ripening in BO cheese the lowest ester was isoamyl butyrate (2.00 μg/100 g). These differences in the volatile profiles of cheeses can be explained by the differences in raw materials, spices and production conditions.

Keywords: goat cheese, oregano plant (*Origanum vulgare*), ripening, volatile compounds

INSTRUMENTAL TECHNIQUES IN VITAMIN C ANALYSIS

Ivana Tomac*, Ivana Buljeta, Jozo Ištuk, Lidija Jakobek

Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
**itomac@ptfos.hr*

poster presentation

Vitamin C is water-soluble and the first synthesized vitamin, which has significant antiradical properties and the positive influence on human health. Usually, the content of vitamin C in real samples is determined by the potentiometric and iodometric titration, spectrophotometry and electrochemical techniques. Because of the rapid oxidation on the surface of the glassy carbon electrode, voltammetric techniques are also a good choice for determination of vitamin C content in the real samples as well chronopotentiometry. The aim of this paper is to show the application of the most common titration techniques and spectrophotometry in comparison to electrochemical techniques such as cyclic, differential pulse and square-wave voltammetry and flow chronopotentiometry in the determination of vitamin C content in real samples (fruits, juices and tablets of multivitamins). The linearity of methods, limits of detection and limits of quantification for all applied instrumental techniques were determined and all techniques proved to be sensitive and selective for determination of the vitamin C content in the real samples.

Keywords: vitamin C, spectrophotometry, titrations, electrochemical techniques, real samples

NUTRITIVE TREASURE OF TRADITIONAL CROATIAN APPLE VARIETIES

Marija Viljevac Vuletić[1*], Daniela Horvat[1], Ines Mihaljević[1], Vesna Tomaš[1], Marija Kovačević Babić[1], Krunoslav Dugalić[2], Dominik Vuković[1]

[1]Agricultural Institute Osijek, Južno predgrađe 17, 31000 Osijek, Croatia
[2]Croatian Agency for Agriculture and Food, Vinkovačka cesta 63c, 31000 Osijek, Croatia
[*]marija.viljevac@poljinos.hr

poster presentation

The development of modern fruit planting in the second half of the 20th century contributed to the large changes in the apple assortments. Sensory and nutritional values of the traditional varieties are often better than in modern ones. Several traditional apple varieties were compared with two modern varieties regard their pomological and chemical characteristics. The traditional variety Ilinjača had the lowest pH and total soluble solids, but the highest total acids (3.11, 10 °Brix and 1.44 g_{MA}/100g, respectively). Dry matter and total soluble solids were the higest in the traditional variety Lijepocvjetka (16.47% and 14.54 °Brix, respectively), while the highest firmness (12.44 kg/cm^3) had traditional variety Adamova zvijezda. The higest value of juice pH and the lowest values of firmness and total acids were found in modern varieties (4.26, 4.00 kg/cm^3 and 0.16 g_{MA}/100 g, respectively). Total polyphenols content varied from 0.318 to 1.051 mg_{GAE}/g_{FW} in the traditional varieties Ivanlija and Ilinjača, respectively. Total flavonoids varied from 0.196 to 0.709 mg_{CE}/g_{FW} in the traditional varieties Ivanlija and Ilinjača as well as polyphenols. Modern varieties Idared and Golden delicious ®Reinders had low total polyphenol and flavonoid content as found in traditional variety Ivanlija. Fructose were predominant sugar in apple fruits (4.38 – 6.67%) and total sugars content varied from 7.21 to 11.99%.

Keywords: flavonoids, polyphenols, sugars, total acids

PRIMJENA PLAZMA AKTIVIRANE VODE U GERMINACIJI JEČMA (*Hordeum Vulgare* cv GOLDEN PROMISE)

APPLICATION OF COLD PLASMA ON GERMINATION OF BARLEY (*Hordeum Vulgare* cv GOLDEN PROMISE)

Tomislava Vukušić*, Antonija Jendrijev, Višnja Stulić, Zoran Herceg

Sveučilište u Zagrebu, Prehrambeno-biotehnološki fakultet, Pierottijeva 6, 10000 Zagreb, Hrvatska
**tvukusic@pbf.hr*

poster presentation / postersko priopćenje

U ovom radu ispitan je učinak plazma aktivirane vode (PAW) na germinaciju ječma (*Hordeum Vulgare* cv Golden Promise). Određivani su fizikalno-kemijski parametri tretirane vode te je praćen učinak na stupanj klijavosti i koncentraciju ukupnih pigmenata. Uzorci vode tretirani su hladnom plazmom pri tri frekvencije: 60, 90 i 120 Hz uz upuhivanje plinova: argon, zrak, kisik i dušik. Tretmani su provedeni u trajanju deset minuta za uzorke u kojima su upuhani argon i zrak te dvadeset minuta za uzorke u koje su upuhani kisik i dušik. Ovim eksperimentom je dokazano da najpovoljniji utjecaj na stupanj klijavosti imaju tretmani PAW vodom u čijoj su proizvodnji kao radni plinovi korišteni kisik i dušik, dok je do povećanja koncentracije ukupnih pigmenata došlo u uzorcima tretiranim PAW vodom dobivenom uz upuhivanje zraka. Plazma tretmanom snizuje se pH vrijednost vode, što omogućuje da takva voda ima i sterilizacijski učinak.

Ključne riječi: ječam, PAW, klijavost, klorofil

Keywords: barley, PAW, germination, chlorophyll

QUALITY CONTROL OF WAFER LEAFS

Sandra Zavadlav*, Vili Herc

Karlovac University of Applied of Sciences, Trg J. J. Strossmayera 9,
47000 Karlovac, Croatia
**sandra.zavadlav@gmail.com*

poster presentation

A wafer leafs falls into a group of confectionery products. The confectionery products are classified into four groups according to raw materials used: cocoa products, sugar confectionery, snack products and flour confectionery.
The aim of this thesis was to analyze the qualitative basic and comparable quality of final products and to conclude the impact of the chemical composition of the raw material on the semi-product in the technological process itself.
The results show the analysis of the flour used in the process of making wafer leaves. Analysis of flour is carried out by analyzing the proportion of water in flour. The other results show the analysis of dough flour analyzes the percentage of water absorption, dough tensile, maximum viscosity, ash and acidity and also shows the analysis of the wafer leafs in which the proportion and the fat content are analyzed.

Keywords: cookie, flour, quality, wafer, wafer leafs

PRODUCTION OF SAFE FOOD AND FOOD WITH ADDED NUTRITIONAL VALUE /

PROIZVODNJA ZDRAVSTVENO SIGURNE I NUTRITIVNO VRIJEDNE HRANE

THE EXTRACTION OF HESPERIDIN FROM MANDARIN PEELS IN DEEP EUTECTIC SOLVENTS

Stela Jokić, Maja Molnar, Ana-Marija Cikoš*, Martina Jakovljević, Marija Banožić, Silvija Šafranko

Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
**acikos@ptfos.hr*

poster presentation

The mandarin peels are most valuable by-products due to their content of bioactive compounds which have shown health-related properties including antioxidant, anticancer and anti-inflammatory. The extraction of bioactive compounds can be performed in deep eutectic solvents (DESs), which are composed of a hydrogen bond acceptor and hydrogen bond donor components. The advantages of using DESs as extraction media are their non-toxicity, thermal stability, biodegradability and easy preparation.

The peels of *Citrus reticulata* Blanco cultivars of a different variety (*Zorica rana, Chahara, Okitsu, Kuno*) from the Opuzen were extracted in 15 different choline chloride based DESs at 50 °C for 30 min and with the 20% of added water. The extracts were analysed by high performance liquid chromatography (HPLC) to found the most suitable choline chloride based DES for the extraction of the highest amount of hesperidin. Screening showed that the best solvent was choline chloride:acetamide (1:2) and the highest amount of hesperidin was found in variety *Zorica rana*.

The results showed that the amounts of extracted hesperidin were completely different according to the used mandarin variety. Furthermore, the application of deep eutectic solvents for the extraction exhibited strong potential for the production of the extracts rich in bioactive compounds.

Keywords: by-product, mandarin peel, deep eutectic solvents, hesperidin

Acknowledgement

This work has been supported in part by 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).

UTJECAJ METODA SUŠENJA NA NUTRITIVNI SASTAV I ANTIOKSIDATIVNI POTENCIJAL BIOOTPADA RAJČICE

INFLUENCE OF DRYING METHODS ON NUTRITIONAL COMPOSITION AND ANTIOXIDATIVE POTENTIAL OF TOMATO BIOWASTE

Tanja Cvetković[1*], Jasmina Ranilović[1], Irena Vađunec Bajrić[1], Domagoj Matković[1], Drago Šubarić[2], Antun Jozinović[2]

[1]Podravka d.d, Istraživanje i razvoj, Ante Starčevića 32, 48000 Koprivnica, Hrvatska
[2]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[*]tanja.cvetkovc@podravka.hr

poster presentation / postersko priopćenje

U preradi rajčice, pokožica, sjemenke i dijelovi pulpe predstavljaju biološki otpad. Osim vlakana koja čine i do 50 % sastava ovog nusproizvoda, prema literaturnim podacima, njegov sastav bogat je antioksidansima kao što su fenoli, karotenoidi i vitamini, koji predstavljaju funkcionalne sastojke te imaju pozitivan učinak na zdravlje. Kako bi biootpad rajčice postao primjenjiv kao sirovina u prehrambenoj industriji mora imati prihvatljivu organoleptičku i nutritivnu kvalitetu, trajnost te se mora tehnološki obraditi. Stoga je cilj ovog istraživanja bio ispitati utjecaj različitih metoda sušenja na nutritivnu i organoleptičku kvalitetu te antioksidativni potencijal biootpada rajčice izdvojenog iz proizvodnje tijekom prerade svježe rajčice.
Istraživanje se sastojalo od prikupljanja biootpada rajčice iz proizvodnje tijekom prerade rajčice (2018.) i provođenja tri različita postupka sušenja: liofilizacije, vakuum sušenja i sušenja vrućim zrakom. Analiza uzoraka dobivenih sušenjem podrazumijevala je određivanje sadržaja makronutrijenata, promjenu boje, mirisa, okusa, sadržaja likopena, polifenola, *β*-karotena te antioksidativnog potencijala. Rezultati su pokazali da ispitivane metode sušenja nemaju utjecaj na nutritivne i organoleptičke parametre biootpada rajčice te da imaju pozitivan utjecaj na antioksidativni potencijal (AP) ispitivanog uzorka, osobito metoda vakuum sušenja (253 AU). Sadržaj likopena (5,46 mg/100 g) i *β*-karotena (2,34 mg/100 g) bio je najviši kod vakuum sušenja, dok je sadržaj polifenola (378,7 mg/100 g) bio najviši kod liofilizacije.

Ključne riječi: biootpad rajčice, antioksidativni potencijal, sušenje vrućim zrakom, liofilizacija

Keywords: tomato biowaste, antioxidant potential, hot air drying, lyophilization

A NOVEL CELL FACTORY FOR COMBINED BIOPROCESSES

Iris Plioni[1], Dimitra Dimitrellou[1*], Panagiotis Kandylis[2], Theano Petsi[1], Argyro Bekatorou[1], Maria Kanellaki[1], Athanasios A. Koutinas[1]

[1]University of Patras, Department of Chemistry, Food Biotechnology Group, 26500 Patras, Greece
[2]Aristotle University of Thessaloniki, School of Agriculture, Department of Food Science and Technology, 54124 Thessaloniki, P.O. Box 235, Greece
[*]dimitrellou@gmail.com; ddimitrellou@upatras.gr

poster presentation

It is usual in food technology two or more bioprocesses to be required in order to produce the final product. In the present study a novel cell factory that allows the simultaneous operation of more than one bioprocesses, was prepared based on starch gel. The conversion of cellulose to ethanol was selected as the case study. The proposed technology involves the production of a two layer biocatalyst with starch gel that will contain entrapped cells of *Saccharomyces cerevisiae* and *Trichoderma reesei* in different layers. Alkaline pretreatment reduced the crystallinity of the material to values near to 61%. Fourier-transform infrared spectroscopy analyses of the novel cell factories showed the characteristic bands of starch but also that of cells (amide II ~1455 cm^{-1} and C=O of the ester groups from lipids and fatty acids 1720 – 1750 cm^{-1}) and CO_2 when *S. cerevisiae* was added. The novel cell factory led to significant ethanol yields of 0.45 g g^{-1}. The results were very promising and this technology may be applied also in other food application that require the combination of several bioprocesses.

Keywords: *Saccharomyces cerevisiae*, *Trichoderma reesei*, bioethanol, FTIR

Acknowledgement
We acknowledge support of this work by the project "Research Infrastructure on Food Bioprocessing Development and Innovation Exploitation – Food Innovation RI" (MIS 5027222), which is implemented under the Action "Reinforcement of the Research and Innovation Infrastructure", funded by the Operational Programme "Competitiveness, Entrepreneurship and Innovation" (NSRF 2014-2020) and co-financed by Greece and the European Union (European Regional Development Fund).

KVALITATIVNI PARAMETRI HERCEGOVAČKE SUHE JARČETINE U CILJU NJENE ZAŠTITE NA NACIONALNOM NIVOU

QUALITATIVE PARAMETERS OF HERZEGOVINA'S DRY-SMOKED GOAT FOR THE PROTECTION OF ITS AT NATIONAL LEVEL

Amir Ganić*, Amina Forto, Munevera Begić

Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Zmaja od Bosne 8, 71000 Sarajevo, Bosna i Hercegovina
**ganicamir@yahoo.com; a.ganic@ppf.unsa.ba*

poster presentation / postersko priopćenje

Šire područje općine Stolac, karakterizira dugogodišnja tradicija u proizvodnji nadaleko poznate "Hercegovačke suhe jarčetine". Proizvodi se isključivo od mesa muških nekastriranih grla - jarčeva. Proizvodnja je karateristična u periodu kasne jeseni, odnosno u vrijeme mrkanja koza. U tom periodu, muška nekastrirana grla imaju intenzivan miris koji potječe od lučenja spolnih hormona. Izuzetno naglašen miris se u značajnoj mjeri prenosi na meso, a u kasnijoj fazi i na finalni proizvod. Nakon obrade trupa, meso se nasoljava isključivo morskom solju, a potom suši i dimi istovremeno u kamenim pušnicama. Za sušenje i dimljenje mesa odabiru se posebne mikrolokacije. Uglavnom su to visinska područja s nadmorskom visinom oko 1000 metara, gdje je intenzivnije strujanje zraka. Posebnost mediteranske klime i biljnog pokrivača, specifičanosti mirisa i arome mesa, kao i tehnologije proizvodnje, daje ovom tradicionalnom mesnom proizvodu izuzetna senzorska svojstva. Cilj istraživanja je bio ustanoviti senzorske i kemijske parametre kvalitete "Hercegovačke suhe jarčetine", s ciljem njegove zaštite na nacionalnom nivou. U okviru istraživanja uzorci su konfekcionirani u osam zasebnih anatomskih cjelina (vrat, slabinski dio, but, leđna muskulatura, potrbušina, grudi, plećka i potkoljenica), na kojima su provedena istraživanja.

Ključne riječi: Hercegovina, suha jarčetina, tradicionalni proizvod

Keywords: Herzegovina, dry-smoked goat, traditional product

TEHNOLOŠKI POSTULATI PROIZVODNJE "VISOČKOG SUDŽUKA" KAO OSNOVA U POSTUPKU DOBIVANJA OZNAKE GEOGRAFSKOG PORIJEKLA PROIZVODA

TECHNOLOGICAL PARAMETERS IN THE PRODUCTION OF "VISOČKI SUDŽUK" AS A BASIS IN THE PROCEDURE OF OBTAINING THE GEOGRAPHICAL ORIGIN OF THE PRODUCT

Amir Ganić*, Munevera Begić

Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Zmaja od Bosne 8, 71000 Sarajevo, Bosna i Hercegovina
**ganicamir@yahoo.com; a.ganic@ppf.unsa.ba*

poster presentation / postersko priopćenje

Mesoprerađivačka djelatnost na području „Visočkog kraja", prisutna je stoljećima unazad. Ne postoje točne povijesne činjenice o genezi razvoja ove djelatnosti na području današnje općine Visoko. Međutim, sasvim se realnim čini da je ova proizvodnja bila usko vezana s kožarskom industrijom, koja se spominje još u Srednjem vijeku. Povijesna literatura spominje da je Visoko kao najznačajnija raskrsnica Srednjeg vijeka u tadašnjoj Bosni, pored trgovine imala veoma razvijen i kožarski obrt, koji je puni procvat doživio za vrijeme Turske uprave. Postoje pisani tragovi koji govore da se u 18. stoljeću u Visokom spominju klaničari koji su klali životinje i prodavali meso. Pored kožara, ćebadžija, mutapčija, samardžija, puškara, spominju se i kasapi – mesari. Prema podacima iz 1795. godine bilo ih je pet "*i svaki je klao u drugi dan, a nije se klalo petkom i subotom".* Proizvodnja "Visočkog sudžuka" ima višestoljetnu tradiciju, koja se generacijama prenosi s koljena na koljeno. Posebnosti "Visočkog sudžuka" ogledaju se u njegovoj tehnologiji proizvodnje, što se u najvećoj mjeri prenosi na vrhunsku kvalitetu, po čemu je nadaleko poznat. U proizvodnji "Visočkog sudžuka", dozvoljena je upotreba samo kuhinjske soli. Primjena ostalih dodataka nije dozvoljena. Od začina koriste se bijeli luk i biber, koji proizvodu daju specifičan miris i aromu.

Ključne riječi: "Visočki sudžuk", tradicionalni proizvod, zaštita kvalitete

Keywords: „Visočki sudžuk", traditional product, protection of quality

RECYCLING OF FOOD INDUSTRY BY-PRODUCTS: PRODUCTION OF COCOA BEAN SHELL POWDER USING SPRAY DRYING TECHNIQUE

Jelena Vladić[1], Senka Vidović[1], Ivana Flanjak[2], Mojca Škerget[3], Stela Jokić[2*]

[1]University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[3]University of Maribor, Faculty of Chemistry and Chemical Engineering, Smetanova 17, 2000 Maribor, Slovenia
[*]stela.jokic@ptfos.hr

poster presentation

Cocoa bean shell, which represents waste generated in the production of cocoa and its products, is proven to contain numerous bioactive components that can be applied in food, cosmetic, and pharmaceutical industry. To valorize this material, it is necessary to develop an adequate method that can provide quality and stabile products of cocoa bean shell that contains bioactive components. With that goal in mind, the spray drying technique with two carriers – maltodextrin and whey protein was applied.

The obtained dry extracts were characterized in terms of physico-chemical properties: moisture content, hygroscopicity, bulk density, rehydratation, water absorption index and water solubility index, content of total phenols and total flavonoids. Furthermore, the content of bioactive components (theobromine, caffeine, gallic acid, caffeic acid, *p*-coumaric acid, (+)-catechin, (-)-epicatechin and (-)-epicatechin gallate) was performed by HPLC method. By using maltodextrin, an approximately 74% efficacy of the process was achieved, while with whey protein it was 59%. The powders obtained with both carriers had a moisture content below 6%, which secures the extended stability of the extract if it is stored in an adequate manner. Similar results were achieved in the case of hygroscopicity which is the capacity of the material to absorb moisture. This capacity was monitored after 2, 5, 7, 10, and 14 days and it ranged from 12.40 to 16.68% for both powders.

The value of the bulk density of the obtained powders were higher in the case where maltodextrin was used, while whey protein was more efficient and adequate carrier for the preservation of polyphenols. As a result, a higher content of total phenols and flavonoids in dry powders dried with whey protein was determined. Higher content of methylxanthines and phenolic acids, except caffeic acid, was obtained when whey protein was used as a carrier while the content of other analyzed active components was the same regardless of carrier type.

Keywords: cocoa bean shell, spray drying, active compounds

POTENTIAL APPLICATION OF LYOPHILIZED TOMATO POMACE IN THE PRODUCTION OF DIRECTLY EXPANDED CORN SNACK PRODUCTS

Antun Jozinović[1*], Tanja Cvetković[2], Jasmina Ranilović[2], Irena Vađunec Bajrić[2], Nela Nedić Tiban[1], Antonija Jozinović Lešić[3], Đurđica Ačkar[1], Jurislav Babić[1], Drago Šubarić[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Podravka d.d., Research and Development, Ante Starčevića 32, 48000 Koprivnica, Croatia
[3]Institute of Emergency Medicine of the Osijek-Baranja County, Josipa Huttlera 2, 31000 Osijek, Croatia
[*]ajozinovic@ptfos.hr

poster presentation

The aim of this study was to investigate possibility of application of lyophilized tomato pomace in the production of directly expanded corn snack products, which are popular products in all human generations. The mixtures of corn grits and lyophilized tomato pomace (100:0; 97:3, 94:6, 91:9 and 88:12) with 15% of moisture content were extruded in laboratory single screw extruder. The obtained extrudates were dried in a laboratory oven, and than milled at laboratory mill with 2 mm sieve. Water absorption index (WAI), water solubility index (WSI) as well as the content of total, soluble and insoluble dietary fibre were determined.
Furthermore, according to the results obtained in our previous work for the expansion and textural properties, the sample with ratio 91:9 was used for flavoring with four different mixtures: palm oil, salt and pumpkin oil pomace (FM_1); palm oil, salt and flax oil pomace (FM_2); palm oil, salt and brewer's yeast flakes (FM_3); palm oil, salt, chili and smoked pepper (FM_4). Sensory evaluation was performed by the panel of 31 panelists using a hedonistic scale with ratings from 1 to 5 and following attributes were rated: external appearance (uniformity, color), structure (porosity, crispness), consistency (chewing), odour, flavor and overall quality. The obtained results showed that the extrusion process significantly increased WAI and WSI values, and that the addition of lyophilized tomato pomace to corn grits resulted in the increase of total, soluble and insoluble dietary fibre contents. By sensory evaluation it was found that all flavored samples had higher sensory scores compared to the unflavored sample, where the sample flavored with the FM_3 is rated as the best product. Finally, it can be concluded that the lyophilized tomato pomace can be successfully used for the production of directly expanded corn snack products with increased nutritional value and high sensory acceptability when the samples are flavored with different spice mixtures.

Keywords: tomato pomace, expanded products, corn grits

IMMOBILIZATION IN WINE MAKING FOR IMPROVED QUALITY

Panagiotis Kandylis*

Aristotle University of Thessaloniki, School of Agriculture, Department of Food Science and Technology, Laboratory of Oenology and Alcoholic Beverages, 54124 Thessaloniki, P.O. Box 235, Greece
**pkandylis@agro.auth.gr*

oral presentation

Cell immobilization is defined as "the physical confinement of intact cells to a certain region of space with preservation of desired catalytic activity". The use of this methodology for alcoholic fermentation offers many advantages over the use of the conventional free yeast cell method. Several methods of immobilization are discussed and the application of immobilized yeast cells in wine making at various temperatures are presented (in laboratory and scale-up systems). The use of immobilized cells leads to wines with improved characteristics. Immobilized biocatalysts may be freeze-dried and stored by wine making industries until the next wine making period without significant loss of cell viability and most importantly capable to produce wines with similar organoleptic characteristics to those of wet cultures. The scale-up process does not affect the fermentation ability of biocatalyst, even at low temperatures, while the produced wines has improved aromatic profile compare to free cells. The present study demonstrates the suitability of immobilized yeast cells for application in wine making. In addition the aims of the Greek Research Infrastructure "Food Innovation RI" are presented and especially those related to Greek wines and the adaption of new technologies for novel products.

Keywords: yeast, wine, immobilization, aroma, GC/MS

Acknowledgement
We acknowledge support of this work by the project "Research Infrastructure on Food Bioprocessing Development and Innovation Exploitation – Food Innovation RI" (MIS 5027222), which is implemented under the Action "Reinforcement of the Research and Innovation Infrastructure", funded by the Operational Programme "Competitiveness, Entrepreneurship and Innovation" (NSRF 2014-2020) and co-financed by Greece and the European Union (European Regional Development Fund).

EVALUATION OF ANTIOXIDANT CAPACITY AND PHYSICOCHEMICAL CHARACTERISTICS OF WINES BASED ON POMEGRANATE JUICE

Evangelos Kokkinomagoulos, Panagiotis Kandylis*, Costas G. Biliaderis

Aristotle University of Thessaloniki, School of Agriculture, Department of Food Science and Technology, 54124 Thessaloniki, P.O. Box 235, Greece
**pkandylis@agro.auth.gr*

poster presentation

Commercial yeast strains were evaluated for the production of alcoholic beverage from pomegranate juice. The effect of yeast strain and fermentation temperature on antioxidant properties and physicochemical characteristics of pomegranate wines were investigated. The total phenolic content and total flavonoids exhibited a decrease at the end of fermentation process that was more significant at higher fermentation temperatures. This effect was more obvious in the case of total phenolic content. The DPPH free radical scavenging capacity, despite the variation during fermentation, maintained at similar levels with the pomegranate juice at the end of fermentation.
Since pomegranate wines are characterized to present better antioxidant protection than the red wines but with increased sourness, in the second part of this work, mixtures of pomegranate fermented juice with red or white wines were prepared. Therefore, a novel beverage/wine was prepared combining the high antioxidant properties of pomegranate wines with the acceptability of grape wines. In addition a new rose wine was produced using pomegranate and white wines. In the new products the antioxidant properties and physicochemical characteristics were investigated and a sensory evaluation was performed. This study offers a new potential in order to increase the acceptability of pomegranate wines by the consumers.

Keywords: yeast, wine, DPPH, sensory, total phenolic content

Acknowledgement
We acknowledge support of this work by the project "Research Infrastructure on Food Bioprocessing Development and Innovation Exploitation – Food Innovation RI" (MIS 5027222), which is implemented under the Action "Reinforcement of the Research and Innovation Infrastructure", funded by the Operational Programme "Competitiveness, Entrepreneurship and Innovation" (NSRF 2014-2020) and co-financed by Greece and the European Union (European Regional Development Fund).

EFFECT OF MODIFIED ATMOSPHERE PACKAGING AND HEMP SEED POWDER ADDITION ON *SKUTA* QUALITY AND SHELF LIFE

Elizabeta Kralj[1*], Marijana Blažić[1], Irena Perković[2]

[1]Karlovac Univesity of Applied Sciences, Food Technology Department, Trg J. J. Strossmayer 9, 47000 Karlovac, Croatia
[2]Croatian Veterinary Institute, Veterinary Institute Vinkovci, Josipa Kozarac 24, 32100 Vinkovci, Croatia
[*]elizabeta.kralj@vuka.hr

poster presentation

In this study we evaluated the effect of vacuum (VP) and modified atmosphere packaging (MAP) on quality characteristics and shelf life extension of *Skuta,* traditional Croatian whey cheese using microbiological, pysichochemical and sensory analyses. *Skuta* samples were produced from whey remained after the production of *Škripavac* from cow's milk. Samples were stored at 4 °C under VP and MAP (70/30% N_2/CO_2) conditions with or without the addition of organic hemp seed (HS) powder (2% w/w). The quality charachteristics and shelf life of both untreated and HS powder treated *Skuta* were assessed using microbiological, physicochemical and sensory parameters. Microbiological results revelad the reduction of total aerobic mesophilic count and growth of yeast and molds for samples packed under MAP conditions. No food born pathogens were detected in samples, regardless of the treatment. The addition of HS powder had a significant effect on the nutritional value of *Skuta*, the proportion of minerals and salt content, but did not have impact on the microbial spoilage. Sensory analysis showed no significant impact of MAP or VP on *Skuta* characteristics, while HS powder addition had acceptable sensory characteristics but no significant impact on shelf life extension.

Keywords: skuta, modified athmosphere packaging, preservation, hemp seed powder, quality

GASTROINTESTINALNA STABILNOST FENOLNIH SPOJEVA SVJEŽE I LIOFILIZIRANE BOROVNICE (*V. corymbosum* L.)

GASTROINTESTINAL STABILITY OF PHENOLIC COMPOUNDS OF FRESH AND LYOPHILIZED BLUEBERRIES (*V. corymbosum* L.)

Nikolina Liović[1*], Greta Krešić[1], Verica Dragović-Uzelac[2], Zoran Zorić[2], Gordana Kenđel Jovanović[3], Sandra Pavičić Žeželj[3], Tea Bilušić[4]

[1]Sveučilište u Rijeci, Fakultet za menadžment u turizmu i ugostiteljstvu, Primorska 42, 51410 Opatija, Hrvatska
[2]Sveučilište u Zagrebu, Prehrambeno-biotehnološki fakultet, Pierottijeva 6, 10000 Zagreb, Hrvatska
[3]Nastavni Zavod za javno zdravstvo Primorsko-goranske županije, Krešimirova 52a, 51000 Rijeka, Hrvatska
[4]Sveučilište u Splitu, Kemijsko-tehnološki fakultet, Ruđera Boškovića 35, 21000 Split, Hrvatska
[*]nikolina.liovic@fthm.hr

poster presentation / postersko priopćenje

Borovnice se smatraju jednim od najbogatijih izvora fenolnih spojeva s raznolikim biološkim funkcijama. Povoljni učinci fenolnih spojeva na zdravlje ne ovise samo o prehrambenom unosu već i o njihovoj stabilnosti koja može varirati ovisno o načinu obrade i čuvanju namirnice, matriksu hrane te o uvjetima u probavnom sustavu. U ovom istraživanju ispitana je gastrointestinalna stabilnost ukupnih fenola te antocijana, flavonol glikozida i fenolnih kiselina svježe i liofilizirane borovnice nakon dvofaznog modela probave uz primjenu humanih probavnih enzima.

Određena je visoka stabilnost fenolnih spojeva nakon provedene *in vitro* želučane faze probave u oba uzorka, međutim sadržaj fenolnih spojeva u liofiliziranoj borovnici bio je 2,6 puta je veći u odnosu na svježu borovnicu. Nakon *in vitro* probave u tankom crijevu značajno smanjenje ukupnih fenola određeno je u svježoj borovnici (p=0,005), dok je u liofiliziranoj sadržaj fenola značajno porastao za gotovo 2 puta (p=0,019). Gubitak antocijana nakon *in vitro* probave u tankom crijevu u oba uzorka bio je potpun, a značajniji gubitak flavonol glikozida određen je u svježem uzorku.

Dobiveni rezultati su pokazali da primjena postupka liofilizacije može osigurati bolju gastrointestinalnu stabilnost fenolnih spojeva borovnice kao i njihovo učinkovitije oslobađanje iz matriksa tijekom *in vitro* probave.

Ključne riječi: fenolni spojevi, *in vitro* probava, liofilizacija

Keywords: phenolic compounds, *in vitro* digestion, lyophilization

PRODUCTION OF FETA CHEESE WITH A REDUCED SALT CONTENT

Katarina Lisak Jakopović*, Irena Barukčić, Angela Božić, Rajka Božanić

University of Zagreb, Faculty of Food Technology and Biotechnology, Department of Food Engineering, Laboratory for Technology of Milk and Milk Products, Pierottijeva 6, 10000 Zagreb, Croatia
**klisak@pbf.hr*

poster presentation

Sodium chloride (NaCl) is crucial for the proper functioning of the organism and has a key role in many physiological processes. However, excessive sodium intake causes higher blood pressure, heart, and cardiovascular diseases. Within the strategy based on the lowering of the NaCl intake in the Republic of Croatia, food production with the lower salt content is encouraged. Cheese is one of the foodstuffs that is widely consumed and has a high ratio of salt especially cheese in brine. This study aimed to investigate whether the replacement of 50% of NaCl with microparticulate salt in brine influences the physicochemical and sensory properties of feta cheese during maturation. Because of its larger surface area, microparticulate salt increases the salinity and thus smaller amounts can be added into the foodstuff compared to the classic NaCl. Analyses of texture, salt content, physicochemical analyses, as well as microbiological and sensory analyses, were performed after 7, 14, 21 and 28 days of cold storage. Based on the results it can be concluded that microparticulate NaCl may serve as a replacement for NaCl up to 50% without significant change in the physicochemical and sensory properties of the cheese compared to the control sample.

Keywords: feta cheese, microparticulate salt, NaCl, texture, sensory analysis

INFLUENCE OF BLANCHING TIME ON PHYSICAL PROPERTIES AND PPO ACTIVITY OF BIOFORTIFIED POTATO

Ante Lončarić[1*], Tihomir Kovač[1], Ante Blažević[1], Zdenko Lončarić[2], Jurislav Babić[1]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia
[*]ante.loncaric@ptfos.hr

poster presentation

The main cause of endemic goitre is iodine deficiency. Iodine deficiency could also lead to the goitre, hypothyroidism and hyperthyrotiropinemia and it is often accompanying with zinc and selenium deficiency. One way to increase the dietary intake of iodine, zinc and selenium is the production of crops, such as potato, with higher concentrations of named compounds in their edible portions. Potatoes are widely cultivated all over the world, especially in many developing countries. It is commonly processed into potato flours, purees, and chips, which are favoured by consumers. However, enzymatic activity in the potato can result in a series of deterioration reactions including undesirable colour and texture. Blanching is a crucial step usually carried out prior to processes such as frying, drying, freezing, and storing because it can inactivate enzymes, destroy microorganisms, and eliminate air in the potato. The aim of this study was to analyse the effects of heating blanching at 100 °C (0, 30, 60 and 90 sec) on the inhibition of PPO, to evaluate the changes of texture and colour of biofortified and control potato after heating blanching and before blanching. The polyphenol oxidase (PPO) activity was affected and decreased by blanching process at all examined time-points. Moreover, the blanching had a significant effect on the colour of processed potato (p<0.05), the values of L^*, a^*, b^* and ΔE were significantly changed, while temperature had no significant effect on b^* value. The value of L^* and b^* decreased with longer treatment times. During the blanching processing hardness decreased with longer treatment times. The flesh firmness was from 408.36 to 486.35 g for untreated potato and from 174.34 to 322.99 g for potato blanched for 90 sec. In conclusion, the blanching process applied to the biofortified potato showed beneficial effect on the PPO activity, texture and colour. Such results suggest suitability of biofortified potato for cultivation, processing up to food products with purpose of increase of the dietary intake of iodine, zinc and selenium.

Keywords: biofortified potato, blanching, texture, colour, PPO

PRODUCTION OF A FUNCTIONAL WHEY CHEESE WITH PHYTOSTEROLS

Janine Wagner, Prodromos Prodromidis, Panagiotis Kandylis, Eugenios Katsanidis, Costas G. Biliaderis, Thomas Moschakis*

Aristotle University of Thessaloniki, School of Agriculture, Department of Food Science and Technology, 54124 Thessaloniki, P.O. Box 235, Greece
**tmoschak@agro.auth.gr*

poster presentation

Phytosterols are food constituents with proven bioactivity. However, the bioactivity of phytosterols is significantly influenced by the size of their crystals; smaller crystals exert a more competitive action against cholesterol absorption. The aim of this study was to produce a whey cheese that contains phytosterols in their functional form.
Macroscopic assessment, polarised microscopy and rheometry were employed to assess the effect of emulsification on the crystal size of phytosterols in water-in-oil emulsions and examine the microstructure, mechanical and sensorial properties of the produced whey cheeses.
Phytosterol crystallization in oil occurs at concentrations >3%. However, in emulsions containing phytosterols, no crystals were formed even at a concentration of 15%. It can be concluded that emulsification can increase phytosterol solubility in oil, implying a potential enhancement in their bioactivity. Similar results were noted in a whey cheese matrix, in which phytosterols were incorporated. The mechanical-sensorial properties of the emulsions and whey cheese products containing phytosterols were found to depend on the extent of phytosterol crystallization. Overall, incorporation of phytosterols in oil-in-water emulsions in food products such as whey cheese, can be an effective method of increasing phytosterol solubility at elevated concentrations, decreasing the formation of crystals and thereby enhancing their physiological function.

Keywords: phytosterols, crystallization, whey-based emulsions, whey cheese

Acknowledgement
We acknowledge support of this work by the project "Research Infrastructure on Food Bioprocessing Development and Innovation Exploitation – Food Innovation RI" (MIS 5027222), which is implemented under the Action "Reinforcement of the Research and Innovation Infrastructure", funded by the Operational Programme "Competitiveness, Entrepreneurship and Innovation" (NSRF 2014-2020) and co-financed by Greece and the European Union (European Regional Development Fund).

PRODUCTION OF A NOVEL WHEY CHEESE BY USING COMPLEX COACERVATION

Janine Wagner, Athanasios Maras, Prodromos Prodromidis, Panagiotis Kandylis, Athina Lazaridou, Costas G. Biliaderis, Thomas Moschakis*

Aristotle University of Thessaloniki, School of Agriculture, Department of Food Science and Technology, 54124 Thessaloniki, P.O. Box 235, Greece
**tmoschak@agro.auth.gr*

poster presentation

Complex coacervation is used for encapsulation, protection and controlled release of bioactive components in food-grade systems. In this study, complex coacervation using cheese whey and gum arabic was employed to produce a novel whey-based cheese. Several parameters were examined, such as biopolymer ratio (1:1, 2:1 and 3:1 of cheese whey proteins (WP) to gum arabic (GA)), and the addition of salt (0 – 1.5% w/w) at various pH.

Macroscopic assessment, confocal microscopy and rheometry were employed to assess the microstructure, mechanical and sensorial properties of the produced whey-based cheeses, which were produced following the basic production steps of Myzithra, a traditional Greek cheese.

By adding GA to the cheese whey, the cheese yield was increased almost double than the conventional. Among the three different WP/GA weight ratios tested, the highest yield was obtained with the weight ratio of 2:1 at pH 4.0. The final product had good sensorial properties and can be used as a spread cheese, an ingredient in bakery and/or patisserie products. The results suggest that complex coacervation has the potential to produce a novel whey cheese with an increased cheese yield, thereby removing more whey proteins from the waste stream in comparison to the conventional method.

Keywords: whey cheese, complex coacervation, novel products, gum arabic

Acknowledgement

We acknowledge support of this work by the project "Research Infrastructure on Food Bioprocessing Development and Innovation Exploitation – Food Innovation RI" (MIS 5027222), which is implemented under the Action "Reinforcement of the Research and Innovation Infrastructure", funded by the Operational Programme "Competitiveness, Entrepreneurship and Innovation" (NSRF 2014-2020) and co-financed by Greece and the European Union (European Regional Development Fund).

OKSIDACIJSKA STABILNOST HLADNO PREŠANOG ULJA KOŠTICA GROŽĐA

OXIDATION STABILITY OF COLD-PRESSED GRAPE SEED OIL

Tihomir Moslavac[1*], Martina Šaravanja[2], Stela Jokić[1], Drago Šubarić[1], Antun Jozinović[1], Mario Jakobović[3]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[2]Poljoprivredna zadruga TRS, Ivana Gundulića 18, 32236 Ilok, Hrvatska
[3]Veleučilište u Požegi, Vukovarska 17, 34000 Požega, Hrvatska
[*]Tihomir.Moslavac@ptfos.hr

poster presentation / postersko priopćenje

Postupkom hladnog prešanja iz koštica grožđa proizvodi se jestivo ulje visoke nutritivne vrijednosti. Ulje koštica grožđa je zelenkasto-žute boje, a dominira esencijalna linolna masna kiselina te alfa i gama tokoferoli koji utječu na otpornost ulja prema oksidacijskom kvarenju. Cilj ovog rada bio je ispitati utjecaj dodatka antioksidanasa (prirodni, sintetski) na oksidacijsku stabilnost hladno prešanog ulja koštica grožđa. Od prirodnih antioksidanasa korišteni su ekstrakt zelenog čaja, ekstrakt ružmarina, ekstrakt nara, ekstrakt maslinovog lista, a od sintetskih BHA, PG i TBHQ. Određivanje oksidacijske stabilnosti ulja te utjecaj dodatka antioksidansa provedeno je testom ubrzane oksidacije ulja Schaal Oven testom. Rezultat oksidacije ulja izražen je peroksidnim brojem tijekom četiri dana testa. Primjenom standardnih metoda u ulju su određeni osnovni parametri kvalitete (peroksidni broj, slobodne masne kiseline). Rezultati ispitivanja pokazuju da ekstrakt zelenog čaja i ekstrakt ružmarina (tip OxyLess CS) efikasnije štite ulje koštica grožđa od oksidacijskog kvarenja, a od sintetskih antioksidanasa TBHQ.

Ključne riječi: ulje koštica grožđa, oksidacijska stabilnost, antioksidansi

Keywords: grape seed oil, oxidative stability, antioxidants

ODRŽIVOST HLADNO PREŠANOG ULJA KOŠTICE ŠLJIVE

SHELF LIFE OF COLD PRESSED PLUM KERNEL OIL

Tihomir Moslavac[1*], Stela Jokić[1], Drago Šubarić[1], Ana-Marija Drempetić[1], Ivana Bošnjak[2]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehnološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[2]Sveučilište u Mostaru, Agronomski i prehrambeno-tehnološki fakultet Mostar, Nadbiskupa Čule, 88000 Mostar, Bosna i Hercegovina
[*]Tihomir.Moslavac@ptfos.hr

poster presentation / postersko priopćenje

Ulje koštice šljive sve češće se koristi u prehrambene i kozmetičke svrhe zbog svojih regenerirajućih i hidratizirajućih svojstava. Postupkom hladnog prešanja iz sjemenke koštice šljive proizvodi se jestivo ulje visoke nutritivne vrijednosti. Ulje je zlatno-žute boje, ima ugodnu voćno bademastu aromu i bogato je oleinskom kiselinom
(60 – 80 %), alfa tokoferolom (vitamin E), provitaminom B5 (beta karoten) i beta sitosterolom. Cilj ovog rada bio je ispitati utjecaj dodatka prirodnih antioksidanasa na promjenu oksidacijske stabilnosti ili održivosti hladno prešanog ulja koštice šljive. Od prirodnih antioksidanasa korišteni su ekstrakt crnog kima, ekstrakt klinčića, ekstrakt ružmarina (tip OxyLess CS), ekstrakt zelenog čaja te eterično ulje primorskog vriska i eterično ulje origana. Određivanje oksidacijske stabilnosti (održivosti) ulja te utjecaj dodatka antioksidansa provedeno je testom ubrzane oksidacije ulja kod temperature 98 °C. Rezultat oksidacije ulja izražen je peroksidnim brojem tijekom pet sati testa. Primjenom standardnih metoda u ulju su određeni osnovni parametri kvalitete (peroksidni broj, slobodne masne kiseline). Rezultati ispitivanja pokazuju da eterično ulje primorskog vriska i ekstrakt ružmarina efikasnije štite ulje koštice šljive od oksidacijskog kvarenja.

Ključne riječi: ulje koštice šljive, održivost ili oksidacijska stabilnost, antioksidansi

Keywords: plum kernel oil, shelf life or oxidative stability, antioxidants

APPLICATION OF DEEP EUTECTIC SOLVENTS IN EXTRACTION OF BIOACTIVE COMPOUNDS FROM FOOD INDUSTRY BYPRODUCT - COCOA BEAN SHELL

Nika Pavlović[1*], Stela Jokić[2], Martina Jakovljević[2], Igor Jerković[3], Maja Molnar[2]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Medicine Osijek, Josipa Huttlera 4, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[3]University of Split, Faculty of Chemistry and Technology, 21000 Split, Croatia
[*]nika.felicita@gmail.com

poster presentation

This is the first report on the extraction of cocoa bean shell (CBS) using deep eutectic solvents (DESs) followed by microwave extraction. CBS was extracted using 16 different choline chloride based DESs at temperature of 50 °C during 60 minutes, with 10% and 50% water addition. Identification and quantification of bioactive compounds in obtained extracts was performed by high performance liquid chromatography (HPLC) with diode array detection. The screening results showed that the extracted amount of active compounds (methylxantines and some polyphenols) varied greatly depending on the used solvent. DES choline chloride:oxalic acid was the most suitable solvent for the extraction of active compounds from CBS. The DES extraction was then coupled with microwave-assisted extraction (MAE), for the comparison and the optimisation was performed by response surface methodology (RSM). Antioxidant activity was also determined using DPPH method. The statistical results showed that water content significantly influenced the extraction of targeted active compounds from CBS, while extraction time and temperature did not show statistically significant influence. The study demonstrated how extraction using DES and microwaves could be of a great importance in the future trends of green chemistry for the production of CBS extracts rich in bioactive compounds.

Keywords: cocoa bean shell, waste, deep eutectic solvents, microwave assisted extraction, active compounds

MEDITERANSKA POLJOPRIVREDA – TEMELJ MEDITERANSKE PREHRANE

MEDITERRANEAN AGRICULTURE – CORNER STONE OF THE MEDITERRANEAN DIET

Vedran Poljak[1*], Eva Pavić[2]

[1]Sveučilište u Splitu, Sveučilišni odjel za studije mora, Ruđera Boškovića 27, 21000 Split, Hrvatska
[2]Klinički bolnički centar Zagreb, Služba za prehranu i dijetetiku, Kišpatićeva 12, 10000 Zagreb, Hrvatska
[*]vedran.poljak@unist.hr

oral presentation / usmeno priopćenje

Mediteransku poljoprivredu prvenstveno vežemo za staru Grčku i Kretu koji imaju značajan utjecaj kako na cijelo zemljopisno područje Mediterana tako i na hrvatske primorske krajeve. Uzgajale su se žitarice, maslina, vinova loza i smokva, kulture koje i danas predstavljaju temelj mediteranske prehrane. Ječam je bio glavna žitarica, a jeo se kao kaša ili mljeo u brašno za kruh. Kao masnoća za konzumaciju ili uljanice koristilo se maslinovo ulje. Grožđe se prvenstveno koristilo za proizvodnju vina, miješajući jedan dio vina s dva dijela vode, a pijenje cijelog vina se smatralo barbarskim običajem. Smokve su se sušile i bile značajan izvor ugljikohidrata. Pojam mediteranske prehrane uključuje cjelovite žitarice, voće, povrće, mahunarke, ribu, orašasto voće, sjemenke, začine te visok unos maslinova ulja. Mlijeko i mliječni proizvodi, jaja i bijelo meso koriste se umjereno. Alkohol se konzumira kao vino (uglavnom crno), dok se crveno meso konzumiralo rijetko i sporadično. Tradicionalna mediteranska prehrana uključuje pretežno sezonsku hranu biljnog podrijetla. Moderni termin mediteranska prehrana počeo se koristiti od sredine 20. stoljeća zahvaljujući rezultatima Keysove studije „Sedam zemalja" o povezanosti prehrane i rizika od kardiovaskularnih bolesti. Prema mnogim istraživanjima, mediteranska se prehrana može smatrati primarnom prevencijom kardiovaskularnih bolesti. Najbolju dijetu predstavlja mediteranska dijeta s idealnim omjerom masnih kiselina, niskim udjelom kolesterola te visokim udjelom prehrambenih vlakana, što je u skladu s preporukama europskog i američkog kardiološkog društva. Znanstveni dokazi pokazuju da je ovakav način prehrane povezan sa značajnim poboljšanjem stanja u zdravstvu, kao što su redukcija ukupne smrtnosti, smanjenje smrtnosti od kardiovaskularnih bolesti, dijabetesa tipa 2, učestalosti i smrtnosti od raka te incidencije Parkinsonove i Alzheimerove bolesti.

Ključne riječi: mediteranska poljoprivreda, prehrana, primarna prevencija

Keywords: mediterranean agriculture, nutrition, primary prevention, cardiovascular diseases

THE INFLUENCE OF PROPOLIS SUPPLEMENTATION ON THE TECHNOLOGICAL PROPERTIES AND MACRONUTRIENT CONTENT OF SKINLESS CHICKEN BREASTS

Ivana Prakatur[1], Matija Domaćinović[1*], Daniela Kenjerić[2], Frane Čačić Kenjerić[2], Dalida Galović[1], Danijela Samac[1], Milica Cvijetić Stokanović[2]

[1]Josip Juraj Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia
[2]Josip Juraj Strossmayer University of Osijek, Faculty of Food Technology Osijek, Franje Kuhača 20, 31000 Osijek, Croatia
[*]mdomac@fazos.hr

poster presentation

The aim of this study was to determine the influence of dietary supplementation with propolis on the technological properties of skinless chicken breasts evaluated through breast muscle pH value measured 45 minutes (pH_1) and 24 hours post mortem (pH_2), water-holding capacity of breast muscle, consistency of breast muscle and its color (L^*, a^*, b^*) and to determine its macronutrient content (protein and fat content). The study was conducted on 180 Ross 308 chickens equally distributed by sex and divided into three groups: the control group of chickens (C) fed with a basal diet and two experimental groups of chickens (E) fed with the same diet supplemented with propolis (E1 2 g/kg and E2 4 g/kg). There was no statistically significant difference between C and E considering pH_1 (p=0.260) but there was statistically significant difference between them considering pH_2 (p=0.037). There was statistically significant difference in L^* breast muscle color (p=0.039) between C and E while there were no statistically significant differences in a^* and b^* breast muscle color between them (p=0.167 and p=0.637, respectively). There were no statistically significant differences between the C and E considering water-holding capacity (p=0.767) and consistency (p=0.505) of breast muscle. There were no statistically significant differences in protein and fat content between C and E. The obtained results confirm the benefits of the tested supplementation.

Keywords: propolis, chicken breasts, chicken feeding, technological properties, macronutrient content

ZAŠTITA NAZIVA *ČEPINSKOG KUPUSA*

PROTECTION OF THE NAME *ČEPIN CABBAGE*

Drago Šubarić[1*], Antun Jozinović[1], Ante Lončarić[1], Jurislav Babić[1], Tihana Marček[1], Hrvoje Hefer[2], Karmen Sinković[3], Borislav Miličević[1], Juraj Rašić[4], Jelena Đugum[5], Đurđica Ačkar[1]

[1]Sveučilište Josipa Jurja Strossmayera u Osijeku, Prehrambeno-tehenološki fakultet Osijek, Franje Kuhača 20, 31000 Osijek, Hrvatska
[2]Hrvatska agencija za poljoprivredu i hranu, Vinkovačka 63c, 31000 Osijek, Hrvatska
[3]Sveučilište Josipa Jurja Strossmayera u Osijeku, Fakultet agrobiotehničkih znanosti Osijek, Vladimira Preloga 1, 31000 Osijek, Hrvatska
[4]Sveučilište Josipa Jurja Strossmayera u Osijeku, Ekonomski fakultet u Osijeku, Trg Ljudevita Gaja 7, 31000 Osijek, Hrvatska
[5]Ministarstvo poljoprivrede, Ulica grada Vukovara 78, 10000 Zagreb, Hrvatska
[*]drago.subaric@ptfos.hr

poster presentation / postersko priopćenje

Nazive autohtonih poljoprivrednih i prehrambenih proizvoda moguće je u Europskoj uniji zaštititi jednom od oznaka kvalitete: zaštićenom oznakom izvornosti (ZOI), zaštićenom oznakom zemljopisnog podrijetla (ZOZP) ili oznakom zajamčeno tradicionalnog specijaliteta (TGS). Republika Hrvatska trenutačno ima 23 poljoprivredna i prehrambena proizvoda čiji su nazivi zaštićeni jednom od oznaka na razini EU (još 10 naziva proizvoda je u postupku). Među navedena 23 proizvoda nalaze se i *Varaždinsko zelje* i *Ogulinski kiseli kupus/ogulinsko kiselo zelje*. Pored navedenih, postoje i druge tradicionalne sorte kupusa po kojima se prepoznaju pojedine regije i koje, zahvaljujući svojim svojstvima imaju sve veću primjenu u uzgoju. Takva je i sorta *Čepinski kupus* koja se od davnina uzgaja na relativno malom području oko Čepina. Za Čepin i njegove stanovnike vezane su brojne priče i anegdote koje povezuju upravo ovo mjesto s proizvodnjom kupusa kao i koristi koju su stanovnici ovoga mjesta imali od ove kulture. Osim toga, i uvjeti života i aktivnosti ljudi, kao i njihove prehrambene potrebe su takvi da *Čepinski kupus* ima svoju primjenu u kulinarstvu kao svježi, termički obrađen ili fermentiran, što je posebno značajno, jer je jedna od najpogodnijih sorti za pripravu tradicionalnih jela koja su na ovom području posebno prisutna kao posljedica miješanja različitih kultura i utjecaja različitih kuhinja. Kako bi *Čepinski kupus* dobio zasluženo mjesto, očuvala i unaprijedila njegova proizvodnja, a potrošači bili sigurni da dobivaju ono što žele pokrenut je postupak zaštite naziva zaštićenom oznakom izvornosti.

Ključne riječi: autohtoni prehrambeni proizvodi, zaštita, *Čepinski kupus*

Keywords: indigenous food products, protection, *Čepin cabbage*

OPTIMIZATION OF VACUUM DRIED SOUR CHERRIES ULTRASOUND-ASSISTED EXTRACTION

Anita Vakula*, Tatjana Daničić, Aleksandra Tepić Horecki, Zdravko Šumić, Branimir Pavlić

University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia
**anitavakula@uns.ac.rs*

poster presentation

Sour cherries (*Prunus cerasus*) were first dried with vacuum drying and dried samples were then used as raw material for ultrasound-assisted extraction (UAE). As a first step, factorial design was used for preliminary experiments in order to determine the most influential factors (temperature, extraction time, ethanol concentration, ultrasonic power and liquid-solid ratio). In this part, total phenols content (TP) and total monomeric anthocyanins content (TMA) were investigated as responses. After the aplication of 2^{5-1} factorial design, it was obtained that temperature, ethanol concentration and liquid-solid ratio were the most dominant parameters. In accordance with this, these parameters were used in the face-centered central composite design. The responses in optimization step were TP, TMA, total extraction yield (Y), total flavonoids content (TF) and antioxidant activity parameters obtained by DPPH, ABTS and FRAP assays. Temperature (40 – 80 °C), ethanol concentration (40 – 80%) and liquid-solid ratio (10 – 30 mL/g) were investigated as independent variables. Experimental results were fitted to second-order polynomial model and analysis of variance was used to determine fitness of the model and optimal conditions. As a result of this research, extracts with a high concentration of polyphenols and anthocyanins which can be used as food additives, were also obtained.

Keywords: *Prunus cerasus,* ultrasound-assisted extraction, optimization

KRUŽNA EKONOMIJA U PREHRAMBENOJ INDUSTRIJI I INDUSTRIJI PIĆA, VISOKOVRIJEDNI PROIZVODI TE ENERGETSKO I MATERIJALNO ISKORIŠTAVANJE OTPADA I NUSPROIZVODA

CIRCULAR ECONOMY IN FOOD AND BEVERAGE INDUSTRY, HIGH ADDED VALUE PRODUCTS, MATERIAL AND ENERGY UTILISATION OF BYPRODUCTS AND WASTE

Gregor Drago Zupančič*, Goran Lukić, Anamarija Havliček, Mario Panjičko

CROTEH d.o.o., Avenija Dubrovnik 15,10020 Zagreb, Hrvatska
**gregor.zupancic@croteh.eu*

oral presentation / usmeno priopćenje

Prehrambena industrija i industrija pića su s godišnjim prihodima od 1190 milijardi € među najvažnijim granama gospodarstva u EU, koje također proizvode i značajne količine nusproizvoda i otpada. Posljednjih godina, kroz uvođenje strategija kružne ekonomije, posebna pažnja posvećuje se iskorištavanju otpadnih tokova iz kojih je moguća proizvodnja visokovrijednih proizvoda. U ovom radu prikazani su primjeri iz proizvodnje hrane i pića, u kojima je iz nusproizvoda moguće proizvoditi aktivne spojeve kao npr. resveratrol koji ima antikancerogeni učinak, različite polu-proizvode kao što su fenolni spojevi, dodaci u prehrani i sl. U radu je posebna pažnja posvećena pivarskoj industriji gdje se iz nusproizvoda (pivske komine) proizvode prehrambeni proteini, a isto tako i mljekarskoj industriji gdje se iz sirutke proizvode mliječne kulture, vitamini, laktoza, laktat i proteini (npr. aktoferini, laktoperoksidaze, imunoglobulini). U smislu strategije kružne ekonomije, ostatci nakon dobivanja novih proizvoda, koji više ne sadrže vrijedne tvari, moraju se zbrinuti na odgovarajući način. Najpovoljnija i najčešće upotrebljena tehnologija zbrinjavanja je anaerobna digestija. Anaerobnom digestijom moguće je otpadne tokove zbrinuti na način da se količine otpada smanje i do 90 % te da se proizvedeni bioplin upotrijebi kao obnovljiv izvor energije u samom proizvodnom procesu. Time je moguće ostvariti smanjenje emisije ugljičnog dioksida do 50 %.

Ključne riječi: cirkularna ekonomija, nusproizvodi, otpad, prehrambena industrija, visokovrijedni proizvodi

Keywords: circular economy, byproducts, waste, food and beverage industry, high added value products

AUTHOR INDEX /
KAZALO AUTORA

AUTHOR INDEX / KAZALO AUTORA

S

Š

T

SPONSORS, DONORS AND EXHIBITORS /
SPONZORI, DONATORI I IZLAGAČI

SPONSORS / SPONZORI

GOLDEN / ZLATNI

ALPHACHROM
science with confidence

SILVER / SREBRNI

SHIMADZU
Excellence in Science

croteh
creating technologies
in harmony with nature !

BRONZE / BRONČANI

ledo

LJEKARNE SRCE

VITA LAB NOVA

KemoLab d.o.o.

Labena

ViA

OTHER SPONSORS AND DONORS / OSTALI SPONZORI I DONATORI

EXHIBITORS

ALPHACHROM science with confidence

SHIMADZU Excellence in Science

croteh creating technologies in harmony with nature !

ledo

LJEKARNE SRCE

VITA LAB NOVA

KemoLab d.o.o.

Labena

VIA

KOBIS Thermo SCIENTIFIC Authorized Distributor

HGK 1852 HRVATSKA GOSPODARSKA KOMORA

PRIMAlab a member of the Metrohm group

KEFO SINCE 1949

Ru-Ve

Sunny Fruit

"OGI" d.o.o.

GOLDEN SPONSOR / ZLATNI SPONZOR

SILVER SPONSOR / SREBRNI SPONZOR

SILVER SPONSOR / SREBRNI SPONZOR

SILVER SPONSOR / SREBRNI SPONZOR

BRONZE SPONSOR / BRONČANI SPONZOR

BRONZE SPONSOR / BRONČANI SPONZOR

Smjerice pravilne i zdrave prehrane

„*Sve što hranom unosimo u organizam gradi nas i mijenja, a o tome što smo unijeli ovisi naša snaga, naše zdravlje i naš život.*"

„*Neka hrana bude tvoj lijek, a lijek neka bude tvoja hrana.*"

Neka nam ove Hipokratove misli budu nit vodilja u smjernicama pravilne prehrane. Pravilno se hraniti znači uživati u raznolikosti namirnica koje organizam čine zdravim. Obilno uživanje većih količina visokokaloričnih jela rezultira poremećajem u organizmu. Pretjerano konzumiranje ugljikohidrata, šećera i masti dovodi do stanja nadutosti, pa čak i boli u abdomenu. Dolazi do narušavanja ravnoteže crijevne mikroflore, osjećaja tromosti crijeva, težine u želucu, žgaravice i zatvora. Javlja se bezvoljnost i depresija te često osjećaj krivnje što smo opet pretjerali s konzumiranjem hrane i dobili na težini.

Ako ipak pretjerate – što učiniti?
Ako nakon svega imate problem, potražite stručnu pomoć u ljekarni. Savjetujemo vam uporabu biljnih čajeva koji će potpuno prirodnim putem regulirati probavu te pomoći u izlučivanju loših toksina iz organizma. Probiotici su mikroorganizmi (iz roda laktobacila i bifidobakterija) dosta učinkoviti kod proljeva i kod zatvora. Uporabom antacida neutralizirat će se želučana kiselina i žgaravica. Laksative je preporučeno koristiti samo s oprezom, ne prečesto jer mogu izazvati nadraženost crijeva i jake grčeve.
Koristiti suplemente i preparate za podizanje imuniteta, cink, selen, beta karoten, vitamin C i magnezij. Našem su organizmu potrebni vitamini i minerali koji pridonose normalnoj funkciji imunološkog sustava. Potrebno je piti dosta tekućine kako bi se štetne tvari pojačano izlučile iz organizma. Konzumirati dosta sezonskog voća i povrća te osigurati unos fermentiranih mliječnih proizvoda koji sadržavaju dobre bakterije. Prestati s lošim prehrambenim navikama bila bi dobra odluka.

Marika Ćebo, mag.pharm.
Ljekarne srce – Ljekarne Osječko-baranjske županije

BRONZE SPONSOR / BRONČANI SPONZOR

BRONZE SPONSOR / BRONČANI SPONZOR

BRONZE SPONSOR / BRONČANI SPONZOR

BRONZE SPONSOR / BRONČANI SPONZOR

Tvrtka **V.I.A.-lab d.o.o.** sa sjedištem za R. Hrvatsku u Varaždinu, bavi se zastupanjem, uvozom i distribucijom različitim dijagnostičkim proizvodima poznatih proizvođača za kontrolu namirnica i kontrolu higijene životne sredine. To su testovi za brzu i klasičnu mikrobiološku kontrolu namirnica i ulaznih sirovina, ELISA testovi, testovi za PCR, kolonama za pročišćavanje uzoraka za HPLC i C18 te testovima za kontrolu higijene po HACCP sustavu. Opskrbljujemo laboratorije prehrambene industrije, laboratorije nacionalnih instituta i laboratorije zavoda za zaštitu zdravlja, bolnice, samouslužne restorane i restorane brze hrane na području R. Hrvatske. Svjesni smo da samo tvrtka sa vizijom uspješno raste i razvija se, zato ćemo i ubuduće tome posvetiti puno pažnje i sredstava.

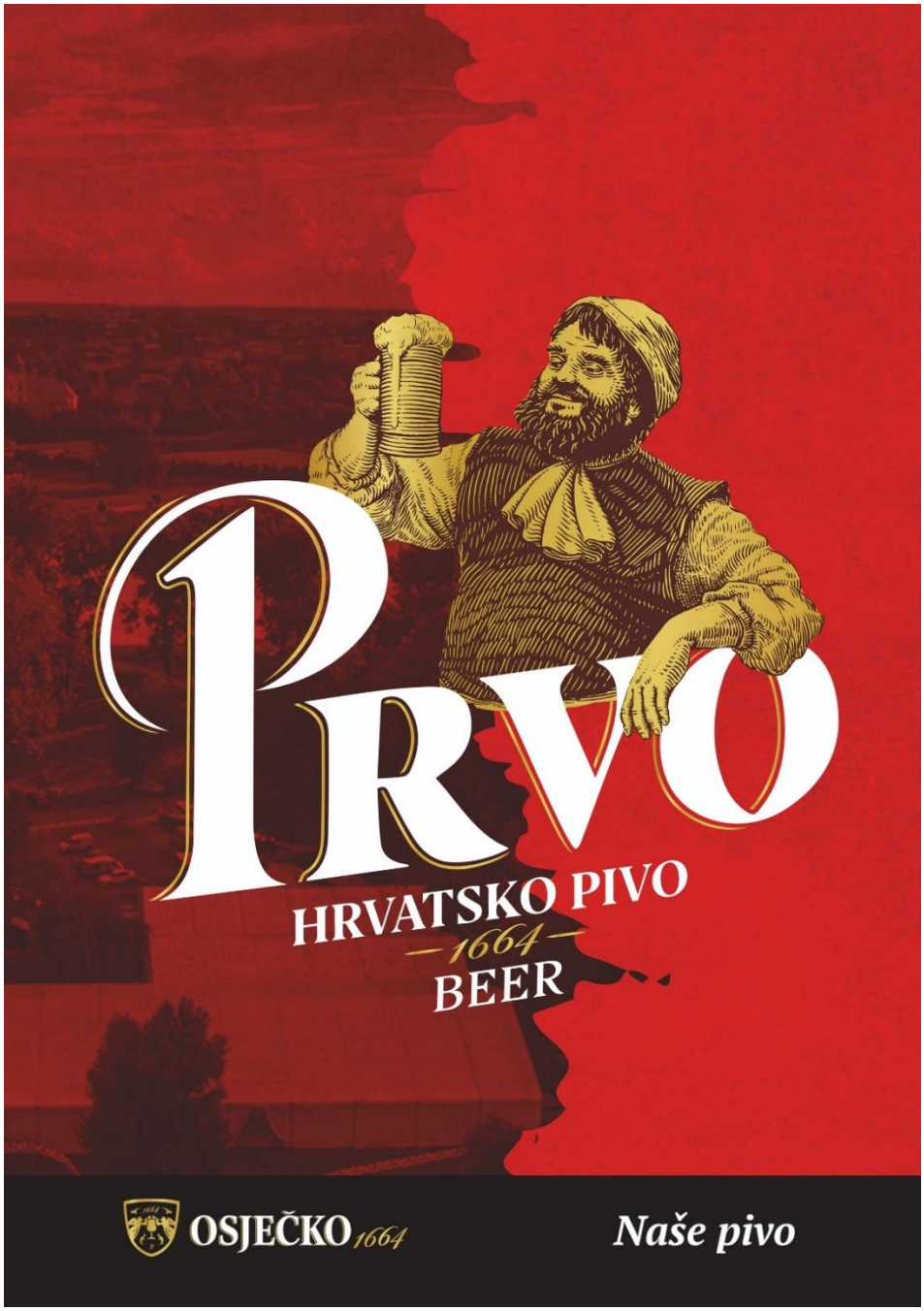
R-Biopharm – Vodeći svetski proizvođač testova za kontrolu hrane, stočne hrane i higijene.	**Celsis – Proizvode aparature na bazi bioluminiscencije za brzu mikrobiološku kontrolu gotovih proizvoda.**	**HiMedia – globalni proizvođač mikrobioloških medija i podloga, podloge u granuli.**
Proizvodi:		
• Encimatski testovi • Alergeni • Antibiotici, Hormoni i anabolici • GMO • Mikrobiologija • Mikotoksini • Vitamini • Potvorbe • Automatizacija	• Celsis Accel System • Celsis Advance II System • Celsis Innovate System	• Mikrobiologija • Molekularna biologija • Laboratorijska oprema

OTHER SPONSORS AND DONORS / OSTALI SPONZORI I DONATORI

HGK
1852

HRVATSKA
GOSPODARSKA
KOMORA

OTHER SPONSORS AND DONORS / OSTALI SPONZORI I DONATORI



Faculty of Food Technology Osijek (University of Osijek, Croatia) / Prehrambeno-tehnološki fakultet Sveučilišta u Osijeku
Faculty of Technology (University of Tuzla, B&H) / Tehnološki fakultet Univerziteta u Tuzli (BiH)
Faculty of Pharmacy (University of Tuzla, B&H) / Farmaceutski fakultet Univerziteta u Tuzli (BiH)
Association for Nutrition and Dietetics (B&H) / Udruženje za nutricionizam i dijetetiku (BiH)
Croatian Association of Nutritionists / Hrvatski zbor nutricionista
Faculty of Chemistry and Technology (University of Split, Croatia) / Kemijsko-tehnološki fakultet Sveučilišta u Splitu
Faculty of Food Technology and Biotechnology (University of Zagreb, Croatia) / Prehrambeno-biotehnološki fakultet Sveučilišta u Zagrebu
Faculty of Agrobiotechnical Sciences Osijek (University of Osijek, Croatia) / Fakultet agrobiotehničkih znanosti Sveučilišta u Osijeku
Polytechnic in Požega (Croatia) / Veleučilište u Požegi
European Hygienic Engineering & Design Group – EHEDG (Germany) / European Hygienic Engineering & Design Group – EHEDG (Njemačka)
ISEKI – Food Association (IFA) (Austria) / ISEKI – Food Association (IFA) (Austrija)
Croatian Agency for Agriculture and Food / Hrvatska agencija za poljoprivredu i hranu
Faculty of Agriculture and Food Technology (University of Mostar, B&H) / Agronomski i prehrambeno-tehnološki fakultet Sveučilišta u Mostaru (BiH)
Department of Biology (University of Osijek, Croatia) / Odjel za Biologiju Sveučilišta u Osijeku
Faculty of Tourism and Hospitality Management Opatija (University of Rijeka, Croatia) / Fakultet za menadžment u turizmu i ugostiteljstvu Opatija
Croatian Society of Nutritionists and Dietitians / Hrvatsko društvo nutricionista i dijetetičara
Chamber of Pharmacists of Tuzla Canton (Tuzla, B&H) / Komora magistara farmacije Tuzlanskog kantona (BiH)
Andrija Štampar – Association of People's Health / Udruga narodnog zdravlja Andrija Štampar

ISBN: 978-953-7005-66-5