Centro Tecnológico Nacional de la Conserva y Alimentación

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11 / 12 MAYO / MAY 2023 · Murcia · Spain

XI INTERNATIONAL SYMPOSIUM FOOD TECHNOLOGY

SYMPOSIUM AND FOOD BROKERAGE EVENT

LIBRO DE RESÚMENES
BOOK OF ABSTRACTS

Este congreso con expediente nº21738/OC/22 está financiado por la Fundación Séneca – Agencia de Ciencia y Tecnología de la Región de Murcia con cargo al Programa Regional de Movilidad, Colaboración Internacional e Intercambio de Conocimiento "Jiménez de la Espada (Plan de Actuación 2022)

Este libro de resúmenes se puede descargar en
This book of abstracts can be downloaded at:

The **National Technological Center for the Food and Canning Industry**, within the framework of the actions it carries out with the **Development Agency of the Region of Murcia** and within its surveillance, prospective and technology transfer activities, celebrates, since 2003, and with character biannual, the **International Simposium on Food Technologies.**

An XI edition that, after the Covid-19 pandemic, is held completely in person and whose **Organizing Committee** is made up of the **IBA Food Bioresources Institute of Bucharest** (Romania), the **Central Institute for Food Research and Food Control of Bursa** (Turkey), the **National Research Center** of Egypt, the **Regional Ministry of Health**, the **INFO** Development Agency, the **Agri-Food Cluster Foundation** and the **Academy of Veterinary Sciences of the Region of Murcia**, the **Food4Life Spain Platform**, the **Mare Nostrum Campus**, the National Reference Center for the Food Industry – Vegetable Canned Area and the **CTNC**.

An organization that would not be possible without the collaboration of the Organizing and **Technical Committee** integrated by the industries **ALLFOODEXPERTS**, **VICKYFOODS**, **HERO ESPAÑA SA**, **MARÍN GIMÉNEZ HERMANOS SA**, **CYNARA EU** and **VEGYTECH SL** To all of them our special thanks for their work and dedication.

Three have been the themes proposed for this eleventh Symposium: Eco-innovation and Sustainability (Agromatter Project), Water Technologies (iWatermap Project) and Trends in the agri-food sector (Agro2Circular Project). All of them have been chosen for their current importance for the agri-food sector, which must adapt its processes and products towards solutions that make their products more competitive in the market, more attractive to consumers, more friendly to the environment and, at the same time, they make it possible to ensure the viability and sustainability of the business activity and the growth of the sector in search of new markets.

A large number of speakers and participants from different countries will have the opportunity to **exchange knowledge and experiences at this Simposium**. From CTNC we thank all of them, and the centres that have collaborated, for their invaluable contribution to the success of this event.

We hope that this Simposium will serve as a support for companies to identify alliances and to share successful experiences that favor organizations and agents involved in the food sector.

Jose Garcia Gomez
President

El **Centro Tecnológico Nacional de la Conserva y Alimentación**, en el marco de las acciones que realiza con **Instituto de Fomento de la Región de Murcia** y dentro de sus actividades de vigilancia, prospectiva y transferencia tecnológica, celebra, desde 2003, y con carácter bianual, el Symposium Internacional sobre Tecnologías Alimentarias.

Una XI edición que, tras la pandemia del Covid-19, se celebra de forma totalmente presencial y cuyo **Comité Organizador** está integrado por el **Instituto de Biorecursos Alimentarios IBA de Bucarest** (Rumanía), el **Instituto Central de Investigación de Alimentos y Control de Alimentos de Bursa** (Turquía), el **Centro Nacional de Investigación de Egipto**, la **Consejería de Sanidad**, el **Instituto de Fomento INFO**, la **Fundación Clúster Agroalimentario** y la **Academia de Ciencias Veterinarias de la Región de Murcia**, la **Plataforma Food4Life Spain**, el **Campus Mare Nostrum**, el Centro de Referencia Nacional de Industria Alimentaria – Área de Conservas Vegetales y el **CTNC**.

Una organización que no sería posible sin la colaboración del **Comité Organizador y Técnico** integrado por las industrias **ALLFOODEXPERTS, VICKYFOODS, HERO ESPAÑA S.A., MARÍN GIMÉNEZ HERMANOS S.A., CYNARA EU** y **VEGYTECH S.L.** A todos ellos nuestro especial agradecimiento por su trabajo y dedicación.

Tres han sido los temas propuestos para este undécimo Symposium: Ecoinnovación y Sostenibilidad (Proyecto Agromatter), Tecnologías del Agua (Proyecto iWatermap) y Tendencias en el sector agroalimentario (Proyecto Agro2Circular). Todos ellos han sido elegidos por su importancia, actual, para el sector agroalimentario que debe adaptar sus procesos y productos hacia soluciones que hagan sus elaborados más competitivos en el mercado, más atractivos para el consumidor, más amigables con el medio ambiente y, a su vez, permitan asegurar la viabilidad y sostenibilidad de la actividad empresarial y del crecimiento del sector en búsqueda de nuevos mercados.

Un gran número de ponentes y participantes provenientes de distintos países tendrán la oportunidad de **intercambiar conocimientos y experiencias en este Symposium**. Desde el CTNC agradecemos a todos ellos, y a los centros que han colaborado, su inestimable contribución al éxito de este evento.

Esperamos que este Symposium sirva de soporte a las empresas para identificar alianzas y para compartir experiencias exitosas que favorezcan a las organizaciones y agentes implicados en el sector alimentario.

Jose Garcia Gomez
Presidente

Jueves 11 de mayo Thursday 11th May **2023**

11 Y 12 DE MAYO
11th AND 12th MAY

SESIÓN DE POSTERS
POSTER SESSION

8.30 / 9.00 **Registro/Registration**

9.00 / 9.15 **Opening Act**

9.15 / 9.30 **OPENING CONFERENCE**
Colaboración para un Mercado Alimentario Global Collaboration for a Global Food Market
Henrik Stamm Kristensen, Blendhub

Primera Sesión / First Session

ECOINNOVACIÓN Y SOSTENIBILIDAD
ECOINNOVATION AND SUSTAINABILITY. **AGROMATTER network**

MODERADORES / CHAIRS: **NASTASIA BELC - IBA ROMANIA, PRESENTACIÓN GARCÍA - CTNC**

9.30 / 9.45 **Sostenibilidad en el sector HORECA** Sustainability in the HORECA sector
Muhammed YÜCEER - Canakkale Onsekiz Mart University.

9.45 / 10.00 **Valorización de cítricos. MEDISMART** Valorisation of citrics. MEDISMART
Daniela da Silva Magalhães, Ana Alexandra Gonçalves Vilas Boas
Universidade Católica Portuguesa UCP - Porto.

10.00 / 10.15 **Aplicaciones en la industria alimentaria de la extracción por fluidos supercríticos**
Applications in the food industry of supercritical fluid extraction
Jaeger, Justian Droste - Eurotechnica GmbH.

10.15 / 10.30 **Requerimientos, especificaciones y escalabilidad en fermentación de precisión**
Requirements, specifications and scalability in precision fermentation
Dr. Juan Moreno-Cid, Bioprocess Specialist - BIONET.

10.30 / 10.45 **WASTX Plastic, innovadora pirolisis para el reciclaje inteligente de plástico no reciclable**
WASTX Plastic, innovative pirolisis for intelligent recycling of non recyclable plastic
Jacob Bang Nielsen - LEANPIO.

10.45 / 11.00 **Desarrollo y aplicaciones de ingredientes funcionales ricos en fibra dietética de subproductos del brocoli**
Development and applications of functional ingredients rich
in dietary fiber from broccoli by-products
Nieves Baenas - University of Murcia.

11.00 / 11.15 **Sostenibilidad en la agricultura, la producción y la tecnología de los alimentos: el programa de Master Danube Agrifood (DAFM)** Sustainability in Agriculture, Food Production and Food Technology - the Danube Agrifood Master programe (DAFM)
Teodor - Ioan TRASCA - University of Life Sciences "King Michael I" Timisoara.

11.15 / 11.45 **DESCANSO / BREAK**

Segunda Sesión / Second Session

TECNOLOGÍAS DEL AGUA INETWATER MEETING POINT - WATER TECHNOLOGIES

MODERADORES / CHAIRS: **PEDRO ANGOSTO - CIFEA, ELENA GARCÍA CARTAGENA - AGRITECHMUR / INFO**

11.45 / 12.00 **Desnitrificación electroquímica de aguas subterráneas** Electrochemical denitrification of ground waters.
Mercedes Alacid Cárceles - Polytechnic University of Cartagena UPCT.

12.00 / 12.15 **Valorizacion de efluentes y reduccion de vertidos en la industria alimentaria**
Valorization of effluents and reduction of discharges in the food industry
Pablo Siegfried Seley - SIVE Fluid Systems

12.15 /12.30 **Sistemas de recirculación de efluentes del sector agroalimentario**
Systems for the recirculation of effluents from the agri-food sector.
Ignacio Diez - NX Filtration

12.30 / 12.45 **Tecnologías innovadoras aplicadas al proceso de limpieza de la producción industrial de aceite esencial de limón. GO SAFEOILS** Innovative technologies applied to the cleaning process of the industrial production of lemon essential oil. GO SAFEOILS.
Miguel Ayuso García - National Technological Centre for the Food and Canning Industry CTNC.

12.45 / 13.00 **Tecnologías de tratamiento de aguas residuales** Wastewater treatment technologies.
Gilberto Martins - University of Minho-Centre of Biological Engineering

13.00 / 13.15 **Huella Hídrica: Herramientas para un uso sostenible del agua en la industria alimentaria**
Water Footprint: Solutions for sustainable water use in the food industry.
Ignacio Bañeres Escribano, Ángel Luis Sánchez Cerón - Spanish Association for Standardization and Certification AENOR.

13.15 / 13.30 **Tratamientos de regeneración y retos tecnológicos para afrontar el nuevo Reglamento Europeo de reutilización de aguas** Regeneration treatments and technological challenges to confront the new European Regulation for water reuse.
Pedro Simón - ESAMUR.

DESCANSO / BREAK

Tercera Sesión / Third Session

TENDENCIAS EN EL SECTOR AGROLIMENTARIO
TRENDS IN THE FOOD SECTOR. **AGRO2CIRCULAR WORKSHOP**

MODERADORES / CHAIRS: **EDUARDO COTILLAS - FIAB, FRANCISCO SERRANO - ALLFOODEXPERTS.**

15.00 /15.15 **Microalgas: Nuevos ingredientes sostenibles para la industria de alimentos funcionales**
Microalgae: Novel sustainable ingredients for the functional foods industry
F. Gabriel Acién Fernández - University of Almeria

15.15 / 15.30 **Fabricación aditiva en el sector de la alimentación** Additive Manufacturing in the food industry
José Camero - TRIDITIVE.

15.30 / 15.45 **Microencapsulación a base de proteínas: una solución de etiqueta limpia para mejorar la salubridad de los alimentos sin afectar sus propiedades organolépticas. Estudio de caso: alternativa a la sal de Nucaps, NUCLA** Protein-based microencapsulation: a clean-label solution for improving healthiness of food without affecting its organoleptic properties. Case study: Nucaps' salt alternative, NUCLA
Mariano Oto, NUCAPS

15.45 / 16.00 **Obtención de compuestos de alto valor a partir de fuentes naturales mediante extracción asistida por MW. Caso de éxito en DOMCA/DMC** Obtention of high-valued compounds from natural sources by MW assisted extraction. Case of success in DOMCA/DMC
Jose Manuel de la Torre Ramírez - DOMCA

16.00 / 16.15 **Matarromera lleva la transformación digital de la cepa a la copa**
Matarromera takes the digital transformation from the vineyard to the glass
Rubén Arce - Bodega Matarromera

16.15 / 16.30 **Recuperación del valor nutricional de los subproductos de las bayas. EUREKA Nutrifruct**
Recovering nutritional value from berries by-products. EUREKA Nutrifruct
Nastasia Belc - National Research and Development Institute for Food Bioresources IBA Bucharest.

XI INTERNATIONAL SYMPOSIUM FOOD TECHNOLOGY

Dirigido a empresas e investigadores
Aimed at companies and researchers

Viernes 12 de mayo Friday 12th May 2023

NO TRANSPORTATION IS PROVIDED.

JORNADA DE PUERTAS ABIERTAS PROYECTO GO DIGFOOD / OPEN DAY

National Technological Centre for the Food and Canning Industry
Location: C/Concordia s/n 30500 Molina de Segura, Murcia, Spain

Previous registration is required:
sese@ctnc.es

Presentación del proyecto

DIGITALIZACIÓN DE LA INDUSTRIA AGRARIA Y ALIMENTARIA PARA LA OPTIMIZACIÓN DE RECURSOS Y ASEGURAMIENTO DE LA TRAZABILIDAD, CALIDAD Y SEGURIDAD AGROALIMENTARIA (DIGFOOD)

Proyecto Financiado dentro de las ayudas a las operaciones para el "Apoyo para la creación y el funcionamiento de grupos operativos de la Asociación Europea para la Innovación en materia de productividad y sostenibilidad agrícolas", correspondientes a la medida 16.1 del Programa de Desarrollo Rural de la Región de Murcia 2014-2020. 4ª Convocatoria del año 2021.

CONOCE EL SOFTWARE DE CHEMOMETRIC BRAIN Y SU IMPLEMENTACIÓN EN EL SECTOR AGROALIMENTARIO DE LA REGIÓN DE MURCIA CON LA COLABORACIÓN DEL CTNC EN EL GO DIGFOOD / LEARN ABOUT THE CHEMOMETRIC BRAIN SOFTWARE AND ITS IMPLEMENTATION IN THE AGRI-FOOD SECTOR OF THE REGION OF MURCIA WITH THE COLLABORATION OF THE CTNC IN GO DIGFOOD

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Ideas innovadoras para un mundo en cambio
Innovative ideas for a changing world

XI SYMPOSIUM INTERNACIONAL SOBRE TECNOLOGÍAS ALIMENTARIAS
XI INTERNATIONAL SYMPOSIUM FOOD TECHNOLOGY

Fondo Europeo de Desarrollo Regional (FEDER)
European Regional Development Fund (ERDF)

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JUEVES 11 DE MAYO

THURSDAY 11TH MAY 2023

OPENING CONFERENCE

OPENING CONFERENCE
Collaboration for a Global Food Market

Henrik Stamm Kristensen

Henrik Stamm Kristensen, a Danish serial food tech entrepreneur and HRI investor, founder of Premium Ingredients, Portable Powder Blending (PPB), Allfoodexperts, Chemometric Brain and Blendhub. Recognized among many prizes as one of the world's most promising circular economy initiatives by WCEF, SITRA and Deloitte, and recently awarded by World Economic Forum with the New Champions' award for Excellence in Societal Impact.

Abstract

The global food production system developed over the last 100 years is unable to meet the mounting challenges from rapid population growth, urbanization, natural resources management, droughts, energy access, among many others.

How will we feed 10 billion people in 2050, sustainably?

Our proposal and commitment is localization of food production, closer to raw materials and final consumers and adaption of food recipes to local ingredients availability, needs and taste, all enabled by the application of exponential technologies and collaboration models between stakeholders at a local and global level.

We believe that platform collaboration among multiple stakeholders in the food value chain sharing purpose and values is key to transforming the current food system towards a more efficient and sustainable model and with the purpose of making healthy and affordable food products available to all people in all places and creating transparently shared value between all.

JUEVES 11 DE MAYO

THURSDAY 11TH MAY 2023

PRIMERA SESIÓN / FIRST SESSION

ECOINNOVACIÓN Y SOSTENIBILIDAD
ECOINNOVATION AND SUSTAINABILITY. AGROMATTER NETWORK

MODERADORES / CHAIRS:
NASTASIA BELC - IBA ROMANIA, PRESENTACIÓN GARCÍA - CTNC

1.1.
SUSTAINABILITY IN THE HORECA SECTOR

Muhammed YÜCEER*

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Muhammed Yuceer (Ph.D.) is a food scientist and an academician at University (Associate Professor in the Department of Food Processing, Canakkale Onsekiz Mart University, Canakkale, Turkey). His research interests focused on food science and novel processing techniques with experience +20 years in both industry and academia.

Abstract

The food system includes activities involving the production, processing, transport and consumption of food. From production to consumption, all components and processes related to the foods are parts of complex and dynamic systems. Foodservice industry (HoReCa) are facilities that serve all about food and beverages that are consumed out of the home. The HoReCa universe has been shifting its focus and taking a robust approach when it comes to sustainability. In this presentation the future of the HoReCa sector segment in terms of social, environmental and economic sustainability of food systems around the globe are explored. Hotels, restaurants and catering businesses faced multiple challenges. By helping businesses and public sector premises to reduce food waste, reduce operating costs, reduce energy and water consumption, eliminating single-use plastics, reducing greenhouse gas emission, and work on sustainable practices in the HoReCa business. The paper intended to broaden the understanding and importance of food system transformation and provide practical tools and solutions for responsible research and innovation for food system transformation as well as international trends, key opportunities, challenges and good practices in the sector.

This presentation will explore some of the biggest, most interesting and disruptive ideas and how sustainable practices, educational initiatives and innovation play a role in transforming the future of hotels, restaurants and catering that are shaping the way we think about the future of HoReCa sector.

Keywords: Food services, food waste, food trends, green materials, gastronomy, Sustainable Development Goal,

1.2.

SUSTAINABLE & INTEGRATIVE APPROACH FOR VALORISATION OF CITRUS BY-PRODUCTS IN THE MEDITERRANEAN – AN OVERVIEW OF MEDISMART

Ana A. Vilas-Boas, Daniela Magalhães, Débora A. Campos, Marta Correia, Paula Teixeira and Manuela Pintado*

Universidade Católica Portuguesa, CBQF – Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 4169-005 Porto, Portugal

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Ana A. Vilas-Boas is a PhD student at the ESB-UCP since 2020 with the main purpose of developing a sustainable & integrative approach to valorise orange juice by-products to create a new dietary supplement to enhance human gut modulation. She holds a B.Sc. in Biotechnology and a MSc in Food Engineering.

Daniela Magalhães holds a BSc in Biotechnology in 2016 from ESAC-Instituto Politécnico de Coimbra and a MSc in Food Safety in 2019 from the Faculty of Pharmacy of the University of Coimbra.

Abstract

Citrus belongs to the family *Rutaceae* and are one of the most widely cultivated fruit crop and one of the main consumed products in the Mediterranean area [1]. The annual production of different types of citrus fruits was approximately 143 thousand tonnes, of which the most important are oranges, *Citrus sinensis* L. (76 thousand tonnes); mandarins, *Citrus reticulata* L. (37 thousand tonnes); lemons, *Citrus limon* L.; and limes, *Citrus aurantifolia* L. (20 thousand tonnes), in the year 2019 [2]. The Mediterranean Basin accounts for about 20% of the world citrus production and about 60% of the world fresh citrus trade. There are two clearly differentiated markets in the citrus sector: fresh citrus market and processed citrus products market. The last one, although with several representative products in the market is mainly dominated by orange juice which, together with the production of other citrus juices (grapefruit and lemon) has increased in the last years, thanks to product convenience and healthiness, promotional activity and technological advances in processing, storage and packaging [3]. However, the huge amount of by-products generated during the citrus juice processing still remains a problem for the companies and also for the environment since these by-products are deposited in landfills. During the citrus processing, about of 50% of fresh citrus weight is by-product (mainly peels and pulps) which are a huge problem if treated as a waste [4]CSCP. Citrus by-products could be used as a profitable and sustainable source of natural, novel, and functional compounds/ingredients since are rich in

pectin, essential oils, phenolic compounds, vitamin C, cellulose, and other valuable compounds, which are lost when discarded as wastes [5]. Therefore, in the frame of MEDISMART Project was created a sustainable and integrative approach based on green chemistry principles to valorise two different citrus by-products (orange juice by-products and lemon peels) to promote the circular economy in citrus processing industries. The new added-value citrus-based ingredients obtained allow to achieve the zero-waste concept, responding the EU recommendations for 2030 and promoting Mediterranean economy.

References:

1. Magalhães, D.; Vilas-Boas, A.A.; Teixeira, P.; Pintado, M. Functional Ingredients and Additives from Lemon By-Products and Their Applications in Food Preservation: A Review. *Foods* ***2023***, *12*, 1095.
2. FAO Citrus Fruit Statistical Compendium 2020.
3. Vilas-boas, A.A.; Magalhães, D.; Campos, D.A.; Porretta, S.; Dellapina, G.; Poli, G.; Istanbullu, Y.; Demir, S.; Mart, Á.; Mart, S.; et al. Innovative Processing Technologies to Develop a New Segment of Functional Citrus-Based Beverages : Current and Future Trends. *Foods* **2022**, *11*, 1–28.
4. Kim, S.Y. Chemical Composition and Antioxidant Activity of Crude Polysaccharide from Citron (Citrus Junos Sieb. Ex Tanaka) Seed. *Prev. Nutr. Food Sci.* **2018**, *23*, 335–340.
5. Panwar, D.; Saini, A.; Panesar, P.S.; Chopra, H.K. Unraveling the Scientific Perspectives of Citrus By-Products Utilization: Progress towards Circular Economy. *Trends Food Sci. Technol.* **2021**, *111*, 549–562.

Acknowledgements: The authors would like to thank the MEDISMART project (reference PRIMA/0014/2019) for support and the scientific collaboration of CBQF under the FCT project UIDB/Multi/50016/2020. In addition, the author Ana A. Vilas-Boas and Daniela Magalhães would like to acknowledge FCT for the individual PhD grant (2020.05655.BD and 2022.12417.BD).

1.3.
APPLICATIONS IN THE FOOD INDUSTRY OF SUPERCRITICAL FLUID EXTRACTION

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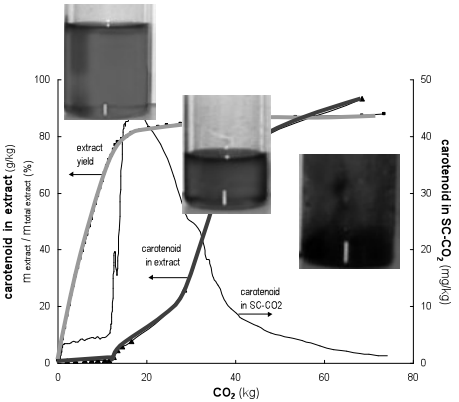
Eurotechnica: https://www.eurotechnica-hd.de/

Chemical engineering degree 1992, PhD 1997 "Supercritical liquid fractionation using carbon dioxide", Full professor at Clausthal University of Technology, Germany since 1/2020, Various courses and workshops on High Pressure Technology around the world. Managing Director of Eurotechnica GmbH, Germany, specialized in development of high pressure processes and manufacturer of lab to pilot scale equipment since 25 years. Areas of expertise and scientific investigation: Supercritical fluid extraction and related technologies, Thermodynamics of interfaces and Mass Transfer at elevated pressures, Behaviour of polymers in presence of compressed gases, Physico-chemical properties of fluid mixtures at process conditions, High pressure equipment design, etc.

Abstract

Based on the tunable physico-chemical properties of supercritical carbon dioxide, a number of interesting applications have been developed in the past decades. Some processes are already established since the last century, like supercritical decaffeination of green coffee and the extraction of α-acids for hops. However, there is a big potential for further development, especially in view of an increasing necessity for environmentally friendly processing of products of high quality and nutritious value. After a concise summary of the most important fundamentals, an overview will be given over recent technological developments in the area of food and pharmaceutical processing using SCF. Reference is made to an installation for Supercritical Fluid Extraction (SFE) that has recently been commissioned at the CTNC at Murcia. Apart from extraction of solid source materials, liquid feed stocks can be processed with the object of concentrating valuable substances or eliminating undesired compounds. After all, supercritical carbon dioxide can be used for product formulation, e.g. for generation of encapsulated or micronized substances, for impregnation of carrier substances or for intensifying processes and increasing the yield, e.g. in mechanical expression of oil seeds. The figure shows the fractionation of an oleoresin, containing high concentration in carotenoids. The presentation will end with some comments on energetic and economical aspects.



SFE extraction kinetics of capsicum, 30 MPa, 60° C,
(Ambrogi, Cardarelli, Eggers (2002). J Food Sci 67: 3236)

1.4.

REQUIREMENTS, SPECIFICATIONS, AND SCALABILITY IN PRECISION FERMENTATION

Juan A. Moreno-Cid*, Ph.D.

Bioprocess Specialist @ Bionet

***juan.morenocid@bionet.com**

Manager of Bionet's bioprocess pilot plant. Chemical Engineer, holding a Ph.D. in Biotechnology. An enthusiastic professional in the field of bioprocesses and biotechnology, with a solid background in Precision Fermentation Technology.

Abstract

Fermentation processes have always been gaining popularity and interest, growing in parallel with the development and needs of societies in the history of humanity, improving processes and products where this technology has already been applied, as well as expanding its application with new products.

To differentiate the classical and traditional fermentation processes of fermented beverages and foods, from those processes based on fermentation with greater technological requirements for operation and controls, the term precision fermentation is applied. The food sector is increasingly demanding new products or alternative methods to the traditional ones of producing new foods or proteins. There is an increase in the development of new processes and changes in the classic fermentation technology with new technological requirements, and more demanding process controls and automation. In any process development, scaling is a key point to ensure the success of industrializing the process, and generally where more problems and deviations from the development and product specifications of interest appear as scale increases. The complexity and relatively high demand of precision fermentation processes add a greater degree of difficulty and effort in scaling the process. The scalings are aspects that are often not taken into account at the beginning of the development of the process, hindering the subsequent phases of design and the correct selection of the equipment and process parameters on an industrial scale.

This presentation will define what the concept of precision fermentation consists of and some aspects and requirements for scaling up in bioprocesses, with precision fermentation technology as the main operation.

1.5.

WASTX PLASTIC, INNOVATIVE PIROLISIS FOR INTELLIGENT RECYCLING OF NON RECYCLABLE PLASTIC

Jacob Bang Nielsen*, CEO LEANpio

***j.n@leanpio.com**

Polluting our planet by transporting waste unnecessarily around the world, do not make any sense. Entrepreneur with passion for simplifying procedures and continuously seeking improvements, for recycling and waste handling, in any business.

Abstract

LEANpio focus on the continuous improvements in any activity or process where a company generates waste, to Reduce their CO2 footprint, Save Time, Money and Energy and at the same time extend the life cycle of products and materials.

Now we can transform non recyclable plastics into Oil to create new Plastic, Oil or energy. The innovative WASTX Plastic recycling technology converts plastic waste into a high-quality circular raw material and into green energy, which is used to power the machine itself in a decentralized way. A unique continuous pyrolysis process based on the thermal degradation of plastics in the absence of oxygen, thus avoiding the devastating effects of combustion derived from waste incineration.

We help our clients to optimize their waste handling, and hereby improving their own Circular economy, applying LEAN and common sense to their waste handling,

Our passion for improving work processes related to waste handling and waste management in industrial production, was born from the spirit of seeking continuous improvements in any process where common sense applied intelligently would save, Time, Money and Resources.

This philosophy have shaped and formed LEANpio's DNA which now with more than 20 years of experience have proved that our innovations and environmental solutions help companies of all kinds to a better Circular and Sustainable Economy,

For this very reason all our waste management equipment and services are designed to reduce the CO2 footprint and recycle in the most optimal way, minimizing and reducing the volume of all kind of solid materials and products generated in their activities.

We have pioneered and created LEANcompacting as a concept and seen the benefits in the companies implementing it in their waste handling processes.

Now with the WastX plastic we have taken it a step further by turning non recyclable plastic back into pure new plastic again.

1.6.

DEVELOPMENT AND APPLICATIONS OF FUNCTIONAL INGREDIENTS RICH IN DIETARY FIBRE FROM BROCCOLI BY-PRODUCTS

Nieves Baenas*, Vanesa Núñez-Gómez, Olga B. Ferrando, Rocío González-Barrio, Mª Jesús Periago

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Dr. Nieves Baenas is post-doctoral researcher Juan de la Cierva in the Research group of Human Nutrition and Food Science at the University of Murcia. Her research interests include: Bioactive compounds from plant foods, revaluation of agro-industrial by-products and their application in nutrition and health.

Abstract:

Given the importance of the agro-industrial sector in the Spanish economy, research on technological solutions to reduce the environmental impact of agro-wastes through its valorisation within an economic circular production system is needed. In particular, the Region of Murcia is the first producer of broccoli in Europe, thus, in this line of research broccoli stalks have been selected as interesting by-products to be valorised through the development of novel fibre-rich ingredients to be used as functional ingredients in the food industry. Agro-industrial by-products are a rich source of nutrients and bioactive compounds with beneficial effects on human health. Especially, broccoli stalks have a high dietary fibre content with potential prebiotic effects, and are also a rich source of bioactive compounds, such as (poly)phenols, glucosinolates and carotenoids. Three different fibre fractions were obtained using water and/or ethanol as solvent: total dietary fibre fraction (TF), insoluble dietary fibre fraction (IF) and soluble dietary fibre fraction (SF). The different samples were analysed to characterise their chemical composition, physicochemical properties, and *in vitro* prebiotic effect. Based on these results, IF was selected as a novel ingredient for the production of bread with 5 and 9 % of dietary fibre. It should be highlighted that IF is extracted using only hot water, making this process environmentally friendly and less contaminating than conventional methods using organic solvents. Breads enriched with broccoli fibre were evaluated for their nutritional profile, mineral content, digestible and non-digestible starch content, glucose release from *in vitro* digestion and organoleptic properties and global sensory acceptability. The results showed that bread with 5 % IF had similar physicochemical and organoleptic properties to conventional wholemeal bread. For this reason, broccoli stalks can be used to obtain fibre-rich ingredients for the production of innovative, value-added foods with improved nutritional and technological properties.

1.7.

SUSTAINABILITY IN AGRICULTURE, FOOD PRODUCTION AND FOOD TECHNOLOGY IN THE DANUBE REGION (DANUBE AGRIFOOD MASTER – DAFM)

Prof. Dr. Teodor - Ioan TRASCA

Head of the Department of Food Technologies, Faculty of Food Engineering, University of Life Sciences ‘’King Michael I’’, Timisoara, Romania.

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Prof. Dr. Eng. Teodor – Ioan Trasca is professor for food equipment, PhD coordinator in Food Engineering. He’s entire professional activity is related to Life Sciences. Former dean and vice-rector, advisor to the Minister of Education from Romania, currently professor, President of the Ethics Commission of the Romanian Agency for Quality Assurance in Higher Education and advisor to the vice-president of the Senat – Romanian Parlament.

Abstract

‘’Sustainability in Agriculture, Food Production and Food Technology in the Danube Region (Danube AgriFood Master – DAFM)” is a Joint Master which focuses on sustainable development as competent response to the upcoming challenges of climate change and protection and promotion of livelihoods. It uses the Danube region as a model region for all riparian regions worldwide.

DAFM program aims to educate students, who are sensitive to sustainable agriculture and food production. To enhance the safety and stability of food production beside sustaining the environmental resources and eco-system services is crucial for adaptation to climate crisis, overpopulation and natural resources depletion.

The master program combines the unique expertise of the Higher Education Institution consortium to provide top-quality research based education in sustainable agriculture, soil, water, climate, food security, food production, food technology and intellectual learning as core contents. The program provides a solid basis in all relevant disciplines from natural sciences, engineering, economics to social sciences, offering extensive opportunities for interdisciplinary approaches and intercultural communication and promotes the idea of **sustainable bioeconomy**.

Full partners offering the DAFM Joint Degree are the Hungarian University of Agriculture and Life Sciences (MATE) (Hungary), the Czech University of Life Sciences Prague (CZU) (Czechia), the University of Natural Resources and Life Sciences, Vienna (BOKU) (Austria), the Slovak University of Agriculture Nitra (SUA) (Slovakia), the University of Zagreb (UNIZG) (Croatia), the University of Novi Sad (UNS) (Serbia) and the University of Life Sciences ‘’King Michael I” from Timisoara (ULST)(Romania).

JUEVES 11 DE MAYO

THURSDAY 11TH MAY 2023

SEGUNDA SESIÓN / SECOND SESSION

TECNOLOGÍAS DEL AGUA
INETWATER MEETING POINT - WATER TECHNOLOGIES

MODERADORES / CHAIRS:
PEDRO ANGOSTO - CIFEA, ELENA GARCÍA CARTAGENA - AGRITECHMUR / INFO

2.1.
ELECTROCHEMICAL DENITRIFICATION OF GROUND WATERS

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Mercedes Alacid Cárceles is associate professor in the Technical University of Cartagena (UPCT), in the Chemical and Environmental Engineering Department. PhD in Physical Chemistry, she has developed her research in the field of Food Chemistry and Water treatment.

Abstract

Eutrophication is a widespread problem in many areas of Europe and the world, particularly in those areas where agricultural activity is intense, where the action of nitrates is the major cause of water nutrient pollution. The main source of nitrate contamination is the use of fertilizers, even though there are other sources such as livestock waste, rejections from desalination plants, wastewaters, industrial discharges, leachate from landfills and deposition of atmospheric pollutants, etc.

The solubility and chemical stability of nitrates favors their presence in groundwater, generating a serious global problem. In EU, 29% of the total area of the groundwater lacks sufficient capacity to meet the needs of ecosystems or society, due to the deterioration of quality and the decrease in quantity resulting from the increasing exploitation of this resource. Drinking water contaminated with nitrates causes methemoglobinemia, especially in infants. In their digestive system nitrates are reduced into nitrites, which inhibits hemoglobin to carry oxygen.

To deal with this problem, there are currently different procedures to reduce the concentration of nitrates in water masses, which are generally classified into three groups (physical, chemical, and biological treatments) that can also be implemented in combination for greater efficiency.

The drawback of physical methods for eliminating nitrates is the generation of a brine solution, with more concentrated nitrates and other accompanying salts. This is the case of reversal osmosis, ion exchange and electrodialysis. The electrolytical treatment is specially indicated for these brines because the requirement of electrical energy decreases with the conductivity of the treated solution. Moreover, the presence of chlorides can be beneficial in the process of electroreduction of nitrates.

The electrochemical elimination of nitrates has the advantage of reducing the oxidation number of nitrogen, transforming nitrates into N_2 or NH_4 as mainly products, being N_2 the desired product.

First of all, the electroreduction of nitrates occurs over the cathode, which is negatively charged. Due to electrostatic forces, nitrates do not touch the cathode surface unless agitation is supplied. Depending on the composition of the treated solution and the nature of cathode, the reduction reaction of nitrates may compete on the cathode with other reduction reactions, like generation of H_2 gas from water. On the other hand, over the anode a simultaneous oxidation reaction takes place. The main oxidation reactions are the generation of O_2 from water or the generation of chlorine gas in the presence of chloride ions. This fact is of crucial importance in this process, due to its transformation into hypochlorite ion, which helps to increase the selectivity to N_2.

In this presentation, the different possibilities of cell configurations are shown, and also the electrodes more frequently used and their conversion yields of nitrates into nitrogen gas.

Among other advantages, this technique doesn´t need the addition of chemicals to the treated water, and only requires electricity, which can be provided by a photovoltaic installation, for instance. Treated waters containing chloride ions become disinfected due to the production of hypochlorite, and oxidation of other contaminants can occur at the same time.

2.2.

VALORIZATION OF EFFLUENTS AND REDUCTION OF DISCHARGES IN THE FOOD INDUSTRY

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Pablo Siegfried obtained the Degree in Aquatic-Ecotechnology Engineering- HZ University of Applied Sciences, Vlissingen, Holland, followed by 20 years of professional experience working on Fluid Filtration and Separation in different sectors- Food and beverage, Biotechnology, Water and others.

Currently CEO at Sive Fluid Systems, SL- Spain. SIVE is now considered one of the leading companies in Designing Solutions for Fluids with a great portfolio of clients. Passionate about keeping and creating a positive and healthy ecologic environment, living each day following these values. Active partner on the Research and Development Field, working together with Universities, Research centers, Public Institutions and Private Companies. Participated in scientific publications and patents related to the Fluid Treatment field.

Abstract

The presentation will be focused on the recovery of water and value-added products from water effluents on the food industry. In these effluents water is recovered for reuse and valuable components are recovered for valorization.

The 2 effluents selected are:

1. Water from whey and milk concentration processes (condensates and permeates).

2. Brine from fish industry.

In the current context, these types of technologies are of great interest due to the increase suffered in energy and raw material costs and due to the environmental requirements.

With these processes, high-quality water is obtained in terms of conductivity, hardness, and organic matter, and on the other hand, proteins, carbohydrates, and other components are recovered instead of being discharged to the waste water treatment plant.

2.3.
SYSTEMS FOR THE RECIRCULATION OF EFFLUENTS FROM THE AGRI-FOOD SECTOR

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Industrial Engineer with a Master's in Business Engineering. More than 5 years in the water sector and over 12 years of experience in industrial companies in Chile and Spain doing sales engineering and international business development, with proven value as a strategic advisor.

Abstract

The problem of water scarcity is a growing concern around the world, with an increasing number of regions facing drought, reduced water supplies, and increased demand for clean water. With limited water resources available, it is essential to find innovative solutions to ensure access to safe and reliable water sources. Membrane filtration recirculation is one such solution that can help address this challenge.

Recirculation is the process of filtering and treating wastewater or other water sources to remove contaminants and make it suitable for reuse. Membrane filtration involves the use of membranes to separate particles and impurities from water, resulting in clean, purified water. The combination of recirculation and membrane filtration can significantly reduce water waste and allow reuse of water resources and other valuable resources in various applications.

Membrane filtration recirculation offers several opportunities to address the water scarcity and other challenges presented by agribusiness. By reusing wastewater or other water sources, recirculation can help reduce demand on increasingly scarce freshwater sources. This technology can be applied in a variety of settings, including industrial and municipal wastewater treatment, agriculture, and even in homes. Membrane filtration recirculation can also help reduce the impact of pollution on water resources by removing contaminants.

To address the challenge of recirculation using membrane filtration, it is essential to develop and implement innovative technologies that can efficiently and effectively filter and treat water sources. For example, nanofiltration technology can be used to remove impurities and contaminants from wastewater, making it suitable for reuse in industrial or agricultural applications.

Furthermore, it is crucial to establish regulations and policies that promote the use of recirculating membrane filtration as a viable and sustainable solution to water scarcity. Governments and

policymakers can offer incentives to industries and households to adopt these technologies and support research and development of new and innovative filtration systems.

In conclusion, the combination of recirculation and membrane filtration presents an important opportunity to address the growing challenge of water scarcity. By reusing wastewater and other water sources, we can conserve freshwater resources and reduce the impact of pollution on water sources. The development and implementation of innovative filtration technologies and policies to promote their use can help ensure access to safe and reliable water sources for generations to come.

2.4.

INNOVATIVE TECHNOLOGIES APPLIED TO THE CLEANING PROCESS OF THE INDUSTRIAL PRODUCTION OF LEMON ESSENTIAL OIL. GO SAFEOILS

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PhD from the University of Murcia. Since 2000 he has been Coordinator of the Water and Environment Area at CTNC. As a result of this activity, he has developed numerous research projects as principal investigator and as a collaborator in numerous research contracts with private and public companies. Author of more than 35 scientific-technical publications and 6 books related to the treatment and recovery of waste, reuse of wastewater, environmental policy and management, etc. He is a regular collaborator with the Regional Administration and with companies on issues related to the environment and the food industry: purification and reuse of industrial wastewater, adaptation of companies to environmental regulations, etc. courses and technical conferences related to the agri-food industry. As a result of all this work, he has acquired extensive experience in the agri-food industry and in the control and processes of water in its different applications.

Abstract

The treatment of certain types of pollutants in wastewater can be a very complex problem due to the great variety of chemical families, the low biodegradability of many of them, their low concentration levels, etc. For this reason, the search for new methods for the efficient removal of this type of contaminant is a topic that has been addressed in recent years by numerous researchers. An alternative that is proving to be effective, viable, and environmentally sustainable is the use of various advanced degradation processes, since it does not change the physical-chemical quality of the water and does not incorporate reagents that generate new toxic compounds. Photocatalysis and electrooxidation are among these types of technologies.

Photocatalysis and electrooxidation are electrochemical processes that, by applying electric current, generate a highly oxidizing environment capable of eliminating different compounds that conventional technologies are not capable of treating. These advanced oxidation technologies have advantages such as: no need to add reagents, do not modify the characteristics of the water, continuous work but can be turned on and off on demand, easily installed, potential ability to eliminate organic contaminants through the oxidation to carbon dioxide, reactivity with most organic compounds, etc.

The characteristics of these technologies make them very interesting for the treatment of different residual and purified effluents in order to eliminate specific contaminants or resistant contaminants that have already gone through other phases of purification, such as remains of phytosanitary products, drugs, cosmetic products, etc.

In this presentation I will show the results obtained with the application of these advanced oxidation technologies to effluents from the citrus sector and more specifically in the process of obtaining lemon essential oils, in order to eliminate traces of phytosanitary products derived from postharvest treatments of the fruit and that can be incorporated into the essential oil, reducing its quality. I will also show the effectiveness of these technologies for the treatment of reclaimed water for agricultural irrigation for the elimination of emerging contaminants in order to meet the objectives of the new European discharge regulations that consider this type of contaminant as a quality barrier.

2.5.

NEW ANAEROBIC WASTEWATER TREATMENT TECHNOLOGIES APPLIED TO AGRI-FOOD INDUSTRY

Gilberto Martins[1,2*]

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Gilberto Martins (GM) completed a PhD in Chemical and Biological Engineering (2011) and a graduation in Biological Engineering (2005). GM is Junior Researcher at Centre of Biological Engineering, University of Minho. GM main research topics are the optimization of anaerobic digestion processes through the use of carbon nanomaterials, resource recovery, water treatment technologies, water quality modelling. GM is author of 20 ISI manuscripts and several oral/poster communications in conferences/symposiums/workshops. In 2012, GM was co-recipient of the Portuguese National Environmental Award - PNIA and the Bronze European Environmental Press Award with the SAPHIR - Solution for Algae-Phosphorus Interaction Rupture technology. Currently GM is a representative of the Norte-PT region in the smart specialisation platform Water Smart Territories.

Abstract:

Agri-food industry produces large amounts of wastewater and are distinguished from municipal and other industrial wastewaters as they are biodegradable and do not contain toxic chemicals. The concept of recovering energy and resources from wastewater has gained growing interest in line with circular economy objectives. In such processes, organic matter can be utilized as substrates by microorganisms to generate energy (in the forms of methane, hydrogen, or electricity) or produce valuable chemicals (e.g., volatile organic acids and alcohols). Agri-food wastewaters are especially attractive for such bioconversion processes due to their high organic contents (typical COD values in the range of 5 to 10 g/L), nutrients and high biodegradability.

Although widely applied, aerobic activated sludge process requires the use of chemicals and involves high capital, operational, and maintenance costs. Energy costs for aeration are significant and depend directly on the organic load to be removed. Industrial wastewater treatment systems, that rely on the anaerobic digestion process for the removal of organic pollutants, offer important advantages over conventionally applied aerobic processes. In anaerobic digestion, the organic wastes are converted into biogas in the absence of oxygen, and is in principle, an energy-generating process through the production of methane-rich biogas, and produces only one-fifth to

one-tenth of biomass per unit of organic substrate converted as compared to aerobic processes. Wastewater treatment based on the circular economy principles aims at resource recovery and water reuse, reducing energy requirements and chemical consumption as well as at decreasing the environmental impacts.

Thus, the development of novel strategies for accelerated methane production from agri-food industry by microbial communities will contribute significantly to tackling major environmental challenges related to methane emissions in nature (from soils, sediments, and groundwater), and to recover valuable renewable energy from contaminated effluents and wastes.

The present work will present and discuss new approaches to optimize the anaerobic digestion process either by accelerating methane production or by improving the resilience and application of anaerobic processes to more recalcitrant compounds.

2.6.

WATER FOOTPRINT: SOLUTIONS FOR SUSTAINABLE WATER USE IN THE FOOD INDUSTRY

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Ignacio Bañeres Escribano, Graduated in Environmental Sciences – Sustainability Technician, Marketing Management and Business Development.

Abstract

Water management is the center of a global debate within the framework of sustainable development. The increase in global demand, its scarcity in some areas and the degradation of its quality make water a key issue for the future of nations and of humanity itself. For this reason, for five years some 40 experts from 20 countries have worked within the International Organization for Standardization (ISO) to develop a standard that helps organizations assess the environmental impacts of their activities on water, favoring improvement in the management of this scarce resource.

ISO 14046, which came to light a few weeks ago and is certifiable by an independent third party, specifies the principles, requirements and guidelines related to the evaluation of the Water Footprint of products, processes and organizations based on the Life Cycle Analysis (LCA).

It should be clarified that it is not a standard whose objective is to compare the results obtained through its application to products, processes and organizations. And this is because in the application of the standard a series of assumptions must be made (geographical scope, system limits, data quality, decision rules on impact assessment, etc.) that give rise to one or a set of indicators. Another reason that does not facilitate the comparison of results with this standard is the possibility of using different databases during the LCA process. Neither is the environmental labelling of products, processes or organizations subject to the standard.

ISO 14046 Standard is based on the study of environmental impact indicators that allow establishing the magnitude of these impacts when talking about water. This standard must allow the identification of opportunities to reduce these impacts and improve and optimize the use of water in the production of products, in process management and in organizations. It will also make it possible to carry out risk management studies associated with the strategic use of water, facilitate decision-making for the management of organizations and, in the end, reduce consumption, impacts and conflicts derived from the use of water.

ISO 14046 Standard is based on the life cycle assessment (LCA) methodology defined in the UNE-EN ISO 14044 Standard. ISO 14046 is a self-sufficient model standard since all the points linked to the LCA are included in the norm itself.

The results of the application of the standard can be expressed in the form of a single impact indicator or as a set of impact profiles (indicators). The possibility of diversifying both the data obtained for the same case and their communication can constitute one of the main stumbling blocks for its implementation, since the standard offers multiple possibilities when it comes to presenting and communicating the same result.

Many developing and emerging countries have considered, and consider, a possible trade barrier to their products, the approval of this standard. Since they believe that they are conditioned to a less efficient technology than that of more developed countries and will not be able to compete with them.

The evaluation of the Water Footprint in accordance with ISO 14046 includes the four phases of the life cycle analysis, which are: definition of the objective and scope of application; Water Footprint inventory analysis; evaluation of the impact of the Water Footprint, and interpretation of the results.

The standard gives an option to two types of results. The first would be a single Water Footprint indicator (for example, Water Scarcity Footprint) related to a single impact category (for example, water scarcity). The second, Water Footprint profile, which includes the results of various indicators such as availability Water Footprint; Eutrophication Water Footprint; Ecotoxicity Water Footprint; Water footprint of acidification, and others. This means that the standard offers results that may vary for the same product depending on the impacts that are considered during the development of the analysis.

2.7.

REGENERATION TREATMENTS AND TECHNOLOGICAL CHALLENGES TO CONFRONT THE NEW EUROPEAN REGULATION FOR WATER REUSE

Pedro J. Simón Andreu*

ESAMUR

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Pedro J. Simón Andreu is Technical Director of ESAMUR. Industrial engineer, with around 30 years of professional experience in water sector, both in public and private companies. The 7 years as CEO in public company EPSAR could be highlighted, managing the wastewater treatment system in Valencia Community (4,5 million of inhabitants and 450 WWTPs) and since 2002 I am working as technical director in ESAMUR, regional public company that manages the wastewater treatment system in Region Murcia Community (1,5 million inhabitants and 99 WWTPs). Water reuse coordinator in AEAS (Spanish Association of Water Supply and Sanitation) association and Vicepresident in ASERSA (Spanish Association of Sustainable Water Reuse) association.

Abstract

Next 26th of June will come into force the UE Regulation 741/2020. The objective is to promote the water reuse in Europe, currently with a very low implantation (3 % in european countries). Spain is the european country with highest water reuse in Europe, with a 12% of implantation, mainly concentrated in Murcia and Valencia regions.

The requirements of the new Regulation are very strict if we compare with our current national regulation (RD 1620/2007). There are some noveltys as the validation of type A treatments or the risk management, that we need to perform and we don´t have experience on it yet.

Validation treatments will require upgrade our treatments in the most of the facilities, to be able to remove viruses and protozoa, and some treatments won´t be valid.

New requirements on verification (ten times more strict than our current ones) will need to increase significantly the control of our facilities and the implementation of new sensors on-line, moreover of needing upgrade the treatments.

Risk management will be a challenge from the administrative point of view and it will require cooperation between the different actors of the water reuse chain.

Barriers could be a system to optimize and make more easy the transition to the new requirements.

In Murcia Region we are making a huge effort to adapt our facilities and management systems to the new scenario and these efforts Will be shown and shared with the attendants.

JUEVES 11 DE MAYO

THURSDAY 11TH MAY 2023

TERCERA SESIÓN / THIRD SESSION

TENDENCIAS EN EL SECTOR AGROLIMENTARIO
TRENDS IN THE FOOD SECTOR.
AGRO2CIRCULAR WORKSHOP

MODERADORES / CHAIRS:
EDUARDO COTILLAS - FIAB, FRANCISCO SERRANO - ALLFOODEXPERTS

3.1.

MICROALGAE: NOVEL SUSTAINABLE INGREDIENTS FOR THE FUNCTIONAL FOODS INDUSTRY

Silvia Villaró[1,2], Endri Taragjini[3], Evan Musari[3], Tomas Lafarga[1,2], José María Fernández-Sevilla[1,2], Gabriel Acién[1,2] *

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Gabriel Acien is graduated by the University of Granada in 1992, and Ph.D. at the University of Almería (Spain) in 1996. Professor at the Department of Chemical Engineering of the University of Almería from 2012 onwards. Prof. Acién has participated in 15 European projects in addition to 40 National projects and contracts with companies. He published more than 150 papers in international journals and 20 book chapters, in addition to 10 patents. He is member of International Society for Applied Phycology and Latino American Society for Algal and Environmental Biotechnology, and editor of Algal Research and RELABIAA journals, in addition to reviewer of international journals. Major contributions on Biotechnology of microalgae field are related with the improvement of photobioreactors design, scale-up of production systems, and economic analysis of production processes. (orcid.org/0000-0002-8434-0365, Scopus ID: 55385950700).

Abstract

Microalgae are a sustainable, safe, and nutritious ingredient with the potential for being used in the development of functional foods, nutraceuticals, and other high-end products. Their utilization as food is now a reality with the number of products containing microalgae launched into the market increasing every year. *Arthrospira platensis,* commercially known as Spirulina, is particularly interesting because of its high protein content which is around 60%. The present study aimed at producing *A. platensis* using demo scale raceway reactors and developing a method to recover high-quality food-grade proteins for industrial use. The latter led to a recovery of 80% of the proteins contained in Spirulina obtaining extracts with a purity higher than 90%. The isolated proteins contained all the essential amino acids, with the content of histidine, valine and lysine being especially high (8.4, 6.6, and 6.2%, respectively). The functionality of the protein isolate was comparable to that of plant or animal proteins. The maximum foaming and emulsifying capacity of the isolated proteins were 182.3 and 80.6%, higher than those of soybean proteins (71.5 and 77.2%, respectively). Moreover, an *in silico* study revealed that a

large number of bioactive peptides were contained inside the isolated proteins. This same study suggested ficin and papain as the ideal enzymes to generate hydrolysates with a large number of known bioactive peptides. Four enzymes namely papain, ficin, pepsin, and Alcalase® were used to produce enzymatic hydrolysates with different degrees of hydrolysis. The generated hydrolysates showed an improved *in vitro* antioxidant capacity and potential for being used in the prevention of the appearance of different disorders including diabetes and hypertension. Overall, Spirulina showed potential for being used not only as a techno-functional ingredient to develop innovative products but also functional foods with health benefits that go beyond basic nutrition. The bioactivity of the generated hydrolysates was assessed *in vitro* and further *in vivo* trials are necessary to confirm these findings.

3.2.
ADDITIVE MANUFACTURING IN THE FOOD INDUSTRY

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Jose Camero is a REAL MASS 3D PRINTING & ADDITIVE MANUFACTURING Entrepreneur. He founded AIR DIGITAL in 1999 as a VMO (Virtual Mobile Operator level 4) and made it grow until 2008 when he moved to Shenzhen to live for 4 years, founded MADIN HK a tech-consultancy company focused on electronic devices, new product ideas, and development. Doing some amazing devices there he discovered 3D printing and quickly realized that this technology was going to be something BIG!. Moved back to Spain to start doing some research on 3D printing and founded TRIDITIVE in 2017. First fully automated industrial 3D printer able to print in metal and polymers. Now focused on solving mass manufacturing adoption for 3D printing in several manufacturing sectors.

Abstract

Additive manufacturing, also known as 3D printing, has the potential to transform the food industry by creating unique and customized food products, improving food safety and reducing waste, and fostering innovation in product development. In this presentation, we will explore several applications of additive manufacturing in the food industry.

One of the applications of additive manufacturing in the food industry is the creation of spare parts. It allows for the rapid and cost-effective creation of spare parts for machinery and food processing equipment. This can reduce downtime and maintenance costs.

Additive manufacturing also can create tools for processing food, such as custom molds to shape products or special cutting tools. This can improve the efficiency and precision of the production process. Additionally, 3D printing can be used to reduce food waste and improving sustainability.

Another application of the additive manufacturing in the food industry is prototyping, it allows food processing equipment manufacturers to create prototypes of new products before mass production. This enables them to conduct tests and adjustments before investing in full production.

Finally, additive manufacturing can also be used to create new and innovative food products. This innovation in product development can help drive growth and competitiveness in the food industry. Also unique and customized packaging for food products. This can improve product presentation and attract consumers.

While additive manufacturing is still a relatively new technology in the food industry, it has already shown great potential in food processing lines, including the creation of spare parts, prototyping, production of custom parts, and creation of custom packaging. These applications can improve production process efficiency, reduce maintenance costs, and enhance product presentation. As the technology continues to evolve, it will be exciting to see how the food industry embraces 3D printing to stay competitive.

Triditive has patented AMCELL®, the first hybrid and automated industrial AM machine for mass production of metal and polymer parts.

Integrated with EVAM®, our proprietary software for remote control and production optimization, AMCELL® enables manufacturers to shorten the supply chain, digitalize inventories and deliver solutions to their customers faster.

3.3.

PROTEIN-BASED MICROENCAPSULATION: A CLEAN-LABEL SOLUTION FOR IMPROVING HEALTHINESS OF FOOD WITHOUT AFFECTING ITS ORGANOLEPTIC PROPERTIES. CASE STUDY: NUCAPS' SALT ALTERNATIVE, NUCLA

Mariano Oto*

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Bachelor Degree in Economics and Business from the University of Navarra. Expert in management and business communication. More than 20 years' experience in management of companies in different sectors and in public administration. Serial entrepreneur and expert in turning ideas and new technologies into businesses, adapted to the needs and demands of the market and society. Since 2017 he is CEO and Co-founder of NUCAPS, an international biotechnology company that designs and manufactures functional ingredients Health Inside: bioactives and probiotics microencapsulated in natural proteins

Abstract

Controlled release in mouth of aromas and flavors can increase the taste perception of the consumer, in NUCLA we use a protein encapsulation to get a controlled release in mouth of salt, creating an experience of more intense salty flavor with a much lower quantity of sodium (reduction of more than 25%), a simple, natural, clean-label and affordable solution.

Microencapsulation technology was developed about 70 years ago for the pharmaceutical sector. Since then, its application has extended to the agri-food, biotechnological, textiles, and cosmetics fields. In food sector, microencapsulation is considered a viable option for improving storage stability, masking unpleasant flavors or tastes, obtaining target delivery, increasing their solubility, or avoiding adverse ingredient interaction.

The coating material, should be of food grade, be able to form a barrier between the active agent and its surrounding environment, be tasteless and flavorless, be impermeable, thermo-resistance to be stable after food treatments and processing and have the ability to release the core at a specific time and site upon the specific environmental factor.

It must be notice that the sensory attributes of a product are of great relevance, as they are strongly involved in the initial intention to buy a product.

Different bioactive compounds, such as omega-3 and omega-6 fatty acids, vitamins, phenolic compounds, carotenoids and probiotics are now widely used to develop products with numerous functional properties to meet up the increasing consumer demands.

However, such compounds are highly unstable under certain conditions of light, temperature, pH, and oxygen, which may result in the modification of the sensory profile of the product. Therefore, the microencapsulation of such compounds protects them from such harsh conditions during processing of foods, while preserves the palatability and sensory attributes of the final product.

Proteins -from animal (whey proteins, gelatin, casein) or vegetal (soy proteins, pea proteins, cereal proteins) sources- are natural polymers, which show several advantages as encapsulants. They are biocompatible, biodegradable, and all of them show good amphiphilic and functional properties such as water solubility and emulsifying and foaming capacity.

Nucaps' encapsulation technology allows the preparation of different type of microparticles with a wide range of applications and a targeted release according to the desired effect: it could be in gut, colon, stomach or, as NUCLA, in mouth.

This ingredient in powder can be incorporated in different food matrixes and/or beverages. In addition, the encapsulation has an effect of the active ingredient release.

In this context, Nucaps has developed an alternative to salt in which the cargo (NaCl) is release in mouth in a controlled way. Thus, the salt content (Sodium) can be reduced without modifying the sensory profile of the food product.

3.4.

OBTENTION OF HIGH-VALUED COMPOUNDS FROM NATURAL SOURCES BY MW ASSISTED EXTRACTION. CASE OF SUCCESS IN DOMCA/DMC

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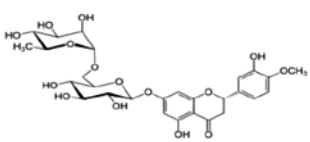
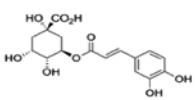
Abstract

It is becoming more frequent the interest in revalorization of wasted and by-products from the agrifood industry. These materials contain high amounts of substances of interest, especially the fruits and vegetables by-products, where high concentration of antioxidants, dietary fibres and sugars are present.

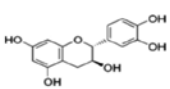
Some examples of this by-products are the citric peels, leaves and stems of artichoke, Colliflower, apple pomace, etc. Relative to the active substances present in those wastes, very active polyphenols have been detected, like: Hesperidin, Chlorogenic acid, catechin, anthocyanin, among others.



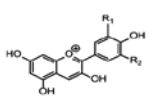
Hesperidin



Chlorogenic acid



Catechin



Anthocyanin

It is a big challenge the possibility of extract these active substances from the mentioned agrifood wastes. That is the key concept of Circular Bioeconomy, the re-use of the discarded materials and their revalorization. But, to be able to achieve that goal in a profitable manner, an intense R&D effort has to be made, looking for methodologies more effective than the currently employed in industry.

DMC RESEARCH is part of the Agro2Circular project, which in its agri-food industry by-products revalorization topic, come up with new extraction methodologies based in Microwaves (MAE) and enzymatic treatments.

Microwaves are non-ionizing radiations that induce the heating of the sample by ionic conduction and dipole rotation mechanisms. This extraction methodology is based in the increase of the temperature inside the cells followed by the increase of the pressure, causing the break of the cell walls and the leakage of the active principles to the extractant. To increase even more the efficiency of the process, the samples are previously subjected to enzymatic treatments.

The concentration of polyphenols in the extracts and their antioxidant activity have been evaluated and compared with conventional extractions techniques, making evidence of the higher efficiency obtained using MAE.

3.5.

MATARROMERA FAMILY WINERIES TAKES THE DIGITAL TRANSFORMATION FROM THE VINEYARD TO THE GLASS

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Abstract

Bodegas Familiares Matarromera has always respected the culture of wine and the past, maintaining an innovative vision that is reflected in its commitment to adopting new technologies.

The Digital Transformation pursues three objectives: to improve the efficiency of the processes, care for the environment and that of all its stakeholders. Being aware that digitization is an essential tool to obtain excellent wines.

To carry out the technological strategy, we will use a 360º model, so that it covers all the needs of a company in our sector, combining different areas and based on the value chain and business model. This need requires proper management of both the raw material (cultivation, tillage, harvest...) and the processing (transformation, production, aging) and distribution, with a safe commitment to traceability and safety of each of the processes to achieve the excellence of the product until it reaches the consumer.

Within the value chain are some of the following transformation projects:

- **Precision agriculture:** (viticulture, oleoculture and harvest) we measure the qualities of crops, soil and climatic factors to apply the best treatment at the right place and time. This type of agriculture not only allows the use, for example, of phytosanitary products where necessary; it also achieves that the farmer is more competitive and a greater traceability of the products.

- **Efficient Warehouse:** (Warehouse production, logistics and distribution). Through this project, the operational management of the main systems, variables and equipment that affect the production and energy process is centralized and automated. The project makes it possible to manage the following modules on a single platform: energy management system, critical point control, occupational risk prevention, lighting remote management, data capture from the treatment plant and photovoltaic solar plant management system.
- **Marketing and customer orientation** : Information anywhere, relationship with customers through CRM, e-commerce and Club Esencia.

3.6.

RECOVERING NUTRITIONAL VALUE FROM BERRIES BY-PRODUCTS

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Abstract

Food waste and by-products recovery is an important desideratum but also a great challenge for food system.

Currently wastes from berries processing (e.g. juice or cold pressed oil processing), are mainly lost, from the circular economy point of view, although these have a significant content of bioactive compounds, such as polyphenols, flavonoids, minerals and fatty acids.

Hippophaë rhamnoides L., also known as sea-buckthorn is a specie of flowering plant in the family Elaeagnaceae, native to the cold-temperate regions of Europe and Asia. It is a spiny deciduous shrub. The plant is used in the food and cosmetics industries, in traditional medicine, as animal fodder, in horticulture, and for ecological purposes.

In this study, extracts from sea-buckthorn by-product (remained from juice processing) were obtained by two different methods using 50% ethyl alcohol solvent, namely through maceration–recirculation (E-SBM) and through ultrasound extraction (E-SBUS), followed by a concentration.

Sea-buckthorn by-product (SBP), extracts (E-SBM and E-SBUS) and the residues obtained from the extractions (R-SBM and R-SBUS) were characterized for the total polyphenols, flavonoid content, antioxidant capacity, mineral contents, and fatty acids profile. The results show that ultrasound was the best option for polyphenols and flavonoids extraction. In the same line, the antioxidant activity of E-SBUS was with 91% higher when was expressed in Trolox equivalents, and with 45% higher, when was expressed in Fe^{2+} equivalents, than E-SBM. Regarding the extraction of minerals, Zn, Mn and Fe were identified and important quantities of K and Mg representing 25% of the RDI value.

The general conclusion is that using the ultrasound extraction method, followed by a concentration process, a superior recovery of sea-buckthorn by-product resulting from the juice processing can be achieved.

This study is part of the international project „NUTRIFRUCT", Ctr.188/2020, under the umbrella of EUREKA. The partnership is consisting in AMC Innova, Spain, Hofigal, Romania and IBA Bucharest.

The project develop new recipes for food supplements, foods and beverages recovering food by-products rich in potentially functional ingredients from pomegranate and citrus (from Spain), sea buckthorn and blueberry (from Romania).

This work was supported by a grant of the Romanian Ministry of Education 444 and Research, CCCDI - UEFISCDI, project number PN-III-P3- 3.5-EUK-2019-0193, within PNCDI 445 III, Ctr.188 /2020.

POSTERS

INDEX

15. OPTIMIZATION OF PHOSPHORUS RECOVERY FROM ANAEROBIC DIGESTER EFFLUENTS IN AGRI-INDUSTRY.
16. LACTOSE AND GALACTOSE CONTENT IN SPANISH CHEESES: USEFULNESS IN THE DIETARY TREATMENT OF PATIENTS WITH GALACTOSAEMIA.
17. WHAT IMPORTANCE DO WE GIVE TO SAMPLING?
18. ESSENTIAL OILS AS NATURAL ANTIMICROBIAL AGENTS FOR FOOD PACKAGING APPLICATIONS.
19. USE OF ESSENTIAL OIL NANOEMULSIONS TO DECONTAMINATE CHERRY TOMATOES ARTIFICIALLY CONTAMINATED.
20. ALGAE4IBD – FROM NATURE TO BEDSIDE - ALGAE BASED BIO COMPOUND FOR PREVENTION AND TREATMENT OF INFLAMMATION, PAIN, AND IBD.
21. ANTIMICROBIAL EFFECT OF DIFFERENT ESSENTIAL OILS.
22. INFLUENCE OF SPICES ON MICROBIOLOGICAL QUALITY OF BEEF DURING STORAGE.
23. SCIENTIFIC SUPPORT OF CLIMATE CHANGE ADAPTATION IN AGRICULTURE AND MITIGATION OF SOIL DEGRADATION.
24. PDAPP OPERATIVE GROUP: ADVANCING TOWARDS A DIGITAL MODEL FOR ZERO WASTE IN THE AGRI-FOOD SECTOR.
25. ALGACEUTICAL: DEVELOPMENT OF SPHERIFICATIONS FROM MICROALGAE.
26. GREEN SUNSCREEN WITH MICROALGAE-BASED UV-ABSORBING COMPOUNDS.
27. IMPACT OF HOT AIR DRYING PROCESS ON NUTRITIONAL AND SENSORY PROPERTIES OF COOKIES PREPARED FROM CAMEROONIAN PUMPKIN POWDER.
28. THE PURCHASING BEHAVIOUR OF THE CONSUMERS FROM S.E. ROMANIA, TOWARDS LOCAL/TRADITIONAL PRODUCTS.
29. ET1CHEAPBIOPLASTIC: TREATMENT OF FOOD BY-PRODUCTS FOR THE PRODUCTION OF BIOPLASTICS.
30. ET2NOVELTECH: COMPARISON OF CONVENTIONAL AND EMERGING TECHNOLOGIES FOR THE EXTRACTION OF COMPOUNDS OF INTEREST FROM AGRI-FOOD WASTES.

31. ET1MILDTREATMENT: APPLICATION OF MICROWAVE-ASSISTED PASTEURIZATION OF STRAWBERRY PUREE.
32. ET2FRESACAPS: RESEARCH ON ENCAPSULATION AND MICROENCAPSULATION OF STRAWBERRY EXTRACTS.
33. AGROMATTER: ESTABLISHMENT OF A CERVERA NETWORK FOR THE DEVELOPMENT HIGHLY SUSTAINABLE TECHNICAL MATERIALS DERIVED FROM SUBPRODUCTS OR RESIDUES OF THE AGRICULTURAL INDUSTRY AND NATURAL SPACE CONSERVATION OPERATIONS.
34. ANALYSIS OF THE COMPOSITION, ANTIOXIDANT CAPACITY AND ANTI-INFLAMMATORY EFFECTS OF OILS DERIVED FROM OLIVE PITTING.
35. 2S ALBUMIN-LIKE PROTEINS OF THE OLIVE SEED.
36. DEVELOPMENT OF GLUTEN-FREE FUNCTIONAL BREAD ADAPTED TO THE NUTRITIONAL REQUIREMENTS OF CELIACS.
37. PROXIMATE COMPOSITION AND ANTIOXIDANT PROPERTIES OF FIVE SEAWEEDS: *Porphyra umbilicales, Undaria pinnatifida, Ulva lactuca, Himanthalia elongata and Arthrospira platensis.*
38. PRIMARY AND SECONDARY METABOLITES CONTENT IN EIGHT VARIETIES OF BLOOD ORANGES GRAFTED ONTO *Citrus macrophylla.*
39. DDIBIORESIN: THE SEARCH FOR NEW BIOPOLYMERS
40. DIGITALIZATION OF THE AGRICULTURAL AND FOOD INDUSTRY FOR THE OPTIMIZATION OF RESOURCES AND ASSURANCE OF TRACEABILITY, QUALITY AND AGRI-FOOD SAFETY. GO DIGFOOD
41. INNOVATIVE PROCESSES FOR OBTAINING PESTICIDE-FREE LEMON ESSENTIAL OILS WITHIN THE FRAMEWORK OF SAFE AGRICULTURAL PRODUCTION. GO SAFEOILS
42. TERRITORIAL CIRCULAR SYSTEMIC SOLUTION FOR THE UPCYCLING OF AGRIFOOD WASTES – AGRO2CIRCULAR PROJECT
43. IMPROVEMENT AND ENZYMATIC HYDROLYSIS OF THE PHYSICOCHEMICAL AND TECHNO-FUNCTIONAL CHARACTERISTICS OF EGG ALBUMEN WITH MICROBIAL TRANSGLUTAMINASE

01.

IDENTIFYING THE NEEDS OF TRAINERS TO PROMOTE FOOD SAFETY AND HYGIENE AMONG TURKISH HORECA WORKERS

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Abstract

This study aims to assess the trainers' needs on food safety and hygiene practices of the HoReCa (hotel, restaurant and catering) staff through a survey. Primary data were collected using a self-completed questionnaire in Turkiye. A questionnaire consisting of a total of 22 questions on training needs was used as a data collection tool and carried out with 38 participants (23 women and 15 men). While approximately 40% of the participants are in the 30-40 age range, 89% of the participants have a graduate degree (M.Sc. or Ph.D.) in terms of academic level. From the answers, it's clear that the infrastructure opportunities to implement food safety practices in the institutions where educators work emerges. Participants agree that it is mandatory for HoReCa employees to attend a training course on food safety and hygiene practices. It was concluded that all of the issues related to food safety recommendations from expert are significantly important ($p<0.05$). There is a need for a corporate education philosophy on an industrial approach. It may be effective for educational materials to include measurement and evaluation. E-learning based training materials may have significant contributions to orientation in cases where new beginners or in-enterprise workers are involved. It is necessary to track the training and an incentive mechanism is needed. It was emphasized that people needed specialized trainings according to their fields and task descriptions. This situation brings the need to increase the number of personnel in the enterprises.

Therefore, our results could be an important starting point for designing ways to improve food safety and hygiene practices in the HoReCa and beyond. This project supported by European Union, Erasmus+ under the grant number of 2021-1-SK01-KA220-VET-000034652.

Keywords: HoReCa, food safety management, hygiene practices, consumer product safety, staff qualifications.

02.
AUTOMATED INDUSTRIAL AM FOR PRODUCTION LINES

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Abstract

TRIDITIVE has patented AMCELL®, the first hybrid and automated industrial AM machine for mass production of metal and polymer parts.

Integrated with EVAM®, our proprietary software for remote control and production optimization, AMCELL® enables manufacturers to shorten the supply chain, digitalize inventories and deliver solutions to their customers faster.

Additive manufacturing is an economical and sustainable solution. And, therefore, it is not surprising that it is one of the foundations of industry 4.0. However, it also has other benefits:

- Additive manufacturing manages to reduce production times by up to 90%. In addition, the materials used are increasingly cheaper.
- This manufacturing model allows for smaller scale and custom runs, maintaining its profitability.
- A virtual stock is available and each part is manufactured on the spot.
- Digitally manufactured parts are much lighter
- Cleaner and more environmentally friendly production. In addition to the reduction in energy consumption, transport costs are lowered.
- Beyond sustainability and cost reduction, additive manufacturing guarantees the independence of the industry.

03.
OBTAINING AND TESTING ELDERBERRY EXTRACTS

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Abstract

Sambucus nigra L. (*Adoxaceae* family) is an extremely accessible and abundant plant in wild flora, native to most of Europe. Elderberry (EDB) can be a potential low cost source of some important bioactive phenolic compounds, associated with their therapeutic properties. For the valorization of the bioactive compounds from elderberries, we used several extraction methods (maceration, extraction with continuous stirring, ultrasound, microwave, and enzymatic extraction). Preliminary studies aimed at optimizing the procedure for obtaining elderberry extracts. For this we used several solvents (methanol, ethanol and acetone), by varying the concentration of the solvent (10-80%), the temperature (20-60°C) and the extraction time (20-60 minutes). The extracts were characterized by determining the total content of phenolic compounds (TPC), the total content of flavonoids (TFC), the total content of anthocyanins (TAC) and the antioxidant activity (AA). Afterwards, the extracts were characterized by HPLC analysis and then microencapsulated.

04.

DECONTAMINATION OF POLYOLEFINS FOR FOOD CONTACT APPLICATIONS AND USE OF IN VITRO BIOASSAYS IN THE RISK ASSESSMENT OF NIAS, RECYCLING INVITRO NIAS

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Abstract

One of the main concerns in the plastics sector and, more specifically, in the food industry is the inclusion of recycled plastic material in packaging. The aim of the RECYCLING INVITRO NIAS Project is efficient decontamination of polypropylene, a polyolefin used in bags, containers and pipes. Being able to recycle this material would be a major step forward for its post-consumer use.

However, it is important to remember that recycled materials may contain non-intentionally added substances (NIAS), either from the recycling process or from the previous plastic material itself, which means that the risk of the presence of these substances in the resulting recycled material must also be assessed. Due to the difficulty of identifying, quantifying and monitoring the presence of NIAS using the analytical techniques mainly based in chromatographic technics, in vitro bioassays can be used to assess the risk of their presence in recycled materials. These in vitro techniques are based on cell cultures and are highly useful in the assessment of NIAS because they study overall toxicity, which makes them a valuable tool for the study of NIAS of unknown nature in complex mixtures.

The RECYCLING INVITRO NIAS Project has a two-fold mission. The first is to develop an innovative method for decontamination of polypropylene for use in food contact. And the second is to optimize in vitro bioassays that simplify the risk assessment process for NIAS and provide an analytical complementary tool to ensure the safety of food packaged or in contact with recycled materials.

05.

EVALUATION OF CHANGES IN THE QUALITY PARAMETERS OF SWEET PAPRIKA UNDER THERMAL TREATMENT

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Abstract

Paprika is a spice obtained from ground dried peppers (*Capsicum annuum* L.), which can be sweet or hot depending on its origin. It is widely used in the food industry as a colouring agent for both its characteristic flavour and its health properties, making it a safe and preferable alternative to the use of synthetic colourings. Factors such as heat, light and humidity can cause the degradation of some important compounds, such as carotenoids, that determine the quality of paprika. The paprika production process includes some steps (i.e. washing, drying and grinding) that can lead to the degradation of these compounds, but storage during the shelf life is one of the main factors that determine the loss of colour and antioxidant capacity. In this regard, the aim of this work was to evaluate the degradation of colour parameters, carotenoids profile and antioxidant capacity of sweet paprika samples from Peru, commercialized in the Region of Murcia, before and after an industrial thermal treatment (80ºC for 8h). The antioxidant capacity was analysed by FRAP and $ABTS^{\cdot+}$, colour parameters using CIEL* a* b* colour space and ASTA, and individual carotenoids content by HPLC-DAD. Because of the heat treatment, approximately 54 % of both a-carotene and b-carotene present in the samples were lost. Similarly, the heat-treated samples showed less antioxidant capacity and lower values for the CIEL* a* b* colour parameters a, L and H, as well as significant differences for ASTA. Thus, it has been shown that paprika samples experienced a significant decrease in their quality parameters during processing and storage. Further studies should shed light on new ways to limit this quality loss and preserve this food product with enhanced nutritional, organoleptic and bioactive properties.

06.

AGROINDUSTRIAL WASTES AS REINFORCEMENT FOR BIOBASED RIGID PACKAGING FORMULATIONS

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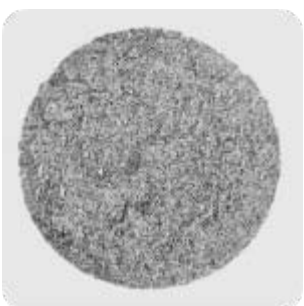
Abstract

The concept of biobased materials in the field of polymers aims to use alternative sources such as biomass instead of petrol to produce new materials. Polylactic acid (PLA) is one of the most attractive biobased polymers due to its excellent strength and biodegradability. However, its brittleness and poor heat resistance restrict its uses in many applications.



With the growing environmental awareness, the concept of sustainable development and eco-friendly materials has become a necessity in order to preserve the environmental resources and to give new alternatives of packaging materials aligned with the Directive 94/62/CE about packaging and packaging waste. In this context, the expansion of the use of natural and renewable lignocellulosic materials as reinforcing fillers in thermoplastic polymers is noticed in the number of scientific articles published, due to their low density, good thermal insulation and mechanical properties, sustainability, low price, and problem-free disposal. Therefore, the use of biopolymers blends, and natural fillers has been proposed to obtain biocomposites with improved properties.

In this context, the study carried out in the frame of AGROMATTER project deals with the use of rice husk as an innovative alternative to additivate the PLA matrix in extrusion compounding process. Additionally, different blends with compostable biopolymers (TPS, PBAT, etc.) and plasticizers were tested in order to obtain a final formulation suitable for rigid packaging applications.

Composites based on PLA with different percentages of rice husk have been obtained. Processing parameters and final formulations have been set up using lab and pilot scale twin-screw extruders. Most promising formulations at lab scale have been selected for the scale-up process and the production of a final prototype. Compounding parameters were optimized for rice husk additivation in order to take advantage of the reinforcing effect of the filler. Once produced, compounds were processed by injection moulding in a BATTENFELD HM45/210 machine for the production of packaging trays (see picture). Final prototypes were characterized in terms of mechanical, thermal and barrier properties. The results exhibit an improvement in thermal stability and barrier properties, reducing the oxygen permeability up to 20%. In view of the obtained results, these novel biobased composites with improved barrier properties have the potential to be used in different packaging applications.

07.

BIOTECHNOLOGICAL VALORISATION OF DIFFERENT AGRI-FOOD BY-PRODUCTS TO PRODUCE BUILDING BLOCKS FOR BIOMATERIALS

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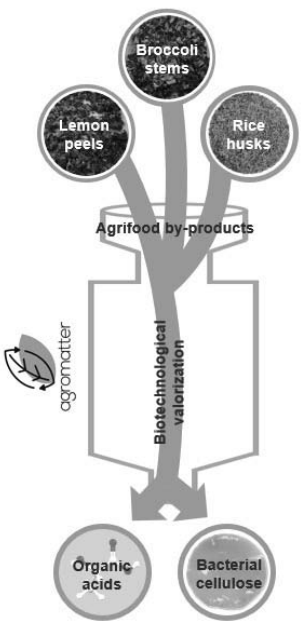
Abstract

The accumulation of **agri-food wastes and by-products** has become a relevant global concern, causing adverse effects for the environment, economy, and society. These materials are generally disposed in landfills or set aside for applications with low-added value. Nevertheless, their high content of nutrients makes them ideal for **biotechnological valorisation systems**. In this sense, different studies have been carried out in AGROMATTER project for the valorisation of a wide range of by-products, such as **lemon peels, broccoli stems and rice husks**, into compounds with high-added value and for multiple applications for the packaging sector: **lactic acid, succinic acid, and bacterial cellulose**. Firstly, these by-products were subjected to chemical and enzymatic hydrolytic pre-treatments, allowing the release of 2nd generation sugars (2G sugars). Considering the higher hydrolysis yield (80-90%) from lemon peels, the resulting lemon peels hydrolysates were selected as medium to generate different building blocks and biomaterials. Regarding the organic acids production, the optimization of lemon peels hydrolysates fermentations with lactic and succinic bacteria, separately, gave fermentation yields around 60-70% of the theoretical maximum reached for both lactic and succinic acids. Furthermore, the application of different sustainable and accessible downstream processes, such as evaporation, precipitation, and extraction, resulted in high purification yields (50-70%) in this step. In the case of bacterial cellulose production, 4 g of dry cellulose per litre of waste was achieved, which is a 4-fold higher yield than that obtained for the control process, with commercial medium.



Overall, an extensive study has been performed during the AGROMATTER project with the aim to determine the potential of different agri-food wastes and by-products, following different biotechnological processes. As a result, **high yields have been reached in the different steps of those processes** when using lemon by-products as raw materials.

08.

CHARACTERIZATION OF LEMON PEEL BY-PRODUCTS AFTER THE TREATMENT WITH PECTINASES

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Abstract

The lemon peel by-products come from the juice production, being an important source of pectin and phenolic compounds, that can be extracted to use as ingredient in food industry or for other industrial applications. The aim of this research was to analyze the chemical composition and functional properties of the lemon peel by-product, and to evaluate the impact of pectinase treatment. To achieve this objective the analysis were performed with two samples: dried lemon peel without treatment (CL) and lemon peel that was hydrolyzed with pectinase and then freeze-dried (CLp). The total, insoluble and soluble dietary fiber (TDF, IDF and SDF), were determined using an enzymatic-gravimetric method (Prosky et al., 1988). The fiber polysaccharides were estimated after the analysis of neutral sugars by GLC and uronic acids by spectrophotometry following the method of English et al., (1992). In addition, technological properties such as Water Retention Capacity (WRC), Swelling Capacity (SWC), and Fat Absorption Capacity (FAC) were measured for both samples, as well as, the content of extractable and non-extractable phenolic compounds, and the antioxidant capacity by Folin-Ciocalteu and the FRAP methods, respectively. Statistical analysis was performed using the SPSS program, applying a Student's t-test, and Pearson correlation. The results showed differences between the two samples, since the CL sample had a greater portion of soluble dietary fiber, better technological properties, and a higher concentration of phenolic compounds and antioxidant activity compared to the CLp sample, which contained a greater proportion of insoluble dietary fiber. The differences between the samples can be attributed to the treatment process and the hydrolysis of the pectins by the pectinase enzyme, which led to the breakdown of pectin chains, resulting in the loss of technological functions and properties. In summary, this research highlights the importance of pectinase treatment to modify the functional properties and chemical composition of lemon peel by-product.

09.

EVALUATION OF THE PREBIOTIC EFFECT OF BREWER´S BAGASSE BY *IN VITRO* FERMENTATION WITH HUMAN FECES

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Abstract

The brewing industry generates a large amount of waste per year, 85% of which corresponds to brewer's bagasse (1). Bagasse is composed of the remains of malt and rice that have been cooked to make brewers' wort, with a high percentage of moisture (75%), fiber (45%) and protein (26%), as well as a high content of phenolic compounds (2). The intestinal microbiota ferment dietary components, especially fiber and phenolic compounds, generating metabolites such as short-chain fatty acids, which can have beneficial effects on health. The aim of the present study was to characterize the prebiotic effect of bagasse meal using in-vitro bacth fermentation with a pool of feces obtained from a group of 8 volunteers. The fermentation protocol described by González-Barrio (3) was followed, and the study was approved by the Ethics and Biosafety Committees of the University of Murcia. Throughout the 48-hour duration of the fermentation trial, aliquots were taken to analyze the formation of short-chain fatty acids (SCFA), ammonium and lactic acid, also evaluating the total gas production and pH. The results revealed a production of SCFA (mostly acetic), as well as ammonium and lactic acid after fermentation of bagasse meal. The results obtained show that the addition of bagasse meal to products made from other cereal flours increases the dietary fiber content, improving the nutritional quality and increasing the beneficial effects on health due to its prebiotic effect.

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10.

VALORISATION OF AGRI-FOOD BY-PRODUCTS AND WASTES THROUGH LIGNIN ISOLATION AND DEPOLYMERISATION

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Abstract

In the first half of 20th century there was a clear trend to use biobased commercial products, mainly lignocellulose and its derivatives. From 1960 onwards, petroleum derived plastic featuring excellent properties became a technical and economic solution leading to environmental damage, though.

Lignin is one of the most abundant biopolymers in plants, forming the cell wall together with cellulose and hemicellulose in a regulated nano-structural arrangement, resulting in lignin-carbohydrate networks. In general, lignins are copolymers derived primarily from three basic phenylpropane monomeric units (monolignols): the most common types found in the building blocks of lignin are: p-coumaryl alcohol, coniferyl alcohol, sinapic alcohol. These monolignol-type compounds are interesting starting reagents for the production of aromatic compounds with high added value.

Depolymerisation of lignin via the Kraft process is mainly due to the breaking of the α- and β-aryl ether (C-O) bonds by lowering the pH, which also reduces the degree of ionisation of the molecules and favours self-aggregation. Since other components of the black liquor, such as inorganics, sugars and their degradation products, are soluble in water over a wide pH range, lowering the pH allows lignin precipitation and recovery at relatively low levels of carbohydrates.

The aim of this work is the direct extraction of lignin from different agricultural residues by means of an ultrasonic bath or probe, and its subsequent depolymerisation through different techniques such as ultrasonic bath, ultrasonic probe, high pressure reactor or microwaves.

The best results for lignin depolymerisation were obtained by using microwave technology and dioxane as solvent, which high polarity provides greater freedom to the chemical species. The depolymerisation achieved was of up to 90%. In the case of depolymerisation using an ultrasonic bath, only 52% of the lignin was depolymerised.

Finally, a large number of monomers have been obtained from the extract of both the black liquor and the residue remaining after lignin extraction or precipitation. These compounds

include guaiacol, vanillin, acetovanillona, syringaldehyde, acetosyringone and 2-2'methylenebis (4-methyl-6-tert-butylphenol, vanillinic acid, p-coumaric acid).

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11.

INTEGRATIVE & SUSTAINABLE APPROACH TO OBTAIN FUNCTIONAL INGREDIENTS FROM ORANGE BY-PRODUCTS – CASE STUDY ON ALGARVE´S *CITRUS* PGI

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Abstract

Sweet orange is the most widely consumed citrus fruit worldwide, with a production rate of 76 million tons in 2021[1]. The Mediterranean Basin accounts for 20% of the total worldwide production where, Portugal produces in the south region the uniqueness and quality Algarve´s *Citrus* PGI (Protected Geographical Indication). The Algarve region represents 70% of national production reaching in 2021 a total production of 0.36 M tons oranges. In Portugal, orange juice production account for 21% of the total production and, during this process almost 50% of orange weight by-products (OBP)[2]. Currently, the sustainable food waste management is considered a vital approach to promote the environment & economic & social sustainability's pillars therefore, OBP could be a profitable and sustainable source of bioactive compounds (BCs) since are rich in essential oils, phenolic compounds, pectin, cellulose, and other important nutritional molecules[3].

Nowadays, some companies, to accomplish with the recent EU directives to decrease the waste launched in landfills started applying the extraction of essential oils after the orange juice extraction. In addition, most of the pectin available in the market are already extracted from citrus waste including, OBP. However, these companies only extract individual valuable BCs and, for instance for pectin they use non-environment friendly methods with very pollutant solvents.

Hence, in this study an integrative and sustainable process was applied based on the green chemistry principles to valorize 25 kg of OBP from a supermarket juice squeezer (ZUMEX®). The OBP are from Algarve's citrus PGI (Lane Late cultivar). The application of cascade extraction demonstrates the promising circular economy approach and allows the production of several BCs: i) orange essential oil; ii) hesperidin-rich polyphenol extract; iii) pectin and iv) insoluble fraction rich in cellulose and lignin. The chemical composition and bioactivities of the various fractions were analysed demonstrating the potential of use these new functional ingredients to develop practical solutions for preventing and controlling human health diseases mainly associated with gut inflammation.

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12.

CHARACTERIZATION OF *CITRUS LIMON* PEELS FOR THE VALORIZATION THROUGH THE RECOVERY OF BIOACTIVE COMPOUNDS

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Abstract

Citrus belongs to the family Rutaceae and are one of the most widely cultivated fruit crop and one of the main consumed products in the Mediterranean area. The annual production of different types of citrus fruits was approximately 143 thousand tonnes, where lemons, *Citrus limon L*.; and limes, *Citrus aurantifolia* L. representing ca. 20 thousand tonnes, in the year 2019 [1]. The processing and consumption of citrus fruits generates a significant amount of waste, including peels, pulp, seeds, and pomace, which represents about 50% of the fresh fruit [2]. *Citrus limon (C. limon*) peels are composed of significant amounts of bioactive compounds, such as minerals, carotenoids, vitamins, essential oils (EOs), phenolic compounds (PCs), and fibres (mainly pectin), which confer them nutritional value and health benefits such as antimicrobial and antioxidant properties [3]. These by-products, which are typically discarded as waste in the environment, can be explored to produce new bioactive and functional ingredients, a desirable approach from a circular economy perspective. In order to understand the potential valorisation of the lemon peels (LPs) it was performed the nutritional characterization. The results showed a high and main concentration of carbohydrates (89.23 g/100 g DM) including a relevant content of dietary fiber (41.16 g/100 g DM). LPs also showed good results regarding vitamin C (56.24 mg/100 g DM) and minerals such as: potassium (597.68 mg/100g DM), calcium (581.04 mg/100g DM), and phosphorus (89.69 mg/100 g DM). PCs are the most important group of bioactive compounds in both Citrus fruit and its juice, determining their biological activity [4]. Eriocitrin and hesperidin were the majors PCs found in LPs at concentrations of 844.42 mg/100 g DM and 254.48 mg/100g DM, respectively. From *C. limon* peels is possible extract bioactive fractions, such as EOs. The recovery of the EOs of these lemon processing by-products, can be explored to produce new functional ingredients with preservative properties. For understand the preservative potential of EO from lemon peels, it was performed the characterization of aromatic/volatile compounds by GC-MS and the results showed the presence of 24 compounds representing approximately 98% of total. The compound D-limonene is the major constituent of LPs essential oils representing 59%, followed by (-)-β-pinene representing 9.88% and γ-terpinene representing 8.17%. According to these results, it can be concluded that LPs contain interesting bioactive compounds and are a good matrix for extracting functional ingredients, which significantly justifies their valorisation in different food applications and can be an innovative idea for a changing world.

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13.

REVALORISATION OF WASTE OR BY-PRODUCTS FROM THE AGRI-FOOD INDUSTRY INTO MULTIFUNCTIONAL INGREDIENTS FOR THE COSMETIC AND DETERGENCY MARKET

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Abstract

The growing consumer demand for sustainable beauty and home care products has led to the reinvention of the market via the use of upcycled ingredients. The waste products or by-products from the agri-food industry are a rich source of active metabolites that acquire the form of multifunctional products with high added-value properties in the sector. Within the framework of the AGROMATTER project, AITEX has studied the use of the extracts obtained from these raw materials in cosmetic formulations to validate their behaviour in different textures and analyse their effectiveness as formulas with high antioxidant potential. Likewise, solid waste from bones, seeds or shells have been used to develop exfoliating particles, offering a solution to the problem of microplastics used in scrub formulas. Notable developments include formulations made by lemon peel extracts with remarkable antioxidant potential, such as a regenerating cream and a shampoo; and scrub formulas made by natural upcycled particles such as olive stone by-product. On the other hand, taking advantage of the antimicrobial nature of the extracts, these raw materials have been included in detergent formulations as boosters of the preservative effect, reducing the use of chemical preservatives and increasing the natural value of the formulations. By using only 0.2% of preservative and the lemon peel extract, microbiologically stable detergent formulations have been developed viable to placing them on the market. In this way, with the use of upcycled ingredients, the AGROMATTER project leads multiple ways for the reinvention of the companies in an innovative and sustainable manner via the use of high added value multifunctional ingredients.

14.

TECHNOLOGICAL SURVEILLANCE ON SUSTAINABLE EXTRACTION TECHNOLOGIES AND TECHNOLOGICAL TRANSFER IN PATENTS ON THESE TECHNOLOGIES IN THE AGRI-FOOD SECTOR. VIPATMUR

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Abstract

Through a Technological Surveillance Report on extraction techniques and technology transfer on patents of those techniques for the agri-food industry and other activities, the sector will be helped to know how these processes are developed and their contribution to the 0 waste objective. Awareness will be raised in the food industry of the Region of Murcia about the importance of the recovery and use of by-products generated not only as environmental sustainability but as a source of wealth and economic profitability too. Three actions have been carried out:

ACTION 1. SURVEILLANCE ON TECHNOLOGY EXTRACTION AND TRANSFER TECHNIQUES OF SUCH TECHNIQUES FOR THE AGRI-FOOD INDUSTRY.

ACTION 2.- SURVEILLANCE AND TECHNOLOGY TRANSFER.

ACTION 3.- TECHNOLOGICAL SURVEILLANCE: FOOD LEGISLATION.

The most important results are the development of the Report on Sustainable Extraction Techniques that can be downloaded at https://www.ctnc.eu/wp-content/uploads/2022/06/INFORME-Vigilancia-tecnologica_-MOD2-CTNC-2022.pdf, 11 legislative alert bulletins in 2022 and the preparation of the XI International Simposium on Food Technologies.

Proyecto subvencionado por una cantidad global de 61.216,67 € por el Instituto de Fomento de la Región de Murcia (INFO) y cofinanciado en un 80%, es decir, hasta 48.973,34 € con recursos del Fondo Europeo de Desarrollo Regional (FEDER) asignados al Instituto de Fomento de la Región de Murcia con arreglo a la Subvención Global mediante la Decisión C(2015)3408, de la Comisión, por la que se aprueba el Programa Operativo de intervención comunitaria FEDER 2014-2020 en el marco del objetivo de inversión en crecimiento y empleo, en la Comunidad Autónoma de Murcia, como Región calificada en transición.

15.

OPTIMIZATION OF PHOSPHORUS RECOVERY FROM ANAEROBIC DIGESTER EFFLUENTS IN AGRI-INDUSTRY

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Abstract

Phosphorus (P) is an essential nutrient to sustain life. P is widely used by agriculture sectors as fertilizer to secure food production and sustain human necessities. Since the major sources of P come from non-replaceable and non-renewable natural phosphate rock reserves, it is expected a depletion of this raw material in the next 80 years. In addition, every year, it is estimated that up to 10 Mt are wasted into the hydrosphere causing serious environmental damage in water bodies (e.g., eutrophication). Alongside climate change and the increased risk of draughts in the near future, it is important to guarantee the quality of those water bodies and secure food and feed production in the agriculture sector. Therefore, to reduce the pressure in water bodies, we should increase the efforts to treat wastewater before release, which in turn can be used as a source for P recovery.

Thus, the main objective of the present work was the optimization of P recovery from full-scale Anaerobic Digestion (AD) effluents using precipitation methods with the addition of chemical (e.g., Mg, Ca or Fe salts), as well as exploring alternatives to conventional chemicals, such as seawater, bine (Mg-rich sources), and mussel shells and cork ashes (Ca-rich sources). This work is integrated in BIOECONORTE project - water and nutrients management based on BIOrefinery and circular ECOnomy towards a sustainable agri-food system of the NORTE of Portugal.

The addition of chemicals was based on the initial concentration of P in the effluent (brewery and dairy industry), and different molar ratios (salt:P) 1:1, 2:1, 3:1 or 4:1 were applied.

P precipitation using $FeCl_3$, at the different Fe:P ratios, showed a P-recovery between 88-100 % and 57-85% in brewery and dairy wastewaters, respectively. With the addition of $CaCl_2$, for the different Ca:P ratios, and adjusting the pH to 10, the P recovery ranged between 58-84% and 92-95% in brewery and dairy wastewaters, respectively. The experiments carried out with mussel shells (only with dairy wastewater, but for the different Ca:P ratios) demonstrated a P-recovery of 12-41%, 89-99%, and 98-99% when using raw shells, calcinated shells, and hydrated-calcinated shells, respectively. The seawater was tested in synthetic wastewater, at a 20% (v/v) ratio, showing a P recovery of 64%. In conclusion, these results demonstrate the viability of the use of alternative salt sources for P precipitation and recovery, contributing to the circular economy of agri-food industry.

16.

LACTOSE AND GALACTOSE CONTENT IN SPANISH CHEESES: USEFULNESS IN THE DIETARY TREATMENT OF PATIENTS WITH GALACTOSAEMIA

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Abstract

In galactosaemia, a strict galactose-free diet is necessary to prevent or resolve acute symptoms in infants. However, because the body produces up to 10 times more galactose than is found in a galactose-restricted diet, excessively restrictive diets should be avoided in children and adults to prevent nutritional deficiencies. Since cheese is a nutritional source of the calcium necessary for bone health, the latest international guidelines on the management of classical galactosaemia (2017) allow the consumption of cured cheeses with less than 25 mg of galactose/100 g and recommend that each country verifies the adequacy of the cheeses, since most mature cheeses do not always have a lower galactose content. In total, 32 cheese samples were purchased (19 Spanish and 13 international cheeses), and their lactose and galactose contents were analysed using ion chromatography with pulsed amperometric detection (IC-PAD). Five Spanish cheeses contained less than 25 mg of galactose/100 g: García Baquero semi-cured cheese; Hacendado, Gran Reserva and Mahon cured cheeses; and García Baquero Reserva 12-month cured cheese. In addition, eight international cheeses were confirmed as suitable: Comté, Gouda, Gruyere, Maasdam, Parmigiano, Edam, Emmental, and some samples of Cheddar. In addition to the well-known low-galactose Swiss and Dutch cheeses, according to the current results, five Spanish cheeses could be safely consumed whenever a long-term monitoring would have confirmed the performance of different bacterial cultures used in cheese production. The greater availability of types of cheese favours better bone health in patients with galactosaemia.

Keywords: inborn errors of metabolism; galactosaemia; galactose restriction; cheese; lactose; galactose.

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17.

WHAT IMPORTANCE DO WE GIVE TO SAMPLING?

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Abstract

Sample concept: a small part or amount intended to show how the whole is. If the sample is not representative, the sampling process is a waste of time, with confusing results and uncertainties.

The importance of cleaning methods: alcohol, steam, CIP/SIP.

What is the best technique for our process?

A suitable equipment guarantees a good sample, but the costs can change the approach. How to be sure to choose the correct solution?

Expert advice and test certificates issued by independent laboratories demonstrating the efficacy of such methods and devices should be sought.

When it comes to Microbiology, certain requirements must be demanded for the sampling devices and valves, such as the minimum dead volume, absence of welds in the body, internal roughness of less than 0.5µm, and design with two coaxial ports to effective disinfection. With this and good training, maximum reliability and the absence of false positives can be ensured.

However, attention should also be paid to the methods and equipment for the collection and transport of the samples, guaranteeing aseptic conditions.

18.

ESSENTIAL OILS AS NATURAL ANTIMICROBIAL AGENTS FOR FOOD PACKAGING APPLICATIONS

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Abstract

The antimicrobial properties of essential oils and their constituents have been extensively documented in recent years. Although the mechanism of action of some essential oil components has been previously explained, a detailed understanding of most of the compounds and their mode of action is still lacking. This knowledge is crucial in determining the impact of essential oils on various microorganisms. By using essential oils, the shelf-life of packaged products can be improved, microbial growth can be controlled, and consumer concerns regarding the use of chemical preservatives can be alleviated. Nanoparticles (NPs) functionalized with essential oils have notable antimicrobial potential against multidrug-resistant pathogens due to increased chemical stability and solubility, reduced rapid evaporation, and minimized degradation of active essential oil components. In this study, the antimicrobial activity of different types of essential oils (Orange, Cinnamon, Rosemary, Lime, Mint, Lavender, Thyme, Bergamot, Citronella, and Grapefruit) against gram-positive (*L. monocytogenes* and *S. aureus*) and gram-negative (*S. typhimurium* and *E. coli*) bacteria was tested using the disc diffusion method, both alone and in combination with ZnO NPs. The combined synergistic antibacterial activity of ZnO and essential oils was highlighted in the case of both gram-negative and gram-positive bacteria. The most effective mixture of ZnO was with thyme, rosemary, and cinnamon oils.

Keywords: essential oils, antimicrobial properties, ZnO nanoparticles, disc diffusion

19.

USE OF ESSENTIAL OIL NANOEMULSIONS TO DECONTAMINATE CHERRY TOMATOES ARTIFICIALLY CONTAMINATED

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Abstract

Processing of many vegetables in the food industry usually includes a washing step, with the main purpose of removing dirtiness on their surface, but also contributing notably to reduce microbial load. To better achieve this goal, washing water is conditioned with some antimicrobial compounds and sodium hypochlorite is usually the preferred option. However, carcinogenic substance formation, such as chloramines, advices against its use, and has given rise to the search for alternatives to replace chlorine.

Our research group has opened a new research line on the use of nanoemulsions of different essential oils and antimicrobial compounds present in essential oils as an alternative to chlorine for the decontamination of vegetables.

Cherry tomatoes were chosen as a model vegetable, after the low microbial load usually present on their surface. Tomatoes were artificially contaminated by dipping them in grown cultures of several microorganisms, both spoilage and food pathogens. Nanoemulsions of essential oils were prepared by ultrasonic homogenisation. Different concentrations and different contact times were tested, using water and hypochlorite as controls.

Results showed that, in general, about one log reduction of the microbial load could be achieved, which was similar to that shown by hypochlorite. The effect depended on the composition and concentration of essential oil, contact time and microorganism.

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20.

ALGAE4IBD – FROM NATURE TO BEDSIDE - ALGAE BASED BIO COMPOUND FOR PREVENTION AND TREATMENT OF INFLAMMATION, PAIN, AND IBD

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Abstract

In our oceans, rivers, and lakes hold almost untapped potential to improve our health. Cyanobacteria, micro- and macroalgae produce an endless number of molecules, many of which have health-promoting properties. They can relieve pain, reduce inflammation, or boost our microbiome. However, most algae remain unstudied, with their health potential unexploited. That is why we launched Algae4IBD, an EU-funded research initiative. Over four years, we will study under- and unexplored algae, and look for compounds with pain-relieving, anti-inflammatory, prebiotic, or antibiotic effects. Our goal is to develop functional food, and medication against pain, inflammation, and IBD (Inflammatory bowel disease). Pain, inflammation, and an imbalanced gut-microbiome are all characteristics of IBD. The combined power of algae can help improve the well-being of IBD patients. IBD is a complex disease whose incidence is steadily increasing. Patients require tailored therapies which are often expensive. However, not everyone responds to the available treatments, leaving some with only one option: surgical removal of parts of their bowel. Therefore, a great need for new medication exists. Our focus is on providing orally available and cost-effective solutions for IBD patients – kids and adults – using algae compounds.

Keywords: algae, IBD, Horisont, patients, compounds

Acknowledgement: Algae4IBD – from nature to bedside - algae based bio compound for prevention and treatment of inflammation, pain, and IBD. Project Horizon 2020.

21.
ANTIMICROBIAL EFFECT OF DIFFERENT ESSENTIAL OILS

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Abstract

Alternatives to today's medicines, such as plant essential oils, are very promising. Their dosage needs to be more thoroughly investigated. The geographic location of the parent plant also has an impact on the grade of essential oil. The composition of essential oils has been found to vary depending on the place of production. They have a lot of possible applications in the fields of health, pharmaceuticals, food, gardening, and cosmetics. We used the disk diffusion method, and the minimum inhibitory concentration (MIC) test to determine the antimicrobial activity of plant essential oils *Thymus serpyllum, Lavandula angustifolia x latifolia*, and *Citrus aurantium* var. *bergamia* on a species of microorganisms, including *Bacillus subtilis, Enterococcus faecalis, Micrococcus luteus, Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella enterica subsp. enterica, Serratia marcescens, Candida albicans, Candida glabrata, Candida krusei, Candida tropicalis* using the disk diffusion method and the minimum inhibitory concentration method were determined. All the essential oils demonstrated potent antimicrobial activity by the disk diffusion method against both Gram-positive, and Gram-negative bacteria. The antimicrobial action of yeasts has been found to be moderate to weak. We found that bergamot essential oil had the greatest inhibitory effect on all the microorganisms we used, according to the technique of minimum inhibitory concentration. or wild thyme essential oil, this effect was the lowest.

Keywords: essential oils, antimicrobial activity, disc diffusion method, minimal inhibitory concentration

Acknowledgement: This work has been supported by the grants of the APVV-20-0058, „The potential of the essential oils from aromatic plants for medical use and food preservation ".

22.
INFLUENCE OF SPICES ON MICROBIOLOGICAL QUALITY OF BEEF DURING STORAGE

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Abstract

The aim of the present study was to evaluate the microbiological quality of beef treated with powdered spices (curry, chilli, black pepper, red pepper) with rapeseed oil in combination with vacuum packaging during storage of meat. Samples from beef shoulder were used in the experiment. Total viable counts (TVCs), coliform bacteria (CB), and lactic acid bacteria (LAB) and genus *Pseudomonas* were determined on the 0^{th}, 5^{th}, 10^{th}, 15^{th} and 20^{th} days of storage of beef at 3 ºC. Individual species of isolated microorganisms were identified using a MALDI-TOF MS Biotyper. Our results show, that the number of TVCs ranged from 2.19 log CFU.g^{-1} to 4.42 log CFU.g^{-1} in aerobically packed control samples on the 20^{th} day of storage. The number of CB were in range from 1.12 log CFU.g^{-1} in the control samples with vacuum packaging on 10^{th} day to 3.33 log CFU.g^{-1} in the aerobically packed samples on 20^{th} day of storage. CB were not present in the samples treated with spices. The highest number of LAB was 2.68 log CFU.g^{-1} in the control samples with vacuum packaging on 20^{th} day of storage. The bacteria of genus *Pseudomonas* were present only in aerobically control samples and they ranged from 1.28 log CFU.g^{-1} on 10^{th} day to 2.02 log CFU.g^{-1} on 20^{th} day of storage. The most commonly isolated bacteria from samples of beef meat was *Lactobacillus sakei* belonging to family Lactobacillaceae, *Brochothrix thermosphacta* belonging to family Listeriaceae, *Kocuria rhizophila* belonging to family Micrococcaceae, *Pseudomonas fragi* and *Pseudomonas lundensis* belonging to family Pseudomonaceae. In conclusion, chilli spices showed the highest antimicrobial activity.

Keywords: beef, spices, microorganisms, antimicrobial effect, vacuum packaging

Acknowledgement: This work has been supported by the grants of the APVV-20-0058, „The potential of the essential oils from aromatic plants for medical use and food preservation “.

23.

SCIENTIFIC SUPPORT OF CLIMATE CHANGE ADAPTATION IN AGRICULTURE AND MITIGATION OF SOIL DEGRADATION

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Abstract

The changes of climatic conditions have a strong impact on agriculture and decrease in soil fertility. The Slovak university of agriculture in Nitra have long term researches in order to improve yields of agricultural crops connected with environmental changes. Our activity of current project, URANOS, was focused on a proposal of adaptation arrangements to prevent negative impacts due to climate change in agriculture. A part of the project was focused on alternative approaches of land management and fertilization, to find ecological solutions in ratio of soil management related to yields of the crops.

During our activity the assessment of chemical, physical and microbiological properties of soils was evaluated in soils tilled with conventional and no-tillage technology. Also, the impact of fertilization to microbial composition was evaluated.

Acknowledgement: This publication is the result of the project implementation: „Scientific support of climate change adaptation in agriculture and mitigation of soil degradation" (ITMS2014+ 313011W580) supported by the Integrated Infrastructure Operational Programme funded by the ERDF.

24.

PDAPP OPERATIVE GROUP: ADVANCING TOWARDS A DIGITAL MODEL FOR ZERO WASTE IN THE AGRI-FOOD SECTOR

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Abstract

The PDApp Operational Group (GO) faces one of the main current challenges in the food chain such as food losses and waste (FW), with multiple social, environmental and economic consequences. In Europe, the most recent data suggests that 20% of the food produced ends up wasting.

Its objective is to **reduce food losses and waste** (FLW) in the **agricultural sector**, particularly in the **fruit and vegetable sector**, through digital tools. Specifically, a decision support service will be designed for companies and agents in this link that will help them prevent FLW. This service includes the necessary accompaniment so that they can digitize their Plan for the Prevention and Reduction of Food Losses and Waste, an element that will be mandatory in the future.

Work will also be done on a **digital tool** that seeks to allow the exchange of surpluses generated between different agents (processing industry, NGOs receiving donations, livestock farmers, feed manufacturers, etc.), guaranteeing traceability and reporting of FLW to the administrations, which is also expected to be mandatory once the state regulations in this regard have been approved. In addition, an accurate diagnosis of food losses and waste in the fruit and vegetable sector will be carried out and awareness will be raised about the importance of measuring and reducing FLW.

The PDApp Operational Group is made up of the following members: Fundación Espigoladors, Centro Tecnológico de la Energía y del Medio Ambiente (CETENMA), Centro Tecnológico EnergyLab, Oreka Circular Economy, Coordinadora de Organizaciones de Agricultores y Ganaderos (COAG), Kiwi Atlantico, Jimbofresh y Conca de la Tordera

25.

ALGACEUTICAL: DEVELOPMENT OF SPHERIFICATIONS FROM MICROALGAE

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Abstract

Microalgae biomass represents a rich source with diverse possibilities. The potential of algae-based ingredients in industry lies in the manipulation and selection of ingredients to meet increasingly specific product specifications. Algae are exposed to extreme environments and have therefore developed a unique protection mechanism. In addition, algae produce different metabolites that we need to identify and exploit in a sustainable way for the production of food, medicines and cosmetics.

AlgaeCeuticals project aims to exploit native algae that produce high added-value products by applying new technologies for encapsulation and production of new products. AlgaeCeuticals aims to examine and characterise algal biodiversity, develop and optimise algal cultivation systems, develop processing strategies and develop novel products.

Product development is a key point for the food industry, from refining an already existing product to developing a completely new one.

Esterified foods have currently undergone a great development, mainly due to their application in the restaurants by famous chefs.

Within the development of new products, spherifications of microalgae (Chlorella and Spirulina) and algae oil have been carried out. Optimal processing conditions have been studied and a shelf life study has been carried out (with sensory, microbiological and nutritional analysis) to determine the commercial life of the products.

Project Number: 778263 Funding scheme: H2020-MSCA-RISE-2017 (Marie Skłodowska-Curie Research and Innovation Staff Exchange)

Keywords: Microalgae, Novel food, Spherification, Encapsulation.

26.

GREEN SUNSCREEN WITH MICROALGAE-BASED UV-ABSORBING COMPOUNDS

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Abstract

Microalgae are a valuable source of a vast array of biomolecules such as pigments, proteins, vitamins, fatty acids and minerals. All these valuable bioactive compounds drew attention by the cosmetics industries to be exploited in the formulation and help to achieve benefits like the maintenance of skin hydration, the protection against UV radiation and the prevention of aging. Nowadays, there is a tremendous rise in the cosmetic market with green products having a dual activity, such as anti-aging and sun protection. It is known that microalgae tend to adapt to UV radiation by developing defense mechanisms including DNA repair, synthesis of antioxidants and UV-absorbing compounds. A remarkable group of microalgae natural products are the mycosporine-like amino acids (MAAs). MAAs are widespread in many macroalgae species, including Chlamydomonas. Chlamydomonas species are considered as GRAS by FDA, since they do not produce any endotoxins and infectious agents, thus they do not raise any health risk. Inspired by the strategy developed by microalgae exposed to UV radiations in confined ecosystems, our work aims to the development of novel UV-protective cosmetics formulas based on naturally occurred MAAs from Chlamydomonas species. MAAs are promising natural alternatives for both direct (UV-absorption) and indirect (antioxidant) skin protection. Furthermore, the effect of microalgae proteins/peptides in cosmetics formulations were also investigated and assessed as additive material for enhancing stability and total antioxidant capacity.

Project Number: 778263 Funding scheme: H2020-MSCA-RISE-2017 (Marie Skłodowska-Curie Research and Innovation Staff Exchange)

27.

IMPACT OF HOT AIR DRYING PROCESS ON NUTRITIONAL AND SENSORY PROPERTIES OF COOKIES PREPARED FROM CAMEROONIAN PUMPKIN POWDER

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Abstract

This study aims to assess the effects of hot air drying treatment using different temperature, on nutritional and sensorial properties of cookies prepared from Cameroonian pumpkin powder. Pumpkins pulp were washed, peeled, cut into slices of 5 mm thickness and dried in a hot air drying, at selected temperature ranged from 40 to 60°C during 36 to 48 hours. The proximate chemical composition of cookies was significantly different ($P < 0.05$) by increasing of drying temperature. There was a significantly increase in fat, proteins and carbohydrate of produced cookies compared to control. Cookies obtained from pumpkin powder dried at 40°C showed the highest level of sugar (14.12 ± 0.020g/100g edible portion) and proteins content (6.67 ± 0.091g/100g edible portion), while the lowest level of proteins content was measured in cookies prepared from pumpkin powder dried at 60°C (2.80 ± 0.020g/100g edible portion). Sensorial properties of cookies were not significantly ($P < 0.05$) affected by increasing of drying temperature. Cookies obtained from pumpkin powder dried at 40°C showed the highest score of texture, taste, aroma, aftertaste and acceptability. These results suggest hot air drying temperatures affect nutritional and sensorial properties of pumpkin powder and cookies. Pumpkin powder obtained from pumpkin pulp dried at 40°C could be a great substitute in food industry for the manufacturing of free-gluten bakery products.

Key words: pumpkin powder, cookies, hot air drying, properties

28.

THE PURCHASING BEHAVIOUR OF THE CONSUMERS FROM S.E. ROMANIA, TOWARDS LOCAL/TRADITIONAL PRODUCTS

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Abstract

The study was done in the framework of the implementation of the project - Loc Food - "Development and cross border cooperation in the area of agricultural products and traditional food" which is implemented in the framework of the Joint Operational Program Black Sea Basin 2014-2020 (ENI CBC BSB 2014-2020) (Priority 1, Specific Objective 1.2).

The aim of the research is to investigate the consumer behaviour of the inhabitants of the SE Romania with regard to local / traditional products. The methodology to be followed is the primary / quantitative research to be carried out by creating and using face to face and electronic questionnaire to be completed through the Google Forms Online Application.

The questionnaire was divided into 3 sections. Section A refers to demographic questions. Section B refers to questions regarding the consumption of local / traditional products and focuses on the frequency of consumption of both Romanian local / traditional products. Section C concerns the recognizability of food quality labels and the consumer confidence in the quality that results from them.

The study was conducted on a group of 250 consumers, 16 % male and 84 % female, mostly from SE of Romania and from urban area. 44 % of the consumers consider that the access (availability) to local/traditional product market is satisfactory. 42 % prefer to consume traditional /local products at home and 46 % at the restaurant. Local/traditional products are consumed except holidays, celebrations, meetings at home mainly on a daily basis. 77 % of consumers agree that the foreign visitors will prefer local/traditional food over standardized. Most of the consumers (38 %) trust the products that bear with the EU labels but more (45 %) trust moderate. Most people know EU labels (TSG, PGI, PDO, Organic) and also the Romanian Traditional label.

By promoting the traditional values, their importance is highlighted, being attracted more consumers in the area of traditional products.

Key words: *Traditional food, local food, European food labeling, cosumers, SE Romania.*

29.

ET1CHEAPBIOPLASTIC: TREATMENT OF FOOD BY-PRODUCTS FOR THE PRODUCTION OF BIOPLASTICS

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Abstract

Plastics have become one of the most manufactured materials and present in our daily lives. Conventional plastics are formed from monomers, which are produced in a series of steps producing pollutants and greenhouse gases such as carbon dioxide (CO_2), thus contributing to environmental pollution and global warming. In addition, many petroleum-based plastics are not biodegradable, which causes their persistence at the disposal site and damages the environment. Eliminating the use of single-use plastics in food packaging does not seem to be the solution, since these packages help to greatly extend the shelf life of food, thus avoiding a large proportion of food waste. In order to address this global problem, alternatives to conventional petroleum-based plastics have been sought. One of these "green" alternatives are bioplastics, which are environmentally sustainable polymeric compounds similar to synthetic plastics. Therefore, the ET1CHEAPBIOPLASTIC project aims to study pomegranate, artichoke and broccoli by-products for the production of bioplastics in order to reduce their production costs and increase their applications.

In the aqueous substrates of artichoke and pomegranate, the levels of polyphenols it contains makes it an unfavourable substrate since this compound is an inhibitor of bioplastic-generating bacteria, therefore it did not help the growth of any of the microorganisms. The tests using *Pseudomonas aeruginosa* as a microorganism capable of producing PHA using a broccoli by-product substrate were satisfactory since in all the tested conditions the presence of these cytoplasmic granules under fluorescence microscopy was discovered.

Keywords: Bioplastic, Low costs plastics, Food waste, Synthesis PHA.

Proyecto subvencionado por una cantidad global de 99.893,44 € por el Instituto de Fomento de la Región de Murcia (INFO) y cofinanciado en un 80%, es decir, hasta 79.914,75 € con recursos del Fondo Europeo de Desarrollo Regional (FEDER), asignados al Instituto de Fomento de la Región de Murcia con arreglo a la Subvención Global mediante la Decisión C(2015)3408, de la Comisión, por la que se aprueba el Programa Operativo de intervención comunitaria FEDER 2014-2020 en el marco del objetivo de inversión en crecimiento y empleo, en la Comunidad Autónoma de Murcia, como Región calificada en transición.

30.

ET2NOVELTECH: COMPARISON OF CONVENTIONAL AND EMERGING TECHNOLOGIES FOR THE EXTRACTION OF COMPOUNDS OF INTEREST FROM AGRI-FOOD WASTES

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Abstract

Food by-products and wastes are potential sources of bioactive compounds, which are of great interest to the food, cosmetic and pharmaceutical industries. The revaluation of these by-products leads to a reduction in environmental pollution due to the reduction of waste, as well as improving the profitability of industries by adopting a circular economy economic model in their production systems. In this study, different low-cost extraction and purification methods, alternative to traditional ones, will be developed to obtain bioactive compounds of interest in artichoke and pomegranate waste by using green technologies, which have high yields and provide a viable economy.

The most representative phenolic compounds of various agri- food wastes have been recovered: artichoke by-product (Chlorogenic Acid, Caffeic Acid and Cynarin), pomegranate by-product (Punicalagin and Ellagic Acid) through different extraction processes: Aquous, ultrasound, enzymatic and polymeric resins technologies.

Pomegranate extracts showed levels of total polyphenols up to 315 g of galic acid/kg when the ultrasound assisted extraction followed by purification with PAD610 (Purolite) resins were applied. In the case of artichoke by-products the optimized extraction technology was aqueous extraction purified by PAD610 (Purolite) resin, the levels of total polyphenols was up to 142 g of galic acid/kg.

Keywords: Pomegranate, Artichoke, By-product, Green extractions, Antioxidante Capacity, Compounds of interest.

Proyecto subvencionado por una cantidad global de 122.685,53 € por el Instituto de Fomento de la Región de Murcia (INFO) y cofinanciado en un 80%, es decir, hasta 98.148,42 € con recursos del Fondo Europeo de Desarrollo Regional (FEDER) asignados al Instituto de Fomento de la Región de Murcia con arreglo a la Subvención Global mediante la Decisión C(2015)3408, de la Comisión, por la que se aprueba el Programa Operativo de intervención comunitaria FEDER 2014-2020 en el marco del objetivo de inversión en crecimiento y empleo, en la Comunidad Autónoma de Murcia, como Región calificada en transición.

31.

ET1MILDTREATMENT: APPLICATION OF MICROWAVE-ASSISTED PASTEURIZATION OF STRAWBERRY PUREE

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Abstract

Strawberry puree is a food product of great importance in the beverage industry due to its unique aroma, color and flavor; however, these organoleptic characteristics may deteriorate during thermal treatment.

The continuous flow thermal processing of liquid foods aims for the inactivation of unwanted enzymes and microorganisms with minimal quality degradation. In the use of conventional heat exchangers (tubular or plate), thermal exchange occurs only by convection, which makes heating slow and non-uniform when in laminar flow. Microwave-assisted processing is of interest for the food industry due to the rapid volumetric heating. The microwave radiation penetrates directly into the food resulting in high rates of heat transfer, high energy conversion efficiency and lower wall temperatures.

To validate the benefits of continuous flow microwave-assisted systems strawberry puree has been pasteurised and compare to conventional tubular heat exchangers heat treatment. The flavor and nutritional quality, phenolic contents, total organic acids, total soluble sugars and microbiology profiles of strawberry puree were not significantly different between the fresh and microwave processed samples, as opposed to conventional processing with heat exchangers. Therefore, this study indicated the potential of microwave processing technology to allow the retention of fresh-like qualities of strawberry after thermal processing. Quality improvement was attributed to the fast heating and to the lack of overheated heat exchange surfaces, which reduced the product exposure to high temperatures

Keywords: Microwave, heat treatment, pasteurization, food.

32.

ET2FRESACAPS: RESEARCH ON ENCAPSULATION AND MICROENCAPSULATION OF STRAWBERRY EXTRACTS

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Abstract

The aim of this project is to preserve the reactivity of the ingredient from the environment, e.g. light, water and oxygen, and by controlling the rate at which this active material is transferred to the medium. Encapsulation and microencapsulation can promote uniform mixing of bioactive compounds and facilitate handling by preventing the formation of clumps. Another function of encapsulation and microencapsulation is that the coating controls the release of the encapsulated content, masks any unpleasant characteristics, such as off-flavours, and contributes to the dilution of the encapsulated content when the bioactive compounds are to be used in small amounts. In addition to its protective function, encapsulation can also play an important role in improving the functional properties of bioactive molecules, including solubility, emulsification and thermal stability. The main mechanisms involved in the gradual release of the encapsulated material are diffusion and controlled degradation, the use of an appropriate solvent, as well as the combined effects of pH, temperature and pressure. ET2FRESACAPS project studies different mechanisms for the encapsulation of extracts obtain from strawberry by-products with the aim to protect and promote their bifunctional capacities.

Keywords: Encapsulation, Microencapsulation, Food ingredient, Compounds of interest.

33.

AGROMATTER: ESTABLISHMENT OF A CERVERA NETWORK FOR THE DEVELOPMENT HIGHLY SUSTAINABLE TECHNICAL MATERIALS DERIVED FROM SUBPRODUCTS OR RESIDUES OF THE AGRICULTURAL INDUSTRY AND NATURAL SPACE CONSERVATION OPERATIONS

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Abstract

There is a growing interest in the development of initiatives for the treatment of food by-products and the recovery of compounds of interest from them, due to the double advantage that they present, since apart from reducing the volume of waste and minimizing the costs involved in waste management, it is possible to recover a product or obtain a new one that can be marketed, with the consequent benefit from the economic point of view. Broccoli and lemon y-products are potential sources of compounds of interest, including phenolic compounds, edible fiber, proteins and sugars, of great interest to the food, cosmetic and pharmaceutical industries. For the extraction of compounds of interest in by-products, different alternative methodologies to the use of organic solvents have been used, including thermal and enzymatic treatment, ultrasound, subcritical water, obtaining extracts rich in edible fiber with antioxidant capacity. Functional foods have been developed with the broccoli and lemon extracts obtained to replace it with modified starch because these extracts have thickening power.

Keywords: By-product, Green extractions, Functional food, Compounds of interest.

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For any additional information regarding this project: www.ctnc.es, or National Technological Centre for the Food and Canning Industry CTNC. Calle Concordia s/n 30500 Molina de Segura, Murcia, Spain. Tel: +34 968389011 ctnc@ctnc.es.

34.

ANALYSIS OF THE COMPOSITION, ANTIOXIDANT CAPACITY AND ANTI-INFLAMMATORY EFFECTS OF OILS DERIVED FROM OLIVE PITTING.

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Abstract

Virgin olive oil is an essential part of the Mediterranean diet, with proved anti-inflammatory properties. In this work, we determined the composition and antioxidant capacity of seed and pulp oils derived from an alternative processing method (i.e. pitting) of olives in comparison with extra virgin olive oil (EVOO). Seed oil contains the lowest peroxide levels of the three oils analyzed and similar K232 and K270 values to pulp oil and EVOO, indicating a lower oxidation state. Concerning its composition, seed oil has a lower content of oleic acid (65.2%) than pulp oil and EVOO (75.2 and 81.2%, respectively), but contains higher levels of linoleic acid (20.9%). The content of sterols and terpene alcohols was similar in all the three olive oils. Seed oil also contains higher amounts of beta-tocopherol and lower concentrations of alpha-tocopherol compared with pulp oil and EVOO. Overall, seed oil shows a greater antioxidant capacity than EVOO and pulp oil. In addition, we also evaluated the anti-inflammatory capacity of seed and pulp oils in adult zebrafish individuals, regularly fed with controlled commercial diets enriched with these oils and exposed to the inflammation inducer LPS (bacterial lipopolysaccharide). The addition of olive oils to the diet effectively inhibited the increase in cytokine production in all cases. However, olive seed oil showed a greater protective effect that is well correlated with its higher antioxidant capacity. These preliminary data suggest that olive seeds, resulting from the pitting process, could be incorporated into the production chain in the form of oil for its use as nutritional supplement in the diet.

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35.

2S ALBUMIN-LIKE PROTEINS OF THE OLIVE SEED.

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Abstract

Olive seeds constitute a material with high agri-food and biotechnological potential that is beginning to be analyzed with a focus into its potential exploitation. Up to date, we have proteomic information regarding the seed, as well as a *de novo* assembled transcriptome. Among the olive seed proteins, 2S albumin-like proteins (seed storage proteins or SSPs) have a high nutritional interest due to their relative abundance and nutritional characteristics. After using the generated transcriptomes to retrieve information, bioinformatic analyzes were performed, identifying 49 olive 2S sequences, 12 of which have been used in the alignment and phylogenetic analysis. Secondary and tertiary structure predict that 2S albumins are prolamins with a function of seed storage. consisting of two domains: the first, a helical hydrophobic domain typical of seed storage function, and the second, a structural domain consisting of 4 helices with a beta-sheet or folded sheet topology, and forming a right-handed superhelix. Alpha-amylase inhibitors are integrated into this domain. The 2S albumin-like contains 15 sulfur atoms, 8 cysteines (participating in 4 disulfide bonds) and also contains 7 methionine residues. In addition, we have managed to generate a specific antibody by designing synthetic peptides based on its sequence that serves to experimentally validate its expression in the seed, analyze their digestibility, allergenicity, cell localization and other properties of interest for their potential use as a food.

This work has been supported by grants AT17_5247, P18-RT-1577 and PYC20_RE_009_CSIC. EEZ (Junta de Andalucía/FEDER/UE) and PID2020-113324GB-100 (MCIU/FEDER/UE).

36.

DEVELOPMENT OF GLUTEN-FREE FUNCTIONAL BREAD ADAPTED TO THE NUTRITIONAL REQUIREMENTS OF CELIACS

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Abstract

Coeliac patients suffer from nutritional deficiencies before and during maintenance of a gluten-free diet; this is due to non-fortified, mostly processed foods, high in saturated fat and deficient in minerals typically present in wheat. A literature search was carried out to determine the deficiencies of these patients: calcium, iron, fibre, folic acid, omega-3, vitamin B12 and vitamin D. Different formulations of gluten-free bread enriched in olive extract (hydroxytyrosol of natural (HXT_O) and synthetic (HXT_S) origin), acerola extract, citrus extract, spinach extract, calcium, iron and linseed were used. Antioxidant capacity, lipid oxidation, volatile compounds, nutritional composition, folates, minerals, colour, pH, microbiological study and sensory analysis were studied to assess organoleptic quality. These studies were carried out on days 0, 4, 7 and 11 to study their evolution. The results in the HXT_S bread showed a higher antioxidant capacity, lower lipid oxidation, pleasant volatile compounds, as well as a higher amount of minerals. It also showed high consumer acceptability, even in relation to commercial gluten-free bread. The HXT_O bread showed a higher antioxidant capacity than the control (C), a higher number of volatile compounds and a higher mineral content; but it showed a higher lipid oxidation. It also had a better sensory acceptability than C, but worse than HXT_S bread. Taking into account the physico-chemical and organoleptic characteristics, the HXT_S sample is the most suitable for enriching the diet of coeliacs.

37.

PROXIMATE COMPOSITION AND ANTIOXIDANT PROPERTIES OF FIVE SEAWEEDS: *PORPHYRA UMBILICALES, UNDARIA PINNATIFIDA, ULVA LACTUCA, HIMANTHALIA ELONGATA* AND *ARTHROSPIRA PLATENSIS*

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Abstract

Seaweed has been used as food for many years in Asian countries. However, as a result of globalisation, migratory movements and new dietary trends, seaweed consumption is increasing in Western countries. The nutritional profile of seaweed makes it of great importance, as it provides large amounts of micronutrients and other components. Due to their richness in minerals and macronutrients, the antoxidant capacity,total phenolic compounds and the bio-accessibility of minerals of five different seaweed (*U. Pinnatifida, Spirulina, U. lactuca, H.elongata and P. umbilicales*)were studied. In addition, the chemical composition, amino acid profile, fatty acid profile, folates and mineral content were also evaluated. Analyses reported high total fibre, insoluble fibre and soluble fibre content in H. elongata, while Spirulina was found to have a high protein and fat content. Regarding mineral content, U. lactuca and P. umbilicales were the algae with the highest iron bioaccessibility; K, Na, Mg and P being the most concentrated elements. On fatty acids, polyunsaturated fatty acid (PUFAs) were the predominant fatty acids in the five seaweeds evaluated, followed by saturated fatty acids (SFAs) and monounsaturated fatty acids (MUFAs). On the other hand, the obtained values using FRAP and ABTS methods showed high antioxidant capacity in *H.elongata* directly related to the increased content of phenolic compounds. However, with the ORAC method, a higher antioxidant capacity was obtained in *P. umbilicales*. Glutamic acid and asparagine were the predominant amino acids found. Finally, the most abundant form of folate was folic acid (278.30-655.91µg/100g DW) and 5FTHF (51.71-318.02 µg /100g DW). In view of the results, the seaweeds can be incorporated into the diet as a functional ingredient or as a fortifier of any kind of food. The important source of minerals, phenolics, proteins, polyunsaturated fatty acid, amino acid and folates make its an excellents extracts with beneficial properties.

38.

PRIMARY AND SECONDARY METABOLITES CONTENT IN EIGHT VARIETIES OF BLOOD ORANGES GRAFTED ONTO *CITRUS MACROPHYLLA*

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Abstract

In Europe the cultivation of blood oranges for fresh consumption is increasing due to their excellent organoleptic and nutraceutical properties, which give this fruit functional status. Blood orange has a higher content of bioactive compounds than white orange, conferring additional benefits for human health. In Spain, its cultivation is scarce and not widespread, however, consumer interest is increasing substantially due to its numerous benefits for human health. For this reason, a characterization and comparison between the main varieties of blood orange consumed internationally is necessary and timely. The content of primary metabolites was characterized by ^{1}H NMR and secondary metabolites by HPLC-ESI-DAD-MS^{n} of eight varieties of blood orange (Sanguinelli, Tarocco Sant'Alfio, Tarocco Dalmuso, Tarocco Rosso, Tarocco Gallo, Tarocco Scirè, Tarocco Meli and Moro) grafted onto *Citrus macrophylla* and cultivated under the environmental conditions of southeastern Spain. These varieties of blood oranges are the most widespread in the Mediterranean basin. The most abundant primary metabolites were proline, aspartate and asparagine, citric acid and sucrose. The highest content of amino acids, organic acids and sugars were found in Tarocco Sant'Alfio and Tarocco Dalmuso, Tarocco Meli and Moro, and Tarocco Meli and Tarocco Scirè, respectively, being the most important varieties in terms of nutritional content. Moro and Sanguinelli juice obtained the highest content of phenolic compounds, being especially interesting for consumers who demand fruits with a high content of bioactive compounds. In fact, Moro juice had the highest levels of total flavones and flavanones (90.07 and 592.88 mg L^{-1}, respectively), and Sanguinelli in total anthocyanins (101.06 mg L^{-1}). To conclude, Tarocco Dalmuso obtained the best values of agronomic parameters, and Moro and Sanguinelli in the highest content of phenolic compounds. In general, the knowledge generated in this work can be used for the agrifood industry by identifying some of the most interesting varieties of blood oranges from the agronomic and/or nutritional point of view. Despite this, more research is needed, particularly on the possible effect of biotic and abiotic stress or rootstock/graft combinations on the bioactive compounds that make them attractive to the agrifood industry.

Keywords: Amino acid; anthocyanins; blood orange; flavones; flavanones; organic acid; phenolic compounds; sugars.

39.

DDIBIORESIN: THE SEARCH FOR NEW BIOPOLYMERS

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EVERSIA S.A., TECNOPACKAGING, UNITED BIOPOLYMERS and UNITED RESINS

Abstract

DDIBIORESIN's aim is to develop new **biopolymers for industrial applications using rosin resins,** in order to create marketable bioplastic products for final packaging.

The project consortium is composed of United Biopolymers and United Resins, who act as material suppliers, as well as EVERSIA and TECNOPACKAGING, who collaborate as bioplastics handlers. As part of the project, both companies will act as industrial end-users, receiving pellets from the materials developed. They will work on optimising them and on adapting manufacturing processes.

The optimised materials will then be used to manufacture three final packaging products.

EVERSIA's objective is to develop a bioplastic film using rosin, which will be used to manufacture an ultra-lightweight bag for transporting fruit and vegetables in bulk. This bag will have improved mechanical properties such as increased resistance to tearing and greater weight bearing. In aesthetic terms, it will also be more transparent.

The use of DDIBIORESIN's new biopolymers for the manufacture of food packaging products is a revolutionary breakthrough that will have a significant impact on the packaging market, as there are currently no similar products based on mixing rosin derivatives, starch and biodegradable polyester polymers.

- Funding body: CDTI and European Union (EUROSTARS-2 programme)
- Dates: 01/06/2021 to 31/05/2023
- File no.: CIIP-20211004

40.

DIGITALIZATION OF THE AGRICULTURAL AND FOOD INDUSTRY FOR THE OPTIMIZATION OF RESOURCES AND ASSURANCE OF TRACEABILITY, QUALITY AND AGRI-FOOD SAFETY. GO DIGFOOD

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Abstract

Currently, the agri-food industries base their internal quality controls on wet analysis using techniques that are normally destructive for the sample and that are subject to possible human error since they depend to a large extent on the skill and experience of the technician in charge of them. This type of analysis involves a high economic cost and requires long periods of time that limit the availability of short-term information for decision-making in the factory during the production period.

The objective of this research is to develop a powerful quality control, food safety, resource optimization and traceability tool, applicable to the agricultural and food sector based on the technology developed by Chemometric Brain, for the digitalization and instant control of food, ingredients and mixtures.

The application of NIR technology together with the chemometric analyses implemented in the Chemometric Brain software offers the user obtaining information about the quality of their samples at an extremely lower cost than that presented by analyses using conventional techniques. Other advantages are the non-destruction of the sample, the obtaining of fast and objective information despite the operator in charge.

The expected results will allow companies to increase the sustainability of the agri-food sector by reducing food loss by ensuring the reduction of losses due to problems with quality and food safety.

Keywords: Digitalization, quality control, food safety, traceability.

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Productivity and Sustainability" from 16.1 measure Rural Development Program of the Region of Murcia 2014-2020. 4th call, year 2021. Partners: EXPLOTACIONES AGRICOLAS AGROMIL S.L (AGROMIL), MARTINEZ NIETO S.A. (MARNYS), POSTRES Y DULCES REINA S.L. (REINA), FRUIT TECH NATURAL, S.A. (FTN) and AGRUPACION DE INDUSTRIAS ALIMENTARIAS MURCIA, ALICANTE Y ALBACETE (AGRUPAL).

41.

INNOVATIVE PROCESSES FOR OBTAINING PESTICIDE-FREE LEMON ESSENTIAL OILS WITHIN THE FRAMEWORK OF SAFE AGRICULTURAL PRODUCTION. GO SAFEOILS

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Abstract

Current agricultural practices and the search for competitive production yields are based on the use of phytosanitary products, which include those known as pesticides. Pesticide residues in food are one of the main factors endangering food safety and human health. One of the value-added products of the citrus processing industry is lemon essential oil (Cold Pressed Lemon Oil-CPLO), which is produced from fresh lemons as raw material in their processing. CPLO is obtained from the oil glands found in the outer skin of fresh lemons, so the use of pesticides in the field and post-harvest is the source for finding a high concentration of pesticide residues in the final product.

The objective of this research is to study different innovative and sustainable technologies to improve the industrial process of elaboration of essential oils in the different stages of production.

The expected results are the validation pesticide elimination procedures and the verification and optimization of the cleaning process of the lemon essential oil industrial production lines.

Keywords: Removal, pesticides, essential oil, citrus.

Acknowledgments: Project financed within the aid to operations for the "Support for the creation and functioning of operating groups of the European Association for Innovation in Agricultural Productivity and Sustainability" from 16.1 measure Rural Development Program of the Region of Murcia 2014-2020. 3rd call, year 2020. Partners: ASOCIACIÓN INTERPROFESIONAL DE LIMÓN Y POMELO, CITROMIL S.L, CITRICOS DE MURCIA S.A, TANA S.A

42.

TERRITORIAL CIRCULAR SYSTEMIC SOLUTION FOR THE UPCYCLING OF AGRIFOOD WASTES – AGRO2CIRCULAR PROJECT

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Abstract

In Europe, fruits and vegetables (F&V) are the higher contributor to the food wastes (>40%). These food wastes are an excellent source of natural bioactive compounds, such as phenolic compounds, dietary fibre and carotenoids, among others, and are not being exploited.

Considering the changes in production models towards a circular economy to improve the sustainability of the food industry and the environmental problems involved in the management of its waste, there is currently a growing interest in the recovery of these agri-food by-products to obtain valuable compounds for food, cosmetic or pharmaceutical applications. Nevertheless, conventional methods of extracting bioactive compounds are inefficient (low yields and purity) and unsustainable.

OBJECTIVE

The objective of the Agro2Circular project is valorisation of agri-food waste through green extraction routes (innovative) to obtain bioactive compounds economically viable for industrial implementation, to produce new nutraceuticals, functional foods and cosmetics formulations.

METHODOLOGIES

For the valorisation of different agri-food waste (broccoli, cauliflower, apple, lemon, grape and artichoke), different extraction, purification and stabilisation routes have been optimised. Green solvents (aqueous solvents, natural deep eutectic point solvents (NADES), enzymatic solutions, subcritical water (SWE)) have been used for this purpose. Assistive technologies to improve extraction yields (ultrasound (UAE) and microwave (MAE)) have also been evaluated.

Subsequently, purification (resins, membranes) and stabilisation (freeze-drying, encapsulation) technologies have been used.

RESULTS

In general, enzymatic extraction has provided the best results in fibre extraction. However, of the agri-food waste studied, artichoke waste treated by ultrasound-assisted aqueous extraction showed the best results for the extraction of dietary fibre, improving enzymatic extraction by 12%. Broccoli waste has followed artichoke in terms of fibre extraction yields.

Lemon waste extracted by subcritical water extraction have provided the best results in the extraction of phenolic compounds, with hesperidin and limonin being the major compounds. SWE has improved the aqueous extraction by up to 34%. Secondly, artichoke residue extracts were the richest in phenolic compounds, with 1,5-O-dicaffeoylquinic acid (cynarine) and chlorogenic acid predominating.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036838.

Agro2Circular

43.

IMPROVEMENT AND ENZYMATIC HYDROLYSIS OF THE PHYSICOCHEMICAL AND TECHNO-FUNCTIONAL CHARACTERISTICS OF EGG ALBUMEN WITH MICROBIAL TRANSGLUTAMINASE

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Abstract

Microbial Transglutaminase (TG) enzyme improves the functional properties of food products. TG enzyme is a food additive used in the food industry for improving the nutritional quality, increasing the gelling properties, improving the emulsification quality, increasing the shelf life, and increasing the water holding capacity. Globally, enzymatic modification of egg products to improve functional properties has gained considerable interest.

In this study the liquid egg albumen (EA) treated with TG by 0%, 0.5%; 1% and 2% concentrations and physicochemical (pH, color-L^*,a^*,b^*, total soluble dry matter-DM, turbidity) and techno-functional characteristics (relative whipping ability, foaming stability, water holding capacity) of the TG modified EA samples were investigated.

The results of the study indicated that TG hydrolysis significantly ($p<0.05$) increased the pH (from 8.65 to 8.73), turbidity and DM (from15 to 17) values of EA while enhancing foaming ability (from 590 to 620) and stability. Color values of the EA samples were also influenced by TG enzymatic hydrolysis. These results suggest a possible potential application of TG in EA applications for HoReCa (Hotel Restaurant Café-Catering) and baking industry for food texture and stability improvement.

This work was supported by Çanakkale Onsekiz Mart University, The Scientific Research Coordination Unit, Project number: FBA-2023-4320.

Keywords: Liquid egg white, egg products, enzymatic modification, functional properties, whipping ability, textural improvement.

XI INTERNATIONAL SYMPOSIUM FOOD TECHNOLOGY

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