2022 Annual Conference & Exhibition
Functional Foods, Nutraceuticals, Natural Health Products, and Dietary Supplements

October 2-5, 2022 / İstanbul - Türkiye

BOOK OF ABSTRACT

www.isnff.org

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 951994

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Message from the Chairs

The International Society for Nutraceuticals and Functional Foods (ISNFF) is pleased to have its 14th International Conference and Exhibition in İstanbul, Türkiye.

The ISNFF was established in 2008 as a not-for-profit organization in response to widespread recognition of the role on natural health products, including functional foods, nutraceuticals as well as dietary supplements for health promotion and disease risk reduction. Over the past several years, the ISNFF has managed to bridge the existing gap among scientific community, health care professionals, industry and investors, as well as the public and consumers through its conferences, short courses, seminars, newsletters, and other publications. Meanwhile, the companion journal of ISNFF, ***Journal of Food Bioactives (JFB),*** published by ISNFF & Associates, is with a calculated impact factor of around 4.81. All presenters are encouraged to submit their manuscripts to the journal. Find out more about the journal and submission process <**isnff-jfb.com**>.

Moreover, the Society organizes short courses/seminars in hot topic areas either prior to the annual conferences or joint with other societies such as Institute of Food Technologists (IFT), American Chemical Society's (ACS) special meetings and International Union of Food Science and Technology (IUFoST). The ISNFF publishes several newsletters each year for communicating the latest information in the field to its members and the public as well as those interested in the latest developments in this ever-growing area. We have had a challenging couple of years due to the COVID-19 pandemic. The ISNFF 2020 Conference and Exhibition that was postponed to 2021, was held October 17-20, 2021 in Nanjing, China in a hybrid form, attracted some 110 international participants, some 2,000 online and 280-300 participants in person.

The 2022 conference includes participation of delegates from 28 countries with 217 presentations (134 orals and 83 posters). The presentations include those from world-renowned experts in the field, bringing to the audience state-of-the-art information and the latest developments in the field. This year's event includes a ''Flash Talk Session'' for student competition.

The 2022 conference of the ISNFF is co-organized as an activity of the **Horizon 2020 – PhenolAcTwin Project**, coordinated by TÜBİTAK MAM. In addition, Food Innovation Platform of Türkiye (TÜGİP), established by TÜBİTAK MAM, supports SMEs' participation at the conference. Two TÜGİP sponsored industry sessions are included in the program.

The exhibition at ISNFF complements its scientific meeting programs with products, services, and publications in the field of functional foods, nutraceuticals, and natural health products.

We encourage you all to actively participate at the conference and its different events and to meet old friends and have the opportunity to make new ones. Please also take advantage of visiting important historical and cultural attractions in any spare time you may find. We would like to extend our gratitude to sponsors, exhibitors, session organizers, conference organizers, and moderators.

On behalf of ISNFF, we wish you a very productive and enjoyable meeting.

Best wishes,

Dr. Fereidoon SHAHIDI & Dr. Cesarettin ALASALVAR (Conference Chairs)

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Companion Journal

All presenters are encouraged to submit their papers to the companion journal, Journal of Food Bioactives (JFB).

Find out more about the journal and submission process < www.isnff-jfb.com >

ISNFF 2022
PROGRAMME AT A GLANCE

	2 Oct / Sun	3 Oct / Mon			4 Oct / Tue			5 Oct / Wed		
All day		Registration			Registration			Registration		
08:30 - 09:00		Opening Ceremony								
09:00 - 10:30		Hall A PL1 PL2 PL3			Hall A PL4 PL5 PL6			Hall A PL7 PL8 PL9		
10:30 - 11:00		Nutrition Break / Poster Session			Nutrition Break / Poster Session			Nutrition Break		
		Hall A	Hall B	Hall C	Hall A	Hall B	Hall C	Hall A	Hall B	Hall C
11:00 - 13:00		S1	S2	S3	S10	S11	S12	S19	S20	S21
13:00 - 14:00		Lunch provided			Lunch provided AGM Meeting			Lunch provided		
14:00 - 16:00		S4	S5	S6	S13	S14	S15	S22	S23	
16:00 - 16:30	Registration	Nutrition Break / Poster Session			Nutrition Break / Poster Session			Closing and Flash Talk Award Ceremony		
16:30 - 18:30		S7	S8	S9	S16	S17	S18	Cultural Tour and Visiting of TÜBİTAK MAM		
19:30 - 23:00	Free Time	Welcoming Reception			Congress Gala Dinner and Awards *					

* ISNFF and Fellow Award Winners will be announced at the Congress Gala Dinner, which will be a ticketed event and be on the Bosporus (Cruise Dinner).
AGM: Annual General Meeting of ISNFF (restricted to Professional Members of ISNFF).
PL: Plenary (30 min each presentation including questions)
S: Session (20 min each presentation including questions)

Session No	Session Title
Session 1	Functional Proteins and Biopeptides - 1
Session 2	Absorption, Bioavailability, Metabolism, and Health Effects of Bioactives
Session 3	Honey, Royal Jelly, and Bee Products in Health
Session 4	Functional Proteins and Biopeptides - 2
Session 5	Advances in Nano/Micro-Encapsulation for Bioavailability Improvement
Session 6	Nutraceuticals and Functional Food Ingredients from Co-products and Processing By-products
Session 7	The Mediterranean Diet and Health Benefits of Nuts and Dried Fruits
Session 8	Pre- and Probiotics, Gut Microbiom, and Gastrointestinal Health
Session 9	Processing and Bioprocessing of Functional Food Ingredients
Session 10	Bioavailability of Dietary Polyphenols
Session 11	Analysis of Nutraceuticals and Functional Food Ingredients
Session 12	Diabetes and Metabolic Syndrome, Obesity, and Weight Management
Session 13	Global Regulations, Traditional Therapeutic, and Fermented Foods
Session 14	Functional Beverages and Human Health
Session 15	Natural Antioxidants and Prooxidants (Phenolics, Carotenoids/Xanthophylls, etc.)
Session 16	Functional Food Ingredients and Nutraceuticals in Brain Health, Cancer Chemoprevention, and Cardiovascular Disease
Session 17	Marine and Algal Products and By-products
Session 18	Encapsulation of Functional Ingredients and their Bioactivity
Session 19	COVID-19 and Other Viral Diseases: Role of Phytochemicals and Traditional Remedies
Session 20	Exploring Medicinal Plants for Human Uses
Session 21	Bioavailability and Bioaccessibility of Functional Food Ingredients
Session 22	Functional Foods: From Farm and Lab Bench to the Market Place
Session 23	Flash Talks

PLENARY SPEAKERS

***Moderators*:**
Fereidoon Shahidi (Memorial University of Newfoundland, Canada)
Jerzy Zawistowski (University of British Columbia, Canada)

PL1	148	Food bioactives and functional foods: Facts and fallacies **Fereidoon Shahidi –** Memorial University of Newfoundland (Canada)
PL2	165	Nanoscience of tea **Pingfan Rao -** CAS.SIBS-Zhejiang Gongshang University (China)
PL3	150	Gut microbiota and metabolism of bioactives **Francisco A. Tomás Barberán -** CEBAS-CSIC (Spain)

***Moderators*:**
Ronald B. Pegg (University of Georgia, USA)
Kazuo Miyashita (Obihiro University of Agriculture and Veterinary Medicine, Japan)

PL4	166	Spontaneous crude lecithin-based liposomes for encapsulation and delivery of hydrophobic bioactives **Alejandro Marangoni -** University of Guelph (Canada)
PL5	141	Beneficial health effect of sphingolipids via regulation of gut function **Kazuo Miyashita -** Obihiro University of Agriculture and Veterinary Medicine (Japan)
PL6	10	Functional foods and health: Essentiality of human evidences **Mauro Serafini -** Teramo University (Italy)

***Moderators*:**
Cesarettin Alasalvar (TÜBİTAK MAM, Türkiye)
Paul Kroon (Quadram Institute, UK)

PL7	5	Five decades of lipid healthcare: Omaga-3LCP story from marine oils to plant science - Natural supplements to medicine **Ian Newton -** CERES Consulting (Canada)
PL8	158	Metabolism and bioavailability of polyphenols and its importance in developing polyphenol nutraceuticals **Paul Kroon -** Quadram Institute (UK)
PL9	137	Mechanistic insights into nutrition and vascular-related diseases using multi-omics and integrative approaches: Machine learning as a next challenge in nutrition research **Dragan Milenkovic -** University of California Davis (USA)

ORAL PRESENTATIONS

Session 1: Functional Proteins and Biopeptides – 1

***Moderators*:**
Rotimi Aluko (University of Manitoba, Canada)
Jianping Wu (University of Alberta, Canada)

O1	Tripeptide IRW protects MC3T3-E1 cells against Ang II stress in a AT2R dependent manner **Jianping Wu -** University of Alberta (Canada)
O2	Therapeutic potential of novel bio-peptides from non-bovine milk **Hisham R. Ibrahim -** Kagoshima University (Japan)
O3	Exploitation of olive (*Olea europaea L*) seed proteins as up-graded source of bioactive peptides with multifunctional properties: focus on antioxidant and dipeptidyl-dipeptidase - IV inhibitory activities, and GLP-1 improved modulation, and glucagon-like peptide 1 improved modulation **Carmen Lammi -** University of Milan (Italy)
O4	*In vitro* inhibition of acetylcholinesterase activity by yellow field pea (*Pisum sativum*) protein-derived peptides as revealed by kinetics and molecular docking **Nancy Asen -** University of Manitoba (Canada)
O5	Contribution of hydrolysis and drying conditions to whey protein hydrolysate characteristics and *in vitro* antioxidative properties **Richard Fitzgerald -** University of Limerick (Ireland)

Session 2: Absorption, Bioavailability, Metabolism, and Health Effects of Bioactives

***Moderators*:**
Rong Tsao (Guelph Research & Development Centre, Canada)
Chin-Kun Wang (Chung Shan Medical University, Taiwan)

O6	The improvement of bioavailability and health benefits by phytochemicals interactions **Chin-Kun Wang -** Chung Shan Medical University (Taiwan)
O7	Phenolics of green and yellow pea hulls: their composition, metabolism, antioxidant and anti-inflammatory activities and roles in intestinal health **Rong Tsao -** Guelph Research & Development Centre (Canada)
O8	Exploring the role of sulphur compounds derived from broccoli on prostate cancer metabolism **Gemma Beasy -** Quadram Institute Bioscience (UK)
O9	A comparative study on the absorption of chain- and cyclic-forms of food-derived prolyl-hydroxyproline after the ingestion of different-molecular-weight gelatin and gelatin hydrolysates **Yu Iwasaki -** Tokyo Kasei University (Japan)
O10	Absorption of balenine in human plasma after ingestion of opah muscle extracts **Yasutaka Shigemura -** Tokyo Kasei University (Japan)
O11	Impact of two novel plant bioactives on rescue of impaired gut barrier function using human primary cell intestinal epithelium **Doug Bolster** - Brightseed (USA)

Session 3: Honey, Royal Jelly, and Bee Products in Health

***Moderators*:**
Erdem Yeşilada (Yeditepe University, Türkiye)
Emel Damarlı (Altıparmak Food Industry and Trade Inc., Türkiye)

O12	A powerful collaboration from naturals: apitherapy + phytotherapy **Erdem Yeşilada -** Yeditepe University (Türkiye)
O13	An investigation of bioactive and physicochemical properties of Turkish pine honey **Emel Damarlı -** Altıparmak Food Industry and Trade Inc (Türkiye)
O14	Production of an artificial perga possessing high antioxidant activity *via* lactic acid fermentation of bee pollen **Nazlı Arda -** İstanbul University (Türkiye)
O15	Quantitation of the myo-inositol and D-pinitol levels as promising bioactive constituents of pine honey and elucidation of the pathway by analyzing sap of *Pinus brutia* and the secretion of aphid *Marchalina hellenica* **İsmail Emir Akyıldız -** Altıparmak Food Industry and Trade Inc (Türkiye)
O16	Changes in biochemical properties of royal jelly by different storage conditions and different packaging materials **İlknur Coşkun -** Altıparmak Food Co. Balparmak R&D Center (Türkiye)

Session 4: Functional Proteins and Biopeptides – 2

***Moderators*:**
Jianping Wu (University of Alberta, Canada)
Rotimi Aluko (University of Manitoba, Canada)

O17	Vegetable leaves as veritable sources of multifunctional protein hydrolysates **Rotimi Aluko -** University of Manitoba (Canada)
O18	Examination of physicochemical and functional properties of proteins isolated from local beans of Türkiye **Rukiye Gündoğan -** İstanbul Technical University (Türkiye)
O19	A cell-based assessment of the muscle anabolic potential of blue whiting (*Micromesistius poutassou*) protein hydrolysates **Niloofar Shekoohi -** University of Limerick (Ireland)
O20	Neutrase-alcalase combined hydrolysation of protein isolates from hazelnut meal: Transforming waste to functional food ingredient **F. Duygu Ceylan -** İstanbul Technical University (Türkiye)
O21	Antihypertensive effect of hydrolysates and peptides from aquacultured flounder fish for developing a health functional food **You-Jin Jeon -** Jeju National University (Republic of Korea)
O22	Casein-phenol interaction during *in vitro* digestion provides better bioactive peptide release and phenol delivery to colon **Aytül Hamzalıoğlu -** Hacettepe University (Türkiye)

Session 5: Advances in Nano/Micro-Encapsulation for Bioavailability Improvement

***Moderators*:**
Nandika Bandara (University of Manitoba, Canada)
Asli Can Karaca (İstanbul Technical University, Türkiye)

O23	Formulation of a layered lipid-protein nanoemulsion system for the delivery of hydrophobic resveratrol **Nandika Bandara -** University of Manitoba (Canada)
O24	Encapsulation of food bioactives using plant proteins as wall materials **Aslı Can Karaca -** İstanbul Technical University (Türkiye)
O25	A new and green particle formation approach to increasing bioavailability of curcumin **Ozan Çiftçi -** University of Nebraska-Lincoln (USA)
O26	Increasing the bioaccessibility of tomato pomace bioactives by using excipient emulsion and potential food applications **Esra Çapanoğlu -** İstanbul Technical University (Türkiye)
O27	Thymoquinone-loaded core-shell nanoparticles: Bioaccessibility and transport across Caco-2 monolayers **Elif Atay -** Mersin University (Türkiye)

Session 6: Nutraceuticals and Functional Food Ingredients from Co-products and Processing By-products

***Moderators*:**
Petras Rimantas Venskutonis (Kaunas University of Technology, Lithuania)
Amin Ismail (Universiti Putra Malaysia, Malaysia)

O28	Bioactives from small fruit processing by-products and waste for functional foods and nutraceuticals **Petras Rimantas Venskutonis -** Kaunas University of Technology (Lithuania)
O29	Microencapsulation of anthocyanins recovered from industrial wastes and usage in processed foods **Saliha Esin Çelik -** İstanbul University-Cerrahpaşa (Türkiye)
O30	Sequential extractions to maximize the valorisation of brewer's spent grains **Martina Minestrini -** Luxembourg Institute of Science and Technology (Luxembourg)
O31	Characterization of the nutritional profile of avocado by-product: The potential of avocado seed powder as a culinary additive **Nour Awad -** Ondokuz Mayıs University (Türkiye)
O32	Effects of *Cystoseira barbata* extracts as a novel seaweed-based biostimulant agent on various crops **Ümit Barış Kutman** – Gebze Technical University (Türkiye)

Session 7: The Mediterranean Diet and Health Benefits of Nuts and Dried Fruits

***Moderators*:**
Cesarettin Alasalvar (TÜBİTAK MAM, Türkiye)
Emilio Ros (Biomedical Research Institute August Pi Sunyer (IDIBAPS) and University of Barcelona, Spain)

O33	Health effects of nuts within the Mediterranean diet: Insights from the PREDIMED study **Emilio Ros -** Biomedical Research Institute August Pi Sunyer (IDIBAPS) and University of Barcelona (Spain)
O34	Health claims, nutrients, bioactives, and health benefits of dried fruits **Cesarettin Alasalvar -** TÜBİTAK MAM (Türkiye)
O35	Natural and roasted hazelnut (*Corylus avellana* L.) dietary fibers differentially modulate the colonic microbiota in a sex-dependent way **Yunus Emre Tuncil -** Necmettin Erbakan University (Türkiye)
O36	Cardiovascular health benefits of hazelnuts consumption **Fulya Balaban Yücesan -** Karadeniz Technical University (Türkiye)
O37	Health-promoting compounds in Turkish hazelnut varieties **Neslihan Göncüoğlu Taş -** Hacettepe University (Türkiye)
O38	Cellular antioxidant activity of pecan phenolics after *in vitro* digestion **Ronald B. Pegg -** University of Georgia (USA)

Session 8: Pre- and Probiotics, Gut Microbiom, and Gastrointestinal Health

***Moderators*:**
Anders Christensen (Apillet ApS, Denmark)
Beraat Özçelik (İstanbul Technical University, Türkiye)

O39	Roles of mechanosensitive ion channel Piezo1 in the dietary fiber-mediated Reg3β expression in the intestine of mice **Dina Mustika Rini -** Hiroshima University (Japan)
O40	Mutation strategies for glucansucrase E81 to produce novel glucans and gluco-oligosaccharides **Enes Dertli -** Yıldız Technical University (Türkiye)
O41	The development of an enteric capsule made from natural materials for oral delivery of probiotics / nutraceuticals **Anders Christensen -** Apillet ApS (Denmark)
O42	Novel approaches for probiotic encapsulation and R&D perspectives in designing functional fruit-based products **Gülce Ertek -** Işık Tarım Ürünleri A.Ş. (Türkiye)
O43	Optimization of galacto-oligosaccharides production method from lactose to maximize the prebiotic efficiency **Emine Aytunga Arık Kibar -** TÜBİTAK MAM (Türkiye)
O44	Novel edible films with probiotics and prebiotics **Kübra Sultan Özdemir -** Konya Food and Agriculture University (Türkiye)

Session 9: Processing and Bioprocessing of Functional Food Ingredients

***Moderators*:**
Vural Gökmen (Hacettepe University, Türkiye)
Mecit Halil Öztop (Middle East Technical University, Türkiye)

O45	Reformulating traditional Mediterranean foods using alternative technologies **Mecit Halil Öztop** – Middle East Technical University (Türkiye)
O46	Formation of bioactive tyrosine derivatives during sprouting and fermentation of different whole grains **Ecem Evrim Çelik -** Hacettepe University (Türkiye)
O47	Use of lyophilised cornelian cherry (*Cornus mas* L.) puree in functional food development by 3D food printing **Zeynep Tacer Caba -** Bahcesehir University (Türkiye)
O48	Bioprocessing of edible jelly mushroom to obtain long-chain glycolipids functional as food-grade antimicrobials **Tuğba Kabasakal -** Gebze Technical University (Türkiye)
O49	Degradation kinetic modelling of moisture, colour and textural properties in Dabai fruit (*Canarium odontophyllum* Miq) during blanching treatment **Rosnah Shamsudin -** Universiti Putra Malaysia (Malaysia)

Session 10: Bioavailability of Dietary Polyphenols

***Moderators*:**
Christine Morand (INRAE, France)
Antonio González-Sarrías (CEBAS-CSIC, Spain)

O50	Clinical evidence of the vascular effects of grapefruit flavanones and underlying molecular mechanisms **Christine Morand -** INRAE (France)
O51	*In vitro* anti-angiogenic activity of circulating phenolic-derived metabolites **Antonio González-Sarrías -** CEBAS-CSIC (Spain)
O52	Interactions of single nucleotide polymorphisms in SULT1A1, SULT1C4, ABCC2, APOA1, LPL, APOE and orange juice intake with flavanone metabolism and cardiometabolic outcomes in humans **Dragan Milenkovic -** University of California Davis (USA)
O53	Dietary anthocyanins and their metabolites: Molecular mechanisms underlying the health effects **Irena Krga -** University of Belgrade (Serbia)
O54	The protective potential of astaxanthin in endothelial cells exposed to uremic serum samples of hemodialysis patients **Abolfazl Barzegari -** Université Sorbonne Paris Nord (France)
-	Introduction of PhenolAcTwin Project - Horizon Europe **Ebru Pelvan -** TÜBİTAK MAM (Türkiye)

Session 11: Analysis of Nutraceuticals and Functional Food Ingredients

***Moderators*:**
Reşat Apak (İstanbul University-Cerrahpaşa, Türkiye)
Bradley Bolling (University of Wisconsin-Madison, USA)

O55	Oxidants, antioxidants, their analytical chemistry and trends - a perspective with reference to the CUPRAC method **Reşat Apak -** İstanbul University-Cerrahpaşa (Türkiye)
O56	Nutraceuticals from plant-based yogurts as inhibitors of angiotensin-converting enzyme 2 (ACE2) **Bradley Bolling -** University of Wisconsin-Madison (USA)
O57	Nutritional components, antioxidative and anti-inflammatory properties of *Schizophyllum commune* (fries) mushroom **Amin Ismail -** Universiti Putra Malaysia (Malaysia)
O58	Antidegenerative agent from Indonesian food sources: *In vitro* and *in vivo* studies **Rumiyati Rumiyati -** Universitas Gadjah Mada (Indonesia)
O59	Analysis of endocannabinoids in fermented foods of animal and plant origin **Tolgahan Kocadağlı -** Hacettepe University (Türkiye)
O60	Comparative study on physicochemical properties of tomato juices with non-irradiated and irradiated supplements: olive powder and sugar-beet leaves protein **Sanda Pleslic -** University of Zagreb (Croatia)

Session 12: Diabetes and Metabolic Syndrome, Obesity, and Weight Management

***Moderators*:**
Debasis Bagchi (Texas Southern University, USA)
Bernard W. Downs (Victory Nutrition International Inc., USA)

O61	A novel technological breakthrough in body recomposition and weight management: A clinical investigation **Debasis Bagchi -** Texas Southern University (USA)
O62	Obesity: A genetically induced metabolic survival defense due to unhealthy food habits and sedentary life style: Aerobic vs anaerobic metabolic events **Manashi Bagchi -** Dr. Herbs LLC (USA)
O63	A patented blend of *Sphaeranthus indicus* and *Garcinia mangostana* extracts for weight management and improving cardiac health. **Trimurthulu Golakoti -** Laila Nutraceuticals (India)
O64	Hypoglycemic effect of bread from purple sweet potato flour, starch, and fiber-rich flour in streptozotocin induced diabetic rats **Elisa Julianti -** Universitas Sumatera Utara (Indonesia)
O65	Pulse bread as a functional food to reduce blood glucose **Dan Ramdath -** Guelph Research and Development Centre (Canada)
O66	The inhibition of insulin/IGF-1 signaling pathway plays a crucial role in the myo-inositol-alleviated aging in *Caenorhabditis elegans* **Nae-Cherng Yang -** Chung Shan Medical University (Taiwan)

Session 13: Global Regulations, Traditional Therapeutic, and Fermented Foods

***Moderators*:**
Apostolos (Paul) Kiritsakis (International Hellenic University, Greece)
Jerzy Zawistowski (University of British Columbia, Canada)

O67	Global regulations of functional foods/nutraceuticals and health claims **Jerzy Zawistowski -** University of British Columbia (Canada)
O68	Olive oil as an important functional food: The role of its polyphenols **Apostolos (Paul) Kiritsakis -** International Hellenic University (Greece)
O69	Current status and future developments in lipid-based therapeutics **Jaroslav Kralovec -** Apollo Health Sciences (Canada)
O70	Effects of environmental stresses on neuroactive compounds produced by *Saccharomyces cerevisiae* in fermented foods **Cemile Yılmaz -** Hacettepe University (Türkiye)
O71	The production of fermented dairy product supplemented with *Spirulina platensis* **Levent Yurdaer Aydemir -** Adana Alparslan Türkeş Science and Technology University (Türkiye)

Session 14: Functional Beverages and Human Health – TÜGİP Sponsored Industry Session Organized in Cooperation with Turkish Fruit Juice Industry Association (MEYED)

***Moderators*:**
Mehmet Pala (Haliç University, Türkiye)
Melis Yasa (AROMSA, Türkiye)

O72	Mineral water: Macro minerals in mineral water and functional benefits of magnesium-rich mineral waters **Tuğba Şimşek** - Kızılay Beverage (Türkiye)
O73	The elephant in the room: The central role of fiber in our health and longevity **Khosro Ezaz Nikpay -** International Fruit and Vegetable Juice Association (UK)
O74	Functional and health transformation in juice drinks **Melis Yasa** - AROMSA (Türkiye)
O75	Whey based functional beverage with psychobiotic potential **Zeynep Ağırbaşlı -** İzmir Institute of Technology (Türkiye)
O76	Determination of vitexin content in hawthorn (*Cretaceous orientalis*) and development of vitexin enriched capsul and powder products **Hilal Akın** - TUNAY Food (Türkiye)
O77	Innovation and consumer trend in functional drinks **Ceren Kutlu Hasgüçmen** - FERSAN Fermentation Products (Türkiye)

Session 15: Natural Antioxidants and Prooxidants (Phenolics, Carotenoids/Xanthophylls, etc.)

***Moderators*:**
Ryszard Amarowicz (Institute of Animal Reproduction and Food Research, Poland)
Hamit Köksel (İstinye University, Turkiye)

O78	Cereals and legumes as a source of phenolic and polyphenolic compounds **Ryszard Amarowicz -** Institute of Animal Reproduction and Food Research (Poland)
O79	Antioxidant capacity and profiles of phenolic acid in various genotypes of purple wheat **Hamit Köksel -** İstinye University (Türkiye)
O80	Relationship between color and antioxidant capacity of fruits and vegetables **Burçe Ataç Mogol -** Hacettepe University (Türkiye)
O81	The effects of basic ingredients on moisture and carotenoid contents, physical properties, emulsion stability, and organoleptic preference of red fruit (*Pandanus conoideus*) oil mayonnaise rich in natural antioxidants **Zita Letviany Sarungallo -** Papua University (Indonesia)
O82	Effect of food combinations and their co-digestion on total antioxidant capacity **Ezgi Doğan Cömert -** Hacettepe University (Türkiye)
O83	Antioxidant and antimicrobial activities of kebar grass leaf extract **Meike Lisangan -** Papua University (Indonesia)

Session 16: Functional Food Ingredients and Nutraceuticals in Brain Health, Cancer Chemoprevention, and Cardiovascular Disease

***Moderators*:**
Kenji Sato (Kyoto University, Japan)
Seung Ho Shin (Gyeongsang National University, Republic of Korea)

O84	Efficacy and safety of a novel dietary pyrroloquinoline quinone disodium salt on brain functions in healthy volunteers: A randomized, double-blind, placebo-controlled study **Yoshiaki Shiojima** - Ryusendo Co., Ltd., Research & Development (Japan)
O85	Discovery of a phytochemical that targets RUVBL1/2 for synthetic lethality **Seung Ho Shin -** Gyeongsang National University (Republic of Korea)
O86	Functional food ingredients for brain health and cancer chemoprevention **Gulacti Topcu** - Bezmialem Vakıf University (Türkiye)
O87	Alleviation of high-fat diet-induced mouse liver damage by chlorella extract and its phenethylamine *via* regulating generation of methylglyoxal **Kenji Sato -** Kyoto University (Japan)
O88	Pain and inflammation in human subjects: A clinical investigation of HerboJoint **Binoy Bordoloi -** Bordoloi Biotech LLC (India)
O89	A proprietary combination of *Punica granatum* fruit rind and *Theobroma cocoa* seed extracts boosts serum Testosterone levels in men **Kiran Bhupathiraju -** Laila Nutraceuticals (India)
O90	Efficacy of a novel *Trigonella foenum-graecum* seed extract in premenopausal women with polycystic ovary syndrome (PCOS): A double-blind, placebo-controlled clinical investigation. **Pawan Kumar -** Chemical Resources (CHERESO) (India)

Session 17: Marine and Algal Products and By-products

***Moderators*:**
Berat Haznedaroğlu (Boğaziçi University, Türkiye)
Jimin Hyun (Jeju National University, Republic of Korea)

O91	An integrated algal biorefinery concept for carbon-negative functional food components **Berat Haznedaroğlu -** Boğaziçi University (Türkiye)
O92	Reversibility of sarcopenia by *Ishige okamurae* and its active derivative diphloroethohydroxycarmalol: aging rodent and human clinical study **Jimin Hyun -** Jeju National University (Republic of Korea)
O93	Optimising cultivation of the Giant Kelp for bioproduct production **Diane Purcell -** Teagasc | Agriculture and Food Development Authority (Ireland)
O94	Composition, properties, and bioactive absorption of functional foods prepared from undervalued marine resources: Case-studies with algae **Carlos Cardoso -** Instituto Português do Mar e da Atmosfera (Portugal)
O95	Effects of baking duration on vitamin B complex of *Chlorella vulgaris* microalgae **Engin Bayram -** Boğaziçi University (Türkiye)
O96	Monitoring the freshness of fish samples by enzymatic hypoxanthine measurement using the CUPRAC colorimetric sensor **Sema Demirci Çekiç -** İstanbul University-Cerrahpaşa (Türkiye)
O97	Waste bread in the production of single cell protein from microalga **Furkan Türker Sarıcaoğlu -** Bursa Technical University (Türkiye)

Session 18: Encapsulation of Functional Ingredients and their Bioactivity

***Moderators*:**
Fatma Yeşim Ekinci (Yeditepe University, Türkiye)
Nurhan Turgut Dunford (Oklahama State University, USA)

O98	Effect of encapsulation techniques on physical properties and shelf stability of fish oil-whey protein microcapsules **Nurhan Turgut Dunford** – Oklahoma State University (USA)
O99	Enhancement the tumoricidal activity of bamlet complexes by enzymatic treatment and encapsulation by double emulsion (WOW) method **Reyhan Koyuncu -** İstanbul Technical University (Türkiye)
O100	Development of liposomes with interdigitated bilayers from a combination of symmetrical phosphatidylcholines and assessment of their stability during storage **Nabil Adrar -** İstanbul Technical University (Türkiye)
O101	Microencapsulated functional hydrophilic extract from black rosehip: characterization, antioxidant properties, and *in vitro* gastrointestinal digestion **Kadriye Kasapoğlu -** İstanbul Technical University (Türkiye)
O102	Encapsulation of omega-3 fatty acids into starch nanoparticle stabilized pickering emulsions **Kevser Kahraman -** Abdullah Gul University (Türkiye)

Session 19: COVID-19 and Other Viral Diseases: Role of Phytochemicals and Traditional Remedies

***Moderators*:**
Hanny Wijaya (IPB University, Indonesia)
Ebru Pelvan (TÜBİTAK MAM, Türkiye)

O103	Polyphenolic compounds i1solated from marine algae: attenuate the replication of SARS-CoV-2 in the host cell through multi target approach of 3CLpro and PLpro **Dineth Pramuditha Nagahawatta** - Jeju National Univesity (Republic of Korea)
O104	Empowering the transformation of renewable forest product cajuput essential oil as functional flavor for recovery from COVID-19 pandemic **Christofora Hanny Wijaya** - IPB University (Indonesia)
O105	Development of chewable tablet formulation with propolis and plant based extracts against SARS-CoV-2 infection **Öznur Karaoğlu** - TÜBİTAK MAM (Türkiye)
O106	Prebiotic and probiotic knowledge and consumption during COVID-19 **Merve Seylan** - İstanbul Nişantaşı University (Türkiye)
O107	Development of throat spray against SARS-CoV-2 infection **Ebru Pelvan**- TÜBİTAK MAM (Türkiye)

Session 20: Exploring Medicinal Plants for Human Uses - TÜGİP Sponsored Industry Session

***Moderators*:**
İffet İrem Çankaya (Hacettepe University, Türkiye)
Erdem Yeşilada (Yeditepe University, Türkiye)

O108	Plants used as dietary supplements and their regulations applied in Türkiye **İffet İrem Çankaya -** Hacettepe University (Türkiye)
O109	Importance of the quality and standardization in natural products **Yiğit Ege Çömlekçi** - Bionorm (Türkiye)
O110	Innovation capability in medicinal and aromatic plants: Competitive advantages in Türkiye and the Pilot Business Model of LUK Botanic **Lütfü Küçük** - LUK Botanic (Türkiye)
O111	Production process and product quality in food supplements in Türkiye **Aytekin Pasha** - TAB Nutraceuticals (Türkiye)
O112	The importance of medicinal and aromatic plants in human health and Talya's role in the sector **Elife Özkan** - Talya Herbal (Türkiye)
O113	Holistic approach in health and quality standards of natural supplements **Deniz Dedeoğlu** - Zade Vital (Türkiye)

Session 21: Bioavailability and Bioaccessibility of Food Ingredients

***Moderators*:**
Koen Venema (Maastricht University, The Netherlands)
Esra Çapanoğlu Güven (İstanbul Technical University, Türkiye)

O114	How inter-individual microbiota composition complicates outcomes of functional food trials or does it? **Koen Venema -** Maastricht University (The Netherlands)
O115	Investigation of the metabolism of black chokeberry (*Aronia melanocarpa*) polyphenols by the human gut microbiota in a computer controlled dynamic colonic fermentation model (TIM-2) **Gizem Çatalkaya -** İstanbul Technical University (Türkiye)
O116	Evaluation of *in vitro* bioaccesibility and ACE inhibition properties of faba bean proteins obtained by ultrasound assisted alkaline extraction **Zehra Mertdinç -** İstanbul Technical University (Türkiye)
O117	Production of metabolite content using bioreactors in opium poppy **Deniz Köm -** TÜBİTAK MAM (Türkiye)
O118	Germination of selected radish (*Raphanus sativus L.*) seeds and investigation of changes in total phenolic content and antioxidant activity of the radish sprouts during *in vitro* gastro-intestinal digestion **Aysun Yücetepe -** Aksaray University (Türkiye)

Session 22: Functional Foods: From Farm and Lab Bench to the Marketplace

***Moderators*:**
Ahmet Ceyhan Goren (Gebze Technical University, Türkiye)
Hicret Aslı Yalçın (TÜBİTAK MAM, Türkiye)

O119	The role of behavioral economy in the future of functional food market **Ebru Akdağ -** MUMSAD (Türkiye)
O120	Certification of neurotoxic amino acids, β-cyanoalanine and γ-glutamyl-β-cyanoalanine, in red lentil **Ahmet Ceyhan Goren -** Gebze Technical University (Türkiye)
O121	Does drought stress only affect kale (*B. oleracea*) negatively? Or should there be another reason for calling it “Superfood”? **Hicret Aslı Yalçın** - TÜBİTAK MAM (Türkiye)
O122	Current perspectives on sugar reduction in fruit products **Sinem Arğün -** Yeditepe University (Türkiye)
O123	The potential risk in fruit products **Işıl Gürsul Aktağ** – Hacettepe University (Türkiye)
O124	Using molecular gastronomy for diet of older adults to meet their special nutrient needs: hydrocolloids and phenolic compounds **Özge Seçmeler -** Altınbaş University (Türkiye)
O125	Changes in biochemical and angiotensin-I-converting enzyme (ACE) inhibitory properties of Spirulina products fermented by *Lactobacilluıs helveticus*, *Kluyveromyces marxianus*, and their mixed culture **Müge İşleten Hoşoğlu -** Gebze Technical University (Türkiye)

Session 23: Flash Talks

***Moderators*:**
Fereidoon Shahidi (Memorial University of Newfoundland, Canada)
Ronald B. Pegg (University of Georgia, USA)

Notes: Selected students from oral and poster sessions will advance to the flash talk session upon invitation. Therefore, all student presenters are expected to be prepared for giving a 5 min (3 min talk with 3 slides + 2 min questions) talk. There will be a maximum of 20 awards to be presented for the first (one awardee), second (two awardees), and the rest as third place (17 awardees); the latter one depends on meeting the required quality. Awards consist of a certificate and cash. All invited finalists must be a member of ISNFF, so applications fees for 2022 will be deducted from the cash payment to ensure membership compliance (please have your membership application complted if you are invited and are not an ISNFF member already).

POSTER PROGRAM

ISNFF 2022

POSTER PRESENTATIONS

Chair: Cesarettin Alasalvar

P1 Evaluation of rowan fruit pomace ingredients in meatballs by conventional quality characterization and UHPLC-QTOF-MS based untargeted metabolomics with multivariate data analysis
Viive Sarv - Estonian University of Life Science (Estonia)

P2 Functional gluten-free macaroni: Enhancement of bioactive compounds and quality using hydrocolloids and low amylose red rice
Anuchita Moongngarm - Mahasarakham University (Thailand)

P3 Valorization of canola meal using an air-frying pre-treatment to improve phenolic extraction and antioxidant activity
Olamide Fadairo - University of Manitoba (Canada)

P4 *Sargassum horneri* as a prebiotic dietary supplement for ımmunity development in *Streptococcus parauberis* ınfected zebrafish model
Nisansala Madushani Liyanage - Jeju National University (Republic of Korea)

P5 Enzymatic hydrolysis of head byproducts from olive flounder surimi industry: pepsin hydrolysate attenuates LPS-induced inflammation and oxidative stress in RAW 264.7 macrophages via blocking cell signaling pathways
Henarath Hetti Arachchilage Chathuri Kanchana Jayawardhana - Jeju National University (Republic of Korea)

P6 Sargachromenol isolated from *Sargassum horneri* inhibits particulate matter-induced inflammation in macrophages through toll-like receptor-mediated cell signaling pathways
Dineth Pramuditha Nagahawatta - Jeju National University (Republic of Korea)

P7 Anti-hypertensive effect of peptide from olive flounder (*Paralichthys olivaceus*) in EA. Hy926 cells and in spontaneously hypertensive rats
Sang-Woon Lee - Jeju National University (Republic of Korea)

P8 Diphlorethohydroxycarmalol, a phlorotannin isolated from ishige okamurae, induces Ca2+-dependent glucose uptake in C2C12 cells and zebrafish model
Hye-Won Yang - Jeju National University (Republic of Korea)

P9 Detection of cyclic imine (CI) toxins in whole body of shellfishes from domestic market in South Korea in 2021
Young-Sang Kim - Jeju National University (Republic of Korea)

P10 Structural characteristics of sulfated polysaccharide from *Sargassum horneri* and immune-enhancing activity of polysaccharides combined with lactic acid bacteria
Young-Sang Kim - Jeju National University (Republic of Korea)

P11 Zebrafish model for studying dexamethasone-ınduced muscle atrophy and preventive effect of maca (*Lepidium meyenii*)
Bomi Ryu - Jeju National University (Republic of Korea)

P12 Diphlorethohydroxycarmalol derived from ishige okamurae improves behavioral and physiological responses of muscle atrophy ınduced by dexamethasone in an *in-vivo* model
Bomi Ryu - Jeju National University (Republic of Korea)

P13 Preparation of water-soluble nanoemulsion of rosemary extract
Bülent Karadeniz – TÜBİTAK MAM (Türkiye)

P14 Polyphenol-rich pomegranate extract suppresses the microbial metabolism of the proatherogenic trimethylamine N-oxide precursor L-carnitine in an *in vitro* colon model
Julia Haarhuis - Quadram Institute Bioscience (UK)

P15 Determination of lipid oxidation oil-in-water emulsion containing vitamin D
Sibel Uluata - Inonu University (Türkiye)

P16 Investigation of physicochemical properties of Malatya apricot gum
Sibel Uluata - Inonu University (Türkiye)

P17 Design of enriched plum puree pieces
Bertuğ Altuğ Arısüt - Mateks Tarım Ürünleri Gıda Enerji San.ve Tic.A.Ş. (Türkiye)

P18 The effect of temperature and roasting time on caffeine content, antioxidant activity, organoleptic properties and quality of Robusta (*Coffea canephora*) ground coffee
Zita Letviany Sarungallo - Papua University (Indonesia)

P19 Food antioxidant or prodrug? The biased inhibitory efficacy of resveratrol monoesters/diesters/triesters in β-carotene bleaching, LDL (low-density lipoprotein) oxidation and DNA scission assays
Han Peng - Memorial University of Newfoundland (Canada)

P20 Phenolic profile of young plants of garlic
Jerzy Zawistowski - University of British Columbia (Canada)

P21 Immune-modulation effect of *Sargassum horneri* polysaccharides on concanavalin A-stimulated splenocytes and allergic asthma mouse model
Hyo Jin Kim - Jeju National University (Republic of Korea)

P22 *Sargassum horneri* ethanol extract containing phenolic acids attenuates PM-induced oxidative stress *via* ROS scavenging and transition metal chelation
Hyo Jin Kim - Jeju National University (Republic of Korea)

P23 Interleukin-17A deficiency alleviates airway inflammation in alleviates allergic asthma mice
Jiwon Yang - Jeju National University (Republic of Korea)

P24 *Sargassum horneri* extract containing sargachromenol attenuates the particulate matter exacerbated allergic asthma through reduction of Th2 and Th17 response in mice
Youngheun Jee - Jeju National University (Republic of Korea)

P25 *Laminaria japonica* polysaccharides impact the productivities and systemic health by modulating the intestinal microbiome and metabolome of ducks
Jiamei Cui – Jeju National University (Republic of Korea)

P26 *Undaria pinnatifida* sporophyll and *Gracilaria verrucose* ameliorate diet-indued obesity and inflammation *via* a physiological alteration of white adipose tissue in C57BL/6 mice
Eunyoung Kim - Jeju National University (Republic of Korea)

P27 Biochemical and haematological indices of weaning wistar albino rats fed sprouted sorghum (*Sorghum bicolor*) and bambara nuts (*Vigna. subterranean*) flour formulated diets
Funmilola Adefolalu - Federal University of Technology (Nigeria)

P28 Nutrient, secondary metabolite and physicochemical constituents of selected plant peels
Famous Ossamulu - Federal University of Technology (Nigeria)

P29 Development of moringa and baobab supplemented healthy snack bars as functional food by using quality function deployment method
Fatma Yesim Ekinci - Yeditepe University (Türkiye)

P30 European cranberrybush (*Viburnum opulus L.)* fruit extracts as functional ingredient, which selectively inhibits the growth of foodborne pathogens but not probiotic lactic acid bacteria
Gizem Özan - Yeditepe University (Türkiye)

P31 Antioxidant properties and prediction bioactive peptides produced from camelina meal (*Camelina sativa* (*L.*) *Crantz*)
Thi Ty Na Ngo - Memorial University of Newfoundland (Canada)

P32 *Octominin abates* LPS-induced chemokines and pro-inflammatory cytokines through blocking tlrs/NF-κB signal transduction from RAW 264.7 macrophages
Mihidukulasuriya Kurera - Jeju National University (Republic of Korea)

P33 Antioxidant activity and color of fresh juices as affected by dielectric barrier discharge cold plasma treatment
Ecre Sahinoglu - İstanbul Technical University (Türkiye)

P34 The relationship of the inflammatory potential of diet with eating attitudes and appetite
Hatice Çolak - Üsküdar University (Türkiye)

P35 Effects of dielectric barrier discharge cold plasma treatment on the total phenolic content and antioxidant activity of avocado seed flour
Aleyna Rabia Karakaş - İstanbul Technical University (Türkiye)

P36 Determination of nitric oxide radical scavenging activity of ascorbic acid with the aid of modified gold nanoparticles and applications
Ziya Can - İstanbul University-Cerrahpaşa (Türkiye)

P37 Olive (*Olea europaea L.)* leaf extracts obtained from different regions of Türkiye inhibit the proliferation and migration/ınvasion of various cancer lines *via* ınducing apoptosis
Birsen Cevher-Keskin – TÜBİTAK MAM (Türkiye)

P38 Investigation antiviral activity of mediterranean herbs and spices against SARS-CoV-2 using i*n silico* methods
Yuksel Cetin - TÜBİTAK MAM (Türkiye)

P39 Screening antiviral and immunomodulatory Mediterranean herbs and spices against SARS-CoV for ACE-2, MPRO, and PAD 4 using in silico pyrx
Yuksel Cetin - TÜBİTAK MAM (Türkiye)

P40 Efects of cold plasma applicatıon on antioxıdant properties of dandelion root
Berfin Eda Elçik - İstanbul Technical University (Türkiye)

P41 Enrichment of ice cream with roselle (*Hibiscus sabdariffa*) powder: Effects on antioxidant capacity and technological properties
Hamza Alasalvar - Nigde Omer Halisdemir University (Türkiye)

P42 Identification of *Lactobacillus plantarum* genes increasing the survival through the upper gastrointestinal tract
Tarık Öztürk - TÜBİTAK MAM (Türkiye)

P43 Protective effect of phytosomes on the hemolytic activity of plant derived Aristoside-C and Davisianoside-B saponins
Şebnem Erçelen Ceylan - TÜBİTAK MAM (Türkiye)

P44 Anti-inflammatory activity of fucoidan extracted from brown alga *Ecklonia maxima* leaves in particulate matter-stimulated RAW 264.7 macrophage cells
Rajasinghe Peli Gedara Sewwandi Kaushalya Amarasiri - Jeju National University (Republic of Korea)

P45 Development of a 3D Printer and its application on fungi based diet for elderly/dysphagia patients
Evren Demircan - İstanbul Technical University (Türkiye)

P46 Mineral profile of enriched modern bread with an ancient Anatolian wheat from Türkiye
Evren Demircan - İstanbul Technical University (Türkiye)

P47 Encapsulation of bioactive algal pigments: Optimization for functional food applications
Tamer Bayhan - Boğaziçi University (Türkiye)

P48 Determination of antiviral properties of PHYTORELIEF® herbal food supplement against Wuhan (B.1.36) variant of SARS-CoV-2 virus
Gamze Çakırca - TÜBİTAK MAM (Türkiye)

P49 Immunomodulatory effects of selected medicinal herbs and their essential oils: A comprehensive review
Emel Önder Firat - TÜBİTAK MAM (Türkiye)

P50 Knowledge in red palm oil as functional food towards purchase intention and future purchasing patterns among Malaysian
Areej Mohd Taufik - Malaysian Palm Oil Council (Malaysia)

P51 Anti-microbiological activity of the pomegranate peel
Busra Örnek - CCC R&D CENTER (Türkiye)

P52 Nutritional importance of blueberry
Merve Çinsar - CCC R&D CENTER (Türkiye)

P53 Determination of marker phenolic compounds for honeys with different botanical origins
Ufuk Alpat - Balparmak R&D Center (Türkiye)

P54 Encapsulation and storage stability of rosemary extract
Sena Saklar Ayyildiz - TÜBİTAK MAM (Türkiye)

P55 Antinutritional compounds in faba bean (*Vicia faba*) proteins as affected by different extraction methods
Chamila Nimalaratne - The University of Manitoba (Canada)

P56 Effect of citric acid fortification on the properties of tiger nut flour
Tawakaltu Abdulrasheed-Adeleke - Federal University of Technology (Nigeria)

P57 Biochemical and heamatological indices of weanling wistar albino rats fed sprouted shorghum (*Sorghum bicolor*) and *Vigna subterranean* flour formulated diets
Olufunmilayo Akanya - Federal University of Technology (Nigeria)

P58 *In vivo* toxicological evaluation of edible chitosan- starch film for food packaging
Helmina Akanya - Federal University of Technology (Nigeria)

P59 Detrimental impact of the fine dust in an aquatic organism Zebrafish: a protective agent on ocular damage *in vitro* and *in vivo* model
Jimin Hyun - Jeju National University (Republic of Korea)

P60 Phytochemical composition, antioxidant and enzyme inhibitory activities of *Dioscorea caucasica* and *D. Nipponica* leaf and tuber extracts
Petras Rimantas Venskutonis - Kaunas University of Technology (Lithuania)

P61 Anti-hypertensive effect of peptide from olive flounder (*Paralichthys olivaceus*) in EA. Hy926 cells and in spontaneously hypertensive rats
Sang-Woon Lee - Jeju National University (Republic of Korea)

P62 Bioactivity screening for antioxidant and anti-inflammatory activities of marine microorganisms (bacteria, fungus, microalgae) collected in South Korea
Sang-Woon Lee - Jeju National University (Republic of Korea)

P63 Immuno-enhancing effect of fucoidan from brown seaweed *Sargassum thunbergii in vitro* and *in vivo*
Fengqi Yang - Jeju National University (Republic of Korea)

P64 Sargachromenol isolated from *Sargassum horneri* inhibits particulate matter-induced inflammation in macrophages through toll-like receptor-mediated cell signaling pathways
Dineth Pramuditha Nagahawatta - Jeju National University (Republic of Korea)

P65 *Sargassum horneri* as a prebiotic dietary supplement for ımmunity development in *Streptococcus parauberis* infected zebrafish Model
Nisansala Madushani Liyanage - Jeju National University (Republic of Korea)

P66 Enzymatic hydrolysis of head byproducts from olive flounder surimi industry: pepsin hydrolysate attenuates LPS-induced inflammation and oxidative stress in RAW 264.7 macrophages *via* blocking cell signaling pathways
Henarath Hetti Arachchilage Chathuri Kanchana Jayawardhana - Jeju National University (Republic of Korea)

P67 Bioavailability of short-chain peptides and amino acid derivatives in miso in rat
Atsuya Nagao - Kyoto University (Japan)

P68 Metabolic fate of pyroglutamyl peptides in a rice protein hydrolysate in intestine and blood after oral administration
Satoshi Miyauchi - Kyoto University (Japan)

P69 Bioavailability of Pro-Hyp upon ingestion of collagen hydrolysate (CH) with the presence of rice protein hydrolysate (RPH)
Sri Wijanarti - Kyoto University (Japan)

P70 Peptides in micro and macro algae and their digests by stomach and intestinal proteases
Rina Shinomiya - Kyoto University (Japan)

P71 Validation and development for uncomplicated quantification by using a reversed-phase HPLC-UV method of fucosterol derived from *Sargassum spp*.
Jun-Ho Heo - Jeju National University (Republic of Korea)

P72 The effect of sulfated polysacchardies derived from *Sargassum thunbergii* on intestinal mucosal immunity in zebrafish model
Jun-Ho Heo - Jeju National University (Republic of Korea)

P73 Diphlorethohydroxycarmalol, a phlorotannin isolated from ishige okamurae, induces Ca2+-dependent glucose uptake in C2C12 cells and zebrafish model
Hye-Won Yang - Jeju National University (Republic of Korea)

P74 Antioxidant benefits of euryhaline microalgal species: An *in vitro* exploration
Manpreet Kaur - Punjab Agricultural University (India)

P75 Bioaccessibility and transepithelial transportation of quercetin and rutin: Effects of supercritical antisolvent micronization process and food models
Gülay Özkan - İstanbul Technical University (Türkiye)

P76 Investigating the antioxidant potential of *Crataegus monogyna Jackq*. and *Crataegus orientalis Pall.* phenolics during gastrointestinal digestion
Dilara Tas - İstanbul Technical University (Türkiye)

P77 Spent coffee phenolics improve the functionality of chickpea proteins
Beyza Vahapoglu - İstanbul Technical University (Türkiye)

P78 The effect of personality on chrononutrition during the COVID-19 lockdown in Qatar
Tamara Al-Abdi - Qatar University, Doha, Qatar

P79 Effects of *Cystoseira barbata* extracts as novel seaweed-based biostimulants on various crops
Ümit Bariş Kutman - Gebze Technical University (Türkiye)

P80 Extracts obtained from *Cistus creticus*, cultivated at varied levels of salinity, exhibit promising therapeutic potential for pancreatic cancer cell lines
Yağmur Arikan - Gebze Technical University (Türkiye)

P81 Biofortification of soilless lettuce with selenium and zinc
Ayşenur Bayrak - Gebze Technical University (Türkiye)

P82 Enhancing the health benefits of strawberry as a functional food by biofortification with selenium and iodine
Ayşenur Çataler Karakuş - Gebze Technical University (Türkiye)

P83 Functionalizing commercial soilless tomatoes *via* Se biofortification
Ömer Faruk Taştan - Gebze Technical University (Türkiye)

ABSTRACTS FOR PLENARY & ORAL PRESENTATIONS

PL1 Food bioactives and functional foods: Facts and fallacies

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Functional foods render physiological benefits related to health promotion and disease risk reduction. The effects are due to the presence of bioactive compounds that are generally present as minor components and are included in food products via fortification, appropriate selection of raw material, and/or genetic modification or via special feeding regime for animals. The bioactives present in seeds of cereals, legumes and oilseeds include phenolic compounds that occur in the free, soluble esters and glycosides as well as insoluble-bound forms. Processing may release them from the insoluble-bound fom but most studies have ignored their contribution, hence one of the causes of often observed differences between the *in-vitro* and *in-vivo* results. Of course, differences about the bioaccessibility and bioavailability of phenolics are also among the factors to be considered. These may, in part, be related to high polarity of the phenolic compounds, hence lipophilization may be carried out to enhance their efficacy and provide added benefits. The fact acids used in the lipophilization may vary in chain length and degree of unsaturation. However, long-chain polyunsaturated fatty acids (LC PUFA), especially eicosapentaenoic acid (EPA) and docosahexaenolic acid (DHA) used in the process provided exceptional additional benefits. These fatty acids are also know to render their own cardioprotective, anti-diabetic and anti-inflammatory properties. While these benefits have mostly been confirmed, there have also been hurdles in the way due to some selective and not fully comprehensive studies. Examples will be provided to shed light on the existing facts and fallacies in the field.

Keyword: Functional foods, lipophenols, EPA, DHA, phenolics and polyphenolics

PL2 Nanoscience of tea

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As a unique phytochemical system with a long history of human utilization, tea has attracted enormous research efforts. Its composition, chemical reactions undergone during processing and its biological efficacy in maintaining human health have successively been elucidated, and a large number of active compounds have been identified. Yet, the mechanism of tea attributes that professionals listed as the quality parameters such as Shengjin(hydration), sweet after taste, and the sense of energy infusion remains a complete black box. The major reason is that the currently dominant approach of single molecular analysis to tea phytochemical system fails to address the reality of tea-body interaction. Any amphiphilic molecule of tea constituent composition will inevitably self-assembled into nanoparticles to constitute the real unit to interact with body. Here we show that a selected species of tea composition molecules are migrating into aqueous phase in a strictly sequential manner to assemble into nanoparticles with hydrodynamic diameters around 100 nanometer. They act as flavor compounds carrier and response to temperature with various assembling modes, which renders a mechanism for tea infusion's unique solution behavior. Tea nanoparticles were found to interact with mucosal microphages to restore their membrane potential, which is an evidence that tea infusion can regulate the body through the direct interaction with immune system, a clue to other immediate body responses to tea such as hydration and sweet aftertaste and energy. It is an example how upgrading a single compound approach to the actual interacting unit of nanoparticle can significantly advances the understanding of food functions.

PL3 Gut microbiota and metabolism of bioactives

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Food phytochemicals constitute a relevant group of food bioactives, including metabolites with different structures and biological properties. These phytochemicals are often absorbed at very low levels and reach the colon, where they interact with the gut microbiota. The phytochemical metabolism by colon gut microbiota is relevant, and the metabolism of different polyphenols (flavonoids and non-flavonoids), terpenoids, and nitrogen-containing compounds have recently been highlighted. Polyphenols studied for transformation by gut microbiota include condensed (proanthocyanidins) and hydrolyzable (gallotannins and ellagitannins) tannins, flavonoid glycosides and aglycones, anthocyanins, isoflavones, hydroxycinnamates, hydroxybenzoates, stilbenes, and lignans. Within the terpenoids, monoterpenes, sesquiterpenes, diterpenes, triterpenes, and their glycosides and carotenoids have been explored for metabolism by gut microbiota. They seem to be a very relevant field of research showing many new metabolites with potential health effects. In the case of nitrogen-containing phytochemicals, amino acids, nucleic acids, alkaloids, amines, betalains, phenolamides, and glucosinolates have also been studied. In this presentation, we will show the state-of-the-art in this field and the potential of the interactions of different phytochemicals with gut microbiota on human health.

PL4 Spontaneous crude lecithin-based liposomes for encapsulation and delivery of hydrophobic bioactives

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Crude deoiled lecithin was used to fabricate giant mutilamellar liposomes spontaneously. These "Bangham" liposomes were hydrated in water at room temperature, forming multilamellar liposomes in the range 7-10 micrometers, depending on the source of lecithin used. The combination of phosphatidylcholine and phosphatidylethanolamine naturally present in the material helped the spontaneous formation of the liposomes without the use of high-pressure homogenization of any sort. These GMV could be used to encapsulate hydrophobic molecules in the interior of the phospholipid bilayers. Cannabinoids such as THC and CBD were used as probes, achieving high loading capacity. We also discovered that homogenization of these GMV using an industrial rotostator was sufficient to reduce their size to 100-120nm, thus creating large unilamellar vesicles carrying a hydrophobic cargo. We also engineered the critical packing parameter (CPP) of the polar phospholipid heads by the use of polyols in the medium. By increasing the CPP, GMV were spontaneously reduced to LUVs without the use of any homogenization at all. A combination of judicious addition of polyols and hydrophobic cargo in a volatile solvent, allowed for encapsulation efficiencies over 90% and loadings of 20mg THC/100mg dry lecithin. Polyol addition and heating to ~70degC achieved commercial microbiological stability, with water activity of 0.8. The product was thus stable at room temperature. The loaded liposomes can be used as drop-in solutions for nutraceutical/pharmaceutical beverages, and are heat and pH stable to boiling for several hours, to 60°C storage for a week, and pH values of 4.0 or above. Stability studies suggest a 2 year shelf-life for the product, but this will depend on the oxidation status of the bioactive.

Keyword: Liposomes, lipophillic molecule, spontaneous, cannabinoid

PL5 Beneficial health effect of sphingolipids via regulation of gut function

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Long-chain base (LCB), known as sphingoid base, forms the essential structure of sphingolipids (SLs) such as ceramide, glucosylceramide, and sphigomyelin (SM). SLs are involved in a wide range of physiological processes, including intracellular transport, cell division, and signal transduction. On the other hand, SLs are found in the human diets. In western countries, dietary SLs mainly consist of SM drived from dairy, meat, and egg. The dietary SLs have been reported to show neuroprotective, anti-inflammatory, cardioprotective, anti-cancer, and skin-protective activities. SL is composed of an LCB with amide-linked fatty acid and a polar head group. In a small intestinal mucosa, a polar group is leberated from the SL to form free ceramide, which is further hydrolyzed to LCB and fatty acid moiety, and then absorbed via lymph. However, the digestive and absorption rates of SL, free ceramide, and LCB are generally lower than those of other lipid classes. Therefore, the major biological significance of dietary SLs has been considered due to the direct action of the digestives, especially LCBs and free ceramide on gut function. Dietary SLs inhibit the intestinal absorption of cholesterol and long-chain fatty acids, reducing the lipid content in plasma and liver. We have found that LCBs have also inhibited the up-take of cholesterol and long-chain fatty acids and the effect was much higher than that of SLs. Free ceramide and LCBs also showed intestinal protection properties and reduced the risk of colon cancer. Moreover, we have alreday reported the strong ability of LCB to inhibit the oxidative deterioration of EPA- and DHA-containing oils. Therefore, LCB and the related lipids can be used as multi-functional nutraceuticals for functional foods.

PL6 Functional food and health: Essentiality of human evidences

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Starting from 1980 when the term "functional food" was developed, research on the identification and on the role of food to modulate key aspects of body's physiology and to decrease risk factors for degenerative diseases increased exponentially. Accordingly, the term functional food has been object of a massive communication from media and social network, becoming widely popular for general audience, modifying dietary habits of consumer. According to EFSA, the term functional food refers to "a food, which beneficially affects one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease". As for any diet or food item, the final target is the human being, with his complicated and fascinating physiology, aiming to optimize resistance to stressors and exogenous threat, preserving wellbeing. The efficiency of a food strictly depends on the process of digestion, absorption, metabolization of the ingested molecules as well as the process of eating is tightly linked to human physiology and immunity for better or for worse. Last but not the least, a higher efficiency of functional foods take place when there is an alteration of the physiological homeostasis, such as in presence of oxidative/inflammatory stress, dysbiosis etc. In this picture is obvious how human studies, represents the optimal model to understand the functionality of a food and to deliver public health recommendations. The Lecture will focus on the importance of **strengthening human-based evidence** and on practical aspects of eating, the **"real life" settings,** to significantly improve scientific-based evidence about the association between diet and wellbeing. Accordingly, evidence-based communication for non-scientific audience will strongly improve, allowing to deliver simple and scientific-based message to the consumer for efficient and practical applications in real life.

PL7 Five decades of lipid healthcare: Omega-3LCP story from marine oils to plant sources, natural supplements to medicines

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Long-chain omega-3 polyunsaturated fatty acids (PUFA) now hold a respectable place in many areas of healthcaresuch as cardiovascular disease, many inflammatory-based conditions, brain and sight functions and in use globally in infant formulas. This presentation will cover a sweeping review from the humble beginnings, showing how these highly specialized molecules have a place with multiple of functions in many areas in the body. Originally touted as an "Old Wives" remedy for brain function and arthritis, these lipids, and their derivatives, through very extensive, and dedicated research, have been shown to be beneficial in maintaining healthy metabolism throughout the body. The discovery, research, development, regulatory status, and the critical collaborations that have placed these natural ingredients at the top of commercial and innovative successes. Commercial product developments, the delivery and efficacy of these molecules within the body, and the regulatory status globally have all combined to make them successful by any standard. The global value at ingredient level is in excess of one billion dollars and at the retail level estimated at over forty billion dollars. Truly exceptional status from humble fish oil beginnings. For any developers or researchers looking to commercialize new ingredients, this success story will give insight into the multitude of steps, the cost and time required, collaborations to be considered, commercialization and trade support needed, and the NGO and government regulations required. All these factors have been critical for long-chain PUFA to achieve their status and success.

Keyword: Omega-3 Long chain lipids, GOED, EPA/DHA, nutraceutical lipids, fats of life

PL8 Metabolism and bioavailability of polyphenols and its importance in developing polyphenol nutraceuticals

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There is considerable interest in developing polyphenol-rich products as nutraceuticals that deliver benefits to human health. The overall evidence from large epidemiological and dietary intervention studies is supportive for several polyphenols and polyphenol-rich foods. However, a major challenge has been establishing which compounds reach the tissues where they may exert effects and demonstrating plausible mechanisms at physiological concentrations. The common approach of testing the bioactivity of food polyphenols does not consider that only a fraction of ingested polyphenols is absorbed, human phase-2 conjugates are the main circulatory forms, and gut microbiota catabolism generates the majority of phenolic metabolites that are absorbed. Studies that seek to connect the ingestion of polyphenols to a health benefit by showing they have a beneficial effect on cellular processes or tissue functions need to be done with the polyphenol structures found in blood. In this lecture, I will provide a short update of the state of the art for polyphenol metabolism and bioavailability, and then give examples of the approaches taken by my research group and others to try and establish plausible mechanisms of action for dietary polyphenols. In addition, I will present the emerging evidence that people exhibit different metabotypes (e.g., in their ability to produce urolithins, valerolactones and other gut microbiota-dependent metabolites) and that this determines whether they benefit from consuming particular polyphenols.

PL9 Mechanistic insights into nutrition and vascular-related diseases using multi-omics and integrative approaches: Machine learning as a next challenge in nutrition research

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Macro- and micronutrients, like polyphenols, have been extensively studied for their effects on vascular and consequently on their role in developing or preventing onsets of cardiometabolic and neurological diseases. Recent data indicate that in biological systems, these nutrients act primarily through genomic and epigenomic mechanisms. The molecular mechanisms underlying their health effects are still not well identified, mainly due to the use of physiologically non-relevant conditions, but also due to the use of targeted genomic approaches aiming to evaluate the effect only on few specific genes, thus preventing to decipher detailed molecular mechanisms involved. The use of state-of-the-art untargeted analytical methods represents a significant breakthrough in nutrigenomics, as these methods enable detailed insights into the effects at each specific omics level. Moreover, the implementation of multi-omics approaches allows integration of different levels of regulation of cellular functions, to obtain a comprehensive picture of the molecular mechanisms of action. In combination with bioinformatics and the methods of machine learning, multi-omics has potential to make a huge contribution to the nutrition science. The aim of this presentation is to provide an overview of the use of the omics, multi-omics, and integrative approaches in studying the vascular effects of macro- and micronutrients as well as address the potentials for use of the machine learning in nutrigenomics.

O1 Tripeptide IRW protects MC3T3-E1 cells against Ang II stress in a AT2R dependent manner

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Multiple strategies including the use of bioactive peptides and other antioxidants are being adopted to maintain bone health. This study provides an improved and deeper understanding of the pharmacological effects that IRW extends on bone health. Our results showed that IRW treatment protects osteoblasts against Ang II induced decline in cell proliferation and restores protein levels of COL1A2 and ALP levels in MC3T3-E1 cells ($p<0.05$). Apart from augmentation of these mineralization factors, the Ang II induced apoptotic stress in osteoblasts was mitigated by IRW as well. At the molecular level, IRW abolished the cytochrome-c release via modulation of pro-and anti-apoptotic genes in MC3T3-E1 cells ($p<0.05$). Interestingly, IRW also increased cellular levels of cytoprotective local RAAS factors such as MasR, Ang (1-7), ACE2, and AT2R, and lowered the levels of Ang II effector receptor (AT1R). Further, our results indicated a lower content of inflammation and osteoclastogenesis biomarkers such as COX2, NFκB, and RANKL following IRW treatment in MC3T3-E1 cells ($p<0.05$). The use of an antagonist-guided cell study indicated that IRW contributed to the process of cytoprotection and proliferation of osteoblasts in face of Ang II stress in an AT2R dependent manner. The key findings of our study showed that IRW could potentially have a therapeutic role in the treatment and/or prevention of bone disorders.

O2 Therapeutic potential of novel bio-peptides from non-bovine milk

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Milk is a superior food for human as a rich source of bioactive compounds that impart its medicinal properties. Bovine milk is extensively searched for dairy bioactive compounds particularly bioactive peptides. However, milk from different dairy animals, other than cow, represents about 17% of milk consumed by humans globally. In contrast to bovine milk, interest in goat milk is intensifying due to reduced allergenicity of its proteins compared to bovine milk and its traditional medicinal properties. On the other hand, camel milk has long been used to cure several diseases due to its therapeutic activities. Surprisingly, no work has been done to explore the effects of the isolated components of goat or camel milk. It is difficult to discern whether these therapeutic effects are unique to the whole milk or to a specific component such as proteins or peptides. In this study, we explore novel bio-active peptides derived from camel and goat milk proteins. Several peptides exhibited potent antioxidant activity and strong antimicrobial activity against skin pathogens as well as remarkable ability to suppress macrophages-mediated inflammation. Certain peptides showed strong anticancer activity against human colon and human breast carcinoma cells. MALDI-TOF-MS allowed the identification of anti-oxidative and anti-hypertensive peptides derived from various caseins as well as whey of goat milk. Lactophorin, glycation-dependent cell adhesion molecule1 (GlyCAM-1), and an intrinsically driven peptide from its C-terminal were the most representative peptides in the most active protein fractions with anticancer and anti-inflammatory properties of camel milk. The results highlight, for the first time, that lactophorin and its unique peptides are the major anti-cancer and anti-inflammatory molecules in camel milk. Further, goat milk proteins were found to possess multifunctional biopeptides, which herald a fascinating opportunity for their potential candidacies as therapeutic agents in the nutraceutical and pharmacological applications.

Keyword: Bio-peptides, antioxidant, anti-inflammation, anticancer, goat milk, camel milk

O3 Exploitation of olive (*Olea europaea L*) seed proteins as up-graded source of bioactive peptides with multifunctional properties: focus on antioxidant and dipeptidyl-dipeptidase – IV inhibitory activities, and glucagon-like peptide 1 improved modulation

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This work was aimed at extracting and characterizing proteins for olive seeds and at producing two protein hydrolysates using Alcalase and Papain, respectively. Peptidomic analysis were performed allowing to identify both medium- and short-chain peptides. Moreover, an extensive characterization of the antioxidant properties of olive seed hydrolysate was carried out, both in vitro by 2,2-diphenyl-1-picrylhydrazyl (DPPH), by ferric reducing antioxidant power (FRAP), and by Az-ino-bis(3-ethylbenzothiazoline-6-sulfonic) acid diammonium salt (ABTS) assays, respectively, and at cellular level by measuring the ability of these hydrolysates to significant reduce the H_2O_2-induced reactive oxygen species (ROS) and lipid peroxidation levels in human intestinal Caco-2 cells. In addition, results underlined that the same hydrolysates reduced the activity of dipeptidyl peptidase-IV (DPP-IV) and stimulate the release and stability of glucagon-like peptide 1 (GLP-1) hormone in a co-colture system in which intestinal Caco-2/STC-1 cells were employed. Based on these results, olive seed hydrolysates may represent new ingredient with antioxidant and anti-diabetic properties for the development of nutraceuticals and functional foods for the prevention of the metabolic syndrome onset.

Keyword: Anti-diabetic activity, DPP-IV, GLP-1, *Olea europaea L.*, antioxidant peptides

O4 *In vitro* inhibition of acetylcholinesterase activity by yellow field pea (*Pisum sativum*) protein-derived peptides as revealed by kinetics and molecular docking.

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Alzheimer's disease (AD) is linked to the loss of cholinergic neurons or acetylcholine (ACh) through quick termination of cholinergic transmission catalyzed by acetylcholinesterase (AChE). Existing therapy involves the use of substances with structural similarity as the natural substrate (ACh) to bind to AChE. Theoretically, peptides from food proteins can occupy the active site of AChE and prevent interaction with the natural substrate. The aim of the study was to determine the kinetics of AChE inhibition and potential enzyme-ligand binding configurations of five novel peptides which exhibited potency in AChE inhibition activity. Peptide separation and purification was carried out on pea protein hydrolysates using Reverse-phase HPLC and mass spectrometry. Subsequently, 20 novel peptide sequences were identified, synthesized and $IC_{50\ d}$etermined. Based on the IC_{50}, the most potent peptides (QSQS, LQHNA, SQSRS, ETRSQ, PQDER) were selected and analyzed for kinetics of inhibition and molecular docking (MD). Galantamine was used as the control for the AChE inhibition activity of the peptides. AChE inhibition activity of peptides was higher (IC_{50} = 0.002-0.0027 mM) and significantly better than the standard drug (IC_{50} = 0.0042 mM) at $p \leq 0.05$. Inhibition parameters of peptides - AChE complex indicated great affinity for the enzyme (K_i < 0.02 mM, V_{max} reduced with addition of peptide and K_m < 0.1 mM). MD revealed that the five peptides were bound in the triad active site of AChE. LQHNA, SQSRS and PQDER exhibited highest binding affinity to AChE (<-165 kJ/mol) than QSQS and ETRSQ. The presence of glutamine (Q) is common in all the peptides but Q in the tetrapeptide C-terminal sequence of LQHNA, SQSRS and PQDER may have contributed to the higher binding affinity. The result of this study will enhance development of novel potent AChE inhibitory substances from natural peptides that could contribute to the therapy for Alzheimer's disease.

Keyword: Acetylcholinesterase, Alzheimer's disease

O5 Contribution of hydrolysis and drying conditions to whey protein hydrolysate characteristics and *in vitro* antioxidative properties

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During the generation of functional food ingredients by enzymatic hydrolysis, parameters such as choice of enzyme, reaction pH and the drying process employed may contribute to the physicochemical and bio-functional properties of the resultant protein hydrolysate ingredients. This study characterised the properties of spray- (SD) and freeze-dried (FD) whey protein hydrolysates (WPHs) generated using Alcalase® and Prolyve® under pH-stat and free-fall pH conditions. The enzyme preparation used affected the physicochemical and *in vitro* antioxidative properties but had no impact on powder composition, morphology or colour. SD resulted in spherical particles with higher moisture content (~6%) compared to the FD powders (~1%), which had a glass shard-like structure. The SD-WPHs exhibited higher antioxidative properties compared to the FD-WPHs, despite similar peptide profiles were observed and no evidence of Maillard reaction product formation during the SD processing was evident. The oxygen radical absorbance capacity (ORAC) and Trolox equivalent antioxidant capacity (TEAC) values of the WPHs showed a positive correlation (r^2 = 0.827-0.961; $p < 0.01$) with the level of peptides < 1 kDa. The most potent antioxidative WPH was generated using Alcalase® under free-fall pH conditions, followed by SD. This hydrolysate had ORAC and TEAC values of 1132 and 686 µmol TE/g, respectively. These results demonstrate that both the hydrolysis conditions and the drying process used impacted the *in vitro* antioxidative properties of WPHs.

Keyword: Whey, hydrolysate, drying, hydrolysis conditions, antioxidant

O6 The improvement of bioavailability and health benefits by phytochemical interactions

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This study was to improve the bioavailability and health benefits of phytochemicals by the interaction with some other major nutrients. The interaction of phytochemicals with carbohydrates, lipids and proteins could increase their bioavailability and provide double or triple health effects. The interaction of royal jelly protein and epigallocatechin gallate (EGCG) led to high bioavailability of EGCG and also showed synergestic health effects of both royal jelly and EGCG. The esterification of EGCG with fish oil, greatly increased the bioavailability of EGCG, and protected the stability of fish oil. The product also showed both health benefits of fish oil and EGCG. The interaction between casein and tannin lowered the bitter taste of red wine, while the addition of 10% inulin to tomato sauce significantly lowered its bioaccessibility. Numerous epidemiological studies have displayed the health issues of phytochemicals, such as oxidative stress-associated degenerative and chronic diseases like obesity, inflammation, cancer, cardiovascular disease, type-2 diabetes mellitus and aging. However, poor bioavailability could influence their different performance. Proper interaction of phytochemicals with some other material could increase and promote the value of phytochemicals.

Keyword: Interaction, phytochemicals, EGCG, royal jelly protein, fish oil

O7 Phenolics of green and yellow pea hulls: their composition, metabolism, antioxidant and anti-inflammatory activities and roles in intestinal health

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Green and yellow pea ***(Pisum sativum L.)*** hulls are by-products of the processing but rich in phenolics and dietary fibers. Value-added use of such agri-food wastes/by-products for functional foods and nutraceuticals has been explored. Different forms of phenolics were examined and a total of 43 phenolics were tentatively identified as free phenolics, mainly flavonoids, including catechin, quercetin, kaempferol and their derivatives; while, the conjugated and bound phenolics were mainly dominated by hydroxybenzoic acids and hydroxycinnamic acids. These compounds contributed to in vitro and in vivo antioxidant and anti-inflammatory activities. The release of polyphenols from pea hulls, absorption of digestive products and their effects on inflammation and intestinal barrier were also studied using *in vitro* digestion, Caco-2 monolayer and the Caco-2/Raw264.7 co-culture models. We found that polyphenols were released from pea hulls, reaching the maximum release amount in the small intestine, and showed good antioxidant activity. Different compounds showed different release behaviors during digestion. Kaempferol trihexoside was the only substance of the digestate that was absorbed and transported. Phenolics in the digestate were shown to contribute to the maintainance of intestinal barrier integrity and anti-inflammatory effects after being absorbed. Pea hull phenolics were found to under phase I (reduction, hydroxylation and deoxidation) and phase II (methylation, glucuronidation and sulfation) metabolism as evidenced in the plasma or urine samples of rats orally introduced the extracts. Metabolites were also identified in the plasma, heart, liver, lung and kidney samples and were found to positively affect on the SOD, GSH-Px, MDA and T-AOC in these organ tissues. The phenolics-rich extract of pea hulls was also shown to ameliorate DSS-induced colitis through Keap1/Nrf2 pathway and gut microbiota modulation. These compounds were responsible for improved inflammatory status (body weight and DAI), colonic function (colonic length, HE staining, and TJ protein), regulated inflammatory factors (IL-6, IL-1β, TNF-α, and IL-10), and restored oxidative balance (MDA, CAT, SOD, and T-AOC) in mice. One of the mechanisms of remission of DSS induced colitis in mice might be through the activation of the Keap1-Nrf2-ARE signaling pathway, downstream regulation of the antioxidant protease (GCLC, HO-1, and NQO1) and gut microbiota by increasing F/B value and promoting the growth of *Lactobacillaceae* and *Lachnospiraceae*, and improving the level of SCFAs. Our results demonstrated significant roles of pea hull polyphenols in improving oxidative stress related diseases, and their potential for improved immune response and intestinal health.

Keyword: Pea, polyphenols, metabolism, inflammation, gut health

O8 Exploring the role of sulphur compounds derived from broccoli on prostate cancer metabolism

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Diets rich in cruciferous vegetables such as broccoli have been shown to reduce the risk of prostate cancer progression due to the presence of sulfur-containing metabolites. Whilst much of the anti-carcinogenic effects have been linked with the glucosinolates such as glucoraphanin and the hydrolytic product of glucoraphanin, sulforaphane, S-methyl cysteine sulfoxide (SMCSO) may have health benefits and play a role in the effect of a broccoli-rich diet. Here we report studies of SMCSO and its metabolite S-methyl methanethiosulfonate (MMTSO), on prostate cancer metabolism, using the human cell line DU145. In these studies, molecular and OMICS techniques including Seahorse Bioanalyser and RNA-sequencing. The RNA-Sequencing analysis was divided into two parts: (I) processing the raw RNA-sequencing reads for quality control, alignment and quantification to estimate gene expression, (II) statistical analysis to identify differentially expressed genes, testing for the effect of MMTSO and SMSCO on gene expression. SMCSO did not significantly affect cell viability, however MMTSO did affect cell viability but only at high concentrations. Using the Seahorse Bioanalyser, MMTSO exposure for 24 hours, but not SMCSO, reduced mitochondrial metabolism and reductions were greater in the high glucose environment. The RNA sequencing analysis Part (I) reported good quality RNA reads with over 95% passing filter, and high overall alignment to the human reference genome of over 97.5%. Exploratory analysis for part (II) reported tight clustering of MMTSO samples and no clustering of SMCSO samples from principal component analysis. Overall, these findings show that MMTSO, but not SMCSO, affects the metabolism of DU145 prostate cancer cells. Current experiments are focusing on the use of metabolomic profiling to understand the effects of these bioactives on DU145 cells and gain an understanding of their role in rewiring central metabolism. This work could give rise to the use of dietary sulfur metabolites as cancer chemopreventive agents.

Keyword: Sulfur metabolites, prostate cancer, health effects, metabolism

O9 A comparative study on the absorption of chain- and cyclic-forms of food-derived prolyl-hydroxyproline after the ingestion of different-molecular-weight gelatin and gelatin hydrolysates

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The ingestion of gelatin hydrolysate (GH) increases the concentration of the collagen-derived bioactive peptide, prolyl-hydroxyproline (Pro-Hyp), in human blood. In a previous study, we demonstrated the absorption of cyclic Pro-Hyp, which is a N- and C-terminal condensate of Pro-Hyp, in human blood. It has been reported that the ingestion of low-molecular-weight (LMW)-GH can enhance Pro-Hyp absorption in human blood compared to large-molecular-weight GH. Therefore, in this study, we compared the Pro-Hyp and cyclic Pro-Hyp concentrations in human blood after the ingestion of gelatin, GH, and LMW-GH. Pro-Hyp and cyclic Pro-Hyp were detected in human blood after the ingestion of gelatin; the concentrations reached 16.1 nmol/mL and 2.4 nmol/mL plasma, respectively. Interestingly, the area under the blood concentration-time curve ($AUC_{0\text{-}4\ h}$) ratio of cyclic Pro-Hyp-to-Pro-Hyp after gelatin ingestion was higher than that observed after the ingestion of GH and LMW-GH. In short, the acquired results suggest that the ingestion of gelatin-containing foods, such as cooked fish, cooked meat, gummi, and jelly, might have health benefits for human skin and joints. Moreover, gelatin can be more effective in terms of absorption of cyclic Pro-Hyp than GH and LMW-GH. Therefore, gelatin is a valuable functional food component that is comparable with GH and LMW-GH.

Keyword: Gelatin, collagen, prolyl-hydroxyproline

O10 Absorption of balenine in human plasma after ingestion of opah muscle extracts

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Opah (*Lampris guttatus*) is a mesopelagic and endothermic fish containing high amounts of balenine (Bal) in its muscles. Balenine is one of the imidazole dipeptides consisting of β-alanine (β-Ala) and 3-methyl-histidine (3-Me-His) and is found in abundance in whale and opah muscles. Very recently, the potential health benefits of Bal have been reported by in vitro studies. Therefore, to support the reported beneficial effects of Bal ingestion, the present study aimed at detecting food-derived Bal in human plasma after the ingestion of opah muscle extracts for elucidating its bioavailability. The plasmas were prepared from subjects who had ingested 5 g of opah muscle extracts, which contained 30% Bal. The concentrations of Bal and the constituent amino acids in the plasmas were analyzed using high-performance liquid chromatography with a pre-column derivatization technique. The Bal concentration increased after ingestion and reached a maximum level (Cmax, 89.87 nmol/mL) after 1 h of ingestion. The β-Ala and 3-Me-His concentrations also increased after ingestion and their Cmax values were 67.94 nmol/mL after 1 h and 116.52 nmol/mL after 2 h of ingestion, respectively. In conclusion, our present study demonstrated the absorption of Bal and constituent amino acids after the ingestion of opah muscle extracts. This may indicate that the ingestion of Bal has beneficial effects on human health, which have been demonstrated by previous *in vitro* studies.

Keyword: Opah, imidazole dipeptides, balenine

O11 Impact of two novel plant bioactives on the rescue of impaired gut barrier function using human primary cell intestinal epithelium

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Obesity is associated with increased gut permeability, a condition in which decreased expression of hepatocyte nuclear factor 4 alpha (HNF4α), a nuclear transcription factor expressed in mucosal epithelial cells along the gastrointestinal tract, has been shown to play a critical role. HNF4α is hypothesized to regulate Paneth cell differentiation, mucin production and tight junction protein expression, each essential for maintaining gut barrier function. N-trans caffeoyltyramine (NCT) and N-trans feruloyltyramine (NFT), two naturally occurring bioactives HNF4α agonists identified in hemp hulls, have the potential to improve gut barrier function. The aim of the study was to determine the effects of NCT and NFT on rescuing impaired gut barrier function using human stem cell derived colon cells. Proliferative human transverse colon epithelial cells were plated onto 4 x 96-well RepliGut® transwell plates and allowed to differentiate. Post-differentiation, cells were co-cultured with TNFα along with either NCT, NFT or NCT/NFT (2.2 ratio) over a 48-hour period to induce inflammation & observe the effects of NCT & NFT on rescuing disrupted gut barrier function. Transepithelial electrical resistance (TEER) and percent permeability using FITC-Dextran were measured at t= 0, t= 24 hours, t= 45 hours, and t= 48 hours. A significant decrease in TEER and increase in intestinal permeability was observed with increased addition of TNFα. Co-administration of NCT and NFT demonstrated a dose-dependent and statistically significant reversal of impaired TEER and intestinal permeability. Novel bioactives NCT and NFT demonstrated a physiologically relevant reversal of impaired gut barrier function in setting of inflammation via significant improvement in TEER and % permeability.

O12 A powerful collaboration from naturals: apitherapy + phytotherapy

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Nature offers endless opportunities for us to keep healthy or alleviate the disease symptoms, or for treatment of diseases. These include bee-products (honey, bee pollen, royal jelly, propolis, etc.) and herbal medicines (phytochemicals, phytotherapy, functional foods, etc.) that have been used extensively throughout history. Recently these two healing systems regained the attention of the scientific community. Consequently, that anecdotal information on their healing benefits has now become supported by detailed mechanistic scientific evidence. Honeybees collect phytochemicals from plants and convert them partially to various modified structures through their endogenous enzyme systems, i.e., phenolic glycosides to aglycones, etc., which act in different metabolic pathways. Honey has been considered a suitable milieu for drug dispensing by lay people and in traditional medicines worldwide.
Combining the bee-products with the standardized extracts of herbal medicines is a motivating idea. This approach would provide a more comprehensive biological activity profile regarding pharmacokinetics and pharmacodynamics parameters. This presentation will discuss the possible advantages of such combinations based on the available scientific evidence.

O13 An investigation of bioactive and physicochemical properties of Turkish pine honey

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Pine honey is a valuable honeydew honey which is produced in Türkiye with 90% majority. Elucidating the bioactive and physicochemical properties of Turkish pine honey is the main objective of this study. The level of 43 different phneolic compounds and 13 minerals were determined as well as their physicochemical (moisture, electrical conductivity, free acidity, diastase activity, HMF, proline, sugar profile) and melissopalynological properities (starch/pollen and honeydewelements/pollen), antioxidant activities and antimicrobial activities of the honey samples. Average values for moisture, electrical conductivity, free acidity, diastase activity, hydroxymethylfurfural and proline were 17,03%, 1,12 mS/cm, 24,75 meq/kg, 18,53 DN, 2,92 mg/kg and 589,9 mg/kg respectively. The average sum of Fructose and Glucose was 58,32%. The average for Fructose/Glucose was 1,21. All samples contained high amounts of K, Ca, Fe and Zn. Potassium was quantitatively the most important mineral. All samples showed antioxidant capacity results between 67,7% and 77,0%. Protocatechuic acid was the most abundant phenolic compound detected. The antibacterial activity was investigated against the reference strains using microdilution method. The Minimum Inhibition Concentration (MIC) of Turkish pine honey against S.aureus varied between 3,12% and 25%. The MIC values of Turkish the pine honey against *E. coli* ranged between 12.5% and 25% (w/V).

Keyword: Turkish pine honey, bioactivity, physicochemical properties, mineral content

O14 Production of an artificial perga possessing high antioxidant activity *via* lactic acid fermentation of bee pollen

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Perga (bee bread), a long-term food source by honey bees, is a rewarding product because of its rich nutritional value and bioactivities. Although its use as a food supplement has increased in recent years, it has not become widespread due to the difficulties in its supply, and its high price. Moreover, it is pretty difficult to find a standard quality and safe product in the market. In this presentation, attempts of our research group to produce an artificial Perga, which has a higher *in vitro* antioxidant activity than a natural one through lactic acid fermentation of bee pollen will be described. The production process of natural bee bread was partially imitated in laboratory conditions. To obtain artificial Perga products, reaction mixtures containing bee pollen samples collected from different regions of Türkiye, starter culture (probiotics, *Lactobacillus plantarum* or *Lactobacillus fermentum* or natural bee bread), and honey were prepared and cultured under anaerobic conditions. Various antioxidant parameters of natural and artificial products, such as free radical scavenging activity, cupric ion reducing capacity, and total phenolic and flavonoid contents were compared.

O15 Quantitation of the myo-inositol and D-Pinitol levels as promising bioactive constituents of pine honey and elucidation of the pathway by analyzing sap of *Pinus brutia* and the secretion of aphid *Marchalina hellenica*

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Pine honey is valuable honeydew honey and it is mainly produced in *Pinus brutia* forests. The fact that *Pinus brutia* is most common in Türkiye in the entire world brings great wealth in terms of pine honey production. *Marchalina hellenica* (*M. hellenica*) uses secretions of *P. Brutia* (pine sap) instead of blossom nectar. *M.hellenica* changes these secretions with various biochemical metabolic reactions and then *Apis Mellifera* L. (Honey bees) produces pine honey by using these secretions (Basra secretion) as nectar. Literature survey showed that up to date there are limited reports on the chemical composition of secretions of *P. brutia* and *M. Hellenica* along with pine honey. In this study, a non-targeted based analytical investigation was applied. Discovery mode/foodomic approach by conducting GC-MS analysis indicated predominant concentrations of Myo-inositol and D-Pinitol levels in pine honey, basra secretion, and sap secretion. Chemical components were characterized according to their retention times and using library data NIST07. Secretions and pine honey samples in this study were collected from Muğla province during the pine honey production season (October 2021). Absolute quantification of the purposed cyclitols in pine honey and secretions which plays a key role in producing pine honey was performed by utilizing novel developed SRM-based HILIC-UPLC-ESI-MS/MS analysis. According to foreseen metabolic pathway, as expected higher levels of both D-pinitol and myo-inositol were present in pine sap followed by Basra secretion. Lower concentrations of myo-inositol (180 mg/kg) and D-pinitol (1160 mg/kg) were found in pine honey in comparison to secretions. Nevertheless, the detection of a high concentration of cyclitols content in pine honey reveals that pine honey can be consumed as a food supplement and that it can offer health benefits as well as high phenolic content as its bioactive components.

Keyword: Pine honey, cylitols, bioactive composition, inositols, foodomic

O16 Changes in biochemical properties of royal jelly by different storage conditions and different packaging materails

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Royal jelly is a valuable bee product that is secreted from the hypopharyngeal glands of worker bees to feed the queen, and has many functional features. Royal jelly has a complex structure, it contains proteins, carbohydrates, fats and minerals. Biochemical properties of the royal jelly can be affected by storage conditions and packaging. In order for royal jelly to show its functional properties, its biochemical properties must be preserved throughout its shelf life. In this context, the changes in its quality and biochemical properties were examined for 18 months while storing in different temperatures and packaging materials. Changes have been monitored for 18 months with 3 different conditions, -18°C, +4°C and room conditions, and 4 different packaging materials: glass, opaque glass, non-permeable glass, and non-permeable laminated bags. Samples were analyzed for different parameters such as Protein Content, Sugar, Fatty Acid and Protein Profiles, Amino Acids, Acidity, Color, Maillard Product, Fat Content, 10-HDA, Starch/Pollen, Pollen, Total Phenolic and Flavonoid Content, Mineral Content, Microbiological parameters. The shelf-life studies of royal jelly showed statistical differences ($p<0,05$) depending on condition and time, although the effect of packaging material is quite low, it has been determined that best protection in some parameters was obtained for non-permeable glass and laminated bag packages. The most significant change was seen in Color, Maillard Product and Protein Profile values. The change in these values is an indication that non-enzymatic browning reactions have taken place. This can be further explained by the decrease in protein profile and some amino acid components over time. When all parameters were evaluated, it was concluded that royal jelly can be stored for 18 months at -18°C, a maximum of 12 months at +4°C, and for 2 months at room conditions, and it can be packaged with non-permeable packaging materials.

Keyword: Royal jelly, biochemical properties of royal jelly, storage conditions, royal jelly packaging

O17 Vegetable leaves as veritable sources of multifunctional protein hydrolysates

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Vegetable leaves contain RuBisco as the major protein component, which provides an abundant raw material to generate bioactive protein hydrolysates. Therefore, the aim of this work was to hydrolyze vegetable leaf protein isolates with various enzymes (alcalase, chymotrypsin, pepsin and pancreatin) and then test the resultant protein hydrolysates for antioxidant and enzyme inhibition properties. The most active hydrolysate was separated by membrane ultrafiltration into <1, 1–3, 3–5, 5–10, and >10 kDa peptide fractions. Results showed that the hydrolysates contained higher contents of hydrophobic amino acids but low levels of sulfur-containing amino acids, when compared to the unhydrolyzed protein. The hydrolysates inhibited linoleic acid oxidation as well as α-amylase, α-glucosidase, and angiotensin converting enzyme (ACE) activities. The ultrafiltration fractions were also active but the <1 and 1–3 kDa peptides were the most effective free radical scavengers and metal chelators in addition to their strong inhibitions of α-amylase, α-glucosidase, and ACE activities. Structural analysis revealed that the leaf protein protein hydrolysates consisted of mainly dipeptides, tripeptides, and tetrapeptides, which could have contributed to the strong antioxidant and enzyme inhibition properties. The results suggest that these leaf protein hydrolysates could serve as veritable sources of multifunctional bioactive peptides for simultaneous reductions of oxidative stress, hypertension and hyperglycemia.

Keyword: Vegetable leaf, RuBisco, protein hydrolysate, enzyme inhibition, antioxidant

O18 Examination of physicochemical and functional properties of proteins isolated from local beans of Türkiye

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Increasing vegan/vegetarian choices among consumers, religious concerns, food security issues that may arise with a growing world population, and trends toward both healthy food and low-cost sustainable agriculture are driving people around the world to consume plant-based protein sources. Plant-based proteins are included in foods due to their functional properties that affect the textural quality and storage stability of the products. The purpose of this study was to determine the amino acid composition, physicochemical and functional properties of proteins isolated from five local beans in Türkiye. The variation in the amino acid composition of the isolates was the lowest, excluding the hydrophobic amino acids. Leucine, lysine, and phenylalanine were the most abundant amino acids in protein isolates, while methionine was the lowest. Thermal properties of bean protein isolates were investigated by differential scanning calorimetry; the denaturation temperature of isolates varied from 90°C to 152°C. Secondary structures of proteins were studied using Fourier transformed infrared spectroscopy and β-layer structure was found to be the major secondary structure among the isolates. Emulsion capacity and emulsifying activity index of protein isolates changed by 402.7–468.5 g oil/g protein and 15.6–22.0 m^2/g, respectively. Isolates' thermal properties and gelation characteristics did not correlate significantly.

Keyword: *Phaseolus vulgaris*, *Phaseolus coccineus*, protein functionality, amino acid

O19 A cell-based assessment of the muscle anabolic potential of blue whiting (*Micromesistius poutassou*) protein hydrolysates

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Blue whiting (BW) represents an underutilized fish species containing high-quality protein which can be extracted using proteolytic enzymes generating BW protein hydrolysates (BWPHs). BWPHs contain numerous potentially bioactive peptide sequences which may improve the economic and environmental sustainability of BW. As the consumption of additional protein is recommended to help prevent or delay muscle wasting conditions, i.e., sarcopenia, there is potential for the application of BWPHs to enhance muscle health. Since it is impractical and uneconomical to test a wide range of protein sources in animal or human studies, a number of cell-based screening assays were utilised to systematically assess the effects of different BWPHs on growth, proliferation and muscle protein synthesis (MPS) in murine muscle (C2C12) myotubes. C2C12 myotubes were employed to screen the biofunctional properties of 14 BWPHs generated using different hydrolysis conditions using an xCelligence™ platform along with western blot analysis. Following *in vitro* simulated gastrointestinal digestion (SGID), C2C12 myotubes were treated with 1 mg protein equivalent/mL (based on prior cell viability analyses) of SGID-treated BWPHs for 4 h. Muscle growth and myotube thicknesses were measured using an xCelligence™. Muscle cell anabolic signalling (phosphorylation of mTOR, rpS6 and 4E-BP1) and puromycin incorporation were determined by immunoblotting. While all BWPHs showed numerically higher bioactivity regarding muscle growth, one BWPH sample significantly increased muscle growth ($p<0.01$) and myotube thickness ($p<0.0001$) compared to the negative control (amino acid and serum free media). MPS, as measured by puromycin incorporation, and rpS6 and 4E-BP1 phosphorylation, was increased compared to the negative control in response to treatment with selected BWPHs. These cell-based screening assays give some insights on those characteristics which pertain to the most bioactive BWPHs and may provide a means of prioritising specific BWPHs for subsequent human studies to assess the impact of BWPH ingestion on muscle health enhancement.

Keyword: Blue whiting, muscle health, C2C12

O20 Neutrase-alcalase combined hydrolysis of protein isolates from hazelnut meal: Transforming waste to functional food ingredient

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The interest in functional foods has significantly increased among consumers last years. Functional foods with high protein content have drawn attention due to their potential benefits in maintaining a healthy lifestyle. Furthermore, some functional properties of proteins are used as a processing booster on sensory characteristics or to enhance the stability of food products during storage and processing. Hazelnut meal is the main valuable by-product of the hazelnut oil industry. It is a rich source of protein and dietary fibre with the great potential to become a valuable functional ingredient. The aims of this study were the characterization of bioactive peptides obtained from hazelnut meal protein isolates using Neutrase-Alcalase combined hydrolysis and the investigation of the biological activity of the bioactive peptides. Before hydrolysis, a pretreatment was applied by means of a microfluidizer to increase the enzymatic hydrolysis. The enzyme treatment was applied by each enzyme individually and in combination. SDS-PAGE, High-Pressure Size Exclusion chromatography (HPSEC) and amino acid profiling were performed to characterize proteins and their hydrolysates. The antioxidant activities of the hydrolysates were measured using 1,1-diphenyl-2-picrylhydrazyl (DPPH), and CUPRAC (Copric Reducing Antioxidant Capacity) methods. Combining microfludization, alcalase, and neutrase treatment, respectively, provided the best degree of hydrolysis as 15.5%. Size of the protein aggregates decreased to 145.9 ± 0.9 nm from 374.3 ± 20.8 nm with the application of microfludization. Similarly, significant reductions were monitored in the polydispersity index (PDI) of protein hydrolyzate with microfluidization. As a result of this study, it can be concluded that protein hydrolysates obtained from the combined application of microfluidization, alcalase and neutrase treatment can be used as a potential functional food ingredient.

Keyword: Bioactive peptides, protein hydrolysates, functional food ingredients, hazelnut meal proteins

O21 Antihypertensive effect of hydrolysates and peptides from aquacultured flounder fish for developing a health functional food

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Aquacultured fish are the richest natural source of protein. However, their overproduced biomass is often discarded due to production imbalance, causing considerable losses to the fishery industry. Therefore, it is necessary to utilize surplus fish and add value to overproduced fish. We performed complex enzyme-assisted hydrolysis to determine the correlation between its physical characteristics and anti-hypertensive activity in vitro and in vivo using an SHR model. Protamex-Pepsin assisted hydrolysate from *Paralichthys olivaceus* ($PO_{pp}H$) produced by complex enzyme-assisted hydrolysis contained low-molecular-weight peptides and amino acids with anti-hypertensive activity. $PO_{pp}H$ regulated blood pressure and serum angiotensin II and angiotensin-I-converting enzyme levels, and histological and ultrasound image analysis revealed substantially reduced thickness and diameter of the carotid aorta in the $PO_{pp}H$-administered SHR group. Therefore, we propose to reduce food loss due to overproduction by utilizing the anti-hypertensive activity and physical properties of $PO_{pp}H$; the results demonstrate its application as a therapeutic agent.

Keyword: Founder fish, *Paralichthys olivaceus*, enzyme-assisted hydrolysis, spontaneously hypertensive rat

O22 Casein-phenol interaction during *in vitro* digestion provides better bioactive peptide release and phenol delivery to colon

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Bioactive peptides, capable of exerting bioactive properties on human health, are derived mostly from milk protein casein. They are recently getting more attention in healthy diets as they possess a series of health-promoting features, such as antioxidant, antimicrobial, ACE-inhibitory and opioid properties. Recently, beta-casomorphins, casein-derived opioid peptides, are related with different gastrointestinal health effects in adults. However, formation of these bioactive peptides might be affected by the protein-phenol interaction. These interactions are important as co-exist in a wide variety of foods, however, they also take place in the gastrointestinal tract after food ingestion. This study aimed to see if bioactive peptide profile is affected and the phenolic compounds reach to colon in a better way by the co-ingestion of casein and phenolic compounds *in vitro*. For this purpose, casein hydrolysate (CH) and phenolic compounds such as chlorogenic acid, catechin, green tea extract and black tea extract singularly or in combination of CH plus each phenolic compound, were digested *in vitro* according to INFOGEST procedure. In the samples collected through the digestion, the total antioxidant capacity (TAC) analysis, degree of hydrolysis and bioactive peptide formation were assessed. TAC analysis showed higher TAC in the bioaccessible part of CH-phenol samples compared to CH or phenol controls, indicating higher release of antioxidant peptides. Similarly, beta-casomorphin-7 was also significantly higher in CH-phenol samples. In addition to them, some AGE-inhibitory and DPP-IV inhibitory peptides were also induced in the presence of phenolic compounds together with CH. TAC analysis of CH-phenol samples insoluble part at the end of digestion pointed that almost all of the initial TAC was delivered to insoluble part. The results of this study confirmed the interaction of casein with phenols in the digestive tract indicating stimulation of bioactive peptide release and showed that casein may be carrier of phenols to the colon.

Keyword: Antioaxidant peptides, casein-phenol interaction, bioactive peptides, beta casomorphin

O23 Formulation of a layered lipid-protein nanoemulsion system for the delivery of hydrophobic resveratrol

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Proteins and lipids are essential in our daily life, biological systems, and the food industry. Technological advancements have enabled us to utilize these basic ingredients to formulate value-added products for various applications. Here, a simple and versatile strategy to formulate nanoemulsions from gelatin (animal protein) and oleic acid (plant-based lipid content) as major components have been discussed. As a proof-of-concept, the physical encapsulation of resveratrol (Res., 2 mg/mL), stability, and sustainable release of the same have been verified using FTIR, RP-HPLC and UV-Vis spectroscopy. The DPPH assay measurement in ethanol also supports the concept of the steady periodic release of the bioactive, which can be correlated with the system's time-bound free radical scavenging ability. The spherical morphology of the nano-formulation was confirmed using TEM and STEM images measured after suitable dilution and negative staining using 1% ethanolic uranyl acetate solution. The effect of surfactant/ co-surfactant ratio on the variation in particle size/ zeta potential and on the long-term storage ability of the nanoemulsions have also been presented. The role of partial chemical crosslinking and a slight increase in particle size on utilizing citric acid as a crosslinker over glutaraldehyde also highlighted the possible tunability of such formulation systems. These nanoemulsion systems are highly adaptable and can be modified and functionalized as per the application.

O24 Encapsulation of food bioactives using plant proteins as wall materials

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Bioactive compounds such as essential oils, vitamins, minerals, polyphenols, carotenoids are physiologically active substances obtained from plant sources. Some of these compounds, which are frequently found in plants and fruits, have antioxidant, anti-inflammatory, anti-bacterial and immunomodulatory activities. Due to such properties, the use of bioactives as natural food ingredients is of great importance. However, most bioactive substances are unstable. Regardless of the form in which they are added to food, they must be stabilized before being added to food, during the food manufacturing process, and throughout the shelf life of the product. Moreover, the addition of bioactive substances can change the flavor, smell and texture of foods. The encapsulation process is widely used as an effective strategy to overcome the challenges associated with the use of bioactive compounds in foods. Encapsulation is applied for coating the active compound in a carrier wall matrix and protects the inner core from the external environment. The chosen wall materials affect the stability, retention efficiency and degree of protection of the encapsulated materials. Proteins obtained from plant sources are macromolecules of industrial interest due to their advantages such as availability, biodegradability, renewability, biocompatibility, and functionality including solubility, emulsifying, foaming, gelling and film forming abilities. In recent years, studies on the use of plant proteins as coating materials in encapsulation have increased significantly. The main goal of this study is to review the main findings of the most recent research focusing on the use of proteins obtained from various plant sources as a wall material in encapsulation of bioactive compounds. In addition, several physical, chemical and biological modification methods used for improving the functionality and encapsulation performance of plant proteins are discussed.

Keywords: Bioactive compounds, encapsulation, plant protein

O25 A new and green particle formation approach to increasing bioavailability of curcumin

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Although the health benefits of curcumin (CUR) are well recognized, CUR's full potential has not yet been realized due to its low bioavailability. CUR is a crystalline powder that is insoluble in water and poorly soluble in fats and oils. Its poor water solubility markedly limits its bioavailability. The objective of this study was to improve the bioaccessibility of CUR by forming the first-of-its-kind "low-crystallinity CUR nanoparticles" (CUR-NP) using nanoporous starch aerogels (NSA) and supercritical carbon dioxide (SC-CO_2).We developed a novel process for simultaneous formation of CUR-NP-NSA using SC-CO_2. The mechanism behind CUR-NP formation was based on the utilization of the nanopores and large surface area of NSA as a cast to decrease the size and crystallinity of CUR by controlling its recrystallization using SC-CO_2. The average particle size of the CUR-NP impregnated in the NSA was 66 nm. Impregnation of CUR into NSA decreased the crystallinity of CUR and did not create any chemical bonding between NSA matrix and the CUR. Bioaccessibility of CUR-NP was 69.1%, whereas that of crude CUR was only 0.4% (173-folds increase). Transmission electron microscope (TEM) images of the bioaccessible fraction after simulated digestion showed increased solubilization of CUR-NP in mixed micelles. CUR-NP was significantly more bioavailable (+350%) than the crude CUR in HT-29 human intestinal epithelial cells ($p<0.05$). Early animal studies have also demonstrated increased bioavailability of the CUR-NP. The expected outcomes include (i) the development of a novel food-grade CUR formulation with enhanced efficacy; (ii) the blueprint to apply to other water-insoluble food bioactive compounds; (iii) the transfer of green technology to food manufacturers; and (iv) enhance the cost-benefit ratio of water-insoluble bioactive compounds.

O26 Increasing the bioaccessibility of tomato pomace bioactives by using excipient emulsion and potential food applications

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Tomato and tomato based products, which are one of the most significant parts of the human diet worldwide, are perfect sources for different bioactives. However, the bioavailability of bioactives is generally limited causing a restriction in their health benefits. Recent studies have shown that the use of excipient emulsions provides a boosting effect on the bioavailability of bioactives, especially lipophilic groups in fruits and vegetables. The main purpose of this study was to produce excipient foods and investigate the effect of excipient emulsion on the content and bioavailability of bioactives in tomato pomace within food matrix. Therefore, whole wheat bread and tomato sauce samples were produced by the addition of only tomato pomace or the mixture of tomato pomace-excipient emulsion at different ratios (5, 10, and 20 wt%). The total antioxidant capacity (TAC), total phenolic content (TPC), carotenoid and phenolic profiles were analyzed before and after *in vitro* gastrointestinal digestion. The presence of excipient emulsion provided higher results for TPC with 4-12 times for bread samples and 6-20 times for tomato sauce samples, and TAC values (for bread samples CUPRAC, DPPH, and ABTS assays with 6-11, 8-11, and 9-12 times, respectively whereas for sauce samples with 12-22, 18-23, and 18-30 times, respectively) compared to other samples containing only tomato pomace at the same ratios. Similarly, excipient emulsion containing samples from both groups had higher levels of carotenoids and phenolics than the samples without excipient emulsion. These results indicated that the use of excipient emulsion may help to improve the content and bioaccessibility of bioactives, and thus the presence of excipient emulsion is more important than its addition level. Therefore, the excipient emulsion addition to different food systems can exhibit an excellent potential for the improvement of bioaccessibility of bioactives leading to better health effects, and design of new functional foods.

O27 Thymoquinone-loaded core-shell nanoparticles: Bioaccessibility and transport across Caco-2 monolayers

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Thymoquinone is one of the lipophilic bioactive components in black seed oil that has received particular attention for its beneficial role in various human metabolic processes. Its use in commercial food products is difficult due to its low water solubility, instability during storage and digestion conditions, and poor chemical stability. These limitations can be overcome by introducing new encapsulation techniques. The coaxial electrospraying allows the production of nano-sized core-shell particles. This study aimed to evaluate the effect of encapsulation on bioaccessibility and transport of thymoquinone across Caco-2 monolayers. The *Box-Behnken* design with four independent variables and three levels was performed to obtain thymoquinone-loaded core-shell nanoparticles. Characterization of the nanoparticles including morphology and encapsulation efficiency was evaluated. Orange juice containing black seed oil and nanoparticles underwent *in vitro* digestion followed by intestinal permeability study. The nanoparticles obtained under optimized conditions had a uniform morphology with a mean diameter of 136 nm. A core–shell structure of nanoparticles verified by confocal laser scanning microscope. The bioaccessibility of thymoquinone in nanoparticles was approximately threefold higher than unencapsulated oil. In the presence of orange juice, the bioaccessibility of thymoquinone in nanoparticles increased from 21.70±2.36 to 33.11±4.16. The transport of thymoquinone across Caco-2 monolayers in orange juice enriched with nanoparticles was higher than that of nanoparticles alone after 3 h assay. Thymoquinone-loaded nanoparticles can be used as an active ingredient for the production of functional foods with significant health benefits.

Keyword: Black seed oil, coaxial electrospraying, nanoparticles, *in vitro* gastrointestinal digestion, Caco-2 monolayers

O28 Bioactives from small fruit processing by-products and waste for functional foods and nutraceuticals

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Many small fruit species or berries accumulate high amounts of health beneficial bioactive constituents such as vitamins, polyphenolic antioxidants, carotenoids and others. Many berries are highly valued for their pleasant and unique flavor and are consumed both as fresh and processed foods, while some others are suitable only for processing due to their unacceptable sensory properties. Berry processing generates large amounts of by-products, which may be used for other purposes or discarded as a waste. Nowadays still large fractions of small fruit processing by-products, e.g. juice pressing residues (pomace) are used rather inefficiently and are causing the loss of valuable nutrients. Therefore, the interest in valorization of berry processing by-products is increasing both among the scientists and producers. This study reports the advances in the development of effective biorefining schemes for the recovery of bioactive phytochemicals and other health beneficial nutrients from various berry pomace, namely black currant, black chokeberry, raspberry, sea-buckthorn, blackberry, blueberry, bilberry, lingonberry, cranberry, guelder-rose berry, elderberry, sour cherry, rowanberry. The following important aspects were considered in developing biorefining processes: (1) application of food and environmentally friendly ('green') extraction and fractionation methods (2) exhaustive recovery of target health beneficial constituents; (3) flexibility in terms of economic and technological upscaling issues; (4) achieving or at least approaching the 'zero waste' goal; and (5) applicability for the specific groups of functional foods and nutraceuticals. Considering all these aspects, various groups of valuable ingredients have been obtained from different berry pomace and characterized using various analytical techniques. These include (1) polyunsaturated fatty acid and nonpolar micro-constituent-rich lipophilic substances isolated under optimized super/subcritical CO_2 extraction and fractionation parameters; (2) defatted antioxidant dietary fiber; (3) polyphenolic antioxidant-rich extracts isolated with pressurized green solvents; and (4) the products (dietary fiber, proteinaceous substances) isolated *via* enzyme (cellulolytic, xylanolytic, proteolytic) and ultrasound assisted extraction and fractionation. Depending on the application goals as well as economic and technological feasibility biorefining scheme may consist of one and more steps, which produce different number of functional ingredients. For instance, the simplest process consists of supercritical CO_2 extraction, which results in 2 functional ingredients, namely lipophilic extract and, which contain polyphenolics, proteins, carbohydrates (mainly dietary fiber), minerals and some other specific constituents. In fact, this residue may be conditionally called as 'antioxidant dietary fiber'. Both ingredients may be adapted in the formulation of various functional foods and nutraceuticals. For instance, CO_2 recovered lipids, depending on the biorefined berry pomace, may be valuable ingredients for nutraceuticals with PUFA, tocopherols, phytosterols, carotenoids, squalene, while the residue is suitable for the increasing antioxidant potential of baked goods and their enrichment with dietary fiber and, in some cases, proteins. Further extraction and fractionation steps may provide tailor-made ingredients for more specific applications. For instance, crude CO_2 extract may be separated into various fractions based on the thermodynamic solubility of lipophilic berry constituents. In short, the proposed biorefining schemes enable effective valorization of berry pomace for the development of valuable ingredients for functional foods and nutraceuticals.

O29 Microencapsulation of anthocyanins recovered from industrial wastes and usage in processed foods

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The effective evaluation of wastes generated during food processing is important for human health, environmental pollution and the country's economy. Within the scope of this project, suitable conditions were determined to increase the stability of bioactive compounds obtained from industrial wastes such as sour cherry, black carrot, black grape and pomegranate rich in anthocyanin compounds by microencapsulation technique. Ultrasonic-assisted extraction was applied to prepare anthocyanin-rich extracts. Total antioxidant capacity (TAC), total phenolic content, free radical scavenging activities, total anthocyanin content of the extracts were determined. Microencapsulation of the extracts by spray drying was carried out using different carrier agents such as maltodextrin, whey, alginate (ALG). Black grape pulp microencapsulated with alginate showed high antioxidant capacity. The highest anthocyanin content was found in alginate-microencapsulated black carrot (ALG-BC). Alginate was preferred as the coating material for microencapsulation. ALG-BC was used in the food application stage, due to its high anthocyanin content and TAC compared to other fruit pulps. Frequently consumed foods such as muffin, yoghurt and cold tea were functionalized utilizing ALG-BC. These products were also evaluated by sensory tests. The effect of encapsulation on the bioavailability of anthocyanins in the body was investigated by applying *in vitro* simulated gastrointestinal digestion of microencapsulated anthocyanin extracts. The changes in the storage conditions of food products were investigated by both spectroscopic and chromatographic analyses. As a result of obtaining bioactive compounds beneficial to human health through the evaluation of wastes and increasing their stability by microencapsulation, the preparation of functionalized foods with improved physical properties has been successfully carried out.

Keyword: Industrial waste, anthocyanin, microencapsulation, bioaccessibility, functional foods

O30 Sequential extractions to maximize the valorisation of brewer's spent grains

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Today and in the near future agricultural and industrial production will have to increase to cope with the growing world population and the demand for food and beverages. This will coincide with a salient increase in the generation of organic waste that needs to be used in a circular way, upcycling of biomass residues into new valuable products, to result in a sustainable economy. The production of beer, the largest alcoholic beverage industry, is one of these growing industries that produces a sizable amount of organic residues, the most abundant of which are spent grains (BSG). BSG is a low-cost biomass composed of the non-soluble parts of the grain that, due to its richness in chemical composition, is intensely studied for the extraction of compounds with antioxidant capacity and health-promoting features. The aim of this study was to maximally exploit BSG by using sustainable and sequential extractions to generate different valorizable BSG-extract fractions. The first step in this cascade is a food-grade extraction from fresh BSG. The pre-treatment of BSG was optimized and the resulting extracts characterized among others leading to the identification of a new class of Maillard reaction products. For the second sequential stage, lipids were the target and different solvents were tested for their extraction using the residue of the first extraction. This second extract contained uncommon lipids, the bioactivity of whom is currently under study. Future experiments aim at using chemical or enzymatic means to extract fibers and proteins with properties of interest for the food sector (Hellebois *et al.*, 2021). BSG composition make this residue a suitable candidate for the upcycling, and the different BSG-extract fractions resulting from sequential extraction may represent one of the solution to valorise and enhance this residue into added-value products.

O31 Characterization of the nutritional profile of avocado by-product: The potential of avocado seed powder as a culinary additive

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During the commercial processing of avocados, a large amount of seeds are produced. The seeds are underutilized and discarded as waste since they are an inedible part of the fruit. Avocado seeds account for 13–18% ofthe total fruit weight. Recently, new features regarding the utilization of plant wastes as by-products for further exploitation in the development of food additives or supplements with high nutritional value have attracted growing interest. As well as, the new orientation for zero waste products is gaining more and more attention. Accordingly, the present research proposed to evaluate the nutritional properties of the avocado seed. During the study, many analyses were carried out including protein content, amino acids composition, fat content, fatty acids composition, FTIR analysis, antioxidant characteristics, and total phenolic compounds. Results showed low protein (1.3%), and low fat (4.2%) content. L-Glutamic acid (Glu) exhibited the highest value (428 mg/ 100g). Saturated fatty acids (30.9%), whereas polyunsaturated fatty acids (69%). Many functional groups were detected by FTIR spectroscopy analysis, as well as the seeds showed moderate antioxidant activity. In short, the utilization of avocado seed powder as a food additive can be a novel idea for reducing production waste and increasing the nutritional value of food products with potential of serving as nutraceuticals and functional food ingredients.

O32 Effects of *Cystoseira barbata* extracts as a novel seaweed-based biostimulant agent on various crops

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Seaweed extracts, which are known to have biostimulant effect thanks to their rich bioactive compounds such as osmolytes, secondary metabolites and plant hormones, are known to have positive effects on germination, plant growth and development and formation of root structure. *Cystoseira barbata*, brown seaweed specie abundant in Türkiye, has not been the subject of research to be used as a biostimulant. In this study, the potential biostimulant effects of different seaweed extracts (water, alkali and acid) obtained from *Cystoseira barbata* were evaluated and different concentrations of seaweed extracts (as seed treatment or soil drench application) were tested on different crop plants. Moreover, the biochemical characterization of the extracts was studied to explain the potential biostimulant effects. The results suggest that seaweed-based biostimulants could improve the wheat seedlings performance and positively affect various growth parameters. In broccoli plants, the dry weight of heads, the component with the highest economic value, showed increases of up to 55%, and the total dry weight of the plants increased by almost 43% with applications of *C. barbata* extracts. The use of seaweed extracts obtained from *C. barbata* as a biostimulant in agriculture may contribute to the reduction of economic losses in crop production, global food security and sustainable agriculture. It may be possible to transform macroalgae, which is seen as a source of pollution on coastal regions, into unique value-added bioeconomy resources which will be environmentally friendly, renewable, reliable, and sustainable commercial products that can at least partially contribute to reduce the need for chemical fertilizers.

Keywords: Biostimulant, *Cystoseira barbata*, seaweed extract, sustainable agriculture, macroalgae

O33 Health effects of nuts within the Mediterranean diet: Insights from the PREDIMED study

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Like all nuts, Mediterranean nuts (almonds, hazelnuts, pine nuts, pistachios, and walnuts) are nutrient-dense foods rich in unsaturated fatty acids, protein, fiber, non-sodium minerals, tocopherols, phytosterols, and polyphenols. The unique composition of nuts contributes to both the salutary nutrient load of the Mediterranean diet and its beneficial impact on various health outcomes, such as cardiovascular diseases (CVD), cancer and dementia. Prospective cohort studies have associated nut consumption with a reduction of all-cause mortality and incidence of CVD, hypertension, atrial fibrillation, and total cancer. Evidence of nut effects on stroke and diabetes has been less conclusive. Nut consumption also benefits brain health, with improved cognition and reduced depression. Randomized clinical trials have demonstrated a consistent cholesterol-lowering effect of nut diets. Nuts also reduce insulin resistance, lower blood pressure, and improve vascular reactivity without undue weight gain in spite of their high energy density. The large 5-year PREDIMED trial tested a nut-enriched Mediterranean diet against a reduced-fat control diet for cardiometabolic outcomes in older participants at high cardiovascular risk. Participants in the nut diet arm consumed daily 30 g of nuts (15 g of walnuts, 7.5 g of almonds, and 7.5 g of hazelnuts). Results of the PREDIMED trial showed that long-term nut consumption reduced incident CVD by 28%, with a striking effect on incident stroke, which was reduced by 45%. Among other hard outcomes, peripheral artery disease, and to a lesser extent diabetes and the metabolic syndrome were also reduced. PREDIMED showed that a long-term intervention with an unrestricted-calorie, high-vegetable-fat Mediterranean diet enriched with nuts was associated with no significant difference in body weight and some evidence of less gain in central adiposity compared with the control diet. In conclusion, the evidence is convincing that nuts, an integral component of the Mediterranean diet, are nutrient-rich foods with wide-ranging cardiometabolic benefits.

Keyword: Gut microbiome, roasting process, short-chain fatty acids, microbial metabolites

O34 Health claims, nutrients, bioactives and health benefits of dried fruits

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Dried fruits are part of our daily diet. They are concentrated forms of fresh fruits with lower moisture content. Dried fruits are consumed whole or as ingredients of many food products such as muffins, cereals, chocolates, energy bars, breads, and cookies, among others. Dried fruits, which serve as important healthful snacks worldwide, are nutritionally equivalent to fresh fruits while providing all of their nutrients and bioactive components in a concentrated form. While the evidence level concerning the health effects of dried fruits lags behind that on nuts, it suggests that individuals who consume dried fruits regularly have a lower risk of cardiovascular disease, obesity, and other non-communicable diseases. This presentation covers recent findings on health claims, nutrients, bioactive constituents, and health benefits of dried fruits and also discusses their great potential as healthy foods to benefit a number of diseases afflicting human beings.

Keyword: Dried fruits, health claims, bioactives, health benefits

O35 Natural and roasted hazelnut (*Corylus avellana L.*) dietary fibers differentially modulate the colonic microbiota in a sex-dependent way

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Although many efforts have been made to characterize the structural and functional properties of hazelnut constituents (mainly its oil, protein and phenolics), those of dietary fibers (DFs) have not been elucidated yet. Here, we aimed to characterize the compositional and structural features of DFs of natural and roasted hazelnuts using gas chromatography-mass spectrometry (GC-MS) and further aimed to investigate their impacts on colonic microbiome *in vivo* (C57BL/6J mice models) by determining the colonic microbiota composition through 16S rRNA sequencing and microbial short-chain fatty acids (SCFA) using GC. Our results showed insoluble hazelnut DFs composed of cellulose (%40-47), xyloglucan (%19-23), pectic polysaccharides (%17-26) and heteromannans (%8-9), whereas their soluble fractions were made up of pectic polysaccharides (%58-68), xyloglucan (%13-18), and mannans (%4.1-8.2). SCFA analysis demonstrated that hazelnut DFs generally show butyrogenic effect in female mice models, whereas acetogenic effect was observed in male counterparts. 16S rRNA sequencing results revealed that hazelnut, especially natural, DF supplementation increased the relative abundances of *Lactobacillus* related OTUs that are known to be probiotics or have probiotic potentials. LEfSe (linear discriminant analysis effect size) analysis revealed that, for female mice, Lachnospiraceae, and *Prevotella*, but *Bacteroides* and *Lactobacillus* for male counterparts were found to be discriminators for natural and roasted hazelnut DFs, respectively. These findings clearly indicate that, although roasting process impact their functionalities, hazelnut DFs have ability to modulate colon function by favoring beneficial microbes and stimulating beneficial microbial metabolites in the colon, which could be a contributing factor to health promoting effects of hazelnut.

Keyword: Gut microbiome, roasting process, short-chain fatty acids, microbial metabolites

O36 Cardiovascular health benefits of hazelnuts consumption

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Cardiovascular diseases (CVDs) continue to be the most important health problem and are the leading causes of death all over the world. Genetic predisposition, age, gender, hypertension, dyslipidemia, diabetes, obesity, oxidative stress, smoking, bacterial and viral infections, and a diet high in saturated fat and cholesterol and low in vegetables, fruits and grains are the main risk factors causing CVDs. Regular consumption of nuts (tree nuts; hazelnuts, almonds, walnuts... and peanuts) in diets is recommended for the prevention and treatment of CVDs. Hazelnuts are highly nutritious food and rich in MUFAs and vitamin E. Additionally, they contain many other health promoting compounds such as dietary fibers, minerals, vitamins, amino acids, phytosterols, flavonoids, and phenolic compounds, among others. Because of favourable nutrient profiles, hazelnuts possess various cardiovascular health benefits. The positive effects of regular hazelnut consumption on plasma lipids, lipoproteins, apolipoproteins, LDL subfractions, LDL oxidation, plasma antioxidant potential, endothelial functions, and body weight and composition in humans have been revealed. The high amount of MUFA (especially oleic acid) and antioxidant actions of vitamin E in hazelnuts, which is low in SFAs, and sufficient in PUFAs, prevent LDL oxidation. The beneficial effect of hazelnut on endothelium is due to its high arginine which is precursor for nitric oxide. Studies support the findings that although hazelnuts provide an additional calorie of approximately 20% of the calorie needs of individuals in their daily diets, it does not increase weight in individuals, and body mass indexes do not alter. In addition, hazelnuts are rich in folic acid among all tree nuts. Folic acid prevents the increase of homocysteine level, which is a risk factor for coronary heart disease. In conclusion, including a recommended amount of hazelnut (42 g/day) in the daily diet can be beneficial in preventing and delaying CVDs.

O37 Health-promoting compounds in Turkish hazelnut varieties

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Hazelnut (*Corylus avellana* L.) is mostly produced in Türkiye (65% of world production) and consumed all over the world. There are 18 hazelnut varieties grown in Türkiye. Hazelnuts are consumed either raw or roasted and in processed foods such as chocolates. The fact that hazelnut contains compounds against diseases such as cardiovascular diseases, obesity, and diabetes has increased the interest in hazelnuts. Therefore, it is important to reveal the health-promoting compounds in hazelnuts. In the studies we have performed with Turkish hazelnut varieties so far, the profiles of water-soluble (amino acids, vitamins, minerals, sugars, organic acids) and fat-soluble compounds (triacylglycerol, free fatty acids, tocopherols) have been revealed. Phenolic acids, phenolic compounds, and flavonoid content in fractions of hazelnut skin extracts have been determined. Total antioxidant capacity of hazelnuts and skins has been measured. Serotonin, a neuroactive compound, has been determined in hazelnuts and their skins for the first time. Glutamic acid, arginine, and aspartic acid represent about 50% of hazelnut protein. Sucrose was the highest sugar and phytic acid was the most predominant organic acid. Hazelnuts were rich in pantothenic acid and potassium. Glyceryl trioleate was the most abundant triacylglycerol and oleic acid concentration was the highest. Hazelnut varieties were found to contain alpha, beta, and gamma-tocopherol. Serotonin was ranged from 0.1 µg/g to 2.0 µg/g hazelnut. Skin of hazelnuts was the part where phenolic compounds were denser and 60% of total phenolic compounds were flavonoids. Flavonoids and phenolic acids were found to be concentrated mostly in the conjugated soluble fraction. Total antioxidant capacity of hazelnut skin was more than 100 times higher than the hazelnuts. Mean serotonin content of skins was 4 times higher than hazelnuts. Moreover, roasted hazelnuts were as valuable as raw hazelnuts in terms of their serotonin content.

O38 Cellular antioxidant activity of pecan phenolics after *in vitro* digestion

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US pecans are rich in phenolic compounds, notably flavonoids and proanthocyanidins (PACs); consequently, they possess significant antioxidant activity. Consuming pecans has been reported to increase plasma antioxidant capacity and lower the rate of lipid peroxidation. In this work, acetonic crude extracts of US pecans were prepared and then subjected to *in vitro* gastrointestinal digestion. Employing a Sephadex LH-20 column, undigested and digested crude extracts were chromatographed into low- and high-molecular-weight (LMW and HMW) fractions, followed by HPLC-ESI-MS characterization. Using a Caco-2 monolayer, the digested HMW fraction was found to possess the highest cellular antioxidant activity; in fact, on an equimass basis it was greater than that of its undigested counterpart. Hydrophilic interaction liquid chromatography revealed the presence of PAC dimers to hexamers; digestion resulted in a loss in trimers to hexamers with a marked increase in the % of dimers. This is attributed to the dimerization of (+)-catechin/(–)-epicatechin and the scission of larger PACs, chiefly tetramers to hexamers. The novelty of this study is a result of the separation of digested LMW and HMW phenolic fractions, and demonstrates that partial decomposition of HMW PACs to smaller ones occurs during *in vitro* gastrointestinal digestion.

O39 Roles of mechanosensitive ion channel Piezo1 in the dietary fiber-mediated Reg3β expression in the intestine of mice

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The sensation of the mechanical forces is critical for normal gastrointestinal function, and the supplemental feeding with dietary fibers possibly increases the mechanical stimulation in the intestine due to their viscous property. A mechanosensitive ion channel, Piezo1, was identified in 2010 and is highly expressed in the intestinal epithelial cells. However, the mechanistic links between Piezo1 function and the physiological effects of dietary fibers in intestinal homeostasis are currently unexplored. Herein, we established intestinal epithelial-specific Piezo-1 knockout mice (Piezo1 cKO, Villi-Cre;Piezo1$^{flox/flox}$) to investigate the roles of Piezo1 on the dietary fiber-mediated intestinal homeostasis. Piezo1 cKO and control (Piezo1$^{flox/flox}$) mice were fed the diets with and without psyllium fiber for 5 days. The RNA sequencing analysis demonstrated that 503 genes were up-regulated more than 2-folds by feeding psyllium fiber in the jejunum of control mice, of which 41 genes were not sensitive in the Piezo1 cKO mice. We found that the *Reg3b* and *Reg3g* genes encoding antimicrobial peptides were included in these 41 genes, suggesting that psyllium fiber stimulated Piezo1 to up-regulate the *Reg3b* and *Reg3g* genes in the jejunum. This finding was confirmed by qRT-PCR analysis. The immunoblot analysis showed that the supplemental psyllium fiber increased the Reg3β protein expression in the jejunum and ileum of the control mice, but not in the Piezo1 cKO mice. In addition, the stimulation of human intestinal Caco-2 cells with Yoda1, an agonist of Piezo1, for 12 h increased *REG3G* mRNA, a human homolog of *Reg3b*, in a dose-dependent manner. Yoda1 also increased *REG3G* promoter activity in a dose- and time-dependent manner in the Caco-2 cells. Taken together, the supplemental psyllium fiber up-regulates Reg3β through the Piezo1 activation in the small intestines.

Keyword: Intestine, dietary fiber, piezo1, regenerating islet-derived protein

O40 Mutation strategies for glucansucrase E81 to produce novel glucans and gluco-oligosaccharides

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Glucansucrases are important carbohydrate active enzymes which can produce novel glucans from cheap sucrose and their acceptor reactions result in the formation of novel gluco-oligosaccharides. Thanks to whole genome sequencing and other genetic applications, the genetic structure of different glucansucrases were identified and the role of different units of glucansucrases were tested. In terms of carbohydrate engineering to obtain novel oligosaccharides and glucans, mutations can be made in glucansucrases especially in their catalytic unit and distinct functional oligosaccharides and glucans can be produced. Recently, an active glucansucrase from Lactobacillus reuteri E81 was expressed and characterised to produce an alternate type homopolymeric exopolysaccharides (EPS) as well as gluco-oligosaccharides with its acceptor reactions with different acceptor sugars such as maltose, cellobiose and mannose. In this study, specific mutation strategies in the catalytic core unit of the glucansucrase E81 to obtain novel functional oligosaccharides and glucans were discussed. This study was supported by TÜBİTAK with the grant number 121O007.

Keyword: Prebiotics, glucansucrase, exopolysaccharides

O41 The development of an enteric capsule made from natural materials for oral delivery of probiotics/nutraceuticals

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Apillet has patented a unique Oral delivery concept (APIVault) which enable targeted release in the intestine of Sensitive (bio) pharmaceuticals, Probiotics and Nutraceuticals. Such compounds are prone to degradation in the stomach and must be protected by a gastro-resistant encapsulation to pass the stomach to maintain efficacy/efficiency. APIVault can, in different formats, be programmed for enteric release in the upper parts of the small intestine or for late release in the colon. There is a strong commercial and clinical need for a gastro-resistant enteric encapsulation made from safe bio-inactive materials (GRAS). The enteric encapsulations currently in use cannot be used for human consumption without a doctor's prescription. This makes them unwanted for delivery of Probiotics and Nutraceuticals. The APIVault technology utilizes that bacterial cellulose (BC) cannot be digested in the gastrointestinal (GI) tract but BC can protect drugs in the harsh conditions during stomach passing. Moreover, certain cellulase enzymes are inactive in the acidic stomach, but digest cellulose in the pH neutral intestine. By combining BC with a cellulase, a GRAS BC/cellulase combo material with enteric properties is obtained. The APIVault combo capsule is engineered to have highly manageable drug release properties.

Keyword: Probiotics, nutraceuticals, sensitive (bio)pharmaceuticals, oral delivery, targeted release in the colon

O42 Novel approaches for probiotic encapsulation and R&D perspecticves in designing functional fruit-based products

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In recent years, the demand for probiotic functional foods has increased rapidly due to their relationship with human health. Probiotics have many positive effects, such as producing various bioactive compounds, preventing the colonization of pathogenic bacteria, and regulating the immune system. To show their beneficial effects, they must be stable against environmental factors and be able to adhere to and colonize the human intestine. For this purpose, different encapsulation technologies such as emulsification, freeze drying, ionic gelation, and spray drying are used. In addition, the global market for probiotic supplements and fruit-based snacks has been expanding rapidly, and encapsulation of probiotics is preferred to improve the resistance of probiotics to harsh manufacturing processes such as drying, freezing, and extrusion. This review highlights recent studies of probiotic cells encapsulated by different encapsulation methods, their usage in fruit-based functional products, and the challenges of incorporation with food matrices. In addition, studies analyzing the stability and viability of encapsulated probiotic cells applied in food will be presented and evaluated. When scientific literature is examined, although many methods are not widely used for probiotic encapsulation in the food industry, some formulations can be easily adapted by the industry. Finally, it should be noted that *in vivo* studies are very important to prove the efficacy of these products.

Keyword: Probiotics, encapsulation, functional foods, healthy snacks, food industry

O43 Optimization of galacto-oligosaccharides production method from lactose to maximize the prebiotic efficiency

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Galacto-oligosaccharides (GOS) are molecules with functional properties since they are non-digestible by the human gastrointestinal tract. They act as prebiotics by stimulating the proliferation of intestinal lactic acid bacteria and bifidobacteria. Therefore, GOS are considered as convenient ingredients in the functional food formulations, due to their stimulating effect on correct development of gut microbiota and benefits to human health. Besides, they tolerate harsh processing conditions, such as high temperatures and low pHs, which facilitates their incorporation into food products. GOS consist of a variable number of galactose units (usually in the range 1-5) combined with a terminal glucose through glycosidic bonds. They are generally synthesized *via* enzymatic catalysis from lactose-rich substrates using β-galactosidase enzyme through a transgalactosylation mechanism. Commercial GOS production is limited to a few countries like USA, Japan and Netherlands. In the commercial GOS products, the polymerization degree of GOS varies substantially from formula to formula. This is the result of complexity of the overall processing, wherein transgalactosylation and hydrolysis reactions take place simultaneously. Additionally, the prebiotic effect of GOS is mainly associated with proportion of tri-GOS and tetra-GOS in the total GOS mixture which makes it crucial to develop an approach for optimization of the enzymatic process' yield and tune the final product composition. In this work, the simultaneous effect of the reaction parameters; pH, temperature and initial lactose concentration on the production and composition of GOS from lactose using a commercial β-galactosidase has been studied by means of surface response methodology. Thus, an efficient model to reach maximum production of the tri-GOS and tetra-GOS has been developed.

O44 Novel edible films with probiotics and prebiotics

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Edible films and coatings are used as an alternative packaging system for foods. The functionalities of film can be enhanced by using vitamins, minerals, antioxidants, and probiotics. At the same time, the role of these films is to act as carriers for these functional molecules besides extending the shelf-life of food products. In this study, the main objective was to develop gelatin-based edible films with probiotic and prebiotic functionalities and application of these films on fresh strawberry for improving their shelf-life. For this purpose, probiotic *Lactobacillus rhamnosus* HN001 and inulin enriched gelatin-based films were prepared. Then, fresh strawberries were coated by these solutions and stored at 4 °C. Probiotic viability, microbial and physicochemical quality parameters, total phenolic content, and antioxidant activities of the samples were monitored during 16 days of storage. According to the results, gelatin-probiotic, and gelatin-probiotic-prebiotic coatings significantly slowed down microbial growth and weight loss in strawberries compared to control. Gelatin and *L. rhamnosus* coatings delayed the senescence during storage and the application of these coatings positively affected the physicochemical parameters (pH, titratable acidity, and total soluble solids) of strawberries. Moreover, inulin supported the viability of probiotic bacteria and gelatin-probiotic-prebiotic based coatings protected the total phenolic content and antioxidant activity of strawberries better than control samples. In conclusion, it was suggested that probiotic and prebiotic enriched coatings can be used for increasing the shelf-life and the functionality of perishable fruit and vegetables.

Keyword: Edible films, gelatin, probiotics, prebiotics, shelf life

O45 Reformulating traditional Mediterranean foods using alternative technologies

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Mediterranean Diet (MedD) has proven to prevent many metabolic syndromes. However, recently the loss of adherence to MedD has increased especially among the young generation. To reattract these consumers, reformulation of traditional Med food can be a strategy. One of the main contributors to the MedD is definitely tomato. Tomatoes and their derived products are known to have strong antioxidant, anti-inflammatory, and anticancer activities. According to the 2019 statistics of *Mediterranean International Association of the Processing Tomato* (AMITOM), ~38 % of world tomato production took place in Mediterranean countries. Another important feature of the MedD is the olive oil. Although it is mostly consumed in the form of oil; the fruit itself is also very nutritive. The phenolics present in the olive are perfect ingredients to design functional foods. In this study, a functional food with Med ingredients have been designed. A salty tomato bar enriched with a specialized olive powder have been produced. Olive powder has been prepared by using high pressure homogenization followed by freeze drying. The snack bar was dried using a microwave vacuum dryer at different processing conditions. Pea protein isolate and Rubisco protein obtained from water lentils were used to make the product more functional. To achieve the desired textural characteristics, starch and pectin were used as additional hydrocolloids. Physical and sensorial properties of the developed product were investigated.

O46 Formation of bioactive tyrosine derivatives during sprouting and fermentation of different whole grains

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Sprouting and fermentation are two popular processing methods in cereal processing. Both methods involve a series of hydrolysis reactions in which starch is broken down into simple sugars and proteins into amino acids. These processes also lead to the formation of various neuroactive compounds, including γ-aminobutyric acid, serotonin, melatonin, and dopamine, which can affect human health and mood. In this study, it was hypothesized that tyrosine, the amount of which increases with sprouting, may form higher amounts of tyrosine-derived neuroactive compounds with a synergistic effect during fermentation. Sprouted whole meals (wheat, einkorn, oat, rye, barley, and buckwheat) were subjected to commercial yeast and sourdough fermentations at different time-temperature combinations to optimize dopamine and L-DOPA formation. Both tyrosine and tyramine concentrations significantly increased with sprouting in all cereals, while changes in the concentrations of L-3,4-dihydroxyphenylalanine (L-DOPA) and dopamine were specific to the cereal. More tyramine, L-DOPA, and dopamine formation was observed during sourdough fermentation than that in commercial yeast fermentation. The maximum concentration of tyramine reached was 172 mg/kg, in the sourdough fermented native rye, which is within the acceptable limits of good manufacturing practices (100-800 mg/kg). For L-DOPA and dopamine, the maximum levels were reached in the sprouted-sourdough fermented rye and einkorn as 56 mg/kg and 45 mg/kg, respectively. Even the average dopamine levels achieved in sprouted-sourdough fermented cereals (in the range of about 5-10 mg/kg) were comparable to those of dopamine-rich foods, including banana (6.4 mg/kg), avocado (4−5 mg/kg), fish (0.3−1.6 mg/kg), and potato (2−7 mg/ kg). Food ingredients naturally enriched with dopamine and L-DOPA may bring functionality to foods that they used in, in terms of human health and mood. These ingredients may also be preferred by the food manufacturers due to their impact on consumers' mood-related and repetitive eating behaviors.

Keyword: Tyrosine, dopamine, L-dopa, tyramine, sprouting, fermentation

O47 Use of lyophilised cornelian cherry (*Cornus mas L.*) puree in functional food development by 3D food printing

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Oxidative stress and inflammation are among the most important causes in the pathogenesis of chronic diseases. Therefore, the interest in development of novel functional food alternatives as a tool to prevent these diseases is ongoing. Cornelian cherry (kızılcık) (*Cornus mas* L.), rich in anthocyanins, ascorbic acid and other phenolic compounds, is a wild berry native to Europe and southwest Asia. Türkiye is also among the most significant growing sites for this berry. Although it has been known and used as a food and medicine with its antioxidant, neuroprotective, anti-atherogenic and anti-inflammatory effects, cornelian cherry is still considered as part of the lesser known fruit species by the society. This study aimed to reformulate the lyophilised cornelian cherry puree (having a high anthocyanin (1187 mg/100 g) and ascorbic acid (303.5 mg/100 g) content), with plant proteins, to create a mousse for individuals with special needs such as the elderly. By the use of the 3D food printing, the new design aims to improve the taste, consistency, nutritional value and ease of chewing as well as the management of chronic diseases. The developed foods will also help prevent sarcopenia, which is common in society, and thus support a healthy and physically active life.

Keyword: Cornelian cherry (*Cornus mas L.*), 3D printing, functional food, anthocyanin

O48 Bioprocessing of edible jelly mushroom to obtain long-chain glycolipids functional as food-grade antimicrobials

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Since the end of the 18th century, the rapid growth in the global population has raised concerns about the increasing food demand, and numerous attempts have been made to ensure the safety and long shelf life of food products. Recently, due to the growing health awareness, more and more people have started to pay attention to the 'natural' and 'free of chemical additive' labels in food products. Thus, developing natural solutions have gained importance for reducing the deleterious effects of spoilage microorganisms. Long-chain glycolipids (LGLs) from *Dacryopinax spathularia* have recently been reported as a promising, natural, food-grade antimicrobial agent. *D. spathularia* is one of the species of jelly mushroom in the family of *Dacrymycetaceae*, known to produce LGLs as a secondary metabolite during aerobic fermentation. To date, the safety of LGLs has been proven with several studies, yet very scant attention given into its fermentative production. In this study, the growth behavior of *D. spathularia* and its antimicrobial activity against several food pathogens were investigated with liquid culture antimicrobial assays and Kirby Bauer disk diffusion method. The highest antimicrobial activity was recorded against gram-positive bacteria. Moreover, a series of laboratory-scale fermentations were performed to determine the optimum operational parameters, e.g. pH, temperature, and medium composition, for LGLs production. With its relatively easy, non-hazardous, and inexpensive production process, jelly mushroom glycolipids hold great potential not only in food preservative market but also in the cosmetics and pharmaceutical industries. The findings of this study will bring into light the antimicrobial properties and fermentation behavior of *D. spathularia* and also provide data on the optimum fermentative production system for LGLs production.

Keyword: Bioprocessing, long-chain glycolipids, antimicrobials

O49 Degradation kinetic modelling of moisture, colour and textural properties in Dabai fruit (*Canarium odontophyllum Miq*) during blanching treatment

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Dabai (*Canarium odontophyllum Miq.*) are well-liked exotic (indigenous) fruits planted in Sarawak and have high demand among local consumer. Dabai blanching is a pre-treatment in hot water to soften the fruit flesh before consumption and to enhance the efficiency of flesh-nut separation for further processing. However, the effects of proper temperature and blanching time on the fruit quality are still limited in the literature. In this study, the effects of blanching treatment on moisture, colour and texture of dabai of variety Kapit were studied at five different time intervals (2, 4, 6, 8 and10 minutes) and temperatures (60, 70, 80, 90 and 100 °C). Degradation was expected for all the quality parameters studied. The results show that reduction at significant different $p<0.05$ in moisture of approximately 7.5% whereas 24.0–74.0% for both color and texture during blanching. In terms of kinetic model, moisture content is expected to fit the Fick's law, where calculation of effective moisture diffusivity can be performed via the utilization of slope. Fractional-conversion order well described the changes of a*, b*, L, chroma and hue angle parameter. Meanwhile, the kinetic model of firmness changes is expected to obey the Arrhenius's law. Gathering the quantitative information on the changes of the quality during blanching of dabai fruit is vital in designing a proper pre-processing condition. In addition, the established models could provide guidelines to line perators to manipulate blancher conditions.

Keyword: Dabai, blanching, colour, moisture, kinetics

O50 Clinical evidence of the vascular effects of grapefruit flavanones and underlying molecular mechanisms

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A growing body of evidence from large cohort studies clearly indicates that high intakes of dietary flavonoids reduce by 10 to 12% the incidence of cardiometabolic diseases and support these phytochemicals as key contributors to the health benefit associated to diets rich in plant foods. These associations are corroborated by data from studies conducted in animal models with isolated flavonoids and in humans consuming flavonoid-rich foods. However the level of clinical evidence is quite variable depending on flavonoid classes due to a lack of clinical trials with some categories of compounds. This is especially the case for flavanones, which level of intakes can highly contribute to the total daily flavonoid intake in citrus consumers. Naringenin is one of the main representative of flavanones and grapefruit constitutes almost the unique and rich dietary source of naringenin glycosides. In view of the above, the presentation will provide an overview of knowledge supporting the vascular protective effects of citrus flavonoids, especially those of grapefruit naringenin. A focus will be made on the available clinical findings targeting vascular function and on recent results from a mechanistic study aiming to decipher the underlying molecular mechanisms of naringenin by multi-omics analysis in PBMCs isolated from human volunteers after consuming a grapefruit juice naturally rich in flavanones or a flavanone-free control drink for 6 months.

Keyword: Citrus flavanones, naringenin, randomized controlled clinical trial, vascular function, multi-omics analysis

O51 *In vitro* anti-angiogenic activity of circulating phenolic-derived metabolites

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For decades, many epidemiological and observational studies have suggested that polyphenols(PPs)-rich diets harbor a wealth of health benefits, including cancer chemopreventive activity targeting different steps in the carcinogenesis process. In this line, angiogenesis is a fundamental hallmark in cancer, recognized for promoting the proliferation, migration, and formation of endothelial cell tubes. Therefore, inhibition of angiogenesis can be an effective strategy for treating cancer progression in different types of tumors. However, although preclinical evidence of the anti-angiogenic effects of specific dietary PPs is growing, the evaluation of the actual circulating bioactive molecules that might be responsible for these health effects is scant. In this regard, the "PolyBiota" project deepens the understanding of the anti-angiogenic effects of phenolic-derived metabolites from dietary PPs such as curcuminoids, isoflavones, and(or) resveratrol, among others, conducting relevant *in vitro* studies testing their circulating derived metabolites and representative mixtures of them, at physiological concentrations previously described in humans. Methodologically, the effects of modulating the endothelial migration (wound healing assay) and forming ring-like structures (tubulogenesis), in a time- and dose-dependent manner, were evaluated on human aortic endothelial cells (HAECs). Besides, the associated molecular mechanisms were tested in VEGF-treated cells. Our results revealed that phenolic-derived metabolites that reach systemic circulation inhibit the tubulogenic capacity and cell migration of the endothelial cells in a dose-dependent manner. Furthermore, the study of the associated molecular mechanisms suggests the inhibitory effects could be related to the ability to block the VEGFR2-mediated signaling in VEGF-stimulated cells. Overall, these findings suggest that physiologically plausible concentrations of circulating phenolic-derived metabolites might counteract pro-angiogenic stimuli in tumorigenic processes. Thus the extrapolation of these results using *in vivo* models deserves further research.

Keyword: Polyphenols, curcuminoids, equol, resveratrol, HAEC cells

O52 Interactions of single nucleotide polymorphisms in SULT1A1, SULT1C4, ABCC2, APOA1, LPL, APOE and orange juice intake with flavanone metabolism and cardiometabolic outcomes in humans

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Citrus fruits and drinks are rich in flavanones and the regular consumption of these foods is inversely associated with the development of cardiometabolic diseases. Previous studies reported a large interindividual variability in the absorption and excretion of these compounds as well as in biological responsiveness. Different factors, such as age, gender or genetic polymorphism of genes involved in the metabolism and transport of the flavanones as well as in regulation of vascular and metabolic functions may explain this heterogeneity. This study aimed to assess the impact of SNP of SULT1A1, SULT1C4, and ABCC2 on excretion of phase II flavanone metabolites in volunteers consuming orange juice, as well as impact of SNP of APOA1, LPL and APOE on metabolic and vascular parameters in volunteers with high excretion capacity. Fifty-six volunteers participated in this study and consumed 500mL of orange juice for 3 weeks. The total phase II metabolites were quantified in 24-h urine and metabolic parameters (total cholesterol, total triglycerides, HDL, LDL) and blood pressure (DBP and SBP) were measured. The volunteers were genotypes for SNPs in SULT1A1, SULT1C4, ABCC2, APOA1, LPL and APOE genes. A significant (<0.05) relationship between the SNPs in SULT1A1, SULT1C4, and ABCC2 and the high excretion of phase II flavanone metabolites were observed. A significant association was also observed between SNPs in APOA1 an LPL, but not in APOE, with lipid parameters and blood pressure in volunteers presenting high excretion phenotype. These results identified novel polymorphisms associated with higher absorption of flavanones and cardiometabolic responsiveness to flavanone intake, results that provide bases for future personalized nutritional guideline to consume flavanone-rich foods rich in these nutrients for better benefit from their health properties.

O53 Dietary anthocyanins and their metabolites: Molecular mechanisms underlying the health effects

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Dietary anthocyanins, phytochemicals abundantly found in berries and berry-derived products, have been linked with lower cognitive decline, improved cognitive performance and protective effects against neurodegenerative diseases. Still, the molecular mechanisms underlying these benefits are not fully established. To contribute to unveiling the mechanisms of reported neuroprotective action of anthocyanin-rich foods, we evaluated the effects of anthocyanin-rich bilberry extract on gene expression in the hippocampus. Male ApoE-/- mice were fed a control diet with or without 0.02% anthocyanin-rich extract for 12 weeks, and hippocampi were collected to examine the global gene expression using microarrays. Bioinformatics analyses were performed to explore the functions of modulated genes and identify potential mediators of the nutrigenomic effect. Anthocyanin-rich extract differentially modulated the expression of around 1700 genes in the hippocampus. Bioinformatics analyses revealed that these genes regulate inflammation, cell adhesion, synaptic function, metabolism, Alzheimer's and Parkinson's disease pathology, and cognitive dysfunction. Several miRNAs and transcription factors (RELA, TRP53, SP1, JUN) were identified as potential mediators of the genomic effect of anthocyanin-rich extract supplementation, and *in-silico* analyses suggested that anthocyanins could bind to putative transcription factors and potentially affect their gene expression regulation. These analyses suggested a multi-target mode of action of dietary anthocyanins in the hippocampus that could contribute to brain health effects associated with anthocyanin-rich food sources. To further explore the mechanisms of anthocyanin action *in vitro*, we evaluated the impact of their circulating metabolites in human brain microvascular endothelial cells using physiologically relevant conditions. Results showed the capacity of these compounds to reduce monocyte adhesion to TNF-α-activated brain microvascular endothelial cells and their transmigration. Moreover, preliminary data suggest that these compounds induce complex genomics modulations in these cells, changing the expression of various protein-coding genes, microRNAs, and long non-coding RNAs, thereby acting on different regulatory levels.

Keyword: Anthocyanins, gut microbiota-derived metabolites, hippocampus, brain microvascular endothelial cells, nutrigenomics

O54 The protective potential of astaxanthin in endothelial cells exposed to uremic serum samples of hemodialysis patients

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Cardiovascular events are the leading sources of mortality in patients with advanced kidney impairment, especially in hemodialysis (HD) patients. Beyond traditional risk factors, uremic toxins, excessive cellular stresses, and chronic inflammation are emerged as major contributors to enhanced cardiovascular events in these patients. Our study aimed to evaluate the effect of Astaxanthin, a keto-carotenoid, on uremic toxin-induced endothelial dysfunction. An *in vitro* model of endothelial dysfunction was carried out by exposing human umbilical vein endothelial cells (HUVECs) to human uremic serum (10% pre- and post-dialysis serum samples of patients with HD) and compared with serum of healthy controls. Different parameters including redox homeostasis, mitochondrial dynamics, antioxidant potential, cell cycle arrest, and cell death were evaluated in HUVECs under uremic conditions. Uremic toxins markedly impaired the vitality and pathways related to oxidative stress, apoptosis and inflammation of HUVECs. Pre-treatment with Astaxanthin could significantly attenuate the endothelial damage induced by inflammation and oxidative stress. Moreover, Astaxanthin could regulate mitochondrial biogenesis and several mitochondria-associated metabolic pathways under uremic milieu. Astaxanthin exerted different biological defenses against uremia-induced endothelial injury through preserving mitochondrial dynamics and its anti-inflammatory, antioxidant, and anti-apoptotic properties.

Keyword: Antioxidants, astaxanthin, hemodialysis, oxidative stress, uremic toxins

O55 Oxidants, antioxidants, their analytical chemistry and trends - A perspective with reference to the CUPRAC method

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Antioxidants prevent or delay the undesired oxidation of food and biological materials by scavenging reactive species. The cupric ion reducing antioxidant capacity (CUPRAC) assay as an electron-transfer (ET) method measuring total antioxidant capacity (TAC), and its modifications can indirectly measure the scavenging capacity of antioxidants toward reactive oxygen species (ROS). This method is widely used in food chemistry and biochemistry laboratories and research centers, and the two leading CUPRAC publications have retrieved a total number of 3500 citations (Google Academic). CUPRAC has definite advantages over other similar ET-based methods. These include (i) the reagent is of low-cost, stable and easily accessible, (ii) method works at near physiological pH, standing as a good simulation of biologically relevant redox reactions, (iii) reagent is selective to genuine antioxidants, by virtue of proper selection of redox potential *via* cupric/cuprous complexation with neocuproine ligand, (iv) reagent displays favorable kinetics for slow-reacting antioxidants, (v) method yields perfectly linear curves over a wide concentration range, (vi) method is robust and is not sensitive to light, oxygen, temperature and pH, (vii) phenolics do not redox-cycle during application of the method, (viii) method can equally determine hydrophilic and lipophilic antioxidants, enabling the measurement of plasma and oil antioxidants in different solvent systems, (ix) reagent can be electrostatically held on a Nafion membrane sensor and operate like a pH-paper, (x) method can be combined with online HPLC through a postcolumn reactor, (xi) microplate and flow modes have been developed, including flow-injection-amperometry, (xii) method can be applied to insoluble food (*e.g.*, bound phenolics), (xiii) method can indirectly measure ROS and their scavengers, and (xiv) method can indirectly determine a number of oxidative and antioxidative enzymes through substrates or enzymatic conversion products. A personal perspective will be presented regarding the current use and future trends of antioxidant activity/capacity assays.

Keyword: Gut microbiome, roasting process, short-chain fatty acids, microbial metabolites

O56 Nutraceuticals from plant-based yogurts as inhibitors of angiotensin-converting enzyme 2 (ACE2)

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Angiotensin-converting enzyme 2 (ACE2) is a multi-functional enzyme in the renin-angiotensin-aldosterone system and a receptor for SARS-CoV-2. Prior studies have described components of vegetables, fruits, and other foods that inhibit ACE-2. However, much remains unknown about the extent diet and nutraceuticals modulate ACE2. A variety of plant-based yogurts (PBYs) are manufactured as dairy substitutes. These products may use a variety of plant-milk bases, including coconut, soy, almond, oat, and cashew and are fortified with varying protein sources and cultures. In this study, 21 commercial PBYs were obtained from local markets in Madison, WI, USA and evaluated for ACE2 inhibition. Extracts of PBY had variable inhibition of ACE2. Of the 21 samples, 9 inhibited ACE2 by 50% at less than 50 mg/mL (fw PBY). Extracts of soy, almond, and oat were among the most potent inhibitors, from 4-11 mg/mL IC50 (fw PBY). Soy, almond, and oat milks were extracted and tested for activity (n = 3 brands each), and soy milks were more potent ACE2 inhibitors than oat and almond milks, having 4-12 mg/mL (fw) IC50 values. Isoflavones contributed to activity, as purified isoflavones inhibited ACE2 and were detected in soy based PBY, soy-protein fortified PBY, and soymilk at levels consistent with ACE2 inhibitory activity. Therefore, ACE2 inhibition by PBY varies considerably, since a wide variety of formulations and processes are used in manufacturing. These results suggest that there are a variety of nutraceuticals in PBYs that inhibit ACE2, and PBY bioactivity depends on the method of manufacturing and selection of the base material. The intake and metabolic fate of these components will dictate the physiological relevance of ACE2 inhibitors in PBYs and other foods.

O57 Nutritional components, antioxidative and anti-inflammatory properties of *Schizophyllum commune* (fries) mushroom

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Schizophyllum commune is an edible and medical mushroom with increasing popularity, especially in Asia. The health-promoting properties of this mushroom have attracted researchers from around the world, prompting expeditions to experimentally explore and exploit *S. commune* due to its various metabolites. The current research progress on the health-promoting properties of *S. commune*, with respect to its nutritional components, antioxidative and anti-inflammatory properties will be discussed. Research on antioxidative properties was mostly limited to investigations on various extracts through biochemical assay, while research on anti-inflammatory involved *in vitro* and *in vivo* models, with more focus on exopolysaccharides from *S. commune*. Contemporary research corroborates these health-promoting properties of *S. commune*, but the experimental study remains deficient and deserves further investigation. More works on the utilization of biotechnological approaches, in vivo models, and in clinical settings are still needed in the future.

Keyword: *Schizophyllum commune*, mushroom, nutritional composition, antioxidants, anti-inflammatory

O58 Antidegenerative agent from Indonesian food sources: *In vitro* and *in vivo* studies

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Indonesia is rich in various food sources such as corn, cassava, lebui seeds (*Cajanus cajan* (L.) Millsp.) and seaweed. As part of the study on the development of these materials for functional food and nutraceutical that have benefits in the prevention of degenerative diseases, it is necessary to conduct a comprehensive study covering the content of active substances and mechanisms for their health benefits *in vitro* and *in vivo*. The raw materials are analyzed in their proximate and glycemic index value. The extracts of the raw material were tested in the antioxidant activity, alpha amylase inhibitory activity and anticancer activity in cell culture. In addition, the development of these raw materials into analog rice formulas and an *in vivo* analysis of their health benefits were carried out using test animals. Based on the results, it is known that the ethanolic extract of lebui seeds has antioxidant activity and anti-cancer activity on colon cancer cells with moderate category. The ethyl acetate fraction of lebui seeds has alpha amylase enzyme inhibitory activity. Based on the glycemic index value, it is known that corn, cassava, seaweed, lebui seeds have low values between 50 -70. The effect of analog rice products in the animals, the product has an increase effect in the insulin production and reduce in blood sugar in the test animals. Corn, cassava, lebui seeds, seaweed and their products have potential as food sources with antidegenerative benefits.

Keyword: Antidegenerative agent, Indonesian food, *in vitro* studies*, in vivo* studies

O59 Analysis of endocannabinoids in fermented foods of animal and plant origin

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Endocannabinoids (ECBs) are lipid signaling compounds composed of different fatty acid derivatives and activate cannabinoid receptors. These compounds are widely found in the human body and play a role in many physiological processes such as nervous system protection, memory, pain control, energy balance and metabolism, and hunger control. ECBs and related compounds are a large group that includes *N*-acylethanolamines, *N*-acylamino acids, *N*-acylneurotransmitters, onoacylglycerols, and primary fatty acid amides. It has been emphasized in recent years that fermented foods influence human mood (food-mood). This effect may be caused by the metabolites of microorganisms in fermented foods. It has been reported that some ECBs and related compounds can be produced by microorganisms, but there are limited studies on their presence in fermented foods. Therefore, the aim was to develop a liquid chromatography tandem mass spectrometry (LC-MS/MS) which can provide information about the presence and changes of ECBs during food fermentation. LC-MS/MS optimization, extraction optimization, and method validation were performed to detect these large numbers of compounds in a single analysis also by using stable isotope labelled internal standards. The validated method was able to quantify 44 compounds simultaneously with a successful chromatographic separation of isomers. It has low detection and quantification limits (1-20 pg on column), high linearity (1-1000 ng/mL, R^2>0.98), high recovery values, and high inter- and intraday accuracy and precision depending on the compound or food matrix. *N*-acylamino acids and *N*-acylneurotransmitters were detected for the first time in foods (fermented Turkish sausage, cheese, kefir, yogurt, bread, olives, cocoa, beer and wine). This LC-MS/MS method can be used to determine the amounts of ECBs and related compounds in foods and can be used to investigate how these compounds change under various processing conditions, including fermentation.

Keyword: Fermented foods, endocannabinoids, LC-MS/MS, method validation

O60 Comparative study on physicochemical properties of tomato juices with non-irradiated and irradiated supplements: olive powder and sugar-beet leaves protein

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The Mediterranean Diet (MedD), recognized as an Intangible Cultural Heritage of Humanity by UNESCO, focuses on vegetables, so plant-based protein powders which can be considered as a good ingredient for MedD. Sugar beet is one of the most cultivated crops in the world. In addition, sixty percent of the World's production of sugar beet belongs to Europe. The sugar beet tubers are used in sugar production, while the leaves are the waste of sugar-producing companies that are normally used as livestock or left on the land. Although the sugar beet leaves are considered as waste, they have a potential to serve as a good protein source due to their high protein content. Olive is another indispensable ingredient for MedD and it can be consumed in the form of table olives, olive powder or olive oil which is the most common form. Tomatoes, olive powder and sugar-beet leaves proteins can be merged in the form of a juice to formulate the functional food and this mix could play a role in inhibiting free radicals, i.e. oxidative stress. Considering their beneficial properties and addition to tomato products, further studies on tomato juices and powders prepared by non-thermal methods are required. This study monitored the changes of the physicochemical properties of tomato juices with supplements: olive powder and sugar-beet leaves protein powder after irradiation treatments. As the powder must satisfy consumers demand in terms food safety with a longer shelf life, preservation with ionizing gamma radiation were applied. The main objective was to compare physicochemical properties of tomato juices prepared with addition of the different concentrations of olive powder and sugar-beet leaves protein, with or without being exposed to irradiation treatment. The irradiation dose was chosen according to IAEA regulati[ons] and in the amount allowed to be presented on the market without Radura symbol, to avoid fear of customers and mistrust to usage of irradiation in food processing. After irradiation, comparative study on changes of physicochemical properties of the powders, analysis of tomato juices such as pH value, total dry matter content, color, total acidity, lycopene content, antioxidative activity, concentration of ROS species and microbiological stability (TPC and TMP) were also investigated and discussed. The results indicated that the proposed procedures based on tomato juices, and differently preserved olive powder and sugar-beet leaves protein powders with optimization of additive concentrations can be used for further use of the resouce from farm to fork to improve the food safety chain.

Keyword: Mediterranean diet, tomato juice, olive powder, sugar-beet leaves protein, irradiation

O61 A novel technological breakthrough in body recomposition and weight management: A clinical investigation

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The prevalence of obesity has increased at an astounding rate of 30.5-42.2% over the last two decades. Fat is the lightest of macromolecules, the highest energy reserve of the body, and the last reservoir of survival insurance to be expended. Water, muscle, and electrolytes are diminished prior to the expenditure of fat resources, the primary cause of rapid weight loss. We hypothesize that evaluating healthy body recomposition is required. There are 10 additional factors that contribute to a reduction in metabolic rate and an increase in fat storage, which are ignored. We developed a novel Prodosomed stimulant- and sugar-free TRCAP21 (TrimRox) formulation that effectively addresses those contributing factors and conducted a 21-day concept validation pilot study on TRCAP21 in 9 subjects to assess changes in various body parts, including chest, upper arms, waist/belly, hips, and thighs, as well as body weight. All subjects experienced a reduction in size of one or more these body parts. Significant improvements in mood elevation, satiety, reduced sugar cravings, elevated energy levels and overall health were observed. Intake of 1 packet twice a day before meals resulted in a significantly greater reduction of body measurements than consuming it once a day. Surprisingly, body weight reduced in all nine subjects from 2 lbs. to 11 lbs. The randomized double-blind placebo-controlled study is underway to confirm these findings. This formulation combines the evidence-based efficacy of six key constituents, mostly of botanical origin, that act synergistically to restore aerobic cellular metabolism, boost energy level, mood elevation, improve satiety, reduce sugar cravings, reduce body weight, and improve health. Owing to the encapsulation of the components in concentric layers of liposome, their release takes place in a sustained and sequential manner. We will explore its efficacy on the Gut-Brain Axis, especially the associated microbiome to obtain further mechanistic insights.

Keyword: Weight management, survival panic, fat, body composition, AMPK

O62 Obesity: A genetically induced metabolic survival defense due to unhealthy food habits and sedentary life style - aerobic vs anaerobic metabolic events

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Increasing obesity in the 21st century is a challenging problem to health professionals. Overindulgence of high calorie unhealthy foods and sedentary lifestyle are major contributors to the global obesity epidemic. Numerous research and commercial weight loss programs have failed to achieve significant loss of body fat and maintain healthy body weight for longer period. Hence, the rise of obesity epidemic, including yo yo weight gain, is related to comorbidities, for examples diabetes, cardiovascular, and inflammatory disorders, continues to escalate. When the body experiences chronic nutritional deficiencies, toxic insults, trauma, excessive physical exertion, and stress, these lead to hypoxic anaerobic bio-environment. In this energy-conserving state, an upregulation of survival insurance occurs as body fat, glycogen, and water retention increases. In this present scenario, an individual can eat a lower quantity of food but still store more energy as body fat. Hence, body fat storage is upregulated in obese individual as compared to a lean individual. We hereby hypothesize that disrupted metabolism and unhealthy food habits lead to an upsurging anaerobic/acidic physiological environment in conjunction with chronic inflammatory disorders. These metabolic disruption shift toward cellular anaerobic glycolysis, and a compensatory expenditure of alkalinizing histidine molecules from the heme protein of deconjugated hemoglobin, which all lead to an array of diverse degenerative disorders. The major emphasis should be focused on healthy metabolism, which governs food intake, energy homeostasis, and body fat storage requirements. This presentation will highlight how healthy food habits, appropriate dietary supplementation, and physical activity can enhance a healthy aerobic environment to boost competent gene expression and proper metabolic pathway.

Keyword: Obesity and overweight, metabolic syndrome, inflammation, aerobic metabolism, nutrition

O63 A novel blend of *Sphaeranthus indicus* and *Garcinia mangostana* extracts for weight management and improving cardiac health

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LI12507F1 (CardiaSlim®) is a unique dietary blend of extracts of *Sphaeranthus indicus* flower heads and *Garcinia mangostana* fruit rind. Three randomized, double blind, placebo-controlled studies conducted in healthy overweight/obese men and women demonstrated the efficacy and tolerability of LI12507F1 in improving cardiovascular health by supporting healthy blood lipid levels and body weight. Studies on LI12507F1 incorporated a diet and exercise plan for an overall lifestyle approach to heart health. LI12507F1 supplementation (n=30; 400 mg twice daily over a period of 8 weeks) significantly reduced the body weight, waist and hip circumferences, and impact of weight on quality of life (IOQOL) and increased the concentration of serum adiponectin. In an another human trial consisting of 60 subjects, daily supplementation of 400 mg of LI2570F1over a period of 16 weeks significantly reduced the body weight, BMI, waist and hip circumferences. In both trials, serum lipid profile and fasting blood glucose (FBG) were significantly improved in LI12507F1 cohort. LI12507F1 reduces the degree of adiposity and improves the insulin sensitivity by reducing adipocyte differentiation, uptake of fatty acids by adipose tissue and increases the lipolysis of stored fat. Overall, LI12507F1 improved LDL (low density lipoprotein) and total cholesterol, healthy HDL (high-density lipoprotein) cholesterol, and triglyceride levels. Also, LI12507F1 promoted weight loss, and reduced hip and waist size. LI12507F1 reduces cardiovascular disease risk, vascular integrity, cardiovascular age (Farmington). LI12507F1 is a novel botanical blend for weight management is safe for human consumption. A battery of *in vitro* and *in vivo* toxicological studies confirmed the safety of LI12507F1.

Keyword: CardiaSlim®, body weight, obesity, cardiovascular integrity, vascular age

O64 Hypoglycemic effect of bread from purple sweet potato flour, starch, and fiber-rich flour in streptozotocin induced diabetic rats

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Purple sweet potato (PSP) is one of the various types of sweet potato that can be used as functional food due to its high anthocyanin and antioxidant levels. The hypoglycemic effect of consumption of bread made from composite flour consists of 75% purple sweet potato flour (PSPF), 5% purple sweet potato starch (PSPS), and 20% fiber rich flour from purple sweet (PSFF) on streptozotocin-induced diabetes mellitus rats was studied. *In vivo* study was carried out on thirty wistar strain rats divided into six groups of five rats each. Three groups were kept a healthy control group, while the rest groups of rats were induced with diabetes using streptozotocin (STZ) by a single dose administration of 60 mg/kg body weight (BW). Group 1: non-diabetic rats fed with 100% standard diet (negative control group. Group 2: non-diabetic rats fed with 25% PSP bread and 75% standard diet. Group 3: non-diabetic rats fed with 50% PSP bread and 50% standard diet. Group 4: diabetic rats fad with 25% PSP bread and 75% standard diet. Group 5: diabetic rats fed with 50% PSP bread and 50% standard diet. Group 6: diabetic rats fed with 100% standard diet and metformin at 150 mg/kg BW (positive control). The hypoglycemic effect was determined by measuring blood glucose levels, body weight, and histopathological of pancreas. The results indicated that PSP bread significantly lowered the blood glucose level of diabetic rats and reduced the weight of rats. Giving PSP bread to healthy rats had no effect on pancreatic beta cells, whereas in diabetic rats its effect on pancreatic beta cells was not significantly different from the administration of metformin.

Keyword: Purple sweet potato bread, Wistar strain rats, hypoglycemic, streptozotocin

O65 Pulse bread as a functional food to reduce blood glucose

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Low glycemic index (GI) diets have been shown to reduce risk of obesity and improve glycemic control in diabetes, when compared to high carbohydrate, high GI diets. Replacing conventional wheat in bread with low GI starchy alternatives such as pulses (eg. lentils, chickpeas) may lower the GI and promote increased pulse consumption. To formulate four pulse-based breads and determine their glycemic response and GI using an acute human feeding trial in healthy volunteers.Following an overnight fast, healthy volunteers (5 males; 7 females) with mean (SD) age 44±18 yrs and body mass index (BMI) of 28.1±4.9 kg/m^2, consumed 50g available carbohydrate (avCHO) test meals of 4 different pulse breads or 1 control (white bread, WB). The pulse-based bread were formulated from pulse flours and incorporated at approximately 50% avCHO from red lentil, chickpea flour, yellow pea flour, or green lentil flour. Blood glucose was measured, by finger prick, at various time points (-5, 0, 15, 30, 45, 60, 90, 120 min) before and after the meal. GI was calculated using blood glucose AUC.The four pulse-bread samples elicited a significantly lower ($P<0.01$) blood glucose response when compared to WB. Blood glucose AUC for WB (204±21) was significantly greater ($P<0.05$) than that of each of the four test pulse breads, which did not differ significantly from each other. The GI calculated for the 4 pulse-bread samples (49.7±5.7, 45.8±5.1, 37.1±3.3, 45.4±5.8) was significantly lower ($P<0.01$), when compared to that of WB. Incorporating pulse-based, slower-digestible starches instead of conventional rapidly-digestible wheat starches can lower the GI of one's diet, providing the health benefits associated with a low GI diet.

O66 The inhibition of insulin/IGF-1 signaling pathway plays a crucial role in the myo-inositol-alleviated aging in *Caenorhabditis elegans*

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The compound *myo*-Inositol (MI) has been shown to alleviate aging in *C. elegans.* However, the mechanism by which MI alleviates the aging remains unclear. MI had been reported to inhibit the expression of phosphoinositide 3-kinase (PI3K) and phosphorylation of AKT. In this study, we hypothesized that MI could attenuate the IIS pathway so as to activate the DAF-16 and exert the anti-aging activity. The wild-type *C. elegans* and two mutants of *akt-1* and *daf-16* were used to explore the mechanism of MI to extend the lifespan, as well as to improve the health indexes of pharyngeal pumping and body bend, and an aging marker of autofluorescence in *C. elegans*. We confirmed that MI could significantly extend the lifespan of *C. elegan*s. MI also ameliorated the pharyngeal pumping and body bend, and decreased the autofluorescence. We further adopted the approach to reveal the loss-of-function mutants to find the signaling mechanism of MI. The functions of lifespan-extending, health-improving, and autofluorescence-decreasing effects of MI disappeared in the *akt-1* and *daf-16* mutants. MI also could significantly downregulate the expression of nematodes' PI3K, inhibited the phosphorylation of nematodes' AKT, and induced the nuclear localization of the DAF-16. Importantly, we found that MI could dramatically inhibit the phosphoinositide 3-kinase (PI3K) activity in a dose-dependent manner with an IC50 of 90.2 uM for the p110alpha isoform of the PI3K and 21.7 uM for the p110beta. All these results demonstrate that MI can attenuate the IIS pathway to activate DAF-16 by inhibiting PI3K activity, thereby alleviating aging in *C. elegans*.

Keyword: Myo-inositol, aging, lifespan, PI3K inhibitor, insulin / insulin-like growth factor 1 signaling pathway, *C. elegans*

O67 Global regulations of functional foods/nutraceuticals and health claims

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The diet-related non-communicable diseases, such as cardiovascular (CVD), diabetes, and other diseases have been on the rise globally. According to WHO, CVD accounted for 44% of mortality in 2016. To combat chronic disease, the nutritional trends have changed during the last two decades. There has been a greater focus on the preventive role of nutrition and food with health benefits, such as functional foods and nutraceuticals. In response to consumer trends, the industry increased efforts to produce functional foods, natural health products, and dietary supplements. To control the production and the marketing of these product categories, many global jurisdictions introduced regulations, including health claims on foods. The regulatory process is complex and dynamic. It requires a continuous update to provide proper information to producers and consumers. This presentation will review the current regulatory systems and health claims for functional foods in selected countries including the US, Canada, and the EU.

Keyword: Functional foods, regulations, health claims

O68 Olive oil as an important Functional Food: The role of its polyphenols

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Extra virgin olive oil (EVOO) contains several unsaponifiable compounds, mainly polyphenols which exert important health benefits. The production of olive oils with high levels of polyphenols and their presence in our body depends on many variables, including soil microbiota, cultivar of the olive tree, environmental factors, cultivation procedures, fruit maturity stage, applied technology in the olive oil milling and human gut microbiota. All microbial microorganisms share with plant and human a reductive/oxidative system (REDOX). Only an optimal balance between the different REDOX systems, starting from that of the soil, can guarantee the well-being of the olive tree, helping in both quantity and quality of polyphenols. Polyphenols are biofunctional antioxidant constituents that modulate the function of the reductive/oxidative (REDOX) system in our body. Failure of the REDOX system results in oxidative distress, a multifactorial systemic disease related to early aging and illness. More than one hundred diseases were found to be related to oxidative distress, including cardiovascular diseases, diabetes, neurodegenerative disorders, infertility, and even cancer. Oxidative distress and inflammation cause the shortening of telomeres, which is associated with several age-related diseases. EVOO polyphenols have anti-inflammatory, neuroprotective, and immunomodulatory activities and can reduce the risk of coronary heart deceases and increase the length of telomeres. This presentation describes the parameters affecting the presence of polyphenols in EVOO, proposes new technologies that can enhance the polyphenol content of olive oil that modulate a reductive oxidation system, thus protecting the body from oxidative distress, increasing telomere's length and prolonging the length of our life, justifying its place as one of the most important functional foods.

O69 Current status and future developments in lipid-based therapeutics

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Lovaza (Omacor), Vascepa (Epadel) and Epanova, omega-3-based medicines derived from highly concentrated fish oil, became successful serum triglyceride reducers. However, a great deal of interest is being devoted not only to further investigation and medical applications of unmodified polyunsaturated fatty acids (PUFAs) but also to their derivatives and other structurally lipid-related entities. It is surprising that PUFAs are not as widespread therapeutics as would be expected. This is primarily due to their instability *in vivo* and thus efforts have been made to stabilize PUFAs on their C-2 carbons with alkyl groups. Also, interesting results have been obtained with hydroxylated long chain fatty acids. Introducing hydroxyl groups to the C-2 sites led to derivatives that are effective in promising membrane-lipid therapy. Considerable attempts are being made to discover and develop bioactive epoxy-derivatives and a number of capable research groups conduct synthesis and study biological effects of other fatty acid-related molecules, including, ethers, thioethers, nitro- and fluorine-containing derivatives. Significant efforts have been made in the development of specialized pro-resolvin mediators (SPMs) and some resolvins and protectins are in various stages of clinical development. Not surprisingly, cannabinoids as therapeutics are also gaining lots of attention and significantly greater efforts are being registered in the exploration of aliamides (autacoid local injury amides) and relevant messengers. These endogenous fatty acid amide hydrolase inhibitors that play important roles in chronic pain, modulation of inflammation, T-cell function, kidney disease and irritable bowel syndrome have been intensively pursued as therapeutics. Arachidonic acid (ARA)-derived amides are of especially great interest to researchers. Major companies realize growing importance of lipid-based therapeutics and are intensively involved in the development of "Lipid Opportunity Maps". Most recent updates on the activities of relevant biotech and pharma and other prolific research groups, and their chief bioactive molecular discoveries and trends will be discussed.

O70 Effects of environmental stresses on neuroactive compounds produced by *Saccharomyces cerevisiae* in fermented foods

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Fermented foods have been consumed by humans for thousands of years. Neuroactive compounds synthesized by microorganisms during fermentation may be the answer to the question of why people prefer to consume fermented foods. *S. cerevisiae* produces some amino acid derivatives that have neuroactive properties during fermentation. Depending on the fermented food, *S. cerevisiae* is exposed to many stresses such as osmotic, pH, and temperature stress during processing. The aim of this study was to investigate the effects of different environmental stresses on the neuroactive substances formed by *S. cerevisiae* in model and food systems during fermentation. Fermentation was performed using *S. cerevisiae* NCYC 88 (brewer's yeast) and *S. cerevisiae* NCYC 79 (baker's yeast) in model systems under different temperature, pH, alcohol, phenolic, and osmotic stress conditions. The stress indicator in yeasts was determined by analyses of yeast growth and stress response molecules. Changes in neuroactive substance profile and concentration in model and food systems (bread and beer) during fermentation were determined by using liquid chromatography tandem mass spectrometry. The increase in stress response molecules was observed in all stress factors except ferulic acid stress. In model stress mediums, tryptophan derivatives including kynurenine, picolinic acid, kynurenic acid, tryptophol, tryptophan ethyl ester, and tryptamine were detected. Differently from models, serotonin, indole-3-acetamide, indole-3-carboxaldehyde, and indole-3-acetic acid were found in foods. Both yeast strains increased the formation of kynurenic acid, tryptophan ethyl ester and tryptophol under osmotic stress conditions in model systems. Alcohol stress was found to be important for tryptophol formation in both model and food systems. In conclusion, stresses encountered by yeasts during fermentation were found to be effective in the formation of neuroactive compounds via this large-scale study. Moreover, this study contains information that can be used for the production of new functional fermented foods rich in neuroactive compounds.

Keyword: Fermentation, bread, beer, neuroactive compounds, stress

O71 The production of fermented dairy product supplemented with *Spirulina platensis*

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The yoghurt type fermented dairy products were produced by *Spirulina platensis* supplementation at 0.5, 1.0, and 1.5% (w/v) concentrations and stored under refrigerator conditions for 21 days. The textural (hardness, cohesiveness, springiness, gumminess), quality (pH, titratable acidity, water holding capacity, syneresis, color), and sensorial properties of fermented products along with flow behaviors (shear stress and viscosity) were determined. The changes in bioactive properties (phenolic content, antioxidant activity, inhibitions of ACE, α-amylase, and α-glucosidase enzymes) were also determined in undigested and *in-vitro* digested fermented dairy products. Thirty-two volatile compounds were identified by using GC-MS-MS and the variations in dairy product compositions were investigated during storage period. The *Spirulina platensis* supplemented dairy products had higher phenolic content, $ABTS^{\cdot+}$ and DPPH radical scavenging activities, and ACE inhibition activities than control sample. After *in vitro* digestion, the phenolic content of samples varied from 2621±188 to 3745±98 mg GA/100g (as increased with supplementation concentration) which were between 12.6±1.5 and 31.7± 6.5 mg GA/100g in undigested samples. Similarly, the antioxidant activities in digested samples were between 190-475 times higher for $ABTS^{\cdot+}$ and 7.7-10 times for DPPH radical than undigested samples. Although a limited increment was observed in ACE inhibition activity in control sample (1.3 times) after digestion process, the remarkable increments (2.6 – 10.2 times) were measured in supplemented products. However, any α-amylase and α-glucosidase inhibitions were not determined in undigested samples, the digested products showed considerable enzyme inhibitions. The general acceptance in sensorial analysis was the highest in control sample and reduced as the algae concentration increased in the product. The supplemented products were softer, less adhesive and less gummy than control sample. Hexanal, heptanal, octanal, 2,5-dimethl pyrazine, nonanal, 2-butyl-2-octenal, α-ionon, geranilacetone, acetophenon were identified in *Spirulina platensis* but they were disappeared during lactic acid fermentation.

Keyword: *Spirulina platensis*, yoghurt, bioactive properties, volatile compounds, texture profile

O72 Mineral water, macromolecules in mineral water and functional properties of magnesium in mineralwaters

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Mineral water is a natural food product that contains a high percentage of minerals useful for human health. These minerals cannot be synthesized in the human body and must be taken from the outside. Mineral water contains dissolved mineral salts, elements and gas. In general, it is obtained from geologically and physically protected groundwater by drilling a well or filling it from a source. In order for the body to grow and develop in a balanced way, it needs macro-minerals and trace elements. These minerals are also abundant in mineral water. Minerals with a daily requirement of the body above 250 mg are called macro minerals, and minerals with a daily requirement below 20 mg are called trace elements. Minerals such as sodium, potassium, calcium are examples of macro minerals, while trace elements such as iron, zinc, selenium can be given as examples. Magnesium intake has a protective effect against chroner artery diseases, remittance and insulin resistance. As a cofactor in about 350 enzymes, it takes part in the synthesis of proteins and nucleic acids. In addition, it provides energy production by helping ATP synthesis. Zinc, selenium and magnesium, on the other hand, play an active role in hormonal functions by acting as catalysis in metabolic pathways. Ions such as sodium, chlorine, potassium, on the other hand, ensure the water-electrolyte balance in the body. Again, minerals such as calcium, phosphorus, magnesium, fluorine are found in bone and membrane structures. Magnesium mineral increases the amount of water in the intestine and facilitates bowel movements. Due to its important function in relieving constipation, pharmaceutical supplements with magnesium sulfate content are often used. Magnesium deficiency can be associated with migraines. Low magnesium values have been found in some migraine patients and magnesium supplementation can be applied in the treatment of migraine.

Keyword: Mineral water, magnesium, macro minerals, functional water

O73 The elephant in the room: The central role of fiber in our health and longevity

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The ultimate goal of any nutritional optimization must be increasing a healthy lifespan. Unlike many other trends such as the protein or micronutrient trends, there is a huge and growing scientific evidence for the life-prolonging benefits of fiber. The benefits are significant. For every additional 10g of fiber, all-cause mortality drops by about 10%, which roughly equates to 7 years of additional healthy life years. There simply exists nothing else in the nutrition space that even comes close. Fiber has also important additional benefits that link to the reduction of a range of major diseases (CVD, cancers, inflammation), as well as a significant impact on obesity (cost of obesity alone is projected to be 3% of global GDP). What is even more tantalising about fiber is that it can easily be added to many products, because it does not have a flavour, and depending on the type of fiber, may have little impact on mouthfeel, or alternatively some fibers can be leveraged to create certain organoleptic properties. And this is a key point, fiber can be added to almost any product without requiring the consumer to change habits or trade-off desired product characteristics. Finally, Fiber is one of the lower-cost natural products and in many cases used in animal feed, thus making its use practical in low-cost consumer products. When looking at juices (especially 100% juices and smoothies) and fruit-based products specifically, the lion's share of the health impact comes from fiber. In comparison, other beneficial ingredients such as phytochemicals, vitamins etc. have a far smaller impact. If companies want to create truly healthier options, ignoring fiber, is ignoring the main ingredient for a long and healthy life.

O74 Functional and health transformation in juice drinks

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2 in 3 consumers globally are more concerned about their personal health and the health of those close to them in the light of the pandemic. Health and well-being is a rising consumer trend for beverage and juice categories. The demand for functional products, clean labels and natural ingredients is increasing when purchasing juice. Still, taste remains among the top reasons to drink juice and flavour is the most important purchase factor. Extracts are a rising trend for producers to expand their portfolios in an innovative way. Extracts, innovative flavors and R&D collaborations…how will they shape the future of food and beverage market? What is the benefit and action from sustainability and circular economy perspective? How flavours remain as a solution to functionality? What are our solution suggestions to develop a holistic perspective in the beverage category? Discover at this session.

Keyword: Functional, juice drinks, beverage, extracts, health

O75 Whey based functional beverage with psychobiotic potential

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Gamma-aminobutyric acid (GABA) is a neurotransmitter found in humans and can also be produced by microorganisms. Most important effects of GABA on human health have been reported against cardiovascular and nervous system disorders such as anxiety and depression. In the literature, GABA producer microorganisms have been mostly utilized as functional starters to produce fermented products. However, limited studies are available on the encapsulated microorganisms synthesizing GABA which incorporated into functional beverages e.g. whey beverage. Whey is one of the major by-product of food industry having high biological oxygen demand. Potential utilization of whey as a high protein source would be a valuable base for functional beverages. The aim of this study was to develop a functional whey beverage having psychobiotic potential by using functional food ingredients e.g. probiotics for brain health. Therefore, potential GABA producer microorganisms, 20 of *Lactococcus* and *Enterococcus* isolates from traditional Çömlek cheese have been investigated. GABA production of potential probiotic strains were determined by RP-HPLC. Among them, GABA concentrations varied in between 20-250 mg/ml in 1% monosodium glutamate containing M17 broth media after 48 hours. Microencapsulation of the highest GABA producer cheese strains e.g. *Lactococcus lactis* were carried out by using whey protein/pectin complex double emulsion technique. Study was evaluated for the incorporation of encapsulated cells into whey. Pasteurized whey beverage was formulated with banana puree, date puree and curcumin. Physicochemical, sensory characteristics of beverage and survival of encapsulated potential probiotic strain during shelf life (21 days) have been investigated. Thereafter, stability of GABA producer strains encapsulated in whey protein/pectin matrix can be preserved with high viability during cold storage of whey-based beverage. Because of the high protein and mineral content of whey, a highly nutritious drink has been developed and it has a great potential to become a carrier for psychobiotic probiotics.

Keyword: Probiotics, encapsulation, GABA, psychobiotic, whey beverage

O76 Determination of vitexin content in hawthorn (*Cretaceous orientalis*) and development of vitexin enriched capsul and powder products

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Hawthorn is a genus of thorny shrub tree in the Rosaceae family. Medicinal properties of chemical content of seeds, fruits, leaves, roots, branches, and flowers of hawthorn have been proven by many scientific studies over the years. Today, hawthorn and its parts are mostly used as cardiotonic, hypotensive, antispasmodic, antiatherosclerosis agents and diuretic. In the present study, vitexin, which is in the structure of the hawthorn plant, known for its wide pharmacological effects, especially for its strengthening effects on heart function, was extracted from the hawthorn fruit. In the first stage of the study, hawthorn fruits were collected from Erzincan and Sivas regions. The species of collected hawthorn fruits have been pomologically identified. In order to determine the general quality characteristics of fresh hawthorn fruits; Brix, pH and total acidity values were determined as 7.91, 3.45 and 0.55% citric acid, respectively. Optimization of the extraction conditions was determined by examining the effects of ethanol concentration and temperature individually on extraction yields that were determined according to the vitexin contents of the samples that were purified by flash chromatography, and analyzed by HPLC. The optimum extraction conditions and vitexin content of the hawthorn puree that was produced and commercialized within the paralel project were also determined. According to the results of HPLC analysis, it was determined that the extract obtained by treating the hawthorn puree produced in our factory with a solvent containing 90% ethanol at 40ºC contains 15,846 ppm of vitexin and this amount is 41,2% more than the amount of vitexin content in the same ratio of fresh hawthorn fruit. Therefore, it was decided to extract vitexin from hawthorn puree. In the next phase of this study, it is planned to commercialize the encapsulated hawthorn puree containing 2% purified vitexin extract as a food supplement.

O77 Innovation and consumer trend in functional drinks

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Functional beverages (FBs) are an important segment of functional food products due to their health benefits and appealing sensory characteristics, suitability and affordability. They include various types of products, among which energy drinks, sports drinks and functional bottled water belong to the category of functional and fortified drinks, which have recorded remarkable growth in recent years. FBs market offers many opportunities for new product development (nutraceuticals, colorants, plant-based medicines and products) with desirable and effective composition of nutrients and bioactive molecules aimed to deliver health benefits and improve human well-being. In Türkiye, fermented black carrot juice (shalgam) is considered as nutritional sources and functional beverage; many studies of shalgam has revealed the presence of multiple compounds of biological importance. Today, we are working on stabilizing the functional properties of shalgam in cooperation with Fersan and TUGIP. According to the 2021 edition of the "EU Food and Beverage Industry Data and Trends" report, it was stated that European Union citizens attach importance to taste, food safety, price, country of origin and ingredients, respectively, in their food purchases.

Keyword: Functional drink, fermented beverage, health

O78 Cereals and legumes as a source of phenolic and polyphenolic compounds

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Cereal grains and legume seeds provide important sources of nutrients, such as protein, starch, dietary fiber and minerals, worldwide. In the human diet, cereals and legumes also offer protective effects against chronic diseases. These plant materials contain a plethora of bioactive compounds including phenolics/polyphenolics such as phenolic acids, flavonoids, and condensed tannins. From nutritional and technological points of view, phenolic compounds possess antioxidant properties. Various evidence indicates that oxidative stress is closely associated with a diverse assortment of diseases such as cancer and cardiovascular disease, which food antioxidants may help ameliorate. The antioxidant capacity of cereals legumes depends on the biological variety of the plant species, with values extending over a broad range. Technological processing and seed germination can change and alter the form of endogenous antioxidants in grains and seeds. Noteworthy is the marked content of phenolic antioxidants in the skin coats of both grains and seeds. In the legume family, lentil seeds are characterized by a very content of phenolic compounds with marked antioxidant properties. In this study, we investigated both green and red lentils in terms of the types and quantity of phenolic compounds as well as their antioxidant potential. The extracts of tested seeds possess a number of key phenolics including *trans*-*p*-coumaric acid, *trans*-ferulic acid, sinapic acid, *p*-hydroxybenzoic acid, quercetin diglycoside, quercetin hexose acylated, apigenin hexose, catechin glucoside, (+)-catechin, epicatechin glucoside, and (–)-epicatechin. Phenolic compounds present in the crude extracts and their fractions of lentil types tested demonstrated antioxidant and antiradical activities, as revealed using a β-carotene-linoleate model system, the total antioxidant activity assay, the DPPH radical-scavenging activity assay, and reducing power evaluation. Results of these assays showed that the lion's share of the antioxidant activity was attributed to their tannin fraction.

O79 Antioxidant capacity and profiles of phenolic acid in various genotypes of purple wheat

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In this study, the studied lines were obtained by a two-stage crossing of donor-colored lines with recurrent promising varieties of Siberian selection Element 22, Aina, Tobol'skaya, and breeding line BW49880 (CIMMYT, INT). The total phenolic content, phenolic compositions, and antioxidant capacity in the grain of 40 purple wheat genotypes were studied. For this purpose, wheat samples were investigated in terms of their composition of free and bound phenolic acids and radical scavenging capacity. The total phenolic content of purple wheat samples ranged from 352.65 to 771.83 mg GAE/100g wheat. The free phenolic content ranged from 164.25 to 271.05 mg GAE/100g DW while the bound phenolic content was between 182.89–565.62 mg GAE/100g wheat. The amount of bound phenolic was found to be higher than the amount of free phenolic in all wheat varieties. The bound phenolic compounds have important functions such as high antioxidant properties and preventing the oxidation of bioactive compounds in the colon. Gallic acid, protocatechuic acid, catechin, 4-hydroxybenzoic acid, syringic acid, ellagic acid, m-coumaric acid, o-coumaric acid, chrysin, caffeic acid, p-coumaric acid, ferulic acid, quercetin, kaempferol, rutin, sinapic acid, and chlorogenic acid were detected. Gallic acid, benzoic acid derivatives, and dominant phenolics, frequently found in cereals, were also dominant in purple wheat samples and in free fractions. The antioxidant capacity (AA%) in the free phenolic extracts of the purple wheat was between 39.7% and 59.5%, and the AA% values of bound phenolic extract of the purple wheat varied between 42.6 % and 62.7%. When the results of antioxidant capacity were examined, it was seen that bound phenolic compounds were more effective than free phenolic ones in terms of DPPH radical scavenging activity. This study suggested that purple wheat samples have high phenolic compound content as antioxidant potential; therefore, consuming purple wheat-containing food products may provide health benefits.

Keyword: Free phenolic, bound phenolic, purple wheat, gallic acid

O80 Relationship between color and antioxidant capacity of fruits and vegetables

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Visual perception exerts a crucial influence on selecting nutritious, safe, and healthy foods. Color, as one of the most important senses of vision, can be used as an indicator of food quality/defects and grade. Consumers are recommended to include various colors in their plates to obtain various vitamins and minerals. In addition to that, the color of fruits and vegetables is also thought to be related to antioxidant capacity. Therefore, this study investigated the relationship between color and antioxidant capacity in various fruits and vegetables. The color of various fruits and vegetables was measured by computer-vision based image analysis to correlate to their total antioxidant activity (TAC) measured by ABTS and DPPH methods. The results indicate that the hue values can be related to TAC of fruits and vegetables, but with some limitations and can be used as a guide for food selection to increase daily antioxidant intake. The fruits and veg etables could be categorized into low-, medium-, and high-antioxidant groups according to their TAC and potential contributions to fulfill the recommended daily antioxidant intake. The results indicated anthocyanin-rich magenta, blue and red color fruits and vegetables are in the high-antioxidant foods category (> 10 mmol Trolox Equivalent / kg fresh weight) by potentially contributing more than 20 % of the required daily antioxidant intake, while the chlorophyll-rich green vegetables are among the low-antioxidant foods. The study showed that not only the TAC of fruits and vegetables but also their serving size is found to be important for the daily antioxidant intake.

Keyword: Color, antioxidants, computer vision based image analysis

O81 The effects of basic ingredients on moisture and carotenoid contents, physical properties, emulsion stability, and organoleptic preference of red fruit (*Pandanus conoideus*) oil mayonnaise rich in natural antioxidants

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Red fruit oil (*Pandanus conoideus*) which has high antioxidant activity and a distinctive fruit oil aroma can result in healthy and preferable functional foods such as mayonnaise. The purpose of this research was to study the effects of basic ingredients of red fruit oil mayonnaise on moisture and carotenoid contents, physical properties (viscosity), emulsion stability, and organoleptic preferences (color, aroma and taste, texture and overall acceptance) by 25 semitrained panelists. Eight mayonnaise formulations were tested in this study which varied the oil type (Crude Red Fruit Oil/CRFO and Degumming Red Fruit Oil/DRFO) and content, combined with emulsifiers (egg yolk, gelatin, lecithin and gum-arabic). The research design was completely randomized design. The results indicated that physical characteristics of the red fruit oil mayonnaise were red-orange in color, red fruit scent, with a distinctive mayonnaise taste. The emulsion was stable for 6 days at room temperature, with viscosity of 127-297 dPoise. The emulsifiers which produced stable red fruit oil mayonnaise were egg yolk, gelatin, and a combination of gelatin and gum-Arabic. The use of DRFO with gelatin, gum-Arabic and egg yolk emulsifiers improved the emulsion stability and viscosity as well as the panelists' preferences for color, aroma and taste, texture and overall acceptance scores 5.6 (slightly liked to liked) of the mayonnaise. The higher content of CRFO increased carotenoid content in mayonnaise. When CRFO was added at 20, 25, and 35% it increased carotenoids i.e. 2550, 32305, and 4605 ppm, respectively. However, the use of DRFO 32-35% had a lower total carotenoid content (3160 - 3410 ppm) compared to CRFO. Apparently degumming removed carotenoids but addition of 25% CRFO might the best released of carotenoid due to acetic acid in the formula. It was evidenced that several functional mayonnaises rich in carotenoid obtained were liked by the panelists.

Keyword: Mayonnaise, red fruit oil (*Pandanus conoideus*), emulsion stability, carotenoid contents

O82 Effect of food combinations and their co-digestion on total antioxidant capacity

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Foods and beverages consumed together in daily diet constitute to the primary sources of natural antioxidant compounds that possibly interact with each other and exert their antioxidant activity synergistically, additively, or antagonistically. From a physiological perspective, foods, after consumption, are subjected to a gastrointestinal digestion process having possible effects on their antioxidant potential. Within this context, this study aims to investigate the antioxidant interactions among mostly co-consumed foods both before and during the digestion. Total antioxidant capacities (TACs) of individual and the binary combinations of certain food samples from different groups including fruits, vegetables, grain sources, dairy and meat products were measured by QUENCHER method, which allows the physiological evaluation without any extraction procedure. The types of interactions (synergism, antagonism, and additive) between food samples were determined by a statistical comparison between estimated and measured TACs. The results revealed an antagonism in the combinations of milk with the fruits or green tea extract while a clear synergism was reported in the combination of fruits with breakfast cereal, whole wheat bread, or yoghurt. Seeds and nuts including polyunsaturated fatty acids and transition metals were found to interact antagonistically with other foods. The selected foods were also subjected to in vitro digestion protocol. Slightly alkaline conditions and enzymatic colonic digestion were found to significantly ($p < 0.05$) increase the TACs of certain foods. Synergism was observed during the digestion of the combinations of milk with fruits or tea extracts. Protein-phenol interactions masking the TACs of phenol rich foods before digestion were thought to stabilize and regenerate the phenolic compounds under the gastrointestinal digestion conditions, providing a synergistic interaction. These findings are thought to make a noteworthy contribution to both food design and regulation of the daily diet, by providing a basis to increase antioxidant activity in daily diet and new food formulations.

Keyword: Interactions, synergism, antagonism, total antioxidant capacity, food combinations

O83 Antioxidant and antimicrobial activities of kebar grass leaf extract

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Kebar grass (*Biophytum petersianum*) is one of the natural ingredients native of Papua that has the potential as a natural food additive and has recently been developed. Several studies have been conducted to examine the biological activity of kebar grass, for example as an antioxidant and an antimicrobial material. However, in an effort to use it as a food additive, of course it is necessary to study its safety. The purpose of this research was to examine the antioxidant and antimicrobial potential of kebar grass extracted with water as a solvent using two methods of extractions, namely decoction and infusion methods. The results of the research showed that kebar grass leaves extracted by decoction and infusion methods had antioxidant activity of 22.71 µg.Eq. of vitamin C/mL and 23.22 µg.Eq. of vitamin C/mL, respectively. Meanwhile, the anti-fungal activity had a respective inhibition of 46 and 67%, and antibacterial has inhibition zone diameters of 10.5 and 9 mm. Thus,the water extract had fungistatic antifungal activity and weak antibacterial activity. These results indicate that kebar grass leaf water extract has the potential as a natural antioxidant and antimicrobial that can be applied to food and possibly developed as a functional food.

Keyword: *Biophytum petersianum*, antioxidant, antimirobial, kebar grass

O84 Efficacy and safety of a novel dietary pyrroloquinoline quinone disodium salt on brain functions in healthy volunteers: A randomized, double-blind, placebo-controlled study

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Brain dysfunctions and loss of memory are increasing alarmingly worldwide. Scientists are exploring the efficacy of functional food ingredients to significantly improve brain performance and function in middle aged to elderly population. Pyrroloquinoline quinone (PQQ), a naturally occurring antioxidant in foods, has been demonstrated to protect brain cells by mitochondrial activation, growth, repair, and protection of nerve cells by increased expression of nerve growth factor (NGF) and NGF receptors; and suppression of fibril formation and aggregation of amyloid β. We developed a novel PQQ disodium salt powder (mnemoPQQ®) and conducted a battery of safety and mutagenicity studies, which exhibited its broad-spectrum safety with "*no observed adverse effect level (NOAEL)*" > 600 mg/kg body weight. A randomized, double-blind, placebo-controlled investigation (RCT) was conducted to demonstrate the efficacy and safety of mnemoPQQ® (dose 21.5 mg/day) for improved cognitive function after 12 weeks of supplementation in 64 healthy Japanese male and female subjects. Subjects were randomly assigned to receive either mnemoPQQ® or a placebo. The efficacy on cognitive performance (memory, attention, judgment, and cognitive flexibility) was examined using Cognitrax as the primary outcome (primary endpoint), and forgetfulness questionnaire (DECO: Deterioration Cognitive Observee) and Mini-Mental State Examination-Japanese (MMSE-J) as the secondary outcome (secondary endpoint). A total of 58 subjects [placebo = 31 (age = 70.91 ± 3.06 Y); mnemoPQQ = 27 (age = 72.10 ± 3.77 Y)] completed the study. Significant improvements were observed on the Cognitrax's cognitive function domain score on "composite memory", "verbal memory", "reaction time", "complex attention", "cognitive flexibility", "executive function", and "motor speed" in the mnemoPQQ® group. The DECO and the MMSE-J scores were also significantly improved in the mnemoPQQ® group. No adverse events were observed. Thus, mnemoPQQ® supplementation improves memory, attention, judgment, and cognitive function in middle-aged to elderly population, who became more forgetful because of aging.

Keyword: Pyrroloquinoline quinone (PQQ), brain dysfunctions, mnemoPQQ®

O85 Discovery of a phytochemical that targets RUVBL1/2 for synthetic lethality

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Precision medicine in disease prevention and therapy is described as the matching of the most accurate and effective treatments with the individual. Mammalian target of rapamycin (mTOR) is an evolutionarily conserved serine/threonine kinase that plays a vital role in protein synthesis in cancer and muscle wasting. We conducted a chemical library screen of FDA-approved drugs and bioactive small molecules, and identified piperlongumine as a selective inhibitor against cells with high mTORC1 activity. Piperlongumine preferentially suppressed the growth of mTORC1-high PDX tumors *in vivo*. Pull-down assays using biotin-labeled piperlongumine confirmed that piperlongumine binds to RUVBL1 and RUVBL2. We further confirmed that RUVBL1/2 knockdown selectively kills cancer cells with high mTORC1 activity. The selectivity and efficacy of piperlongumine in mTORC1-high cells could be further exploited for biomarker development and therapeutic applications against diseases such as cancer and sarcopenia.

Keyword: Piperlongumine, phytochemical, synthetic lethality, mTOR, RUVBL1/2

O86 Functional food ingredients for brain health and cancer chemoprevention

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Terpenes are secondary metabolites, consisting of isoprene units, which are very important defense mechanisms of plants, and are divided into several subclasses as mono-, sesqui-, di-, sester- and triterpenes/triterpenoids (Topcu G, 2006). Triterpenoids have various biological activities as one of the main secondary metabolites of plants. Some activities of most common pentacyclic triterpenoids with oleanane, ursane and lupane skeletons have been already investigated and still continue such as antioxidant, anti-inflammatory, antibacterial, antiviral, cytotoxic, antitumor/anticancer, antidiabetic, cardioprotective, hepatoprotective, and neuroprotective properties (Topcu et al., 2018). Several bioactive triterpenoids including lupeol, betulin, betulinic acid, oleanolic acid, maslinic acid, ursolic acid, asiatic acid, boswellic acid, corosolic acid, and their derivatives found in commonly consumed fruits, such as apple, mango, green pepper, strawberries, mulberry, guava, olives as well as in many aromatic herbs, e.g., sage, catnip, basil, oregano, rosemary and lavender (Topcu et al., 2000). They have also been reported in many trees, such as eucalyptus leaves (Topçu et al., 2011) and birch bark, and caper fruits etc. As a results of our studies since over last 30 years, Lamiaceae family plants have been found a rich source in oleanane and ursane and lupane type triterpenoids, especially in oleanolic acid (OA), and ursolic acid (UA) and their derivatives. Until now, over 200 diterpenoids, mostly abietanes, and about 60 triterpenoids (OA and UA and their derivatives) were isolated from *Salvia* (sage) species and their structures were characterized by 1D- and 2D NMR techniques by our group, more than half of them were identified as new triterpenoids (Topcu et al., 2018). Furthermore, their more active derivatives prepared by semi-synthetically (Tuncay et al., 2018), and some of them patented. Most of them have been investigated for their antioxidant, cytotoxic, antiinflammatory, anticholinesterase activities and found to be fairly promising agents in brain health and cancer chemoprevention.

Keyword: Biological activity, triterpenoids, secondary metabolite, functional foods

O87 Alleviation of high-fat diet-induced mouse liver damage by chlorella extract and its phenethylamine *via* regulating generation of methylglyoxal

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Effect of high fat diet-feeding on glucose metabolism was examined. High fat diet-feeding significantly decreased glyceraldehyde 3-phosphate dehydrogenase (GAPDH) in protein level. From the substrates of GAPDH, dihydroxyacetone phosphate and glyceraldehyde 3-phosphate, glyceraldehyde and methylglyoxal are potentially generated. Indeed, methylglyoxal in liver increased in high fat diet-feeding group. In addition, mandialdehyde increased in liver. These facts indicate that methylglyoxal triggers oxidation of accumulated lipid, which generates malondialdehyd and consequently induces liver damage. Short chain aldehydes can react amino and thiol groups of amino acids and proteins. The high fat diet feeding extensively decreased cysteine in liver. Thus, free cysteine in liver can protect protein from reaction with the short chain aldehydes that are generated by disturbance of glucose metabolism. It has been demonstrated that supplementation of hot water extract of chlorella (WEC) can ameliorate high fat diet-induced liver damage. Phenethyl amine was identified in WEC and extended life span of SOD-knockout Drosophila melanogaster. This study examined the effects of oral administration of WEC (100 mg/kg bodyweight) and phenethylamine (10 μg/kg bodyweight) on high-fat diet (HFD)-induced liver damage in mice. Phenethylamine significantly mitigated HFD-induced lipid oxidation (generation of malondialdehyde) and liver damage without markedly decreasing hepatic lipid accumulation. WEC exerted similar effects although with decreased efficacy. In addition, WEC and phenethylamine decreased the methylglyoxal levels and increased the GAPDH protein levels in the liver. Suppression of generation of toxic aldehydes by WEC and phenethylamine was also confirmed by maintaining hepatic cysteine. Thus, trace amounts of phenethylamine alleviate HFD-induced liver damage by regulating methylglyoxal via improving glucose metabolism.

Keyword: Glucose metabolism, high fat diet, oxidative stress, GAPDH, aldehyde

O88 Pain and inflammation in human subjects: A clinical investigation of HerboJoint

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Standardized botanical formulations have often yielded promising results in the treatment of debilitating joint pains. We report a novel formulation of essentials oils made from the Generally Recognized as Safe (GRAS) family of plants widely used in Ayurveda, namely Kattrna (CC-*Cymbopogon citratus*) (3.0%), Sati (*Hedychium spicatum*) (1.0%) and Tumuru (ZA- *Zanthoxylum alatum*) oil (1.0%) along with USP grade Menthol (M- *Mentha arvensis* that also contains Menthol) (1.3%) in a non-greasy cream base which can provide relief against joint pains arising out of arthritis and other causes. The formulation was designed as a topical cream for applying around the affected joint. Its purity was confirmed through HPLC and GC-MS analysis by comparing with identifiable marker components. The formulation in HerboJoint was patented and it was able to substantially bring down the levels of inflammatory cytokines TNF-α, IL-6 and IL-1β in a Type II collagen induced mouse arthritis model over a 21-day period. In human clinical trials, the formulation significantly decreased joint pain, joint swelling and joint stiffness by 29%, 31% and 60%, respectively, in a 21 Day investigation and provided relief to about 90% of patients selected randomly. The corresponding TNF-α levels in the sera of patients also decreased substantially thus indicating that the formulation was effective in management of joint pain. The present invention based on synergistic action of essential oils and menthol is believed to provide a significant relief to these extremely painful and potentially incurable medical conditions.

O89 A proprietary combination of *Punica granatum* fruit rind and *Theobroma cocoa* seed extracts boosts serum testosterone levels in men

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Tesnor® (LN18178) is a novel, standardized, proprietary herbal blend containing aqueous ethanol extracts of *Punica granatum* fruit rind and *Theobroma cocoa* seed. Two independent, randomized, double-blind, placebo-controlled human studies have established the clinical efficacy and tolerability of LN18178. One hundred and twenty healthy young male volunteers (age 21-35 years) participated in the first study. They consumed either a placebo (n=40) or LN18178 (n=40) (200 or 400 mg) over a period of fifty-six consecutive days. At the end of the intervention, LN18178-supplemented participants showed significant increases in serum total testosterone (TT), free testosterone (FT), and luteinizing hormone (LH); and increased muscle size and strength. Also, in the second trial, one hundred and twenty healthy aging male participants (age 36-55 years) were randomized (n=40) to placebo, 200 or 400 mg of LN18178. After fifty-six days of supplementation, both low and high-dose groups significantly reduced the aging males' symptoms (AMS) scores and improved general, psychological, and sexual well-being. LN18178 supplementation also significantly increased the participants' serum TT and FT levels, increased muscle strength, and reduced perceived stress at the end of the study. No major adverse events were reported in these trials. Also, the herbal supplementation did not significantly alter hematology and total blood chemistry parameters, vital signs, and urinalysis values. LN18178 supplementation was tolerable to the participants. A battery of *in vitro* and *in vivo* toxicological studies also established the broad spectrum safety of LN18178. Taken together, LN18178 is a safe and efficacious botanical blend to boost men's overall health, wellness, vitality and vigor. Thus, LN18178 will be a promising potential ingredient for sports performance, muscle building and exercise in nutraceutical and functional food industries.

Keyword: Aging males' symptoms, LN18178, tesnor, testosterone, sports nutrition

O90 Efficacy of a novel *Trigonella foenum-graecum* seed extract in premenopausal women with policystic ovary syndrome (PCOS): A double-blind, placebo-controlled clinical investigation

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Polycystic Ovarian Syndrome (PCOS), also known as hyperandrogenic anovulation (HA), or Stein–Leventhal syndrome, is a commonplace endocrine disorder affecting around 20% women chiefly in their reproductive age. PCOS is characterized by hyperandrogenemia, and accompanied by elevated androgen level, menstrual irregularity, and hirsutism. The consequences include infertility or miscarriage. It is a challenging problem to the physicians. In a one-arm, non-randomized preliminary investigation in fifty premenopausal women, we demonstrated the efficacy of Furocyst®, a patented, standardized *Trigonella foenum-graecum* extract, in ameliorating the symptoms of PCOS over a period of 90 consecutive days. In the present study, a double-blind, two-arm, single-center, randomized, comparative study was conducted to assess the efficacy of Furocyst® (2 capsules of 500 mg/day) with diet and lifestyle therapy in 336 pre-menopausal women (age:18-45 years, BMI < 42 kg/m^2) diagnosed with PCOS. Ethical committee approval was obtained. A total of 208 subjects (placebo = 95; Furocyst® = 113) completed the investigation. Furocyst® supplementation significantly reduced the number of cysts, ovarian volume, and hirsutism levels, as well as normalized the menstrual cycle in Furocyst®-treated subjects as compared to placebo group. Furocyst® significantly reduced luteinizing level (LH), follicle stimulating hormone (FSH), and thyroid stimulating hormone (TSH) levels, and reduced the prolactin and sex hormone binding globulin (SHBG) levels as compared to the placebo group. Furocyst® significantly reduced the fasting blood glucose levels, HOMA Index, cholesterol, LDL, and triglyceride levels as compared to the placebo group, while the free testosterone levels were significantly decreased in the Furocyst® group. Extensive blood chemistry analyses and hematological analyses were conducted to exhibit the broad-spectrum safety of Furocyst®. No significant adverse events were observed. The studies collectively demonstrated the efficacy of Furocyst® as a safe, natural phytochemical-based formulation to alleviate the symptoms of PCOS.

Keyword: Polycystic Ovary Syndrome (PCOS), Furocyst®, *Trigonella foenum-graecum*, infertility, hyperandrogenemia

O91 An integrated algal biorefinery concept for carbon-negative functional food components

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Climate change is increasingly recognized as a major crisis for the commonwealth and prosperity of humanity, and a major threat to global biodiversity and environmental systems. As such, the interest in generating sustainable food has gained attraction for quite long time and investigated by both public and private entities. In particular, Europe Union (EU) targets for a bioeconomy driven future where aquatic biomass resources such as algae are used for sustainable agriculture and functional food research to gain traction in a timely manner. In this presentaion, I will go over recently established algal biorefinery at Boğaziçi University's Sarıtepe Campus, located on the coast of Black Sea, powered by a wind turbine, enabling carbon-negative functional food components. I will present some perspectives on algae-based ingredients as possible solutions to our to our ever-growing demand for food and agriculture in response to global climate change related extreme events result in loss of limited fertile lands and droughts posing significant threats to sustainability of our natural resources.

O92 Reversibility of sarcopenia by *Ishige okamurae* and its active derivative diphloroethohydroxycarmalol: Aging rodent and human clinical study

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With the rapid increase in the elderly population worldwide, the number of people with sarcopenia has also increased significantly, and this disease is emerging as a medical and social issue. The development of pharmaceutics targeting sarcopenia is limited owing to the occurrence of side effects, and exercise therapy also has a limited scope of application. Therefore, it is necessary to develop safe and biocompatible agents to treat age-related sarcopenia. *Ishige okamurae* (IO), an edible brown alga, and its active substance, diphloroethohydroxycarmalol (DPHC), have been reported to have various physiological functions, including skeletal muscle regeneration ability. However, this effect has not been verified in an *in vivo* aging model. As an aging model, the oral IO extracts and DPHC supplemented 14-month-old female C57BL/6J mice were compared to the young group in this study; the mice model showed a substantial restoration of physical exercise ability with the imbalance of famine hormone and senescence-associated secretary phenotypes compared with those in young mice. Regarding the lean mass increase in aging mice following IO extract and DPHC administration, the muscular characteristics and molecular alterations in the gastrocnemius and soleus muscles, which are sensitive to the damage that occurs during the aging process, were significantly improved. Interestingly, the improved physical performance and androgen hormone imbalance, and enhanced gastrocnemius muscular characteristics were reproduced in 12-month-old aging male mice. In addition, the clinical trial (Age: 50-85, period: 12-weeks) showed a significant increase in quadriceps muscle strength (right) as was observed in IO extract treatment group via ITT and PP analysis, and no hazards were found in safety assessment for participants. Collectively, the current study revealed that the natural agent IO extract and its derivative DPHC can reverse sarcopenia that occurs during the process of aging by improving the imbalance of muscle regeneration *in vivo.*

Keyword: Sarcopenia, *Ishige okamurae*, DPHC, aging mice, skeletal muscle regeneration

O93 Optimising cultivation of the Giant Kelp for bioproduct production

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The application of seaweed-derived bioproducts in pharmaceuticals, foods and functional foods has accelerated in recent years. Sustainability of seaweed supply is crucial to ensure growth of this industry and the blue Bioeconomy. Presently, 94% of the annual seaweed biomass used globally is from cultivated sources, only 10 seaweeds provide 98% of seaweed biomass produced globally but Macrocystis pyrifera (Giant Kelp) is not one of these. Our work used Macrocystis pyrifera cultivars from Tasmania (UTAS, supplied 2020). These were cultivated at hatchery scale at temperatures ranging from 12-18°C. Results found that sporophytes grew best at 12°C with 12/12 light/dark (L/D) conditions as opposed to 16/8 L/D. The most effective photo irradiance was 30 µmol m^{-2} s^{-1}, using F/2 media, with aeration that enabled complete mixing of tanks. Trials ran for 90 days. The optimal cultivation time was 45-58 days to produce sporophytes of 4-5 mm in length. A comparison of nutritional composition for all treatments from 12-18°C was carried out. Nutritional composition of cultivated biomass (Sporophyte culture 12°C (12/12) was 12 ± 0.75 % W/W for total polysaccharides and 0.4 ± 0.07 % DW for sulphated polysaccharides, these results were significantly higher than the other three treatments conditions tested, 15°C (12/12), 12°C (16/8), and the 18°C (12/12). The highest protein content (using the Dumas method and a nitrogen to protein conversion factor of 5) was 22.48 ± 1.80 % DW, for biomass grown at 12°C (16/18). These results indicate that optimal hatchery-scale cultivation conditions may influence specific bio-product production.

O94 Composition, properties, and bioactive absorption of functional foods prepared from undervalued marine resources: Case-studies with algae

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Undervalued and edible marine resources, such as some brown seaweed species (e.g. *Treptacantha abies-marina*) and small pelagic fish (e.g. *Scomber colias*) of the North Atlantic, have excellent nutritional content and/or bioactive compounds, but relatively less palatability and/or appeal to Western modern consumers. Hence, production of innovative functional foods on the basis of their biomass or extracts thereof is a promising alternative strategy to upgrade these biocompounds and contribute to the world food security. In this context, three case-studies were developed: yogurt sauces enriched in *T. abies-marina* (Tpc Sc), cookies also enriched in *T. abies-marina* (Tpc Ck), and hamburgers based on chub mackerel and with biomass of a brown seaweed, *Saccorhiza polyschides*, added (MSp Ham). In the latter case, a storage stability study was also carried out. Control products were also prepared as references. The proximate composition, elemental composition, and phenolic content as well as the antioxidant —measured by 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS), 2,2-diphenyl-1-picrylhydrazyl (DPPH), and Ferric Ion Reducing Antioxidant Power (FRAP) methods— and anti-inflammatory activities of the control and Tpc-/MSp enriched nutraceutical products were determined. The bioaccessibility was assessed through an *in vitro* model simulating the human digestive system. Sauces, cookies, and hamburgers differed in their elemental composition. The addition of seaweed biomass in Tpc Sc and Tpc Ck affected the As concentration, which increased from 4.8 ± 0.7 to 40.4 ± 2.7 mg/kg dw and from 3.7 ± 0.2 to 15.9 ± 1.3 mg/kg dw, for sauces and cookies, respectively. On the basis of FRAP and ABTS, the aqueous extracts of sauces and hamburgers were more efective antioxidant than those of cookies. The hamburgers were anti-inflammatory, reaching up to 80 % inhibition of the cyclooxygenase-2. Elemental bioaccessibility was mostly high, namely for Ca, Mg, and Na.

Keyword: *Scomber colias*, treptacantha abies-marina, *Saccorhiza polyschides*, elemental composition, biological activity

O95 Effects of baking duration on vitamin b complex of *Chlorella vulgaris* microalgae

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Edible microalgae are exceptional candidates for functional food industry due to their high protein, vitamin, essential fatty acids content combined with carbon fixation ability without requiring fertile lands and hazardous pesticides during agricultural practices. To overcome the main drawback of the consumption of the microalgae, the undesired taste or odor, in this study, we explored the potential usage of the green microalgae *Chlorella vulgaris* for functional food baking recipes. On this path to explore the thermal stability of the vitamins present in *Chlorella vulgaris*, Vitamin B complex was selected for baking tests. This presentation will provide the results showing the effects of baking at 125^0C for 15 min (short) and 35 min (long) durations on the vitamins B1, B2, B3, B5, B7, B9, and B12 and *Chlorella vulgaris* grown in custom-made, batch-type photobioreactors and quantified with liquid chromatography-mass spectrometer (LC-MS/MS). We provide evidence that some of the heat sensitive B vitamins can be conserved in *Chlorella vulgaris* and long duration baking had no significant effect on majority of B vitamins. Consequently, biomass of *Chlorella vulgaris* green microalgae seem to be suitable for addition to functional food baking recipes considering the durability of the water soluble vitamin B complex.

Keyword: Chlorella, Vitamin B complex, functional food

O96 Monitoring the freshness of fish samples by enzymatic hypoxanthine measurement using the CUPRAC colorimetric sensor

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With the emphasis that white meat consumption is healthier than that of red meat, interest in fish and seafood consumption is increasing. Sensitive control and monitoring of the freshness of fish and fish products, either freshly caught or packaged, is always a challenging concept for the food industry. One of the main indicators showing the freshness of fish is undoubtedly the amount of hypoxanthine (HX). The formation of HX is paralleled with the cessation of ATP biosynthesis, and starts as soon as the synthesis stops with a gradual increase over time. It even reveals itself with its unique unpleasant smell and taste, without the need for any chemical analysis above a certain concentration. However, since the consumption of spoiled products causes serious health problems, HX determination should be started at much earlier stages in terms of shelf life estimation. Based on this fact, a colorimetric method for the enzymatic determination of HX using the CUPRAC (cupric ion reducing antioxidant capacity) sensor was developed by our research team. Uric acid and H_2O_2 are enzymatically produced by xanthine oxidase (XO) from HX, and both products are CUPRAC-responsive to produce the cuprous neocuproine (Cu(I)-Nc) chromophore chelate formed *in situ* on a Nafion perfluorosulfonate anionic membrane on which the cationic Cu(II)-Nc complex was immobilized. HX was measured at different time intervals in the meat samples taken from sea bass (*Dicentrarchus labrax*), which was left to stand at room temperature for a time period between 0-24 hours; the level of spoilage was determined from the coloration of the CUPRAC membrane sensor (*via* absorbance measurement at 450 nm). It was observed that there was a linear increase in the amount of HX during the measurement period. The linear detection range of the developed method for HX was 2.0-32.0 μM with an LOD of 0.79 μM.

Keyword: Hypoxanthine, xanthine oxidase, CUPRAC-Nafion sensor, fish freshness

O97 Waste bread in the production of single cell protein from microalgae

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The search for new protein sources to supplement the existing conventional sources in order to fill the so called "protein gap" has been the route of inspiration for many scientists for years. Microalgae have been identified as one of the most reliable sources of protein during the second half of the twentieth century. Microalgae, like *Chlorella* and *Spirulina,* **are used as excellent food and feed due to their easy digestibility and nutrient content. Despite the increased interest for the algal biomass there is still much to be done in terms of algacultural implementation in order to make this foodstuff available at an affordable cost.** For to be costly affordable in algacultural techniques, staled breads are seemed to be a good carbon and nitrogen sources which are needed for microalgal growth medium. Considering the efforts to prevent bread waste and the high level of data on bread waste, the use of nutrient medium obtained by enzymatic hydrolysis of stale bread in the growth medium for the cultivation of microalgae is seen as an important solution pathway. The primary aim of the study is to produce single-cell protein with good functional properties, rich in essential amino acids, high added value, and high nutritional value from Spirulina and Chlorella species, which are accepted as "safe" by FAO. The secondary purpose is to carry out this production at less cost with the media to be created using stale bread. In the presented study, waste breads were collected and hydrolyzed with amylolytic and proteolytic enzymes. *Spirulina platensis* and *Chlorella vulgaris* will be grown by preparing growth medium mixtures (containing 25% EH, 50% EH, 75% EH and 100% EH) with the obtained bread hydrolyzate medium (EH) and commercial Spirulina and Chlorella growth mediums, individually.

Keyword: Microalgae, single cell protein, waste prevention, alternative protein

O98 Effect of encapsulation techniques on physical properties and shelf stability of fish oil-whey protein microcapsules

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Oxidative stability and shelf life of fish oil can be enhanced by microencapsulation. Spray and freeze-drying techniques are commonly used for encapsulation. Conventional spray-nozzles utilize two channels to dry an emulsion. Multiple fluid channels allow mixing of wall and core materials at the point of atomization. Either a pressurized gas stream or sonic energy can be employed for atomization of a liquid stream. This study examined the effect of spray nozzle type and design on fish oil encapsulation efficiency and microcapsule properties. Pressure nozzles with 1 and 2 liquid channels and a sonic atomizer with 2 liquid channels were examined for their suitability to encapsulate fish oil in whey protein isolate. Physical and chemical properties of the microcapsules prepared with different spray nozzle type and designs and freeze-drying of an emulsion were evaluated. Storage stability of the microcapsules were also examined. The 2-fluid pressure and ultrasonic nozzles had the highest (91.6%) and the lowest microencapsulation efficiencies (76%), respectively. The ultrasonic nozzle showed a significantly narrower particle size distribution than the other nozzles. The findings of this study demonstrated that new nozzle designs that eliminate emulsion preparation prior to spray drying can be beneficial for microencapsulation applications.

O99 Enhacement the tumoricidal activity of bamlet complexes by enzymatic treatment and encapsulation by double emulsion (WOW) method

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BAMLET (bovine alpha lactalbumin made lethal to tumor cells) is an effective complex with a tumoricidal effect. This complex, which is obtained from mammalian milk and consist of the combination of a-lactalbumin with oleic acid, is affected by the adverse conditions in the process of making it an active drug substance. In this study, a-lactalbumin was purified from skimmed cow's milk and BAMLET was produced with oleic acid. The cytotoxic character and anti-cancer activity of BAMLET and its hydrolysed form were comparatively analysed *in-vitro* on breast cancer (MCF7) cell and prostate cancer cell (DU145) lines. The hydrolysed BAMLET complex, whose effectiveness has been proven, was encapsulated with the double emulsion (WOW) method. In this way, the active ingredient was protected from adverse conditions. Results showed that the most effective dose of unhydrolysed BAMLET reduced the viability of MCF7 and DU145 by 89.2% at 10 ug/mL and 48.0% at 2.14 ug/mL, within 24 hours, respectively. The hydrolysed BAMLET complex showed different effective doses. However, under the same conditions, for hydrolysed BAMLET, the anti-cancer effect increased to 21.9% for MCF7 and 32.2% for DU145. As a result, BAMLET complex formed with hydrolysed form of a-lactalbumin was found to be more effective than BAMLET complex. Moreover, hydrolysed BAMLET complex, a natural anti-cancer product, highly increased the viability of fibroblast cells and did not show anytoxic effects.

Keyword: Bovine a-lactalbumin, BAMLET, breast cancer, prostate cancer, enzymatic hydrolysis

O100 Development of liposomes with interdigitated bilayers from a combination of symmetrical phosphatidylcholines and assessment of their stability during storage

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Microencapsulation and nanoencapsulation are a technology that can be used for the protection, stabilization, and slow release of nutraceuticals and food ingredients. Liposomes are of great importance as an effective and safe tool for the encapsulation and delivery of bioactive molecules. However, their stability during storage and *in vivo* remains a challenging aspect to consider. In this study, liposomes were prepared in four different formulations. In order to obtain small and stable liposomes with interdigitated leaflets, two formulations consisted of combinations of 1,2-dilauroyl-sn-glycero-3-phosphocholine (DLPC) and 1,2-distearoyl-sn-glycero-3-phosphocholine (DSPC): DSPC/DLPC (1:1, mol/mol) and DSPC/DLPC (3:1, mol/mol), while liposomes consisting of Lipoid S75 or DSPC alone were considered as two control formulations. Liposomes were characterized for their entrapment efficiency of gallic acid (EE), size, polydispersity index (PDI), and surface charge. The molecular state of the bilayers and their thermal behavior were evaluated by FTIR and differential scanning calorimetry (DSC), respectively. The physical stability of the liposomes in suspension during storage was evaluated by measurements of size and PDI over 84 days. The initial size of liposomes ranged from 36.61 to 125.43 nm and their PDI from 0.14 to 0.28. EE and ζ potential were around 22% and -3 mV for all formulations. The formulations combining DSPC and DLPC have resulted in physically, very stable liposomes during up to 84 days of storage with no significant change in both size and PDI except a slight raise in size on the 42nd day. In contrast, Liposomes formed from DSPC have shown a significant increase in size and PDI with time. The stability results are ascribed to the different molecular organization and thermodynamic behavior of phospholipids in the bilayers. Combining DSPC with DLPC at 3:1 molar ratio is assumed to result in liposomes with interdigitated leaflets, which increases interlayer hydrophobic interactions and thus enhances their stability.

Keyword: Encapsulation, liposomes, stability, interdigitation, lipid bilayers

O101 Microencapsulated functional hydrophilic extract from black rosehip: Characterization, antioxidant properties, and *in vitro* gastrointestinal digestion

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Green extraction of natural antioxidants is crucial for the functional food and nutraceuticals industry by means of generating chemical solvent-free and biocompatible extracts to protect consumers as well as our environment. In addition, there is a larger focus on the incorporation of such extracts into food formulation using a suitable delivery method. In this study, dry soy phosphatidylcholine liposomes are prepared which contain hydrophilic bioactive compounds including anthocyanins and phenolic acids, extracted in a pressurized system using hot water as solvent. The extract obtained from black rosehip fruit showed great antioxidant capacity both in DPPH and CUPRAC assays (15444.7±183.4 and 40777.7±1099.8 µmol/g DW, respectively). Samples were characterized in terms of particle size, zeta potential, entrapment efficiency, and color. Results exhibited a significant increase between total phenolic content and the antioxidant capacity of liposome entrapped extracts than non-encapsulated extract following *in vitro* simulated digestion. This promising evidence reveals the potential of food-derived antioxidant extracts to design functional foods and beverages.

O102 Encapsulation of omega-3 fatty acids into starch nanoparticle stabilized pickering emulsions

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Starch is one of the biopolymers commonly found in nature and in its native form, is not a good emulsifier due to its polar parts. However, it can be modified to increase its ability to stabilize emulsions. During acid hydrolysis, the amorphous part is converted to smaller parts and removed with washing. The remaining parts, which can be also called “starch nanoparticles (SP)” have both hydrophobic and hydrophilic parts, which make them possible stabilizers for emulsions. The main handicap of SP production is the low yield as the amorphous part of most of the starches are lower compared to the crystalline parts. The aim of this study was to produce starch nanoparticles with high yield and investigate the potential protective effect of starch nanoparticle stabilized Pickering emulsions against oxidation of flaxseed oil. We hypothesized that using cross-linked wheat starch may result in high starch nanoparticle yield due to its chemical structure. It was mixed with H_2SO_4 and hydrolyzed. The neutralized starch suspension was freeze-dried and SP samples are collected. To prepare the Pickering emulsions, SP were homogenized with water and flaxseed oil. Emulsions were stored at 25°C in a test cabinet for 15 days for further analysis. During the storage, the physical and oxidative stability of emulsions was determined. Emulsions were physically stable during the storage. Flaxseed oil and emulsions had the same peroxide value at the initial storage time. The peroxide value of flaxseed oil increased 3 times at the end of the storage indicating the primary oxidation. However, the peroxide value of the emulsions did not change significantly showing that Pickering emulsions stabilized using starch nanoparticles protect the lipid oxidation of flaxseed oil and increase its stability during storage. This study shows that the oxidation problem of omega-3 fatty acids can be overcome using starch nanoparticle stabilized emulsions.

Keyword: Starch nanoparticle, emulsion, omega-3, flaxseed oil, oxidation

O103 Polyphenolic compounds isolated from marine algae; attenuate the replication of SARS-CoV-2 in the host cell through multi target approach of 3CLpro and PLpro

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The global health concern has emanated due to the recent pandemic of coronavirus disease of SARS-CoV-2. The identified coronavirus SARS-CoV-2 expressed significant differences from previous coronaviruses. SARS-CoV-2 spike protein initially binds to the cell surface receptor called angiotensin-converting enzyme 2 (ACE-2) and subsequently, enters the endosome, and finally viral membrane fuse with the lysosomal membrane. Furthermore, SARS-CoV-2 expresses a complicated replication mechanism and it provides excellent drug targets. Papain-like protease (PL^{pro}) and 3-chymotrypsin-like protease ($3CL^{pro}$) play a vital role in polyprotein processing giving rise to functional non-structural proteins, essential for viral replication and survival in the host cell. Moreover, PL^{pro} is employed by SARS-CoV-2 for reversing the host immune responses. The continuous mutations of SARS-CoV-2 spike protein disturb to development of the antiviral drug against SARS-CoV-2 cell entry. Therefore, if some particular compound has the potential to interfere with the proteolytic activities of $3CL^{pro}$ and PL^{pro} of SARS-CoV-2, it has a great potential as treatment or prophylaxis for Covid-19. The present study aimed to inhibit SARS-CoV-2 through $3CL^{pro}$ and PL^{pro} by natural products isolated from marine algae. Molecular docking was utilized for the initial screening of selected natural products based on the $3CL^{pro}$ and PL^{pro} protein structures. Ishophloroglucin A (IPA), Dieckol, Diphlorethohydroxycarmalol (DPHC), and Eckmaxol expressed elevated binding ability with $3CL^{pro}$ and PL^{pro} of SARS-CoV-2. Therefore, the resultant compounds were isolated and used biological assays to further confirm the inhibition activity. IPA showed the best inhibition activity against existing drug targets. Moreover, Dieckol, DPHC, and Eckmaxol also expressed the potential as inhibitors. Therefore, the results of the present study confirmed the potential of IPA, Dieckol, DPHC, and Eckmaxol as inhibitors against SARS-CoV-2. To the best of our knowledge, this is the first report concerning the assessment of marine natural products as a multifactorial approach against $3CL^{pro}$ and PL^{pro} of SARS-CoV-2.

Keyword: SARS-CoV-2, 3CLpro, PLpro, marine algae, antiviral

O104 Empowering the transformation of renewable forest product cajuput essential oil as functional flavour for recovery from COVID-19 pandemic

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Essential oil is one of the economically sound renewable agro-products. Indonesia makes a significant contribution to world essential oil trading. Cajuput oil is an essential oil produced by distillation of the leaves and branches of *the Melaleuca cajuputi* plant. It is one of the essential oils on the priority list. *M. cajuputi* sub sp. *Cajuputi* is the indigenous *Melaleuca* species found in the Moluccas. Based on a series of studies since 1996, this *Melaleuca cajuputi* essential oil (MCEO) has been successfully utilized as a functional flavor in candy instead of its traditional usage for ointment or outer medicinal purposes. MCEO produced in Buru Island has been reported to have a specific flavor, warm and eucalyptus-like aroma, in addition to a soothing effect. Based on the collaboration studied with researchers in the faculty of dentistry, UI, this MCEO as the prominent flavor ingredients of "Cajuputs® Candy" (CC), lozenges, having the ability as oral care, such as anti-caries, anti-mouth ulcers, and inhibiting halitosis. Nowadays, CC has been utilized as afunctional candy to prevent Covid-19. The molecular docking of MCEO showed that the volatiles retained in the CC served as anti-Covid-19 agent. CC has been commercialized since 2010 and is still maintaining the market. The utilization of MCEO as functional flavoring should improve the benefits of cajuputs oil as a renewable forest product. The new role of MCEO should be able to increase the economic value of MCEO as an environmentally friendly forest commodity. It will also trigger the transformation of essential oil utilization in other areas to attain a higher economic value. The emerging issues which need to be pursued for further studies are to confirm the efficacy of cajuputs oil toward the Covid-19 viruses and to determine the biomarkers for MCEO as a flavoring agent

Keyword: Cajuputs (*Melaleuca cajuputi*) oil, functional flavor, Covid-19 pandemic, cajuputs candy, renewable forest product

O105 Development of chewable tablet formulation with propolis and plant based extracts against SARS-CoV-2 infection

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SARS-CoV-2 is a cause of COVID-19 an acute respiratory syndrome affected people globally and caused severe and fatal illnesses in humans. A broad range of evidence has confirmed that certain natural extract shows antiviral property and might has potential to suppress in COVID-19 infection. Therefore, this study aimed to develop a chewable tablet formulation for prophylactic use in the oral cavity or help treatment modalities. Based on a reference survey, pomagranate peel extract, green tea extract, billberry extract and propolis extract were selected, and cytotoxicity and antiviral activity of each component and the developed chewable formulation were examined against SARS-CoV-2 infection using Vero E6 cells with the xCELLigence real-time cell analyser-multiple plates system. Anti-inflammatory and analgesic activities as well as mutagenicity and anti-mutagenicity of the formulation were analysed. The chewable tablet with 1:256-fold dilution neutralized the virus by 112% (61% cell viability) at 110 µg/mL concentration and 35% (82% cell viability) at 70 µg/mL concentration. In the present study, it can be concluded that a combination of natural plant and bee product extracts at the right concentrations can be used as a supplement for the prevention of SARS-CoV-2 infection.

Keyword: Covid-19, chewable tablet, extract, propolis, phenolics

O106 Prebiotic and probiotic knowledge and consumption during COVID-19

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Novel Coronavirus Disease (COVID-19) is a contagious respiratory disease that affects humans, caused by severe acute respiratory syndrome coronavirus 2. In particular, safe and effective interventions are needed to prevent COVID-19, reduce susceptibility and reduce its severity. Interactions between the human gut and the lunsg show potential positive immune responses triggered by probiotics or prebiotics. This study was carried out to determine the probiotics and prebiotics knowledge level of university students in İstanbul and to evaluate their consumption before and during COVID-19. The research was conducted with the participation of 429 university students. A questionnaire consisting of 45 questions prepared by using the literature was sent to the participants via e-mail and online platform, and information was provided with the accompanying voluntary consent form. The results were considered statistically significant at $p<0.05$. A statistically significant relationship was found between the diagnosis of COVID-19 and the use of Prebiotics-Probiotics before COVID-19, the use of supplements before and after COVID-19, the department of the students and their knowledge about prebiotics and probiotics ($p<0.05$). It was reported that the level of knowledge about prebiotics and probiotics was higher among the students in health sciences departments. The awareness of students about probiotics was higher than prebiotics, but not enough even among university students. So, the training program should be organized to increase the awareness level and consumption rate of these two components, as they have great health benefits. Studies on the relationship between COVID-19 and probiotic/prebiotic consumption are also very limited and more research is needed.

Keyword: Probiotics, prebiotics, COVID-19

O107 Development of throat spray against SARS-CoV-2 infection

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Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which is the causative agent of coronavirus disease 2019 (Covid-19) disease, is an infectious viral disease that causes serious respiratory tract infections in humans. The aim of this study was to develop an oral/throat spray with several essential oils, a cold-pressed fatty oil, and propolis and examine it against SARS-CoV-2 infection using Vero E6 cells with the xCELLigence real-time cell analyser-multiple plates system with its cytotoxicity. Anti-inflammatory, antimicrobial, and analgesic activities as well as mutagenicity and anti-mutagenicity of the formulation were analysed. Forty-three phenolics were identified in both propolis and oral/throat spray, 17 of which were quantified. The spray with 1:640-fold dilution provided the highest efficacy and the cytopathic effect was delayed for 54 h at this dilution, and the antiviral activity rate was 85.3%. The oral/throat spray was found to be safe based on mutagenicity and anti-mutagenicity tests. From the result, it can be concluded that a combination of natural products with essential oils at the right concentrations can be used as a dietary supplement for the prevention of SARS-CoV-2 infection but also for several other bacterial or viral infections.

Keyword: SARS-CoV-2, throat spray, propolis, essential oil

O108 Plants used as dietary supplements and their regulations applied in Türkiye

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Plants are both the main food source and the first medicines used by humans. Since ancient times, people have been interested in plants in almost every part of the world, trying to learn which plants can be nutritious, beneficial, or harmful, instinctively or by trial and error. Today, this information has been filtered through science, and the safe use of plants used in traditional medicine as herbal products or dietary supplements has begun to be proven. The plants, fresh or dried, whole, fragmented or comminuted, or their used parts, including aerial part, flower, fruit, and other parts that have not been subjected to any other processing; and herbal preparations (essential oils, fixed oils, juices, extracts, and resins) upon processes such as extraction, distillation, squeezing, condensation, enrichment, and fermentation are defined as “Dietary Supplements”. Especially in CAM Practices, consumption of these herbal products is quite common. Considering the consumer and human health, the quality, efficacy, and safety assessment of the plants used in dietary supplements will be discussed. In order to obtain quality and standardized products and to increase the market opportunities for medicinal/aromatic plants, it is necessary to cultivate plant species, determine the appropriate environmental conditions, grow plants in accordance with good agricultural practices, to collect and store them at the right time. The plants and herbal products to be produced must be of Pharmacopoeia quality and satisfy world standards. Therefore, information on the procedures and principles regarding the applications within this scope, labeling rules, lists of plants and their use in supplements, and conditions of use will also be given. Plants that are not commonly consumed in daily nutrition in Türkiye and their preparations will be mentioned, and detailed scientific data will be presented regarding risk assessments.

Keyword: Plant, dietary suplements, regulations

O109 Importance of the quality and standardization in natural products

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Natural herbs have been used for medicinal purposes, which date back to 5,000 years by Sumerians that used plants such as thyme and caraway. However, archaeological excavations revealed the usage of plants in the same way even 60,000 years ago in Iraq. Today we are still using these herbs and continue to discover new potential ones with the power of science. The medicinal effects are known to be due to the active compounds found in plants that affect the action mechanism of our body. Even the amount of these molecules can vary based on the grown area, humidity, and temperature. This variation may change the healing status of herbal extracts or other herbal products to a lethal level and must be kept under control, especially in pharmaceuticals. For this reason, medical or pharmaceutical societies worldwide have published data based on the plants and compounds in medicinal products with validated methods and parameters, known as pharmacopoeia or the dictionary of products from the view of standardization. The methods and specifications in this publication set mandatory quality indices for drugs and raw materials for manufacturing various pharma-grade preparations. Other product quality ensurance systems are GMP (good manufacturing practice) and ISO (International Organization of Standardization). This presentation will be focused on these topics.

O110 Innovation capability in medicinal and aromatic plants: Competitive advantages in Türkiye and the Pilot Business Model of LUK Botanic

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The tendency to use natural products is increasing rapidly in the world. The process, which started long before Covid-19, continues to increase exponentially. Public awareness of natural products is probably at its peak. The use of natural products in the fields of health, nutrition and cosmetics is rapidly replacing synthetic substances. This development creates significant opportunities for Türkiye. Natural phytochemicals used instead of synthetic chemicals in the health, food and cosmetics sector, are mostly obtained from plants that grow naturally, and to a fewer extent from cultivated plants. Nearly four thousand endemic plants grow in Türkiye, and this number is higher than the endemic plants in all Europe. The presence of microclimate regions in Anatolia allows a wide variety of non-endemic plants. However, the plants collected from nature are dried and exported at low prices, and the phytochemicals obtained from these plants are imported at high prices. Using supercritical extraction and sophisticated complementary technologies, LUK Botanic aims to extract botanicals and transform Türkiye's rich potential from raw material exports to high value-added product exports. In the newly built R&D laboratory of LUK Botanic, with 3,300 m^2 area and two separate clean rooms, endemic plants that grow naturally in Türkiye are characterized and their active ingredients are determined. With the results obtained, new applications in health supplements, food supplements and cosmetic additives are being investigated. Regular use of endemic plants as industrial inputs motivates contacts with local governments and farmers to start for the cultivation of these plants. The extracts obtained are a mixture of phytochemicals. The separation of phytochemicals from the extract into pure chemical substances increases the value much more. In the second stage of LUK Botanic business plan, produced extracts will be separated into pure chemicals and will be exported.

O111 Production process and product quality in food supplements in Türkiye

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Supplement industry is experiencing a rapid development and transformation process worldwide and in Turkiye. Especially during the pandemic period, awareness of supplements has increased in a large part of the society. The concepts of strengthening immunity, being healthy and getting a healthy age have become increasingly important. Supplements do not save lives, but can prevent illness and improve quality of life. There are now cGMP certified production facilities and others that meet GMP conditions in our country. The increasing quality of production facilities has made a significant transformation in terms of workforce. Quality control laboratories and microbiology laboratories have taken their place functionally in our factories. R&D began to be given more importance and we have developed powerful formulas in R&D centers. Supplement producers inTurkish companies Vitafoods presented their production and product quality to the World market with strong representation in 2022 in Geneva. We've come a long way in 10 years. It has become more important that we pay attention to the fact that the products used in the supplementary food market, have an ever-expanding range, and a clean content. Synthetic sweeteners, colorants, and preservatives should follow suit as they can lead to allergic reactions as well as inflammation and chronic diseases.

A reliable and quality product should be:

1) produced in production facilities with GMP and HACCP, where analyses are done at every stage of production,
2) containing raw materials obtained with appropriately standardized methods,
3) include natural flavorings,
4) using naturally sourced dyes and flavours,
5) include harmless and active form of vitamins and minerals which is more bioavailable,
6) not to contain harmful material,
7) have the same ingredient on the box / bottle as on the label.

O112 The importance of medicinal and aromatic plants in human health and Talya's role in the sector

Elife Özkan
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Medicinal and aromatic plants hold an important place in many fields such as food, cosmetics, aromatherapy, phytotherapy, textile, medicine, agriculture, industry, due to their therapeutic effects, taste and smell. Today, most people cannot have access to natural and additive-free products in sufficient quantities and thus cannot meet the beneficial substances their body needs with their daily diet. In addition to malnutrition, which negatively affects human health, environmental factors and stress also play a major role in the quality of human life. It has been proven by long experience that plants have therapeutic value and with the slogan of "revival of the nature", social awareness began to increase. In the recent years, people aiming at leading healthy and quality lifestyle, started turning to plant-based products such as functional food and dietary supplements, which in its turn lead to increase in people's interest to medicinal and aromatic plants. Harvest time, region, parts of the plant used in production, manufacturing method, chemical composition, application method, storage time and conditions - all this factors are crucial for medicinal and aromatic plants efficacy, safety and quality. Talya believes that the way for people to live a longer, healthier and higher quality lives lies in nature, and therefore Talya carries out its sustainable studies in compliance with global standards. Talya team, which strives to be useful to people and make the useful substances available, offers value-added products while paying attention to goods standardization. In order for people to benefit from plants in the most effective way we develop many products such as essential oils, fixed oils, plant extracts, hydrosols, and supplements in collaboration with Talya Science Board, R&D Laboratory and universities, and offer them to our consumers.

O113 Holistic approach in health and quality standards of natural supplements

Deniz Dedeoğlu
Zade Vital, Konya, Türkiye

Introduction of thousands of chemicals into our lives every year after the industrial revolution, fast living habits and the inefficient use of natural resources began to negatively affect our lives and health. The incidence of chronic and autoimmune diseases increased and the onset of these diseases regressed to childhood ages. Preventive healthcare practices and healthy living habits became very important and natural herbal supplements began to take their place in all branches of health. Eventually, the number of producers increased, a market with a variety of products but highly polluted has emerged. Under these circumstances, increasing the awareness of the public and health workers on this issue and producers' taking responsibility for production/product quality is very important. Supplements, which are not followed by strict legislation such as drugs, should be brought into use after appropriate processes governed by international quality standards. These standarts include the selection of the plant, conscious agricultural practices, harvest, storage and transfer processes, laboratory applications, analysis and finally the production stages where the plant turns into the final product.

Keywords: Integrative health, natural supplements, quality standarts, phytotherapy

O114 How inter-individual microbiota composition complicates outcomes of functional food trials or does it?

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The gut microbiota is important in health and disease, but varies enormously between individuals. These large inter-individual differences are primarily defined by host genetics, diet, lifestyle and use of medication. In a crossover study comprising 15 prediabetic Indonesian individuals, we investigated gut microbiota changes during interventions with taro-starch, alone or in combination with the probiotic *L.plantarum* IS-10506 (taro+prob) or beetroot (taro+beet), compared to a placebo. Volunteers followed 2-week intervention periods, with 2-week wash-outs in between. Stool samples were taken at all baseline timepoints, as well as after the 2-week interventions with i) placebo – products made with wheat-starch; ii) wheat products replaced with products made with taro-starch (taro); iii) taro+prob; and iv) taro+beet. The gut microbiota composition was determined by sequencing the 16S rRNA gene (V3-V4 region). Beta-diversity analyses showed clustering by individual, rather than by intervention. Only *Butyricimonas* was significantly different between control and taro-feeding, but only when all three taro-groups were clustered. None of the other 303 taxa were different between interventions, but of these 202 showed differences between individuals. These differences were either a) individual-specific, b) almost mutually exclusive; c) mostly co-occurring; or d) prevalent, but varying in abundance. Moreover, upon the different interventions 6 individuals showed major changes in beta-diversity, while 9 individuals had a much more resilient microbiota. Even those 6 individuals with large changes did not show the same trajectories in the first two coordinates of the PCoA plot, indicating very different responses to the interventions. Our study confirms that the microbiota is highly individualized, but also shows that the microbiota composition of some individuals is more resilient than that of others. However, this allows for the development of personalized strategies to optimize microbiota composition, e.g. through the use of personalized prebiotics, thereby still allowing efficacious functional food trials.

Keyword: Functional food, gut microbiota, interindividual variation, intervention, personalized approach

O115 Investigation of the metabolism of black chokeberry (*Aronia melanocarpa*) polyphenols by the human gut microbiota in a computer controlled dynamic colonic fermentation model (TIM-2)

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Despite numerous biological activities of polyphenols, only 5-10% of total dietary polyphenols are estimated to be directly absorbed in the small intestine. The remaining polyphenols reach the colon, where they are further metabolized by the colonic bacteria to molecules with varied physiological significance. Black chokeberries are one of the richest plant sources of bioactive polyphenols, especially anthocyanins. However, their sour and astringent taste limits their consumption in the diet. Therefore, these berries are generally processed into juices. The objective of the present study was to investigate the interaction of black chokeberry phenolics and human gut microbiota in a dynamic colonic fermentation model (TIM-2). For this purpose, black chokeberry pomace (BCP) as a juice processing by-product, anthocyanin-rich extract from BCP, and encapsulate of the extract in the maltodextrin-gum Arabic system were examined in terms of the change in phenolic metabolite composition. Stool samples were collected from four healthy donors to prepare a standardized microbiota cocktail. The experiments in TIM-2 lasted 40h where the first 16h was the adaptation period of the human faecal microbiota, and the last 24h was the test period. Samples were collected from lumen and dial compartments at times 16h and 40h and analyzed in UPLC-ESI-QqQ-MS/MS. Our results showed that black chokeberry polyphenols present in different matrices were affected differently by the gut microbiota. Also, some anthocyanins not commonly specific to black chokeberries, such as pelargonidin-3-O-glucoside and petunidin-3-O-glucoside, were detected in pomace samples in lumen after 24 hours of fermentation. On the other hand, encapsulation protected some of the phenolic compounds from microbial metabolism. To conclude, underutilized black chokeberry by-product could be used as a rich source of polyphenols in the human diet. Further studies are needed to investigate the effect of black chokeberry polyphenols on gut microbial composition.

Keyword: Gut microbiota, *Aronia melanocarpa*, polyphenol metabolism, dynamic colonic fermentation

O116 Evaluation of *in vitro* bioaccesibility and ACE inhibition properties of faba bean proteins obtained by ultrasound assisted alkaline extraction

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In recent years, the tendency to alternative plant-based food sources has been increasing due to many reasons such as population growth, depletion of food resources, climate change, and animal rights. Plant-based diets are also known that are effective in preventing diseases such as cardiovascular diseases, Type-2 diabetes, obesity, and hypertension. In this study, one of the faba bean species native to Türkiye is evaluated according to *in vitro* protein digestibility and ACE inhibition potential for anti-hypertensive properties with helping ultrasound application on protein extracts. In order to analyze these functions, dried faba beans, faba bean protein extracts which were obtained by conventional and ultrasound-assisted alkaline extraction methods, and hydrolysates that were digested with pepsin enzyme were used to compare among themselves. Results of the gastrointestinal digestion showed that the highest *in vitro* protein bio-accessibility was detected in ultrasound-assisted hydrolysates at 46.39%. On the other hand, the IC_{50} values of the hydrolysates obtained from alkaline and ultrasound-assisted extraction were calculated as 504.42 and 222.89 μg/ml, respectively. All these results support that, the ultrasound-assisted extraction technique enhanced the ACE inhibitory properties and bio-accessibility of the proteins which may lead to the use them in functional food applications.

Keyword: Faba bean, protein extraction, ultrasound, ACE inhibition, *in-vitro* protein bioaccessibility

O117 Production of metabolite content using bioreactors in opium poppy

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Papaver somniferum L. (opium poppy) is a species of the Papaver genus and mostly produced for its seed oil and opiate content. Opiate content is located to capsules of plant. Opiates (mostly morphine, codeine, noscapine, thebaine, sanguarine and oripavine) are important metabolites used in medicine. Opium poppy cultivation and opiate production is restricted and controlled by United Nations by law. Türkiye is one of the major producers of opium poppy. Climate changes and its effects on agriculture are one of the global major concerns on agriculture of plants produced for food, medicine, cosmetics, industry etc. Abiotic factors which are the results of climate effects such as drought, heat and salinity are threatening conventional agriculture methods. Thus trends of development and optimization technological alternatives for cultivation (such as hydroponic methods) and metabolite production in industry (bioreactors etc.) are increasing rapidly. This methods provide risk free and soil independent production of plants and their metabolites. Ofis 1 (Office 1) cultivar is provided by Turkish Grain Board and used as plant explant source. Within the scope of this project, we were able to produce morphine alkaloid, which can only be produced from poppy capsules, using cell suspension cultures derived from somatic cells in bioreactor systems. HPLC analysis confirmed that the amount of morphine produced using bioreactors was the same as the production of poppy capsule in the field. Moreover, extracted material is not classified as synthetic because end product is still plant based. With the method we have optimized, it will be possible to produce standardized, continuous and reproducible opiate content independent of external factors (soil, climate, pests) by using bioreactor systems in industrial scale.

Keyword: Bioreactor, metabolite, opiate, drug, *Papaver somniferum*

O118 Germination of selected radish (*Raphanus sativus* L.) seeds and investigation of changes in total phenolic content and antioxidant activity of the radish sprouts during *in vitro* gastro-intestinal digestion

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Plants include of high levels of phenolic compounds with antioxidant activity. Germination of edible seeds to produce sprouts increase their bioactive properties. The objectives of this study were to (i) germinate selected radish seeds to produce radish sprouts, (ii) extract polyphenolics from the sprouts by ultrasound-assisted extraction and (iii) investigate changes in total phenolic content (TPC) and antioxidant activity (AOA) of selected radish (*Raphanus sativus* L.) sprouts during *in vitro* gastro-intestinal digestion. Firstly, four different radish seeds (PWPW (white peel and white pulp); PBPW (black peel, white pulp); PRPW (red peel, white pulp) and PWPR (white peel, red pulp) were germinated at room temperature in the range of 22±2 °C and harvested at 7th of their growth. Then, TPC and AOA of the extracts before *in vitro* gastro-intestinal digestion and the digested sprouts after *in vitro* gastro-intestinal digestion were determined by spectrophotometric assays. According to the results, TPCs of the extracts from PWPW, PBPW, PRPW and PWPR were 44.53±0.85 mg GAE/g dw, 44.25±0.37 mg GAE/g dw, 46.15±0.72 mg GAE/g dw and 58.88±1.80 g GAE/g dw, respectively ($p>0.05$). The AOA of the extracts was 19.56±0.93 mg TE/g dw, 19.60±2.09 mg TE/g dw, 23.00±0.44 mg TE/g dw and 23.59±1.36 mg TE/g dw in CUPRAC assay and 19.26±0.39 mg TE/g dw, 22.13±1.42 mg TE/g dw, 26.22±2.14 mg TE/g dw and 21.04±1.77 mg TE/g dw in DPPH assay for PWPW, PBPW, PRPW and PWPR, respectively ($p>0.05$). A significant increase in both TPC and AOA was observed after *in vitro* gastro-intestinal digestion ($p<0.05$).

O119 The role of behavioral economy in the future of functional food market

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Human beings' interests in having a healthy lifestyle have been increasing since many years but the contribution of pandemic as well as climate and food crises have accelerated that need. Healthy nutrition with added values, therefore functional foods are without any doubt constitutes a very important part of healthy lifestyle. Not only elder or sensitive people with special requirements, but also new generations are now demanding functional foods that would meet both their nutritious requirements and be in line with their lifestyles. However producing functional foods through innovation is not enough, if the product is not well understood. We are living in the era of "attention economy", where the supply of consumer attention does not keep pace with the increasing demand for it. Attention enables a person to categorize and recognize stimuli. Individuals direct their attention to stimuli or circumstances with which they perceive themselves to be related and that makes the role of the heuristics crucial. Food advertising affects consumer attitudes, purchase intention and nutrition behavior. Understanding the relationship between heuristics and attention, and implementing it in building up the consumers' knowledge regarding functional foods would open the door for the bright future of this market.

O120 Certification of neurotoxic amino acids, β-cyanoalanine and γ-glutamyl-β-cyanoalanine, in red lentil

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Red lentil is the one of important food sources for human beings. As an important vegetable protein source, many benefits of red lentil seeds on human health have been reported and it has taken its place in the daily diet lists of almost all societies due to its high protein content, dietary fiber content and supporting the digestive system, as well as the prebiotic properties of the fibers it contains. The production of young branches and leaves of vetch (*Vicia sativa*), another legume family, as vegetables and seeds as livestock feed is very common. Vetch seeds, which are very similar to lentils in nutritional value and external appearance, are sometimes mixed with lentil seeds during agricultural practices in nearby areas. This mixture can sometimes be made by human hands for the purpose of adulteration. However, vetch contains two neurotoxic amino acids called β-cyanoalanine and γ-glutamyl-β-cyanoalanine., In Turkiye, the vetch grains in yellow lentils should not exceed 5%. For this reason, it is equally important to investigate the lentil varieties grown in our country, their compositions and the factors affecting the quality of lentils. The quality of investigation depends on usage of reliable analytical measurement method to determine neurotoxic amino acids in lentil. In this study, lentils and vetch were ground in a stone mill with a grain size of 390 µm and mixed in appropriate proportions in three-dimensional mixers to produce a reference material containing neurotoxic amino acids β-cyanoalanine (BCA) and ɣ-glutamyl β-cyanoalanine. As a result of these processes, one certified reference material for which β-cyanoalanine (BCA), ɣ-glutamyl β-cyanoalanine reference value was determined and three quality control materials were produced and certified in accordance with ISO 17034 standard. Certification values for produced SI traceable BCA and gGBCA were determined at 747.88 ± 36.98 and 0.97±0.05 mg/kg, respectively.

O121 Does drought stress only affect kale (*B. oleracea*) negatively? Or should there be another reason for calling it "Superfood"?

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The term "Superfood" is usually given to fruits or vegetables because of their nutrient density score. In this study we found an interesting effect of drought stress and show how kale has another reason to be called superfood. Brassicas are major agricultural crops grown throughout the world and include a diverse range of crop types such as a great diversity of leaf and root vegetables. Their production is threatened by diseases and abiotic stresses such as drought which cause significant losses to farmers. This study aims to improve knowledge on the signalling crosstalk in the immune system of brassicas to improve their resilience to abiotic and biotic stresses. The first layer of active defence system in plants is based on the perception of Pathogen Associated Molecular Patterns (PAMPs) leading to PAMP-triggered immunity (PTI). PTI contributes to quantitative disease resistance (QDR), a desirable breeding trait that potentially provides durable control of diseases in plants. This work is focussed on understanding the effect of abiotic stress on PTI and disease resistance in *B. oleracea* using a population generated with cross between Chinese Kale (*Brassica oleracea* ssp *alboglabra*, A12DHd) and Broccoli (*Brassica oleracea* ssp *italica*, GDDH33) (BolAGDH population). Induction of PTI by drought stress was determined by quantifying the PAMP-induced reactive oxygen species (ROS) production in the BolAGDH population. The results revealed transgressive segregation for drought-induced ROS phenotype and for increased disease resistance to the necrotrophic fungal pathogen *Botrytis cinerea*. QTLs associated with QDR against *B. cinerea*, and drought-induced ROS production were identified. RNA-Seq data from extreme lines were used to identify differentially expressed genes (DEGs) induced by drought stress conditions. Our investigation provides the first insight into the effect of drought stress on PTI and QDR *in B. oleracea*, a globally important vegetable crop.

Keyword: Superfood, kale, *Brassica oleracea*, drought, disease resistance

O122 Current perspectives on sugar reduction in fruit products

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Over-consumption of sugar has increased worldwide and contributes to many health-related problems. The World Health Organization (WHO) has asserted that sugar consumption should constitute only 10% or less of total energy daily; however, it constitutes much more. Therefore, sugar reduction in food products has been gaining significant importance nowadays. There are some sugar reduction methods in fruit products (fruit juices, fruit nectars, fruit jams, and jellies), such as the use of dietary fibers and sweeteners, production of fructooligosaccharides (FOS), and sugar alcohols. Dietary fibers are commonly used as a sugar replacer in foods. Furthermore, sweeteners are used as an alternative to sugar, while sugar replacers like honey, coconut sugar, or agave syrup are chosen as healthier alternatives to sugar. However, reducing sugar content is correlated with important changes in taste, texture, volume, and shelf life of the food; therefore, it is difficult to find suitable sugar substitutes that result in satisfactory products. Apart from sugar replacers, an enzymatic method is commonly used in the food industry. Fructose found in most fruits is converted into fructooligosaccharides (FOS), which are classified as prebiotics due to their health-promoting properties, by fructosyl transferases. Therefore, this review highlights sugar reduction methods applied in fruit-based products and recently published research results on the quality changes of sugar-reduced products.

Keyword: Sugar reduction, fruit products, fructooligosaccharides (FOS), dietary fibers

O123 The potential risk in fruit products

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Fruit products are important components of a healthy diet, however, a series of reactions occur such as caramelization and Maillard reaction during their production and storage. These reactions result in undesirable consequences such as formation of potential toxic compounds, 5-hydroxymethylfurfural (HMF) and α-dicarbonyl compunds (DCs) which are related with various diseases such as diabetes, cataract, Alzheimer disease. From this point of view, determination of the levels of DCs and HMF is of importance in terms of quality deterioration and safety evaluation of fruit products which are known as healthy snacks. Therefore, this study aims to survey the occurrence of these compounds in different types of fruit products. Different commercial fruit products including dried fruits, fruit purees, puree concentrates, juices, and juice concentrates were analyzed. Among the DCs, 3-deoxyglucosone formation, which was the dominant DCs in fruit products, varied between 21.9 - 4117.0 mg/kg. This level (4117.0 mg/kg in raisin) was the highest reported in the literature up to now. HMF was also found higher in dried fruits (2136.5 mg/kg). The results confirmed that lower pH and moisture promoted the formation of HMF in fruit products. Accordingly, the concentrations of DCs were found significantly higher than the levels of HMF in all types of fruit products. It is concluded from the results that DCs should be measured together with HMF in order to better evaluate the quality and safety of processed fruit products. The daily intake levels of DCs and HMF through fruit products were calculated according to the recommended healthy diet for adults and children. Considering their potential adverse effects on human health, it is considered that the exposure levels especially calculated for DCs through the consumption of processed fruit products cannot be neglected.

Keyword: Fruit juice, dried fruit, maillard reaction, dicarbonyl compounds, 5-hydroxymethylfurfural

O124 Using molecular gastronomy for diet of older adults to meet their special nutrient needs: Hydrocolloids and phenolic compounds

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It is reported that "the proportion of the world's population over 65 years will rise further to 16 per cent by 2050, one-sixth of the people in the world. Looking at the definition of the health declared by WHO (1948) "*a state of complete physical, mental, and social well-being and not merely the absence of disease, or infirmity*", life satisfaction of older people is crucial for the health of the population. Food and beverage (F&B) industry could focus on the nutritional values of geriatric functional foodse, in addition, increasing their participation in social environments such as restaurants and cafes. Older people need the use of some natural plants, nutraceuticals, and supplements such as Momordica charantia L. and phenolic rich bitter products, for their special nutrient needs. These products cause the elderly to enjoy the taste and pleasure. On the other hand, the problems faced by older people such as tooth loss, difficulty in chewing foods, and decreased sense of taste and smell, leads to their malnutrition. They need functional foods with soft texture to increase their appetite to enjoy eating. In molecular gastronomy, the "gelling" technique using "hydrocolloids" can be used for hydrogel formation in soft and elastic textures depending on the type and amount of material used. The cellulose derivative are the low-cost hydrocolloids, and methyl cellulose is the one with lower gelation temperatures (55-60°C) and a wide pH range. This is advantageous in creating formulations containing heat sensitive bioactive compounds. In this study, molecular gastronomy recipes are reviewed along with the information as to how methyl cellulose and gelling techniques could be used for the consumption of older people to ensure they enjoy their meals. This study is the first start of further studies to use molecular gastronomy for functional food recipes in F&B industry.

Keyword: Molecular gastronomy, bioactive compounds, functional foods ingredients, nutraceuticals, diet of older adults

O125 Changes in biochemical and angiotensin-I-converting enzyme (ACE) inhibitory properties of Spirulina products fermented by *Lactobacilluıs helveticus*, *Kluyveromyces marxianus*, and their mixed culture

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Fermented *Spirulina* (FS) could be a good strategic approach for diversifying microalgae-derived formulations to a current functional food market. In this study, microbial growth properties, total and free amino acids, protein hydrolysis, volatile organic compounds (VOCs) and ACE-I activity properties of FS and unfermented *Spirulina* (unFS) products by *L. helveticus*, *K. marxianus* and their mixed culture were evaluated. The highest proteolytic activity with *L. helveticus* and their mixed culture were confirmed by electrophoretic analysis (SDS-PAGE). An approximately 4 log increase were obtained in cell densities for 48 h fermentations. According to free amino acid (FAA) results, the increase in FAA was more prominent in the fermented *Spirulina* (FS) products by *L. helveticus* than others. On the other hand, concentration of total amino acids (TAA) were higher in unFS compared to FS products. The pyrazine content, the most prevalent VOCs in unFS and reduced remarkably in FS products. As for the ACE inhibition assay performed by HPLC analysis, the FS products showed higher ACE inhibitory activity than unFS (23.81%). Among FS products, fermentations with *K. marxianus* reached maximum ACE inhibitory activity (67.60%) result. These findings will provide insights toward achieving the industrialization of FS products as novel food.

ABSTRACTS FOR POSTER PRESENTATIONS

P1 Evaluation of rowan fruit pomace ingredients in meatballs by conventional quality characterization and UHPLC-QTOF-MS based untargeted metabolomics with multivariate data analysis

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Recent studies on pomace valorization revealed the possibility of obtaining valuable ingredients for foods. In this study, defatted with supercritical CO_2 rowanberry pomace (2%-AC), its EtOH/water extract (1%-E) and extraction residue (2%-R) were tested in meatballs. The samples were packaged under modified atmosphere (70% N_2 and 30% CO_2) and stored at 4 °C. The lowest cooking loss was achieved when the meatballs contained mainly fibre-rich 2%-R. Only in case of 1%-E, the pH of meatballs was significantly lower compared to the control sample (P=0.0132), on the 6-day. During the same period, 2%-AC and 1%-E containing higher amount of bioactives decreased the yellowness (b*) of meatballs. The meatballs with 1%-E demonstrated the highest 2,2-diphenyl-1-picrylhydrazyl radical (DPPH•) radical scavenging capacity. The untargeted metabolomics approach (UHPLC-QTOF-MS followed by multivariate statistics) was applied for evaluating the effect of pomace ingredients on the meatball chemical composition during storage, particularly for tracking oxidation related compounds. Preliminary data indicate that some metabolites, which may be related to the oxidation, such as 4-hydroxy-2-nonenal, hexanoylcarnitine and 6-hydroxypentadecanedioic acid were accumulated in the control sample at higher concentrations. In general, the untargeted metabolomics demonstrated the opportunity for evaluating the effects of pomace ingredients, which may delay oxidation processes of meat products.

Keyword: *Sorbus aucuparia* berry pomace, food metabolomics, lipid oxidation, antioxidants; meat quality

P2 Functional gluten-free macaroni: Enhancement of bioactive compounds and quality using hydrocolloids and low amylose red rice

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Macaroni is one of the most popular types of pasta made from durum wheat semolina containing gluten, which causes gluten intolerance and celiac disease. Macaroni is a starch-based product that contains low bioactive compounds. Therefore, the development of functional gluten-free products is required. The objectives of this study were to develop gluten-free macaroni (GFM) using unpolished red rice flour as a source of bioactive compounds incorporated with xanthan gum (XG) and guar gum (GG) at different concentrations, 0, 1, 1.5, and 2 g/100 g of rice flour as food thickening agents. The suitable level of xanthan gum (XG) and guar gum (GG) was evaluated on cooking properties, textural quality, and physical properties of GFM. The cooking yield and cooking loss tended to increase and decrease, respectively, with increasing the amount of XG and GG. Both XG and GG improved the properties of the GFM, producing substantial changes in the physical and textural properties. The results showed that 1.5% XG or GG had the highest potential to improve the quality of GFM with the low cooking loss and the suitable values of texture profiles. The GFM had dark purple in color from red rice color. The bioactive compounds including total phenolic compounds, total anthocyanins, and proanthocyanidin were determined compared with wheat macaroni. The antioxidant activity was monitored through the DPPH and ABTS radical scavenging and ferric reducing antioxidant power (FRAP) assay. The results indicated that total phenolic compounds, anthocyanins, proanthocyanidin, and antioxidant activity of GFM were significantly higher than in wheat macaroni. The study suggested that it was possible to apply red rice incorporated with XG to produce GFM rich in bioactive compounds.

Keyword: Gluten-free pasta, pigmented rice, guar gum

P3 Valorization of canola meal using an air-frying pre-treatment to improve phenolic extraction and antioxidant activity

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The current study investigated the efficacy of an air frying pre-treatment to enhance the extraction and recovery of the predominant sinapic acid derivatives (SADs) from canola meal and the antioxidant potential of its methanolic extracts. Canola meal was obtained by air frying canola seeds at 160, 170, 180, and 190 °C for 5, 10, 15 and 20 min, respectively. Oil was removed using the Soxtec method and the phenolic compounds extracted from the de-oiled meal fraction by ultrasound-assisted extraction with 70 % (v/v) methanol. The major sinapates were quantified by high performance liquid chromatography-diode array detection (HPLC-DAD). The antioxidant potential of the meal extracts was evaluated by 2,2-diphenyl-1-picrylhydrazyl (DPPH), ferric reducing antioxidant power assay (FRAP), and metal ion-chelating activity (MIC) as well as the total phenolic content (TPC) determined. Sinapine, sinapic acid and RT- 26.6 min compound were the major sinapates identified with highest concentration (7571.59 ± 479.20 µg/g DW, 726.88 ± 43.45 µg/g DW and 1762.9 ± 73.5 µg/g DW) at 160 °C for 5 min for sinapine, sinapic acid and RT-26.6 min compound, respectively. An appreciable amount of canolol (151.35 ± 7.65 µg/g DW) was also obtained when air fried at 170 °C for 20 min. The highest TPC (3.15 mg GAE/g DW) was recorded in meal extract obtained after air frying at 190 °C for 15 min. The FRAP and MIC results correlated positively (r=0.85) but generally decreased with increase in air frying temperature-time conditions. The highest FRAP and MIC values (0.53 mM and 79.9%) were obtained after air frying at 160°C, 5 min and 20 min, respectively. These findings will contribute new knowledge that will enhance the value-added processing and by-product utilization of canola seed.

Keyword: Air frying, canola meal, antioxidants, phenolics, extraction

P4 *Sargassum horneri* as a prebiotic dietary supplement for immunity development in *Streptococcus parauberis* infected zebrafish model

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Sargassum horneri (SH) is a brown macroalgal species commonly found along the coast of Japan, China, and Korea. SH possesses valuable bioactive compounds that can be developed as functional food ingredients as well as pharmaceutical agents for both humans and animals. In this study, SH was tested for its potential prebiotic effect. Several solvent-assisted extracts of SH were tested on the growth of three species of probiotics (LAB) (*Lactobacillus plantarum*, *Lactobacillus pentosus, Lactobacillus brevis)* and fish pathogen bacteria (*Streptococcus iniae, Streptococcus parauberis, Edwersiella tarda*) both in vitro and in vivo. According to the in vitro results, Celluclast extract (SHC) and crude polysaccharide extract (SHCPs) of SH showed outstanding growth enhancing activity in all LAB species and excellent antibacterial activity against pathogenic bacteria dose-dependently. Both SHC and SHCPs induced the production of secondary metabolites from LAB. The secondary metabolites successfully reduced pathogenic bacterial growth. Furthermore, in vivo experiments revealed that co-treatment with LAB and SHC/SHCPs diminished the mortality of *S. parauberis-infected* zebrafish by modulating iNOS, COX-2 expressions. Similarly, SH act as an anti-inflammatory agent against *S. parauberis* infection by hindering NF-κB pathway activation. Conclusively, the results achieved from the study suggest that S. horneri has the potential to be used as a prebiotic dietary supplement and possesses a protective effect against *S. parauberis* infections in the aquaculture industry.

Keyword: *Sargassum horneri*, prebiotics, *Streptococcus parauberis*, secondary metabolites, diet

P5 Enzymatic hydrolysis of head byproducts from olive flounder surimi industry: pepsin hydrolysate attenuates LPS-induced inflammation and oxidative stress in RAW 264.7 macrophages *via* blocking cell signaling pathways

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Surimi industry-related fish head byproducts contribute around 15% to the total body weight which are often discarded. However, previous studies have evidenced those byproducts as having health-promoting effects due to the high amount of essential nutrients. Olive flounder (OF), one of the most common fish species in South Korea was targeted for this study to optimize its utilization. The inhibitory potential of OF head byproducts pepsin hydrolysate (OFH-PH) against lipopolysaccharide (LPS)-induced inflammation and oxidative stress were examined in RAW 264.7 macrophages. OFH-PH showed strong anti-inflammatory activity via down-regulating nitric oxide (NO) while upgrading the cell viability in *in vitro* model. For further confirmation, the inhibitory potential of pro-inflammatory cytokines (IL-1β, IL-6, TNF-α) and PGE2 was evaluated. Moreover, the results were supported by the inhibitory activity of iNOS and COX-2 protein expressions. Western blotting was carried out to analyze the expression levels of inflammation-related and oxidative stress-related pathway proteins. The results evidenced that the mediation is activated via nuclear factor κB (NF-κB) and mitogen-activated protein kinase (MAPK) pathways. Inflammation is directly linked with oxidative stress, which could be assessed using the Nrf2/HO-1 pathway. Obtained results suggest that OFH-PH is a potential candidate for anti-inflammatory activity-based nutraceuticals and functional foods.

Keyword: Fish head byproducts, anti-inflammatory activity, oxidative stress, NF-κB and MAPK pathways, Nrf2/HO-1 pathway

P6 Sargachromenol isolated from *Sargassum horneri* inhibits particulate matter-induced inflammation in macrophages through Toll-like receptor-mediated cell signaling pathways

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Sargassum horneri is an invasive brown seaweed that grows along the shallow coastal areas of the Korean peninsula, which is potentially harmful to fisheries and natural habitats in the areas where it is accumulated. Therefore, we attempted to evaluate the anti-inflammatory mechanism of Sargachromenol isolated from *S. horneri* against particulate matter (PM)-stimulated RAW 264.7 macrophages. PM is a potent inducer of respiratory diseases such as lung dysfunctions and cancers. In the present study, the anti-inflammatory properties of Sargachromenol were validated using enzyme-linked immunosorbent assay (ELISA), Western blots, and RT-qPCR experiments. According to the results, Sargachromenol significantly downregulated the PM-induced proinflammatory cytokines, Prostaglandin E2 (PGE2), and Nitric Oxide (NO) secretion via blocking downstream activation of Toll-like receptor (TLR)-mediated nuclear factor kappa B (NF-κB) and MAPKs phosphorylation. Thus, Sargachromenol is a potential candidate for innovation in various fields including pharmaceuticals, cosmeceuticals, and functional food.

Keyword: Sargachromenol, *Sargassum horneri*, particulate matter, anti-inflammation, TLR

P7 Anti-hypertensive effect of peptide from olive flounder (*Paralichthys olivaceus*) in EA. hy926 cells and in spontaneously hypertensive rats

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The current study aimed to separate bioactive peptides (IE; Leucine-Glutamic acid, IER; Leucine-Glutamic acid-Arginine, IDD; Leucine-Aspartic acid-Aspartic acid) from Protamex-pepsin assisted hydrolysate from *Paralichthys olivaceus* ($PO_{pp}H$) and investigate their potential anti-hypertensive activity *in vitro* and *in vivo*. In vitro study, peptides from $PO_{pp}H$ significantly increased the nitric oxide (NO) production and hydrogen sulfide (H_2S) production in EA. hy926 cells by up regulation of p-eNOS, p-AKT, p-PI3K in EA. hy926 cells. In vivo study, blood pressure measurement using CODA non-invasive BP system showed significant decrease in systolic blood pressure after 6 hours of sample administration. IER show most significantly decrease systolic blood pressure compared with control group of SHRs model (Systolic: SHRs 158.70 ± 20.00 mmHg vs IER-treated group 140.30 ± 16.57 mmHg). Our findings demonstrated that peptides from Paralichthys olivaceus possessed potential anti-hypertensive activity and we suggest that $PO_{pp}H$ and its peptide could be used as a raw material in food and functional food industries.

Keyword: Anti-hypertensive activity, paralichthys olivaceus, hydrolysate, peptide, fish

P8 Diphlorethohydroxycarmalol, a phlorotannin isolated from *Ishige okamurae*, induces Ca2+-dependent glucose uptake in C2C12 cells and zebrafish model

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Diphlorethohydroxycarmalol (DPHC), a type of phlorotannin isolated from the marine alga *Ishige okamurae*, reportedly alleviates impaired glucose tolerance. However, the molecular mechanisms of DPHC regulatory activity and by which it exerts potential beneficial effects on glucose transport into skeletal myotubes to control glucose homeostasis remain largely unexplored. The aim of this study was to evaluate the effect of DPHC on cytosolic Ca^{2+} levels and its correlation with blood glucose transport in skeletal myotubes *in vitro* and *in vivo*. Cytosolic Ca^{2+} levels upon DPHC treatment were evaluated in skeletal myotubes and zebrafish larvae by Ca^{2+} imaging using Fluo-4. We investigated the effect of DPHC on the blood glucose level and glucose transport pathway in a hyperglycemic zebrafish. DPHC was shown to control blood glucose levels by accelerating glucose transport; this effect was associated with elevated cytosolic Ca^{2+} levels in skeletal myotubes. Moreover, the increased cytosolic Ca^{2+} level caused by DPHC can facilitate the Glut4/AMPK pathways of the skeletal muscle in activating glucose metabolism, thereby regulating muscle contraction through the regulation of expression of troponin I/C, CaMKII, and ATP. Our findings provide insights into the mechanism of DPHC activity in skeletal myotubes, suggesting that increased cytosolic Ca^{2+} levels caused by DPHC can promote glucose transport into skeletal myotubes to modulate blood glucose levels, thus indicating the potential use of DPHC in the prevention of diabetes.

Keyword: *Ishige okamurae*, diphlorethohydroxycarmalol, Cytosolic Ca2+ level, skeletal muscle, hyperglycemic zebrafish

P9 Detection of cyclic imine (CI) toxins in whole body of shellfishes from domestic market in South Korea in 2021

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Among marine biotoxins, cyclic imines (CIs), including spirolides(SPX), pinnatoxins(PnTX), pteriatoxins(PtTX), and gymnodimines(GYM) which are produced by microalgae species and accumulated in food chain of marine organisms is a novel biotoxin that does not belong to the classical group of marine biotoxins, are not managed in many countries, such as the USA, European nations, and South Korea, because there are not enough poisoning cases or data for the limits on these biotoxins. In the present study, we investigated the presence of CI biotoxins in commercial seafood product purchased from Korean seafood market in 2021 year, including mussels (*Mytilus coruscus*), clams (*Ruditapes philippinarum*), abalone (*Haliotis discus*) and they were analyzed by structure-based approach for quantifying CIs on LC/MRM-MS that can enrich CIs extracted from shellfish. Results showed that the presence of the emerging PnTX-G in *Mya arenaria* at levels up to 41.03 ppt in April, and GYM-A in *Crassostrea nippona* at levels up to 393.34 ppt in April, respectively. This study was performed to confirm the presence of emerging CIs in Korean, the world's TOP 1 fisheries consumer. There was no significant amount of toxins in shellfish, but it is important to continuously monitor causative phytoplankton and poisoning of accumulating shellfish by CI marine biotoxins because of the high risk of toxicity in humans.

Keyword: Cyclic imines, LC/MRM-MS, shellfish, pinnatoxin-G, gymnodimin-A

P10 Structural characteristics of sulfated polysaccharide from *Sargassum horneri* and immune-enhancing activity of polysaccharides combined with lactic acid bacteria

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Sargassum horneri (SH), marine brown algae, is known to contain a variety of bioactive ingredients and previous studies reported sulfated polysaccharides in SH as a potential candidate for a functional ingredient. However, immune enhancement activity combined with *Lactobacillus plantarum* (LAB) is not yet studied. In the present study, we attempted to characterize sulfated polysaccharides (SHCPs) in SH by MALDI-TOF/TOF mass spectrometry and evaluate their immune-enhancing effect on macrophage cells. The main residues of SHCPs in SH is 2-sulfated 1,4-linked L-fucose and this epitope combined with LAB shows immune enhancement properties through cytokine production at the cellular level and increases the population of lymphocyte and myelomonocyte in adult zebrafish kidney. These results indicate that SHCPs, along with LAB have potent immune-enhancing activity and may be utilized as a potential immunomodulatory ingredient.

Keyword: *Sargassum horneri*, sulfated polysaccharides, MALDI-TOF, lactic acid bacteria, immune-enhancing activity

P11 Zebrafish model for studying dexamethasone-induced muscle atrophy and preventive effect of maca (*Lepidium meyenii*)

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Loss of myofibers during muscle atrophy affects functional capacity and quality of life. Dexamethasone, an inducer of rapid atrophy of skeletal myofibers, has been studied as a glucocorticoid receptor in muscle atrophy or motor neurodegeneration. In this study, we examined dexamethasone induced muscle atrophy using zebrafish (*Danio rerio*), a vertebrate model, and assessed whether administration of *Lepidium meyenii* (maca) as a dietary supplement can prevent muscle atrophy. Changes in skeletal myofibers in zebrafish were evaluated after exposure to dexamethasone for different periods and at different concentrations. Under optimized conditions, zebrafish pre-fed with maca for 3 days were exposed to 0.01% dexamethasone for 1 h/day for 7 days. Thereafter, myofiber loss, damaged muscle contractile proteins, and abnormal exploratory behavior due to the structural and functional impairment of skeletal muscle associated with muscle atrophy were investigated using hematoxylin–eosin, immunofluorescence staining, and behavioral analyses. Our findings suggest that dexamethasone induces muscle atrophy in zebrafish, inhibiting exploratory behavior by inducing myofiber loss, inhibiting muscle contraction, and causing changes in endurance and velocity. Thus, the zebrafish model can be used to screen pharmaceutical agents and to study muscle atrophy. Furthermore, maca is a potential dietary supplement to prevent muscle atrophy, as it protects muscle fibers.

Keyword: Zebrafish, muscle atrophy, dexamethasone, maca

P12 Diphlorethohydroxycarmalol derived from *Ishige okamurae* improves behavioral and physiological responses of muscle atrophy induced by dexamethasone in an *in-vivo* model

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Muscle atrophy refers to the loss of skeletal muscle mass, myofiber size, and related physical functions such as walking speed or grip strength caused by aging or a lack of physical activity due to injury or illness and can also be attributed to excessive exposure to corticosteroids. *Ishige okamurae* (IO) and its active component, diphlorethohydroxycarmalol (DPHC), have been known to improve glucose homeostasis by controlling the contraction of skeletal muscles. Based on this idea, we hypothesized that the effects of DPHC and IO extract on muscle metabolism are associated with their role in improving muscle physical function. This study assessed the effects of DPHC or IO extract on muscle behavioral responses with their metabolic properties in muscle atrophy induced by glucocorticoids and dexamethasone (DEX) in vivo. In addition to the improvement in muscle behavioral response by DPHC or IO extract, the loss of muscle fiber and the related metabolic properties by DEX exposure in the gastrocnemius and soleus of calf muscle was prevented. These findings suggest that IO extract and its active component DPHC can potentially prevent muscle atrophy caused by exposure to corticosteroids and could be used to treat reverse skeletal atrophy.

Keyword: Muscle atrophy, *Ishige okamurae*, diphlorethohydroxycarmalol, dexamethasone, physical function

P13 Preparation of water-soluble nanoemulsion of rosemary extract

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Rosemary (*Rosmarinus officinalis* L.) is an aromatic plant which is known worldwide as a culinary spice and used as food flavouring and natural food preservative due to its high antioxidant and antimicrobial activities. Carnosol, carnosic acid and rosmarinic acid are important natural antioxidants found in rosemary. Rosemary extract obtained from the rosemary plant can be used as an antioxidant in the fields of food, cosmetics and health. In order to increase the stability and usage area of rosemary extract antioxidant, products in different forms (oil/water soluble, liquid/powder) are produced. In this study, a water-dispersible liquid nanoemulsion was developed from rosemary extract and its stability was tested. Rosemary extract was mixed with sunflower oil and (medium chain triglycerides) MCT in two different oil ratios, 10% and 20%. The water phase was prepared with a pH 5 buffer solution and Tween80. After the oil and water phases were prepared, the two phases were homogenized by ultraturax. The homogenized mixture was brought into nanoemulsion form by passing it through a high pressure homogenizer at 1000 bar. The prepared nanoemulsions were stored in the dark at 4 and 23 °C for 30 days. In each sample, particle size, PDI (particle distribution index), zeta potential, carnosic acid, carnosol amount and pH values were measured weekly. The initial particle size of the nanoemulsions was between 64.26-91.20 nm, the particle distribution index (PDI) was between 0.069-0163, the zeta potential was between (-43.2)-(-47.8), pH value was between 5.33-5.79, and the total amount of carnosol+carnosic acid was between 0.52-1.09 g/100 ml. With this study the nanoemulsions remained stable throughout the 30 days shelf life. Sunflower oil and MCT oil were determined to be suitable as carrier oils.

Keyword: Rosemary, nanoemulsion, carnosic acid, carnosol, rosmarinic acid

P14 Polyphenol-rich pomegranate extract suppresses the microbial metabolism of the proatherogenic trimethylamine N-oxide precursor L-carnitine in an *in vitro* colon model

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Plasma trimethylamine *N*-oxide (TMAO) is a metabolite that has been associated with several chronic diseases, including cardiovascular disease (CVD), chronic kidney disease, non-alcoholic fatty liver disease (NAFLD), obesity, type II diabetes mellitus, and colorectal cancer. TMAO is formed from trimethylamine (TMA), which is produced by gut microbiota that metabolise dietary l-carnitine, choline, and betaine. Polyphenols, on the other hand, have been linked to reduced risks of overall mortality, CVD, and cancer. We previously found that anthocyanins (flavonoid derivative) reduced the conversion of choline to TMA *in vitro*. Here, we explore the effects of a pomegranate (*Punica granatum L.*) extract, which is rich in ellagitannins, anthocyanins, and procyanidins, on l-carnitine metabolism. In an *in vitro* human colon model, 1% of fresh faecal slurry was inoculated with 2000 µM l-carnitine, along with different concentrations of Dermogranate® pomegranate extract (5.7, 11.4, or 22.8 mg/mL). A control vessel with l-carnitine and no pomegranate extract was included for each donor. The vessels were kept anaerobic (N_2 flow), at a set pH (between 6.6-7.1), and at 37 °C. Samples were collected over 48 hours and stored at -80 °C until analysis. The samples were analysed for the concentration of l-carnitine, γ-butyrobetaine (γ-BB), TMA, and related metabolites, using LC-MS. In the vessels treated with pomegranate extract, the formation of γ-BB was slower compared with the control vessels, reaching significance at 8, 10, 12 and 20 hours after inoculation. While TMA started to appear after 28 hours in the control vessels, no TMA appeared in the pomegranate-treated vessels, reaching a significant difference at 48 hours. These results indicate that the pomegranate extract suppressed l-carnitine conversion to the intermediate metabolite, γ-BB, and TMA. Consequently, this may lead to lower levels of the reportedly proatherogenic TMA-derivative, TMAO. Prospectively, these findings need to be confirmed in human studies.

Keyword: TMAO, cardiovascular disease, ellagitannins, anthocyanins, gut microbiome

P 15 Determination of lipid oxidation oil-in-water emulsion containing vitamin D

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Oxidation is one of the most important factors affecting the deterioration of oils. The degree of unsaturation in fatty acids, exposure to light and heat, the presence of molecular oxygen, pro-oxidant and antioxidant components are factors that affect the oxidative stability of lipids. It is mostly found in plants and animals such as linseed oil, sunflower oil and fish oil. With the increase of unsaturated groups (double bond), lipid oxidation increases significantly. Vitamin D is among the important fat-soluble vitamins for human health, and this vitamin is very sensitive to light, heat and oxygen. Color, taste and odor losses may occur during oxidation. In this study, the oxidative stability of emulsions formed by using different emulsifiers, different oils and vitamin D were investigated. The emulsion enriched with vitamin D was prepared by ultrasonication and pickering emulsion method using oil phase (linseed, sunflower and mct oil), emulsifier (pea and lentil protein). Peroxide values (PV)) for primary oxidation products and thiobarbituric acid reactive substances (TBARS) for secondary oxidation products were used. The emulsions were stored for 21 days at 32°C and their absorbance was read spectrophotometrically on certain days. An increase in PV and TBARS values was observed from day 1 in both methods. However, a slower increase was observed in the samples prepared by pickering emulsion methods, hence a better oxidative stability. More stable results were obtained for 21 days in pea protein and MCT oil, which is a saturated fat, used as emulsifiers in emulsions prepared in both methods. After 10 days, lipid oxidation occurred in emulsions prepared with polyunsaturated oils (linseed and sunflower oil) and lentil protein.

Keyword: Vitamin D, emulsion, plant based protein

P16 Investigation on physicochemical properties of Malatya apricot gum

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Apricot gum is a polysaccharide obtained from the trunk and branches of the apricot tree (*P. armeniaca*). In this study, the physicochemical properties of gums collected from Malatya apricot trees in 2020 were investigated and gums obtained were dried and preserved for analysis. Then, the purification process was carried out and moisture, ash, pH, total fat content and dietary fiber ratio were determined by specific methods in both purified gum (PG) and crude gum (CG). For the pH value, an aqueous dispersion of PG and CG samples at 5% in distilled water was prepared and the values were measured. The pH was 4.87±0.07 for PG and 4.85±0.01 for CG. The moisture content of the gums was determined by oven drying and was 8.98±0.5% for PG and 12.37±0.6% for CG. For ash was 3.87±0.05% for PG and 4.37±0.01% for CG. Soxhelet method was used for fat determination and was 0.11± 0.44% for PG and 0.13± 0.02% for CG. Total dietary fiber, soluble fiber and insoluble fiber amounts were 88.61, 74.29, 14.32% for PG and 84.13, 11.59, and 77.02% for CG, respectively. Based on these results, the Malatya apricot gum was determined to be different from other tree gum exudates by identifying certain functional properties. Thus, it was concluded that its use may become common in the developing food industry to contribute to the production of this native raw material.

Keyword: Apricot gum, physicochemical properties, functionality

P17 Design of enriched plum puree pieces

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Food manufacturer researches and consumer demands are increasingly towards food alternatives that offer variety, provide both functional and nutritional benefits with reduced carbon footprints and are natural with clean label ,convenient and healthy foods. Fruit puree pieces are prepared by dehydration of formula which contains fruit puree ,fruit juice concentrate and other ingredients such as sugars, hydrocolloids and other components. They can be preferred as nutritious, economical, convenient alternatives to consume fruit or to use as an ingredient in other food products by most of food manufacturer and consumers. The aim of this work was to enrich plum puree pieces with uncooked red lentil puree to increase nutritional value, functionality and to obtain more healthy and with higher market potential fruit based- new product. The nutritional value, microbial stability, sensory properties and customer satisfaction were determined aswell.

Keyword: Black plum, healthy snack, red lentil, clean label, enriched dried fruit

P18 The effect of temperature and roasting time on caffeine content, antioxidant activity, organoleptic properties and quality of Robusta (*Coffea canephora*) ground coffee

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Robusta coffee beans (*Coffea canephora*) contain phenolic compounds that are responsible for antioxidant activity, which is strongly influenced by temperature and roasting time. This study aims to determine the effects of temperature and roasting time on caffeine content, antioxidant activity, sensory properties and quality of Robusta ground coffee from Lembata Regency, East Nusa Tenggara province, Indonesia. This study used a factorial randomized block design with two factors, namely a combination of temperature treatment (160°C, 180°C, and 200°C) and roasting time (30, 40 and 50 minutes). Raw coffee beans were used as a comparison. The caffeine content of coffee was determined using a spectrophotometer, while its antioxidant activity was tested by the DPPH method (2,2-diphenyl-1-picrylhydrazil); then analyzed the organoleptic properties (color, aroma and taste), as well as the quality of ground coffee (moisture, coffee extract content and pH). The results of this study indicate that the roasting time and temperature treatment affect the caffeine content, antioxidant activity, sensory properties and quality of the coffee powder produced. Caffeine content of raw coffee is the highest at 1.82% with antioxidant activity (IC50) 32.56 g/mL lower than BHT (39.62 µg/mL). The higher the temperature and the roasting time, the caffeine content will increase and the antioxidant activity will decrease, respectively at 160°C ranging 1.79-1.08% and 97.20-232 µg/mL; at 180°C ranging 1.18-0.11% and 216-282 µg/mL; and at 200°C ranging 1.14-0.66% and 228-257 µg/mL. The best quality of Robusta ground coffee was achieved at a temperature of 160°C with a roasting time of 30 and 40 minutes, producing coffee powder with bitter taste, medium light colour, and strong aroma. The product had a moisture content of 0.67-0.91%, coffee extract content of 25.88-26.65% and pH 5.5 (meets the requirements of ground coffee according to the Indonesian standard SNI-01-3542-2004); with antioxidant activity of 97-102 g/mL which is included in the strong category (50-100 g/mL).

Keyword: Antioxidant activity, caffeine, roasting, robusta coffee (*Coffea canephora*)

P19 Food antioxidant or prodrug? The biased inhibitory efficacy of resveratrol monoesters/diesters/triesters in β-carotene bleaching, LDL (low-density lipoprotein) oxidation and DNA scission assays

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Resveratrol, a phytoalexin of spermatophytes such as grapevine, mulberries, and peanuts, serves as an efficient natural antioxidant with numerous health effects but it is relatively poorly bioavailability. Acylation has been prevalently applied to increase bioactivity and bioavailability of supplement and pharmaceutical substances. In this study, the bioactive properties of acylated resveratrol derivatives prepared enzymatically, were evaluated in food and biological model systems. Resveratrol monoesters were prepared using one-step enzymatic acylation. Meanwhile, resveratrol diesters/triesters were synthesized using base-catalyzed acylation. Various vinyl fatty acids with 2 to 18 carbon atoms were used as acyl donors. The purified products were then tested for their antioxidant activity using β-carotene bleaching, LDL (low-density lipoprotein) oxidation and DNA scission assays. In β-carotene bleaching assay, the bleaching rate of β-carotene was inhibited by both resveratrol and its esters. Under air-exposed thermal condition (50°C), the maximum inhibitory effect was at around 20-35 min, but then decreased gradually during 6-hours of measurement. In the LDL oxidation assay, a downtrend antioxidant ability was also observed after the point of maximum antioxidant efficiency (14.5-70 h). However, compared to resveratrol, resveratrol diacetate and dibutyrate exhibited a higher ability in inhibiting LDL oxidation. In the DNA scission test, the resveratrol monoacetate and diacetate, showed a similar or higher DNA-scission inhibition with resveratrol itself, which was higher than other resveratrol esters. Similar to the chemical antioxidant assays, resveratrol esters displayed an overall low antioxidant activity in biological/food model system assays employed here. However, the original biological effects of several resveratrol esters including resveratrol monoacetate and diacetate as an antioxidant were well retained after the modification process. Thus, these two resveratrol analogs may serve as viable alternatives to traditional synthetic antioxidants, especially in lipidic systems such as bulk fats and oils, or utilize as functional ingredient in supplements and prodrugs.

Keyword: Acylation, transesterification, resveratrol esters, amphiphilic antioxidants, phenolic modification

P20 Phenolic profile of young plants of garlic

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The objective of this study was to determine the content of selected flavonoids and phenolic acids in whole plants of garlic grown from cloves. The research material consisted of young garlic (underground part, stem, and leaves) of Polish winter varieties Harnaś and Ornak. Garlic was grown from cloves and harvested in various months between 2018 and 2020, in the experimental station of the Agricultural University in Krakow, Poland. Young plants of garlic cultivar Harnaś, harvested in July, contained the highest concentration of naringenin, epicatechin, apigenin, and hesperidin, and the lowest level of sinapic and chlorogenic acids. The highest level of quercetin was found in the same cultivar but collected in June, while the lowest content of 4-hydroxybenzoic acid and phenolic acid was found in samples harvested in June and July. This cultivar harvesting in May exhibited the highest content of flavonoids and phenolic acids. In contrast, the lowest content of flavonoids was found in Harnaś garlic harvested in June. Ornak variety collected in July exhibited the lowest content of quercetin, rutin, and hesperidin, and the highest level of caffeic acid. Compared to other samples, ferulic, p-coumaric and chlorogenic acids were significantly higher in the Ornak harvested in May. Both cultivars, harvested in July, had the lowest content of syringic acid in relation to the other samples from the May and June harvest dates. In short, popular Polish varieties of garlic, harvested at an early stage of development, are a valuable source of polyphenolics and may be used as natural health ingredients.

Keyword: Garlic, flavonoids, phenolic compounds

P21 Immune-modulation effect of *Sargassum horneri* polysaccharides on concanavalin A-stimulated splenocytes and allergic asthma mouse model

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Sargassum horneri (*S. Horneri*) is an edible species of large brown algae inhabiting the coasts of northeastern Asia extensively. *S. Horneri* has sterols, polyphenols, and polysaccharides, that have various biological activities such as antioxidative, anti-inflammatory, and immune-regulatory. However, their molecular immunological mechanisms are still unknown. This study investigated the curative effects of *S. horneri* polysaccharides (SHPS) on allergic asthma progression. First, we performed cell viability assays, LDH and 3H-thymidine incorporation of *S. Horneri* on splenocytes to examine its cytotoxicity. There were no cytotoxic effects on concentrations 3.9 ~ 250 μg/mL of SHPS. SHPS increased the expression of toll-like receptors (TLRs) in splenocytes of ConA stimulation. SHPS reduced the production of transcription factors and cytokines involved in the differentiation of diverse Th cell types such as Th1 (IL-β, IFN-r, TNF-α), Th2 (IL-4, IL-10), and Th17 (IL-17A, IL-22) in ConA-stimulated splenocytes. Moreover, SHPS significantly decreased the abundance of B cells (CD19+CD45R/B220+) and macrophages (CD45+CD11b+) in ConA-stimulated splenocytes. In addition, SHPS suppressed TLRs expression and Th-type cytokines (Th1, Th2, and Th17) in lungs of PM-induced allergic asthma mice. The histopathological results confirmed that SHPS mitigated lung tissue inflammation and suppressed the hypersecretion of mucin in the PM-induced allergic asthma mouse model. The mucin secretion is regulated by genes such as MUC5AC, MUC5B, and SHPS reduced MUC2 in PM-induced allergic asthma mice. In this study, we provide a compelling rationale that SHPS may afford a promising approach for immunotherapy as an alternative for the treatment of allergic asthma induced by ambient PM.

Keyword: Respiratory health, *Sargassum horneri*, polysaccharides, seaweed, immune-modulation

P22 *Sargassum horneri* ethanol extract containing phenolic acids attenuates PM-induced oxidative stress *via* ROS scavenging and transition metal chelation

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Particulate matter (PM) generate oxidative stress and damage to exposed cells. In this study, we investigated the antioxidant mechanisms of *Sargassum horneri* ethanol extract (SHE) against PM in lung epithelial cell, MLE-12 cells. We discovered that transition metals in PM adhered to the surfaces of MLE-12 cells, triggering intracellular ROS generation and lipid peroxidation. The PM-induced oxidative stress in turn reduced the antioxidant enzymes activities. This disturbance in redox balance further produced oxidative DNA damage and eventually led to apoptotic cell death as expected. However, we uncovered that SHE containing polyphenols chelated the transition metals (Si, Mg, Al, Ti, and Fe) on the surfaces of MLE-12 cells. In addition, SHE not only attenuated the intracellular ROS and lipid peroxidation but also regulated antioxidant enzymes to suppress the PM-induce oxidative DNA damage and apoptotic cell death. These results suggest that SHE containing polyphenols contribute to the alleviation of the PM-induced oxidative stress and apoptotic cell death via ROS scavenging and transition metals chelating.

Keyword: Partilculate matter (PM), oxidative stress, metal chelating, antioxidant mechanisms, *Sargassum horneri*

P23 Interleukin-17A deficiency alleviates airway inflammation in alleviates allergic asthma mice

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Particulate matter (PM) aggravated airway and lung inflammatory response in asthma. Asthma could be induced by a Th2/Th17-mediated response and IL-17A is a key pro-inflammatory cytokine in the Th17 pathway. In this study, we investigated the mechanism of IL-17A role in PM-induced allergic asthma mice. 4-6 weeks old C57BL/6 mice in each of IL-17A wild type (WT) and knockout (KO) strains were randomly divided into the following experimental groups: healthy control, PM only, OVA only, OVA+PM treatment groups. PM only, OVA only, and OVA+PM treated wild-type mice with both facilitate the overt histopathological symptoms characteristic to allergic asthma such as mucus overproduction and goblet cell hyperplasia while, IL-17A KO mice mitigate overproduction and goblet cell hyperplasia compared to WT mice. Also, mRNA expression of Th2/Th17 cytokines (IL-13, IL-17A, IL-22) was not significantly increased by PM exposure in IL-17A KO mice. Interestingly, IL-17A KO significantly decreased IL-13 and IL-17A expression compared to WT. These results revealed that IL-17A played an important role in allergic asthma.

Keyword: Particulate matter (PM), asthma, IL-17A, inflammatory response

P24 *Sargassum horneri* extract containing sargachromenol attenuates the particulate matter exacerbated allergic asthma through reduction of Th2 and Th17 response in mice

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Airborne particulate matter (PM) has become a serious health issue causing pulmonary diseases such as asthma. Due to side effects and non-specificity of conventional drugs, there's a promising need to develop natural product based alternative treatment. *Sargassum horneri* is a brown algae shown to have anti-oxidant, anti-inflammatory and anti-allergic effect. Thus, we sought to determine whether ethanol extract of *Sargassum horneri* (SHE) mitigates the effect of PM exposure on asthma development. To establish a mouse model of asthma, BALB/c mice were sensitized with ovalbumin (OVA, 10 μg) and challenged with PM (5 mg/m^3) for 7 days consecutively. SHE (200, 400 mg/Kg), Prednisone (5 mg/Kg) or PBS was daily administrated orally before PM exposure. SHE mitigated PM exacerbated dendritic cell activation. More importantly, SHE restrained Th2 polarization by attenuating transcription factors GATA3 and STAT5 which further mitigated the expression of Th2 cytokines interleukin (IL)-4, IL-5, IL-13 in lung homogenates of PM exacerbated asthmatic mice. SHE further attenuated PM exacerbated eosinophil infiltration in lung, trachea, and BALF. In addition, SHE markedly mitigated the activation of mast cells and IgE level in serum. Concomitantly, SHE further restrained the TH17 cell response in PM exposed allergic mice through attenuating expression of transcription factors RORγT, STAT3 and expression of relevant effector cytokines IL-17a.This resulted in mitigated neutrophil infiltration in lung. Taken together, SHE significantly suppressed PM exacerbated hyper secretion of mucus in asthmatic mice. These results suggest that SHE have therapeutic potential for treating PM exacerbated allergic asthma through concomitantly inhibiting Th2/Th17 responses.

Keyword: Particulate matter, asthma, Th2 response, Th17 response

P25 *Laminaria japonica* polysaccharides impact the productivities and systemic health by modulating the intestinal microbiome and metabolome of ducks

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It has documented that polysaccharide derived from *Laminaria japonica* (LJPS) exerted the beneficial effects on improving animal systemic health. However, little information is available regarding their impacts on duck. The aims of this experiment were to assess the effects of LJPS on productivities, intestinal microbiome and metabolome of ducks, and their correlations between the healthy indexes, microbiota, and metabolites. A total of 10,000 Cherry Valley ducks at 21 days of age with similar body weights were randomly assigned to 10 groups (1,000 per group) that were fed either LJPS-supplemented or normal diet for an 18-day experimental period. The average daily gain (ADG), average daily feed intake (ADFI), ratio of feed to gain (F/G) and the digestibility of nutrients, intestinal microbiota and metabolome of the ducks were examined at the end of the experiment. The findings showed that ducks fed LJPS-supplemented diet had the greater ADG, the digestibility of dry matter (DMD), neutral detergent fiber (DNFD), crude protein (DCP), while decreased ADFI, compared to that of control group. Additionally, the LJPS-fed group demonstrated the lowered the alpha-diversity of the gut microbiota, whereas significantly increased the abundance of *Bacteroides* and *Prevotellaceae*, compared with those in the control group. Feeding LJPS-supplemented diet to duck upregulated some metabolic pathways involving vitamin B6, nicotinate and nicotinamide, and some essential amino acids, compared with the control group. Moreover, the abundance of the microbiota exerted an intimate correlation to the alterations of health parameters and metabolism pathways of ducks. In conclusion, feeding LJPS shaped the intestinal microbiota of ducks with decreased alpha-diversity, while improving relative abundance of some specific microbes and upregulating certain growth-related metabolic pathways, which contributed to the augmented growth performance and digestibility of nutrients. Thus, it is a recommendable dietary strategy to supplement LJPS to ducks for superior product performance and feed efficiency.

Keyword: *Laminaria japonica* polysaccharide, health parameters, intestinal microbiome, metabolome, ducks

P26 *Undaria pinnatifida* sporophyll and *Gracilaria verrucose* ameliorate diet-indued obesity and inflammation *via* a physiological alteration of white adipose tissue in C57BL/6 mice

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Edible seaweed is a rich source of the natural bioactive compounds that are known to improve human health. The present study was conducted to evaluate potential metabolic health-promoting effects of *Undaria pinnatifida* sporophyll (UPS) and *Gracilaria verrucose* (GV) using *in vitro* and *in vivo* models. We evaluated effect of seaweed water extracts (SWE) on lipid accumulation in 3T3-L1 adipocytes as well as effects of seaweed freeze-dried powder (SFP) supplementation with high-fat diet (HFD, 60% kcal by fat) on alteration of food intake, obesity, insulin resistance, and inflammation in C57BL/6 mice. The results indicated that both SWEs significantly inhibited adipogenesis in 3T3-L1 adipocytes by downregulating the major adipogenesis-related genes. Furthermore, SFP supplementation significantly inhibited body weight gain, prevented insulin resistance and hypertriglyceridemia compared to the HFD group. In addition, the SFP supplementation significantly reduced liver weight and levels of triglyceride in the livers compared to that of the HFD group. Strikingly, the SFP supplementation not only attenuated subcutaneous fat pad weight, which could be associated with the whole-body weight loss, but also downregulated M1 macrophage related inflammatory genes compared to the HFD group. Taken together, our findings demonstrate that popular edible seaweed, UPS and GV can ameliorate diet-indued obesity and inflammation particularly by regulating a macrophage infiltration in C57BL/6 mice. Therefore, they are promising ingredients to be developed as functional foods for managing the obesity-metabolic disorders.

Keyword: *Undaria pinnatifida* sporophyll, *Gracilaria verrucose*, High-fat diet, obesity, white adipose tissue

P27 Biochemical and haematological indices of weaning Wistar albino rats fed sprouted sorghum (*Sorghum bicolor*) and bambara nuts (*Vigna. Subterranean*) flour formulated diets

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Fortification and formulation of diets have been used to supply deficient nutrients in diets of malnourished children. The effect of feeding diets formulated from sprouted sorghum and Bambara nut flour blends on the biochemical and haematological indices of weaning albino rats was the study's focus. Forty (40) Wistar weaning albino rats were randomly distributed into eight (8) groups (A to H) of five rats each. The animals were fed the formulated diets and water ad-libitum for 28 days. Rats in groups A and B were fed only sorghum and Bambara flour respectively while groups C, D, E and F were fed sorghum supplemented with 5, 10, 15, and 20 % sprouted Bambara nut flour respectively. Rats in group G were placed on normal rat chow while those in H were fed commercial weaning food. Haematological and biochemical parameters were determined using auto-haematological analyzer and diagnostic assay kits respectively. Rats in group F had a significantly higher ($p<0.05$) weight (15.28 %) compared to the other treatments and control group. Haematological analysis showed that all parameters were within normal range. However, haematological parameters (PCV, Hb, MCV and MCH) were significantly ($p<0.05$) higher in the group fed with commercial weaning meal compared to others while there was no significant difference ($p>0.05$) in the RBC of the groups fed 20 % Bambara nut supplemented diet and standard weaning meal. The serum enzyme activities (AST, ALT and ALP) were higher in rats placed only on sorghum and Bambara nut flours and lowest in the rats placed on standard weaning meal but were all within normal range. The renal function indices were significantly ($p<0.05$) higher in the standard weaning meal group. Hence, the research suggests that the blend is safe for food and may therefore be good for the formulation of weaning diets.

Keyword: Fortification, formulation, nutrient, weaning formula, enzyme

P28 Nutrient secondary metabolite and physicochemical constituents of selected plant peels

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Food scarcity has been a major scourge to majority of third-world countries as many plant food materials are being lost to spoilage or are diverted into livestock breeding. This study was aimed at evaluating the nutrient, physicochemical and antioxidant properties of flours of the peels of selected tuber crops (potato, plantain and yam). The proximate composition revealed that moisture and ash content of the samples showed no significant difference ($p>0.05$). However, potato peel flour had a significantly ($p<0.05$) higher concentration of fat (1.13±0.06%) and carbohydrate (59.72±0.02%), while plantain peel flour had higher ($p<0.05$) protein (2.14±0.01%) and crude fiber (77.87±0.06%) content. The peels showed appreciable amount of mineral composition (mg/100g), although potatoes peel flour had significant ($p<0.05$) amount of phosphorus (255.15±0.58), sodium (382.077±0.84), potassium (644.83±0.12) and magnesium (150.58±0.07). The Na^+/K^+ was significantly low in plantain peel flour (0.0057±0.25). The water absorption capacity was significantly higher ($p<0.05$) in yam peel flour (49.33±0.58%), while gelatinization temperature was higher ($p<0.05$) in plantain (80.50±0.50^{0}C). The result for antioxidant properties showed that yam and plantain peel flour had the highest ($p<0.05$) total phenol (57.86±0.56mg/100g) and flavonoid (7.18±0.28mg/100g) contents respectively. The anti-nutrient composition of the tuber peel flours showed that oxalate (0.67±0.03mg/kg), phytate (0.34±0.01 mg/kg) and cyanide (0.38±003mg/kg) contents were very low in plantain peel flour. The nutrient, mineral, antioxidants as well as low anti-nutrient content of tuber peels present them worthy for animal-feed production and plant solid waste management.

Keyword: Nutrient, antioxidant, peels, tuber crops, phytochemicals

P29 Development of moringa and baobab supplemented healthy snack bars as functional food by using quality function deployment method

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Nowadays, the consumer's awareness toward food products is changing. They not only prefer foods with health benefits but also prefer to consume food products as portable, convenient for consumption, and storage. In this sense, functional snack bars are very popular and there is a high interest in making new types of bars containing a diverse group of bioactive compounds. In this study, the aim was to design new unprocessed, preservative and gluten-free, vegan snack fruit bar, supplemented with Moringa (*Moringa oleifera Lam.*) leaf and Baobab (*Adansonia digitata L.*) fruit powders without addition of sugar. Quality Function Deployment (QFD) method, a customer-driven design and manufacturing tool, was used to determine target audience requirements through a survey conducted with the focus group and to translate customer needs to the quality of the product. Different percentages of raw cashew, date paste, dried pineapple, mango, moringa leaf and baobab fruit powders were used for bar preparation. The focus group survey was applied by asking both open and close-ended questions to get feedbacks for the development of new formulations and supported with sensory evaluation which was performed for the acceptability (color, taste, smell, texture and physical appearance) of different bar samples on a 5-point hedonic rating scale. The package of the bar was also designed based on focus group preferences. The results obtained from the QFD method helped to guide formulation of trials, which products should be chosen, which fruits are desired and how the texture of the bar should be. Among various trials and focus group feedbacks, it was suggested that fruit bars enriched with moringa leaf and baobab fruit powders may be expected to fulfill the requirements of health conscious of consumers and have a potential to attract the attention of the target audience in the functional market.

P30 European cranberrybush (*Viburnum opulus L.*) fruit extracts as functional ingredient, which selectively inhibits the growth of foodborne pathogens but not probiotic lactic acid bacteria

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The utilization of phenolic compounds (PC) in different industries has dramatically increased due to their several promising health benefits. Especially, the use of PC in the food and pharmaceutical industries as natural functional ingredients has gained attention mostly because of their antioxidant and antimicrobial activities. The fruits of European cranberrybush (*Viburnum opulus* L.) (ECB) are rich in different varieties of PC by offering opportunities to be used as functional ingredients. In the present study, the susceptibilities of wide range of foodborne pathogenic, spoilage, and probiotic microorganisms to various concentrations of ECB fruit extracts (800-400-200-100 mg/ml) were examined by using agar well diffusion and broth microdilution assays, following determinations of the zone of inhibition (ZI), minimum inhibitory concentration (MIC), and minimum bactericidal/fungicidal concentration (MBC/MFC). High concentrations (800 and 400 mg/ml) of ECB fruit extracts showed inhibitory effect on all pathogenic bacteria and spoilage yeasts at different levels; ZI values ranged between 12.73±0.3mm and 1.12±0.1 mm. Contrarily, the effect on probiotic lactic acid bacteria (LAB) strains were slight. *Lactobacillus brevis* (800 and 400 mg/ml)*, L. plantarum and L. acidophilus* (400 mg/ml) did not display ZI values at high concentrations of ECB extracts and MIC's and MBC's ranged from 200 to 100 mg/ml. *Streptococcus thermophilus* St-21 had the highest MIC and MBC (400 mg/ml) among probiotic LAB. Most of the pathogenic bacteria were still susceptible to low concentrations (200 and 100 mg/ml) of ECB extracts with MIC's and MBC's of 50 to 200 mg/ml whereas probiotic LAB growth were not affected. The results of the study suggested that a selective effect of ECB extracts as an antimicrobial agent, which may be of great interest for the food industry, especially for probiotic foods application.

Keyword: European cranberrybush fruit extract, phenolic compound, functional ingredient, antimicrobial activity, probiotic LAB

P31 Antioxidant properties and prediction of bioactive peptides produced from camelina (*Camelina sativa (L.*) Crantz) meal

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Camelina meal is a valuable underutilized by-product of the oil-processing industry, produced in a large amount during the oil extraction process. Protein hydrolysates were produced from camelina seed meal with Alcalase and Flavourzyme. Protein hydrolysates were examined for antioxidant activity. In addition, bioactive peptides were predicted by employing bioinformatics methods. The results showed the essential amino acid composition of camelina protein isolates and hydrolysates was comparable and adequate. All camelina hydrolysates had higher radical scavenging activity in DPPH and ABTS assays than the corresponding protein isolates. In contrast to larger peptides (>3 kDa), smaller peptides (<3 kDa) scavenged DPPH and ABTS radicals more effectively. Moreover, according to BIOPEP, camelina protein hydrolysates can serve as precursors for the release of peptides with a dual role in the inhibition of the angiotensin-converting enzyme (ACE) and dipeptidyl peptidase IV (DPP IV). All digestive resistance peptides were shown to be non-toxic and had good functional characteristics, indicating that they might be used in various food applications. Most peptides also displayed favorable drug-like qualities, according to *in silico* absorption, digestion, metabolism, and excretion profile predictions based on physicochemical attributes and Lipinski's rule-of-five. This research highlights the possible application of underutilized camelina processing waste to creating nutraceuticals or functional food ingredients.

P32 Octominin abates LPS-induced chemokines and pro-inflammatory cytokines through blocking TLRs/NF-κB signal transduction from RAW 264.7 macrophages

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Inflammation is a well-organized innate immune response and plays a vital role during pathogen infection and mechanical injuries. The Toll-like receptor (TLR) mediated nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB) is a major signal transduction pathway observed in RAW 264.7 macrophages during the inflammatory responses. Octominin is a bioactive peptide isolated from *Octopus minor* that inhibits the lipopolysaccharides (LPS)-stimulated transcriptional activation of NF-κB in RAW 264.7 cells. The Anti-inflammatory activity of Octaminin was evaluated by using Enzyme-linked immunosorbent assay (ELISA), western blotting, molecular docking, and quantitative PCR Analysis. According to the results of the present study, Octominin treatments significantly downregulated the LPS-induced proinflammatory cytokines (interleukin-β; IL-1β, IL-6, and tumor necrosis factor-α) and chemokines (CCL3, CCL4, CCL5, and CXCL10) secretion from RAW 264.7 cells. Additionally, the pro-inflammatory mediators such as nitric oxide (NO), prostaglandin E2 (PGE2), and gene and protein expression of inducible NO synthase (iNOS), and cyclooxygenase-2 (COX-2) in macrophages repressed significantly. Furthermore, *in-silico* docking outcomes recognized that Octominin has a potential to inhibit TLR4 mediated inflammatory responses via blocking the formation of TLR4/MD-2/LPS complex. In conclusion, the results shown that Octominin is a potent inhibitor of the TLR mediated NF-κB signal transduction pathway and is a capable applicant for the treatment of inflammatory diseases.

Keyword: *Octopus minor*, peptide, inflammation, chemokines, RAW 264.7

P33 Antioxidant activity and color of fresh juices as affected by dielectric barrier discharge cold plasma treatment

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The production of fruit juice with high quality and nutrient content is important for the industry, but thermal sterilization processes can cause loss of some quality attributes, such as color, nutrients, and antioxidant properties. In addition, within the aspect of consumer preference, non-thermal processes, such as cold plasma can be used instead of thermal processes for juices after optimization of process parameters. This study investigated the changes in the antioxidant activity and color of apple, black carrot, and strawberry juices upon dielectric barrier discharge cold plasma (DBDCP) treatment. Apple, black carrot, and strawberry fresh juices were obtained using a juice extractor and treated with atmospheric DBDCP at 28 kV and 50 Hz for 0 s, 30 s, or 60 s. The DBDCP source consisted of two cylindric stainless steel electrodes (74 mm diameter and 3 mm thickness) which were separated with one glass dielectric barrier (2 mm thickness) coupled to the bottom electrode. The distance between the dielectric barrier and the top electrode was 5 mm. All treatments were repeated twice. Methanolic extracts of the juice samples were obtained using ultrasound-assisted extraction. The antioxidant activity of the samples was evaluated using the 2,2′-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay. The L*, a*, and b* values of the fresh juice samples were also measured. Atmospheric DBDCP treatment up to 60 s did not alter the antioxidant activity of the apple, black carrot, or strawberry juices. The color of the samples was also maintained by the treatment, as no statistically significant changes in the L*, a*, and b* values were observed. Collectively, it can be said that DBDCP can be utilized in fruit juice processing without altering the antioxidant activity or color properties.

Keyword: Antioxidant activity, DBDCP, apple juice, black carrot juice, strawberry juice

P34 The relationship of the inflammatory potential of diet with eating attitudes and appetite

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The dietary inflammatory index (DII) is a parameter that examines the effects of dietary components on serum pro-inflammatory and anti-inflammatory indicators. The aim of this study was to examine the relationship between dietary inflammatory potential, eating attitude, and appetite of the students of the Department of Nutrition and Dietetics. Questions including sociodemographic characteristics and nutritional status, EAT-40 to evaluate eating attitudes, Simplified Nutritional Appetite Questionnaire (SNAQ) for assessment of appetite, and a questionnaire containing a 3-day dietary recall record were applied to calculate the dietary inflammatory indices of the participants. The average age of the students was 22 years and 91.9% were female. The frequency of the normal weight group was 69.4% and 78.3% of the students skipped meals, the most frequently skipped meal was lunch with 40.5%. Most of the students had a normal eating attitude with 92.3 percent. It was found that 95.1% of the students with normal eating attitudes were female, 49.3% were 4th-grade undergraduates and 70% were of normal weight. It was found that 91.1% of the students whose appetite status was not impaired were women and 48.9% were 4th-grade undergraduates. Most of the students with anti-inflammatory diet potential were female with 93% and, 45% were 4th-grade undergraduates while 70% of them were of normal weight. No statistically significant correlation was found between the students' EAT-40 scores and BMI, between EAT-40 and DII scores, and between BMI and DII scores ($p>0.05$). It was found that students' EAT-40 scores did not significantly affect DII scores ($p>0.05$), and BMI did not significantly affect DII scores ($p>0.05$). Dietary inflammatory potential has no effect on eating attitude and appetite.

Keyword: Appetite, inflammation, eating attitude, dietary inflammatory index

P35 Effects of dielectric barrier discharge cold plasma treatment on the total phenolic content and antioxidant activity of avocado seed flour

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Within the increasing population of the world, the waste problem is increasing exponentially every year. The food industry is one of the industries that generate the most amount of waste. High amounts of by-products and waste occur in food production processes, and these waste and by-products can be used for various purposes in other processes. Avocado is used for different purposes the industry. During the processes, high amounts of avocado seed, which has a rich nutritional content, emerge as waste. In this study, it was aimed to investigate the effect of dielectric barrier discharge cold plasma (DBDCP) treatment on the total phenolic content and antioxidant activity of avocado seed flour. The avocado seeds were dried and ground to obtain avocado seed flour. A 2 g of the seed flour was subjected to DBDCP at 28 kV for 0s, 30 s, or 60 s. Then the ethanolic extracts of the samples were obtained using ultrasound-assisted extraction. After the extractions, the total phenolic content in avocado seed flour was determined by Folin–Ciocalteu assay and the antioxidant activity was observed using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) and 2,2'-azinobis (3-ethylbenzothiazoline-6-sulfonic acid) diammonium salt (ABTS) methods. According to the results of the analysis, the total phenolic content of the samples ranged between 0.012 and 0.020 mg gallic acid equivalents / g sample, and it did not change after the treatments. Similarly, no significant changes in the antioxidant activity of the samples were noted as assessed by the DPPH and ABTS assays. In short, DBDCP treatment does not negatively alter the total phenolic content and antioxidant activity of avocado seed flour.

Keyword: Dielectric barrier discharge cold plasma, avocado seed flour, ABTS, DPPH, Folin–Ciocalteu assay

P36 Determination of nitrirroxide radical scavenging activity of ascorbic acid with the aid of modified gold nanoparticles and applications

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Oxidative stress is a predominance of oxidants/prooxidants over antioxidants. Reactions initiated by reactive oxygen species: ROS (such as superoxide ($O_2^{\bullet-}$), hydroxyl ($^{\bullet}OH$), peroxyl ($ROO^{\bullet}$), and alkoxyl ($RO^{\bullet}$) radicals) and reactive nitrogen species: RNS (such as nitric oxide ($^{\bullet}NO$) and nitrogen dioxide ($^{\bullet}NO_2$) radicals, and peroxynitrite anion ($ONOO^-$)) may cause dermatological disorders, cancer, cardiovascular and neurological diseases. RNS may also have benefits such as involving in the generation of cell signals and in the defense against bacterial/fungal pathogens. As $^{\bullet}NO$ may act as both an antioxidant and prooxidant in biological systems and react slowly with most molecules, its determination is a challenge. Sodium nitroprusside (NaNP) is generally used as $^{\bullet}NO$ source, and NaNP solutions produce nitric oxide radical which reacts with oxygen to turn into nitrite. In the developed $^{\bullet}NO$ scavenging activity method, these radicals were scavenged by antioxidants and the remaining $^{\bullet}NO$ was determined after converting to nitrite by the gold nanoparticles (AuNPs)−based nitrite determination method previously developed by our group. Nitrite was converted to an azo-dye in the presence of N-(1-naphthyl) ethylenediamine (NED) with 4-ATP−modified AuNPs, of which the absorbance was measured at 565 nm. The $^{\bullet}NO$ scavenging activity was accepted as the decrease of absorbance in the presence of scavengers, and the calibration equations were established as absorbance decrements (ΔA) against antioxidant concentrations. The optimized method was applied to ascorbic acid scavenging of $^{\bullet}NO$. A good linear calibration curve ($r = 0.9997$) was obtained with an IC_{50} value of $1.622 \times 10^2 \pm 1.25 \times 10^{-2}$ μmol L^{-1}. In addition, the developed method was applied to orange juice as a real sample and the results were calculated in terms of trolox equivalents (TE), *e.g.*, the antioxidant capacity of orange juice was found to be 9.30 mmol TE L^{-1}.

Keyword: Radical scavenging activity, gold nanoparticles, nitric oxide radical

P37 Olive (*Olea europaea L.*) leaf extracts obtained from different regions of Türkiye inhibit the proliferation and migration/invasion of various cancer lines *via* inducing apoptosis

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Polyphenols are known to play an important protective role in cancer and other inflammation-related diseases. Olive leaf polyphenols are protect against DNA damage initiated by free radicals was demonstrated in cancer cell models. Although these anti-cancer features are thought to be derived from phenolic compounds present in olive, the mechanism of cell death induction in cancer remains unknown. In this study, olive leaves obtained from different regions of Türkiye (Gemlik, Memecik, and Ayvalik) were extracted and protein expression profiles of each variety were identified by LC-MS-MS. The leaf extracts were studied for their effects on growth in human prostate cancer PC-3, human breast cancer MDA-MB-231, human intestine adenocarcinoma Caco-2, and human lung carcinoma A549 cell lines. Chinese hamster ovary CHO-K1 cell line was used as control. Subsequently, ROS levels (H2DCFDA), cell apoptosis, cell migration, and invasion were determined. Olive leaf extracts reduced the cell viability of PC-3, MDA-MB-231, A549, and Caco-2 cells in a time- and dose-dependent manner. The highest inhibition of cell proliferation was obtained from olive leaf extract of Gemlik and followed by Memecik and Ayvalik Additionally, apoptosis assay indicated that olive leaf extracts induced the apoptosis of the two cell lines which was confirmed by a dose-dependent increase of ROS levels. Consistently, the inhibitory effects of olive leaf extracts on migration and invasion were also observed *in vitro*. Olive leaf polyphenols have various bioactive properties for inhibition of the progression and development of cancers. The pathways and signalling cascades of the mechanisms involved in the potential anti-cancer action of olive leaf polyphenols will also be identified at RNA expression level. In conclusion, Olive leaf extracts have anti-tumor activity against different cancer cells by inhibiting cell proliferation and migration and by inducing apoptosis and might be very useful and promising neutraceuticals for complementary cancer treatment.

Keyword: Polyphenols, olive leaf extract, antioxidant, cancer, LCMS/MS

P38 Investigation antiviral activity of Mediterranean herbs and spices against SARS-CoV-2 using *in silico* methods

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The overall objective of this research was to evaluate antiviral potential of herbs and spices, significantly contributing the use of functional foods to overcome COVID-19 pandemic on health issues in the Mediterranean region. The main aim of this study was to investigate antioxidant activity, antiviral activity, and immuno-modulatory effects of the Mediterranean herbs and spices against SARS-CoV-2 infection using *in silico* methods, and in vitro models. Lists of candidate active compounds found in Mediterranean herbs and spices were derived from the literature. These compounds, together with other compounds obtained from pre-existing databases of phytochemicals, were prepared *in silico* using Schrodinger software. GLIDE was used to dock the compounds into the target ACE2 protein obtained from the PDB. Known binders were used to validate the docking results. The binding energy was used to evaluate the fit of the compounds to the protein structure. The use of obtained extracts and in-house prepared extracts using different extraction procedures had been physicochemically profiled to identify the relevant bioactive chemical compounds obtained from *in silico* studies. The extracts were tested for potential cytotoxic effects onto human cancer cell lines using MTT assay furthermore the exhibited antioxidant activity was determined using both non- cellular based assays and cellular based assays using DCFDA assay. A number of compounds demonstrated good binding to the ACE2 structure *in silico*, with calculated binding energies approaching or equalling those of known binders. Further studies are proposed in order to validate the results obtained *in vitro* methods. The innovations on functional herbs and spices might increase the adherence to the Mediterranean diet as a valuable and culturally acceptable model of sustainable and healthy dietary pattern.

Keyword: Mediterranean herbs and spices, antiviral activity, antioxidant potential, SARS-CoV-2, *in silico* methods

P39 Screening antiviral and immunomodulatory effect of Mediterranean herbs and spices against SARS-CoV for ACE-2, MPro, and PAD 4 using *in silico* PyRx

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To meet the increasingly growing demand for therapeutics targeting a SARS-CoV-2, natural-derived compounds constantly become a worthy therapeutic alternative against SARS-CoV-2 due to their innately better toleration in the human body. The main aim of this study was to screen angiotensin converting enzyme-2 (ACE-2), and main protease (MPro) for assessing antiviral activity, and Protein Arginine Deiminase-4 (PAD4) enzyme for immuno-modulatory effects of the Mediterranean herbs and spices against SARS-CoV using *in silico* PyRx virtual screening. Active compounds of Mediterranean herbs and spices were prepared in DSV (Discovery Studio Visualizer) format. The efficacy of compounds against SARS-CoV-2 targeted ACE-2 and MPro were investigated. The structure of ACE-2 (7DF4) and MPro (7JQ2) proteins were retrieved from Reserach Collaboratory for Structural Bioinformatics:Protein Data Bank (RCSB:PDB). Proteins; Virtual screening was performed in the PyRx tool by selecting the Spike binding region for ACE-2 and the active region for MPro as the target. NETosis of neutrophils increases as a result of immune dysregulation during SARS-CoV-2 infection and DNA-induced coagulation develops in the extracellular space and the air-blood barrier in the lung. The disruption of the air-blood barrier causes multi-organ failure by disrupting the oxygenation of the blood. PAD4 enzyme is required for NETosis to occur therefore, the immunomodulatory activity of the compounds was investigated by targeting the active site of the PAD4 enzyme. The structure of the PAD4 enzyme (4X8G) was obtained from RCSB:PDB and the activity of the compounds against PAD4 were screened using the PyRx tool. As a result of virtual screenings for ACE-2, MP, and PAD 4, active compounds with Gibbs free energy change (ΔG) less than -9 were selected as candidate molecules. The innovations on functional herbs and spices in the region might be increased the adherence to the Mediterranean diet as a valuable and culturally acceptable healthy dietary concept.

P40 Effects of cold plasma application on antioxidant properties of dandelion root

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Compared to many traditional and novel methods, cold plasma has become an increasing trend in food research. It does not cause sensory problems in products, and it can cause relatively lower losses in nutritional values compared to thermal processing. Cold plasma studies applied to food are generally focused on inhibiting enzymatic activity and providing microbial inhibition by causing a change in the cell wall structure. In this study, the effects of cold plasma treatment on the antioxidant properties of dandelion root, which is considered food waste, investigated. Thus, the dandelion roots were ground into 450 µm-300 µm particles. Then, dielectric barrier discharge cold plasma (DBDCP) at 28 kV was applied to the ground samples for 30 s and 60 s. The cold plasma treatment chamber included a 74-mm cylindric stainless steel high voltage electrode (top) with a 3 mm thickness and a ground electrode (bottom). The two electrodes were separated with a glass dielectric barrier (2 mm thickness) attached to the top electrode. The distance between the dielectric barrier and the bottom electrode was 5 mm. All treatments were repeated twice. Samples that are not treated with DBDCP were used as the control. Then the samples were extracted in methanol with the aid of an ultrasonic water bath. Then, the total phenolic content and the antioxidant activity of the samples according to 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity and 2,2' azinobis (3-ethylbenzothiazoline-6-sulfonic acid) diammonium salt (ABTS) assays were measured. The DBDCP treatment up to 60 s did not cause only minor differences in the total phenolic content and antioxidant activity of the dandelion root samples, and these differences were not statistically significant. In conclusion, it can be said DBDCP can be utilized for the treatment of food waste high in bioactive content, such as dandelion root, without compromising its antioxidant potential.

Keyword: Cold plasma, antioxidant properties, dandelion root, food waste, phenolic content

P41 Enrichment of ice cream with roselle (*Hibiscus sabdariffa*) powder: Effects on antioxidant capacity and technological properties

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Ice cream is a frozen dairy dessert having good acceptability by children, adolescents, adults, and the elderly across the world. It is considered a good source of multiple nutrients. However, an ordinary ice cream formulation includes a lower concentration of bioactive compounds such as phenolic antioxidants. Therefore, the purpose of this study was to produce functional ice cream with the addition of roselle (*Hibiscus sabdariffa*) powder. The addition of the roselle powder (< 212 µm) into ice cream at 0.25, 0.5, 1, and 2% (w/w) resulted in significant changes in the total phenolic content, antioxidant capacity, color property, pH, and viscosity of the samples. The total phenolic content of ice cream samples varied between 21.60 and 35.44 mg GAE/100 g. The DPPH, ABTS, and CUPRAC antioxidant capacities of ice creams varied from 3.60 to 6.40, 95.52 to 147.20, and 4.71 to 11.95 mg TE/100 g, respectively. Ice cream samples with different levels of roselle powder showed significant differences in terms of color values compared with the control sample. The lowest L* and b* values as well as the highest a* value were measured in the sample containing 2% roselle powder. The addition of roselle powder led to a decrease in the pH, from 6.54 to 5.00, of the samples. The control sample had a lower viscosity value (1724 cP) compared to other samples. The addition of roselle powder up to 0.5% level increased the viscosity value, however, the viscosity of samples decreased after this level. Consequently, roselle powder could be used to improve the bioactive and technological properties of ice cream.

Keyword: Ice cream, hibiscus, enrichment, bioactive compounds

P42 Identification of *Lactobacillus plantarum* genes increasing the survival through the upper gastrointestinal tract

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Probiotics are defined as live microorganisms, which confer a health benefit on the host when administered at adequate amounts (FAO/WHO 2002). Potential probiotic strains should survive the passage through the upper gastrointestinal tract to be effective in the colon. Optimisatıon of the survival of Lactic acid bacteria through a ratıonal design is a quite difficult task. Since strains are subjected to various stress conditions such as low gastric pH, presence of bile salts and digestive enzymes and nutrient deprivation. Thus, evolutionary engineering has been employed to develop a *L. plantarum* strain with high survival rate through the upper gastrointestinal tract by using the TIM-1 system as a selective natural pressure. Comparison of whole genome sequences of the wild-type L.plantarum 129 and L.plantarum J-1 revealed that the mutations were point mutations, typical to EMS mutagenesis. Genome annotation studies revealed point mutations in the genes coding for phosphoribosylformylglycinamidine synthase subunit PurL, Glutamine ABC transporter, permease protein, DNA repair protein RecN, ribosome small subunit-dependent GTPase A, molecular chaperone DnaK, DNA-directed DNA polymerase III, alpha chain PolC-type phosphatidate cytidylyltransferase, cell surface protein, cardiolipin synthetase, and ATP-dependent zinc metalloprotease FtsH. Analysis of these mutations may suggest that the stress resistance of J1 might potentially result from two main molecular mechanisms: the modification of the cellular metabolism and the modification of the cell wall structure. To understand the complex molecular mechanisms of stress resistance and robustness in lactic acid bacteria during the passage through the uper gastrointestinal tract, further studies on the effect of these mutatıons and the mutations leading to increased survival in other lactic acid bacteria are necessary.

Keyword: Lactic acid bacteria, evolutionary engineering, TIM-1, probiotics

P43 Protective effect of phytosomes on the hemolytic activity of plant derived Aristoside-C and Davisianoside-B saponins

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Saponins are plant-derived molecules that are glycoside secondary metabolites with a broad distribution in plants. Saponins have a wide range of pharmacological effects, including anti-inflammatory, immunomodulatory, vasoprotective, antibacterial, antifungal, anticancer, and anticonvulsant activity. However, saponins show high affinity to membrane lipids which ends up with cell lysis. This is a big obstacle for the application of saponins as therapeutics. It is possible to increase biocompability, bioavailability, biosafety and overcome solubility problems by loading such plant extract to nanocarriers. Phytosomes are vesicular nanocarriers, consist of natural active ingredients and phospholipids. Phytosomes have emerged as prospective carrier systems for enhancing the biocompatibility and bioavailability of plant extracts, due to their structural components, which are similar to the lipid content of the mammalian cell membrane. In this study, phytosomal formulations of plant drived Aristoside C (*Cephalaria aristate Koch*), and Davisianosides-B (*Cephalaria davisiana Gokturk & Sumbul*) saponins were prepared thin film hydration technique. Phytosomal formulations of Aristoside-C saponin are called as ALPs and Davisianoside-B saponin as DLPs. Size and zeta potential values of phytosomal formulations were characterized by dynamic light scattering method. Hemolytic activity tests were performed for the evaluation of cell lysis property of phytosomal saponin formulations. In this analysis, increased hemoglobin absorbance is an indicator of cell lysis on erythrocytes. Hemolytic activity of ALPs and DLPs were evaluated by absorbance of hemoglobin release of erythrocytes via spectrophotometer at 540 nm. As a result, hemolytic activity of phytosomal saponin formulations were reduced dramatically that improves the biosafety of saponins.

Keyword: Saponin, phytosome, hemolytic activity, natural health product, vesicular nanocarrier

P44 Anti-inflammatory activity of fucoidan extracted from brown alga *Ecklonia maxima* leaves in particulate matter-stimulated RAW 264.7 Macrophage cells

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Ecklonia maxima is a brown alga mainly grows in the West coast of South Africa. Brown alga is a fine source of sulfated polysaccharides such as fucoidan. Fucoidan has been widely studied due to its numerous interesting biological activities including antitumor, antioxidant, anticoagulant, antithrombotic, immunoregulatory, and antiviral. In this study, structural characterization of sulfated polysaccharides extracted from E. maxima leaves was performed by using Fourier transmittance infrared spectroscopy analysis, high-performance anion-exchange chromatography with pulsed amperometric detection analysis of monosaccharide content, and nuclear magnetic resonance. Troll-like receptor (TLR)-mediated nuclear factor kappa B (NF-κB) and mitogen-activated protein kinase (MAPK) signaling pathways were assessed and the results indicate that fucoidan fraction 7 (EMLF7) purified from E. maxima leaves decreased the Troll-like receptor-mediated NF-κB and MAPK protein expressions in the particulate matter-stimulated RAW 264.7 macrophage cells. Thus, EMLF7 fucoidan fraction indicates the best anti-inflammatory activity and this was further proved by the successful down-regulation of Prostaglandin E2, NO, and pro-inflammatory cytokines, such as Tumor Necrosis Factor-alpha (TNF-α), Interleukin-6 (IL-6), and Interleukin-1β (IL-1β). Moreover, EMLF7 comprises the highest sulfate content among the extracted fucoidan fractions. Hence, these findings confirm the anti-inflammatory activity of EMLF7 and its potential use as a low-cost fucoidan source.

Keyword: *Ecklonia maxima*, fucoidan, sulfated polysaccharide, inflammation

P45 Development of a 3D printer and its application on fungi based diet for elderly/dysphagia patients

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New technology brings new solutions for chronic problems. Elderly people or dysphagia patients suffers from mastication and swallowing food and has limited choices of food sources, which has the risk of malnutrition. 3D-printing technology, which spread along different research areas, contains different opportunities in food technology and can be used to overcome this problem. In this study a laboratory type 3D-Printer that is capable of printing shaped foods was constructed and possible food printing capabilities was observed. For this purpose dryed mushrooms which contains high antioxidants and rich in protein was mixed with an edible food ink that comprised of soy protein and xanthan gum paste. Fungis; *Pleurotus ostreatus* (oyster mushroom) and *Agaricus bisporus* (cultivated brown mushroom) that have 19.83% and 33.42% amount of protein in dry base and antioxidant activity of 7.60 mg/g and 11.77 mg/g and phenolic content of 6.00 mg/g and 4.74 mg/g dry fungi respectively, was used. Printing of edible ink was conducted with 1.6 mm nozzle size, speed of 20 mm/s and 1.5 mm layer height with 4 layers. As a result, a regular polymer-printing 3D-Printer was converted to food printing capable laboratory scale food printer and a layered flower shape, that has size of 47 mm width and height, was printed with fortified food paste (ink). This research showed that visual acceptance of paste-like foods that fortified with mushrooms can be increased by new technology 3D food printers and so that they can be possible solution for malnutrition of patients.

Keyword: Mushroom, 3D, food printer, elderly food, fortified food paste

P46 Mineral profile of enriched modern bread with an ancient Anatolian wheat from Türkiye

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Bread is an essential part of the diet in many cultures accounting for a significant portion of daily carbohydrate energy intake. *Triticum aestivum* L., a hexaploid (2n=42 chromosomes) is a high-yielding wheat also known as "common wheat," "bread wheat," or "modern wheat," which makes up around 95% of wheat production. However, ancient grains are becoming popular with their nutritional and dietary value and unique flavor qualities. *Triticum turgidum* ssp. *dicoccum*, also known as "kavilca" grown in Kars, Türkiye, is rich in terms of resistant starch, phytochemical, fibers, and especially minerals. Mineral deficiency in a diet negatively affects human health, especially in countries where there is insufficient consumption of fruits, vegetables, and foods of animal origin. The aim of this research was to determine the mineral composition of wheat bread enriched with 15% *Triticum turgidum* ssp. *dicoccum* flour and this way to support the integration of ancient wheat into bakery products. The mostly found macro element in the bread was K (209.84±0.65 mg/100 g dw) ($p<0.05$). The bread was rich in terms of essential elements Mn (18.40±0.10 mg/kg dw), Fe (15.82±6.15 mg/kg dw), and Zn (7.94±3.08 mg/ kg dw), respectively. The amount of Al in the bread sample was 6.22±1.34 mg/kg dw which is a toxic element. The addition of 15% *T. dicoccum* flour increased the amount of Ca, Mg, K, Mn, Zn compared with 100% wheat flour. This study would encourage the integration of *T. dicoccum* into the food industry.

Keyword: *T. dicoccum, T. aestivum*, ancient wheat, bread wheat, mineral

P47 Encapsulation of bioactive algal pigments: Optimization for functional food applications

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Usage of bioactive algal pigments have considerably increased in recent years with key applications in functional food and beverage sectors, as well as nutraceutical and pharmaceutical industries due to their high antioxidant activities, antimicrobial and antiviral effects, flavor and fragrance advantages. Among the highly sought pigments from microalgae, phycocyanin is a blue colored, odorless, non-toxic, water-soluble natural colorant with strong fluorescent properties and strong neutralization against reactive oxygen species. Astaxanthin, is one of the most potent antioxidants, with applications in fish feed and nutraceuticals. Beta-carotene from marine algae also has promising effects for several olfactory diseases and natural orange-coloring agent. These pigments, collectively can be used as natural pigments in food, textiles and cosmetics as safe and sustainable alternatives of synthetic pigments. Their antioxidant and anti-inflammatory properties contribute to extended usage in functional foods as well as pharmaceutical industry. In this study, the optimization of maximum recovery for microalgal bioactive pigments will be evaluated by changing the immobilization conditions during encapsulation processes. Effects of alginate concentration, $CaCl_2$ concentration, temperature of $CaCl_2$, bead size, crosslinking time on bioactive pigment loading efficiency into alginate beads will be presented.

Keyword: Phycocyanin, astaxanthin, spirulina, cyanobacteria, encapsulation

P48 Determination of antiviral properties of an herbal food supplement against Wuhan (B.1.36) variant of SARS-COV-2 virus

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The pandemic of coronavirus disease 2019 (COVID-19) is caused by SARS-CoV-2, which can cause mild symptoms to life-threatening pneumonia. Infection from the disease still constitutes a hazard to global health. Consequently, disclosing efficient research methodologies and identifying quantification procedures are crucial. Biosafety level 3 (BSL3) laboratories are required for handling coronavirus neutralization procedures securely. Vaccine and new medicine development necessitate the use of effective and appropriate techniques [Zheng, 2013]. For this study, a high-throughput, quantitative RTCA assay was performed using xCELLigence RTCA MP (Agilent Technologies, CA, USA) to determine the herbal food supplement Phytorelief® 's effects on the (B.1.36) SARS-CoV-2 virus. As a model for SARS-CoV-2 viral infection, the Vero E6 cell line, derived from the kidney of an African green monkey, was utilized. Phytorelief® samples were diluted serially and cultured with Vero E6 cells in the presence of the SARS-CoV-2 Wuhan (B.1.36) virus. During 160 hours, the cell viability was assessed at 15-minute intervals and graphed cell-index data indicating cell viability based on impedance was recorded [Rahim 2011]. The investigation revealed that in the presence of SARS-CoV-2, Phytorelief® samples with a concentration of 31.25 ug/mL maintained cell viability for 160 hours. Based on impedance and cell-index data, this dose delayed the Wuhan variant (B.1.36) of SARS-CoV-2 infection in Vero E6 cells by 41 hours relative to the control virus and had a neutralization rate of 45.4%.

P49 Immunomodulatory effects of selected medicinal herbs and their essential oils: A comprehensive review

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Medicinal herbs and their essential oils are used in human health promotion and disease prevention since ancient times. In the last two decades, many studies have been carried out to both identify bioactive compounds in medicinal herbs and derived essential oils and to examine their biological effects in experimental models; clinical trials, however, have been scant. This review discusses in vitro, in vivo, and clinical evidence supporting the immunomodulatory role of eleven medicinal herbs (bay laurel, black cumin, clove, fennel, lemon balm, lemongrass, marjoram, peppermint, rosemary, sage, and thyme) and their essential oils and bioactive components. Safety and toxicity aspects for consumption as well as future perspectives are also covered. Relevant data from the existing literature have been compiled and summarized. These herbs and oils, which are increasingly consumed, can be considered as valuable dietary supplements due to their health-promoting bioactive constituents. Well-design clinical trials are warranted to better ascertain the immunomodulatory effects of these herbal products.

Keyword: Medicinal herbs, essential oils, immunomodulation, polyphenols, safety

P50 Knowledge in red palm oil as functional food towards purchase intention and future purchasing patterns among Malaysian

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Red palm oil (RPO) is regarded as a super food that contains provitamin A carotenoids which will be converted to vitamin A by the body once ingested. RPO contains mainly beta-carotene (apart from alpha-carotene), which yields the most vitamin A out of all the provitamin A carotenoids. Carotene particularly strengthens the body's immune system, helps boost heart health and may help reduce the risk of cancer. The American Dietetic Association (ADA) Report has stated that functional foods include whole foods and fortified, enriched, or enhanced foods that have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels. Some foods are now viewed as "super foods" because of their therapeutic effects, as possible cure and prevention of diseases. These super foods are known as functional foods which contain additional benefits beyond nutritional value. Research on the knowledge on RPO and functional food towards purchasing patterns is scarce among Malaysians. Hence, this study determines whether knowledge on functional food and RPO influence purchase intention and future purchasing pattern of an RPO-based product. The survey was conducted by MITRANS in collaboration with MPOC and IIUM. Survey questions were disseminated to respondents (n=300). Statistical analysis was conducted by Smart PLS. Majority have knowledge on functional food, red palm oil, it's halal status and B carotene content. Moreover, majority perceived familiarity and information on product label/information reflect safety and quality of halal functional food. In the future, majority would switch eating patterns toward functional food and would purchase and consume such products.

Keyword: Functional food, red palm oil, fats and oil, lipids, survey

P51 Antimicrobial activity of pomegranate peel

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Pomegranate *(Punica granatum*) which is a perennial plant belonging to the *Punicaceae* family, is an important source of polyphenols. Nowadays, studies have increased to evaluate the peel, which constitutes forty percent of the pomegranate. In these studies, the antioxidant activities of the extracts obtained from the pomegranate peel by the help of solvents such as methanol, ethanol and acetone were investigated. Also as a result of these studies, it has been proven that the pomegranate peel has high antioxidant properties due to the presence of tannins. Tannins, which bind and precipitate proteins, are divided into hydrolyzable and non-hydrolyzable (condensed) tannins according to their molecular structures. Hydrolyzable tannins are derivatives of the gallic acid and are divided into gallotannins and ellagitannins. Ellagitannins are a complex polyphenol group which include one or more hexahydroxydiphenol (HHDP) group. Ellagitannins are unstable in nature under physiological conditions. Generally, ellagitannins are turn into more stable structure like ellagic acid which is not easily hydrolyzed as a result of hydrolysis and polymerization reactions. The components such as punikalagin, punicalin, gallic acid, ellagic acid glycosides are tannin group components which provide antioxidant properties. For many years it is known that tannins have a bacteriostatic or bactericidal effect against microorganisms. There are too many opinions about the antimicrobial mechanisms of tannins. One of them is toxicity due to the effect of tannin on cell membranes. In addition, since tannins easily form complexes with the substrate or enzymes in the environment, they show an inhibition effect. Tannins can cause toxicity with their high ion binding capacity. Also, tannins show antiviral effect by inhibiting the replication of viruses. According to increasing studies on the bioavailability of tannins, the use of pomegranate peel extract in functional foods is increasing.

P52 Nutritional importance of blueberry

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Vaccinium myrtillus L., also known as the blueberry in the *Ericaceae* family, is one of the grape-like fruits that has rich content. It was determined that 100 grams blueberry fruit occurs 83% water, 0.7% protein, 0.5% fat, 15% carbohydrates, 1.5% fiber and provides 62 calories. Blueberry has high antioxidant capacity and include much phenolic compound. There are many studies about the antioxidant activity of the blueberry extract that prepared by different extraction methods. Potential antioxidant, anticancer, antimicrobial and anti-inflamatuar activities of the blueberry takes part in the literature. Also it is known that blueberry has been tried for treatment of the illnesses. Many researchers have used extracted anthocyanin instead using blueberry fruit directly and they prove that anthocyanins have important role in the activity of the blueberry. Anthocyanins which include in flavonoid group of the phenolic compounds are glycoside form and responsible from the specific colours of fruit and vegatables that wide range of red to purple. Anthocyanins can absorb the light that has 400-800 nm wavelength. In the structure of phenolic compounds which make up the aglycone part of anthocyanins has hidroxyl group and metoxy group, hidroxyl group is responsible from the blue colour and the metoxy group is responsible from the red colour. According to studies, anthocyanins reduce the risk of developing chronic diseases by supporting the body's defense system. In addition, these compounds have been detected to reduce oxidative stress and inflammation, repair DNA damage, reduce platelet reactivity and contribute to the reduction of neurotoxicity. Anthocyanins which include in the blueberry are 3-*O*-galactosides, 3-*O*-glycosides, delphinidin, cyanidin, petunidin, peonidin and malvidin-3-*O*-arabinoside. And it is estimated that these anthocyanins constitute ninety percent of the total phenolics of the blueberry. Consumption of blueberry which the high anthocyanin contents are proven by many studies will support the diet rich in antioxidants.

P53 Determination of marker phenolic compounds for honeys with different botanical origins

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In this study, total phenolic content, antioxidant capacities, and phenolic compound compositions of 128 honey samples of different botanic origins were investigated. Pine, sunflower, cotton, citrus, and polyfloral honey samples were obtained directly from beekeepers. Total phenolic content and antioxidant capacity were determined by spectrophotometric methods, and the phenolic compound composition was determined by HPLC-PDA. The total phenolic contents varied on average from 25.8 to 65.8 mg GAE/kg. The highest average total phenolic content was observed in pine honey. Using DPPH method, the average antioxidant capacities of the samples ranged from 16.8% to 68.2%. The highest average antioxidant capacity was observed in pine honey. It has been determined that pine honeys were significantly different from other honey types in terms of protocatechuic acid, syringic acid, and taxifolin, while sunflower honeys were significantly different in terms of 3-4 dimethoxy cinnamic acid, naringenin and quercetin, citrus honeys in terms of chlorogenic acid, cotton honeys in terms of myricetin and polyfloral honeys in terms of gallic acid. Based on a CART® test an 8 Node Tree explains %94 for Polyfloral, %100 of the samples for pine and citrus, %100 for sunflower, and for cotton honeys with one misclassified polyfloral sample for each type.

Keyword: Honey types, phenolic compounds, marker compounds, CART

P54 Encapsulation and storage stability of rosemary extract

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Antioxidant activities of rosemary (*Rosmarinus officinalis* L.) extracts are related to the presence of phenolic diterpene compounds, such as carnosic acid (CA), carnosol (C) and rosmarinic acid (RA). Carnosic acid and carnosol are lipophilic antioxidants that scavenge singlet oxygen, hydoxyl radicals and lipid peroxyl radicals thus preventing lipid peroxidation. The addition of rosemary extracts to foods is still challenging due to their low water solubility. The aim of this study was to encapsulate rosemary extract with different wall materials by spray drying to powder form increasing water solubility. Powder properties and stability of CA, C and RA during storage were evaluated. Four different combinations of maltodextrin (MD), gum arabic (GA) and whey protein concentrate (WPC) were used as wall materials in 1:1 ratio (extract: wall ratio). Drying process was performed in a spray drier at 170 °C. Encapsulation efficiency, particle size analysis, wettability, moisture and water activity analysis were carried out. Microstructure of encapsulated extracts was analysed by the scanning electron microscope. CA, C and RA contents of encapsulated extracts were analysed at 23 °C for 6 months. Combination of GA+WPC showed the highest encapsulation efficiency at 79.9% as the retention of total CA+CA. Mean particle size of encapsulated powder was obtained as 71.69 nm with 4.06% moisture, 0.085 water activity and 10.20 min wettability. Encapsulated powder contained 3.98, 2.00 and 0.46 mg/100mg CA, C and RA at the beginning of the storage, respectively. CA, C and RA contents decreased 9.16%, 48.52%, 2.15% and reached to 3.62, 1.03 and 0.45 mg/100 mg at the end of the 6 months storage. ESEM micrographs showed the encapsulated powder as spherical particles with no cracking. GA and WPC are suitable encapsulation materials with better encapsulation efficiency for rosemary extract.

Keyword: Rosemary, encapsulation, carnosic acid, carnosol, rosmarinic acid

P55 Antinutritional compounds in faba bean (*Vicia faba*) proteins as affected by different extraction methods

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Faba bean is a legume crop with a higher seed protein content (26-35% protein) and limited use as human food. Recently, faba bean proteins have gained popularity as a potential alternative protein source for the food and supplementary food industry, generating a vast array of new knowledge and information. In this study, we aimed to determine the antinutritional compounds in faba bean proteins extracted using a newly optimized extraction method based on the Deep Eutectic solvents compared to the traditional alkaline extraction method. Total phenolic content, phytic acid content and trypsin inhibitor units were determined in extracted proteins and faba bean flour based on the dry weight of samples. DES extracted proteins had higher contents of total phenolics (93.4 mg of GAE/ 100 g sample) and trypsin inhibitor units (7.3 TIU/mg sample) compared to those in alkaline extracted proteins (25.7 mg of GAE/ 100 g sample and 5.2 TIU mg sample, respectively). However, the phytic acid content in DES extracted proteins was lower (603 mg/ 100 g sample), than in the alkaline extracted protein sample (1646 mg/ 100 sample). These results indicate that the extraction method can significantly alter the composition of minor compounds such as antinutritional factors in extracted protein samples, and it is important to assess these aspects before utilizing these proteins as protein supplements.

P56 Effect of citric acid fortification on the properties of tiger nut flour

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The effect of citric acid fortification on the properties of tiger nut flour was evaluated. Flour was obtained from tiger nut and fortified with citric acid after which proximate and antinutrient compositions of the native and fortified tiger nut flour were evaluated using standard methods of analysis. Doughnut was produced with fortified flour after which, sensory evaluation, microbial analysis and shelflife was compared with that of unfortified flour (positive control) and wheat flour (negative control). Result showed that there were significant differences ($P<0.05$) in the proximate, antinutrient and sensory evaluations of the fortified flour and that of the control. The ash and carbohydrate contents of the fortified flour (5.51 ± 0.1 and 67.52 ± 0.031%, respectively) were significantly higher ($P<0.05$) than the control (1.60 ± 0.1 and 44.36 ± 0.011%, respectively). Protein contents of the control (5.50 ± 0.0%) was significantly higher than that of the fortified flour (4.20 ± 0.00%). Phytate, oxalate and tannin contents of the fortified flour samples (0.667 ± 0.54, 1.8008 ± 0.01, 0.220 ± 0.11%, respectively) were significantly higher than the control samples (0.845 ± 0.28, 11.399 ± 0.42 and 0.117 ± 0.31%, respectively). Cyanide contents of all the flour samples were not significantly different from each other. Organoleptic score revealed that the taste, texture and appearance of doughnuts made with fortified flour was better than the controls, hence doughnuts made with fortified flour was the most acceptable and preferred. No bacterial growth was recorded in all the doughnut samples however; the shelve-life of doughnuts prepared with fortified flour was higher than (6 days) that of unfortified (4 days) and wheat flour (3 days). Therefore, fortified tiger nut flour may replace the conventional wheat flour in bakery and confectionary owing to its nutritional value and longer shelflife.

Keywords: Citric acid, tiger nut flour, fortification, shelflife

P57 Biochemical and heamatological indices of weanling wistar albino rats fed sprouted sorghum and bambara flour formulated diets

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This study focused on the effect of formulated weaning diets from sprouted sorghum and bambara nut flours on the biochemical and haematological indices of weanling albino rats. Experimental rats were randomly distributed into eight groups (A to H) of five each and fed the formulated diets for 28 days. Groups A and B were fed only sorghum and Bambara flour respectively while groups C, D, E and F were fed blends of sprouted sorghum and graded Bambara nut (5, 10, 15, and 20 % respectively) flours. Group G was fed normal rat chow while group H was placed on standard baby food (Cerelac). Haematological parameters were determined using auto-haematological analyzer and biochemical parameters were determined using Randox assay kits. The group fed 20 % sprouted Bambara nut had significantly higher ($p<0.05$) weight gain (15.28 %) than the other experimental and control groups. The PCV, Hb, MCV and MCH were significantly ($p<0.05$) higher in the group fed standard diet than in other groups. No significant difference ($p>0.05$) was observed in the RBC of groups F (20 % Bambara nut) and the standard diet. The AST, ALT and ALP values were significantly higher in groups fed only sorghum and Bambara nut flours and lowest in the standard group. The renal function indices were significantly ($p<0.05$) higher in the standard diet group except for total bilirubin. The findings suggest that the blend of sprouted sorghum and bambara nut flours are safe and can find relevance in formulation of weaning diets.

Keyword: Supplementation, proteins

P58 *In vivo* toxicological evaluation of edible chitosan- starch film for food packaging

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This study aimed at evaluating the toxicity of edible chitosan-starch film in albino rats. Edible chitosan-starch film was prepared by the casting method, commercial rat diet was supplemented with 5 – 40 % portions of chitosan film, proximate analysis was carried out using AOAC methods. Twenty-five rats were randomly distributed into five groups and fed the supplemented diets for 28 days. The daily feed intake, weekly body weight was taken. Hematological and biochemical parameters were determined using auto-hematology analyzer and Spectrum diagnostic kits respectively. Histopathology of the liver, kidney and intestine was carried out. Chitosan was significantly ($p<0.05$) lower in all proximate components except for carbohydrate and fibre, chitosan film was significantly higher in moisture, fat and ash compared to the supplemented diet and the control. Rats on 5% edible chitosan-starch film had the highest feed intake and weight gain while those on 40% had the least. The kidney and intestine body-weight ratios were significantly ($p<0.05$) lower in the rats on the supplemented diets compared to control, not different in the liver body-weight ratio. Hematological parameters varied significantly in experimental rats. Serum enzymes in rats fed the supplemented diets were significantly higher than control. The total protein in the diet groups were similar to the control but significantly ($p<0.05$) lower in albumin and higher in bilirubin. The renal function parameters were significantly higher ($p<0.05$) in the experimental groups and lower in lipid profile indices except HDL when compared to the control. The liver showed normal intact hepatic cells, while kidney and intestine showed degeneration of the glomeruli, capsular space, and connective tissue inflammation in rats fed diets above 5% of edible chitosan-starch film. This study suggests that edible chitosan-starch films may be toxic to albino rats at levels higher than 5% diet inclusion.

Keyword: Chitosan, edible chitosan -starch film, supplemented diet

P59 Detrimental impact of the fine dust in an aquatic organism Zebrafish: A protective agent on ocular damage *in vitro* and *in vivo* model

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Pollution caused by fine dust is becoming a global problem in the aquatic environment. Many research works have been undertaken on the hazards that fine dust can pose to terrestrial organisms, but information of the effects on the aquatic environment remains limited. In this study, the physicochemical characteristics of the fine dust associated with the captured powder or liquid state were compared using scanning electron microscopy (SEM) and energy dispersive X-ray spectrometry (EDS). Raw fine dust (RFD), as the captured powder state, was suspended in water (SFD), and its elemental composition, morphology, and size distribution were analyzed. Zebrafish were used as the model to study the effects of SFD on aquatic organisms. A fatal malformation was observed in the integument of zebrafish exposed to SFD, especially in the exterior and interior eye tissues. Furthermore, the exposure of SFD to Tg(flk;EGFP) zebrafish remarkably increased ocular vessel diameter expansion along with blood flow velocity. Regarding vessel diameter expansion, EA.hy926 cells exposed to SFD were adversely affected, with a significant increase in cell migration and capillary-like structure formation, which are angiogenic markers. The SFD-induced angiogenesis *in vitro* and *in vivo* was dramatically restored to normal via α/β-adenosine isolated from the anti-angiogenic brown algae *Ishige okamurae* extract. Taken together, the current study presents solid evidence of the altered physicochemical characteristics of SFD compared to RFD, and the detrimental impact of SFD in an aquatic *in vivo* zebrafish model. In addition, the protective effect of α/β-adenosine, a marine natural product, on SFD-induced angiogenesis suggests that it can be used as an agent to reduce the adverse effects of SFD on aquatic animals.

Keyword: Zebrafish, *Ishige okamurae,* aquatic organism, scanning electron microscopy&Energy dispersive X-ray spectrometry, water pollution

P60 Phytochemical composition, antioxidant and enzyme inhibitory activities of *Dioscorea caucasica* and *D. nipponica* leaf and tuber extracts

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Dioscorea is a large genus of Dioscoreaceae family, consisting of about 715 species. Nowadays, the most important from the nutritional point of view species are spread worldwide and commonly are called yams. *D. nipponica* Makino grows naturally in China, Korea, Manchuria, Russian Federation, Japan; *D. caucasica* Lipsky is a rare tertiary relict endemic plant naturally growing in the Western part of Transcaucasia regions. More recently, both species have been well adapted in the temperate region of the Baltic sea countries as well. Ethnopharmacological information about health benefits of yam preparations encourages more systematic studies to further unravel their chemical composition and bioactivities. This study reports phytochemical composition of hydroethanolic extracts of *D. nipponica* and *D. caucasica* leaves and tubers, their antioxidant properties and effects on physiologically important enzymes, namely α-amylase, α-glucosidase, acetylcholinesterase (AChE) and angiotensin converting enzyme (ACE). The leaf extracts were remarkably stronger inhibitory agents that tuber extracts and, in general, inhibited the enzyme activity in a dose-dependent manner. For instance, the level of inhibition by *D. caucasica* leaf extract was 11.94 to 78.49% (at 3.125–100 µg/mL); 12.8 to 48.6% (at 80–480 µg/mL); 27.55 to 45.85% (at 25–100 µg/mL) and 35.46 – 58.34% (at 250 – 1250 µg/mL) for α-glucosidase, α-amylase, AChE and ACE, respectively. It is evident that inhibition of α-glucosidase and AChE required lower leaf extract concentrations as compared with other two tested enzymes. For instance, the IC_{50} values (the concentration required to reduce enzyme activity by 50%) of α-glucosidase and α-amylase inhibition by *D. nipponica* leaf extract were 66.08 and 438 µg/mL, respectively, while the inhibition of ACE at 250-1250 µg/mL varied from 28.02 ± 1.17 to 77.13 ± 0.78%. According to the results obtained by chromatography-mass spectrometry (UPLC-QTOF/MS), the leaf extracts were rich in phenolic acids (mainly quinic and chlorogenic acids) and flavonoids (mainly quercetin glycosides), while the tuber extracts contained several tentatively identified hydroxylated long chain fatty acids and saponin glycosides. Leaf extracts, most likely, due to the presence of polyphenolic compounds, were remarkably stronger antioxidants and enzyme inhibitors than tuber extracts. Quinic, chlorogenic acids and quercetin glycosides are well-known enzyme inhibitors from the previously published results. Kinetics studies using Lineweaver-Burke inhibition plots were performed to establish inhibition mode; for instance, leaf extracts displayed a mixed-type non-competitive mode of α-glucosidase inhibition, while tuber extract competitively inhibited this enzyme. It may be concluded that the inhibitory effects of hydroethanolic *Dioscorea* extracts were from weak (tubers) to mild and therefore they may be considered as possible 'soft regulators' of the activities of the tested enzymes when applied in the formula of foods and/or food supplements. In general, the results obtained substantially expand our knowledge on *D. nipponica* and *D. caucasica* as a promising underutilised crop in developing new health beneficial ingredients for functional foods and nutraceuticals.

Keyword: Antioxidant, extract, *Dioscorea caucasica*

P61 Anti-hypertensive effect of peptide from olive flounder (*Paralichthys olivaceus*) in EA. hy926 cells and in spontaneously hypertensive rats

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Olive flounder (*Paralichthys olivaceus*) is the one of the major species developed for aquaculture in South Korea. However, their overproduced biomass is often discarded due to overproduction, causing considerable losses to the fishery industry. Therefore, it is necessary to study how to utilize the surplus Olive flounders. The current study was aimed to separate bioactive peptides (IE; Leucine-Glutamic acid, IER; Leucine-Glutamic acid-Arginine, IDD; Leucine-Aspartic acid-Aspartic acid) from protamex-pepsin assisted hydrolysate from *Paralichthys olivaceus* ($PO_{pp}H$) and investigate their potential anti-hypertensive activity *in vitro* and *in vivo*. *In vitro* study, peptides from $PO_{pp}H$ significantly increased the nitric oxide (NO) production and hydrogen sulfide (H_2S) production in EA. hy926 cells by up regulation of p-eNOS, p-AKT, p-PI3K in EA. hy926 cells. In *in vivo* study, blood pressure measurement using CODA non-invasive BP system showed significant decrease in systolic blood pressure after 6 hours of sample administration. IER show most significantly decrease systolic blood pressure compared with control group of SHRs model (Systolic: SHRs 158.70 ± 20.00 mmHg vs IER-treated group 140.30 ± 16.57 mmHg). Our findings demonstrated that peptides from *Paralichthys olivaceus* possessed potential anti-hypertensive activity and we suggest that $PO_{pp}H$ and its peptide could be used as a raw material in food and functional food industries.

P62 Bioactivity screening for antioxidant and anti-inflammatory activities of marine microorganisms (bacteria, fungus, microalgae) collected in South Korea

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Seas of South Korea have many different specific environments characterized by a wide range of temperatures, hydrostatic pressures, and levels of salinity. For this reason, a wide variety of marine microorganisms exist in seas of south Korea. Marine microorganisms are promising sources of new bioactive compounds of potential value to humans. Therefore, the purpose of this study is to investigates bioactivities of marine microorganisms that inhabit in seas of South Korea. In this study, antioxidant and anti-inflammatory effects were investigated for 120 species of microorganisms (80 species of bacteria, 20 species of fungi, and 20 of microalgae). All samples were extracted by different extraction methods (XAD, EtOH/EA, sonication). Antioxidant activities were evaluated by DPPH radical scavenging assay, ABTS radical scavenging assay, and ROS scavenging in RAW 264.7 cells. Seventeen samples showed over 60% of ABTS radical scavenging activity at 50 μg/ml concentration. Anti-inflammatory activities were evaluated by NO and PGE2 inhibitory activities. PGE2 inhibitory effect using PGE2 sensitivity ELISA kit, no effect on 40% PGE2 inhibition activity was found in all extracts. As a result of measuring the NO inhibitory effect using the Griess reagent kit, nitric oxide production was inhibited by more than 40% in a total of 10 types of samples. Concisely, these results could help to better utilize this resource as a functional raw material for marine microorganisms that inhabit in the seas of South Korea.

P63 Immuno-enhancing effect of fucoidan from brown seaweed *Sargassum thunbergii in vitro* and *in vivo*

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Fucoidan prepared from marine algae are potential ingredients in nutraceutical, pharmaceutical, and cosmeceutical industries. The purpose of this study was to evaluate the immuno-enhancing effect of a fucoidan isolated from *Sargassum thunbergii* by ethanol precipitation. Fucoidan (S3) possesses the significant highest sulfated polysaccharide (58.64 ± 1.33%) and lowest polyphenol contents (3.53 ± 0.26%). S3 exhibit contained a relatively higher amount of fucose (197 mg/g), galactose (89 mg/g), and xylose (47 mg/g), moreover, guluronic acid (11 mg/g) and mannuronic acid (18 mg/g) content was lower than the others especially the sodium alginate (S4) sample. S3 effectively enhanced NO production in vitro in RAW 264.7 macrophages and in vivo in zebrafish. Furthermore, phagocytosis is an important defense mechanism that provides protection against pathogen incursion and clearance of necrotic cell debris in the immune system. S3 significantly increased the phagocytic activity. More importantly, our results demonstrated that fucoidan from *Sargassum thunbergii* upregulated the secretion of TNF-α, IL-6, IL-1β, and IL-10 in a dose-dependent manner through upregulation of NF-κB signaling pathways. In terms of monosaccharide composition, S3 contains relatively high content of fucose and galactose, which contribute to its role as an immunomodulator. Taken together, S3 may exert its immuno-enhancing potency via activating NF-κB signaling pathways, and suggest that S3 could potentially be used as ingredient in nutritional, pharmaceutical, and functional food.

Keyword: *Sargassum thunbergii*, fucoidan, immuno-enhancing, NF-κB

P64 Sargachromenol isolated from *Sargassum horneri* inhibits particulate matter-induced inflammation in macrophages through toll-like receptor-mediated cell signaling pathways

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Sargassum horneri is an invasive brown seaweed that grows along the shallow coastal areas of the Korean peninsula. It is recognized as potentially harmful to fisheries and natural habitats in the areas where it is accumulated. Sargachromenol is a highly abundant sesquiterpene found in *S. horneri.* Terpenoids or its derivatives express anti-inflammation activities. Therefore, the author attempted to evaluate the anti-inflammatory mechanism of Sargachromenol isolated from *S. horneri* against particulate matter (PM)-stimulated RAW 264.7 macrophages. PM is a potent inducer of respiratory diseases such as lung dysfunctions and cancers. In the present study, the anti-inflammatory properties of Sargachromenol were validated using enzyme-linked immunosorbent assay (ELISA), Western blots, and RT-qPCR experiments. According to the results, Sargachromenol (15.6–62.5 μg/mL) showed low toxicity in RAW 264.7 macrophages and significantly increased the viability of PM-stimulated cells. The treatment of Sargachromenol significantly downregulated the PM-induced Prostaglandin E2 (PGE2), pro inflammatory cytokines including tumor necrosis factor (TNF-α), interleukin (IL)-1β, interleukin (IL)-6, and nitric oxide (NO) secretion via blocking downstream activation of Toll-like receptor (TLR)-mediated nuclear factor kappa B (NF-κB) and MAPKs phosphorylation. The present study provides an insight into PM-induced inflammation and its reduction by Sargachromenol. Thus, Sargachromenol is a potential candidate for innovation in various fields including pharmaceuticals, cosmeceuticals and functional food.

Keyword: Sargachromenol, *Sargassum horneri*, particulate matter, anti-inflammation

P65 *Sargassum horneri* as a prebiotic dietary supplement for immunity development in *Streptococcus parauberis* infected zebrafish model

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Sargassum horneri (SH) is a brown macroalgal species commonly found along the coast of Japan, China, and Korea. SH possesses valuable bioactive compounds that can be developed as functional food ingredients as well as pharmaceutical agents for both humans and animals. In this study, SH was tested for its potential prebiotic effect. Several solvent-assisted extracts of SH were tested on the growth of three species of probiotics (LAB) (*Lactobacillus plantarum*, *Lactobacillus pentosus, Lactobacillus brevis)* and fish pathogen bacteria (*Streptococcus iniae, Streptococcus parauberis, Edwersiella tarda*) both in vitro and in vivo. According to the in vitro results, Celluclast extract (SHC) and crude polysaccharide extract (SHCPs) of SH showed outstanding growth enhancing activity in all LAB species and excellent antibacterial activity against pathogenic bacteria dose-dependently. Both SHC and SHCPs induced the production of secondary metabolites from LAB. The secondary metabolites successfully reduced pathogenic bacterial growth. Furthermore, in vivo experiments revealed that co-treatment with LAB and SHC/SHCPs diminished the mortality of *S. parauberis-infected* zebrafish by modulating iNOS, COX-2 expressions. Similarly, SH act as an anti-inflammatory agent against *S. parauberis* infection by hindering NF-κB pathway activation. Conclusively, the results achieved from the study suggest that S. horneri has the potential to be used as a prebiotic dietary supplement and possesses a protective effect against *S. parauberis* infections in the aquaculture industry.

Keyword: *Sargassum horneri*, prebiotics, *Streptococcus parauberis*, secondary metabolites, diet

P66 Enzymatic hydrolysis of head byproducts from olive flounder surimi industry: pepsin hydrolysate attenuates LPS-induced inflammation and oxidative stress in RAW 264.7 macrophages *via* blocking cell signaling pathways

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Surimi industry-related fish head byproducts contribute around 15% of the total body weight which are often discarded in the ocean or produce less value-added products. However, previous studies evidenced those byproducts as having health-promoting effects due to the high amount of essential nutrients. Olive flounder (OF), one of the most common fish species in South Korea, was targeted for this study to optimize its utilization. The inhibitory potential of OF head byproducts pepsin hydrolysate (OFH-PH) against lipopolysaccharide (LPS)-induced inflammation and oxidative stress were examined in RAW 264.7 macrophages. OFH-PH showed strong anti-inflammatory activity via down-regulating nitric oxide (NO) while upgrading the cell viability in an *in vitro* model. For further confirmation, the inhibitory potential of pro-inflammatory cytokines (IL-1β, IL-6, TNF-α) and PGE2 was evaluated. Moreover, the results were supported by the inhibitory activity of iNOS and COX-2 protein expressions. Western blotting was carried out to analyze the expression levels of inflammation-related and oxidative stress-related pathway proteins. The results evidenced that the mediation is activated via nuclear factor κB (NF-κB) and mitogen-activated protein kinase (MAPK) pathways. Inflammation is directly linked with oxidative stress, which could be assessed using the Nrf2/HO-1 pathway. The results so obtained suggest that OFH-PH is a potential candidate for anti-inflammatory activity-based nutraceuticals and functional foods.

Keyword: Fish head byproducts, anti-inflammatory activity, oxidative stress, NF-κB and MAPK pathways, Nrf2/HO-1 pathway

P67 Bioavailability of short-chain peptides and amino acid derivatives in miso in rat

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Miso is Japanese traditional seasoning. It is made of steamed soybean, fungus starter and salt. Fungus starter is prepared by inoculation of *A. sajae* to steamed soybean, rice or barley. Soybean proteins are degraded to amino acid and short-chain peptides during fermentation. We have demonstrated presence of four isomers of D/L-aspartyl isopeptides, pyroglutamyl peptides, proline-containing diketopiperazines, and *N*-acetyl amino acids in water extract of miso. The objective of the present study is to evaluate bioavailability of these compounds. Wistar/ST rat were acclimated for one week. Blood and inner content of small intestine (lumen) were collected one hour after oral administration of water or water extract of miso which was prepared from miso with soybean-based fungus starter (1 g/kg rat). The compounds identified in miso were chemically synthesized and used as standards. Peptides and amino acid derivatives were quantified using LC-MS/MS in MRM mode. After single administration of water extract of miso, there were no, significant difference in contents of almost all simple protein fragment peptides detected in miso. In contrast, contents of aspartyl peptides with b-peptide bonds were significantly increased in lumen and only hydrophobic aspartyl peptides with b-peptide bonds were significantly increased in plasma. Contents of almost all pyroglutamyl peptides were significantly increased in lumen, while only pyroglutamyl proline were increased in plasma. Contents of hydrophilic diketopiperazines were significantly increased in lumen and plasma, while hydrophobic diketopiperazines were significantly increased only in plasma. Contents of four *N*-acetyl amino acids were significantly increased only in lumen. Almost all simple degraded peptides of protein didn't increase in lumen one hour after administration of water extract of miso, while some isopeptides, modified-peptides and -amino acids significantly increased. These results suggest structures of isopeptides and modified peptides could be stable to *in vivo* digestion in rat and can be candidates for bioactive compounds.

Keyword: Miso (Japanese traditional fermented soy paste), isopeptide, pryoglutamyl peptide, diketopiperazine, N-acetyl amino acid

P68 Metabolic fate of pyroglutamyl peptides in a rice protein hydrolysate in intestine and blood after oral administration

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Pyroglutamyl peptides, which are non-enzymatically generated from peptides with amino terminal glutaminyl residue, are abundantly present in food protein hydrolysates and fermented foods. Short-chain pyroglutamyl peptides resist to *in vitro* endo- and exopeptidase digestion; however, little are increased in human blood after ingestion of food protein hydrolysates. The objective of this study was to elucidate metabolic fate of pyroglutamyl peptides in a rice protein hydrolysate (RPH) in rat small intestine and blood after oral administration. RPH was subjected to an *in vitro* exopeptidase digestion using leucine aminopeptidase and carboxypeptidase A. Pyroglutamyl peptides in RPH and its *in vitro* exopeptidase digest were collected by solid-phase extraction using strong cation exchanger and fractionated by size exclusion chromatography (SEC) and identified by LC/MS/MS analyses. Peptides other than pyroglutamyl ones were derivatized with 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate after fractionation by SEC and identified by LC/MS/MS. Inner content of small intestine, ileal tissue, and portal blood were collected from male Wistar rats before and one hour after oral administration of RPH (250 mg/kg body weight). The identified peptides in these samples were quantified using LC-MS/MS in MRM mode. Most pyroglutamyl dipeptides in RPH remained after the *in vitro* exopeptidase digestion of RPH, while other peptides were completely degraded. In rat ileal tissue and lumen, the exopeptidase-resistant pyroglutamyl peptides significantly increased after administration of RPH. In contrast, the exopeptidase-susceptible peptides did not. PyroGlu-Leu, pyroGlu-Val, and pyroGlu-Lys significantly but slightly increased in portal blood, while hydrophilic ones such as pyroGlu-Glu and pyroGlu-Gln did not. However, these above pyroglutamyl peptides were stable in rat ileum extract and plasma for 6 h, which indicates that peptidases were not responsible for disappearance of these pyroglutamyl peptides in blood. Pyroglutamyl peptides in enterocytes might be secreted to lumen and exert some bioactivity by acting on intestinal surface.

Keyword: Pyroglutamyl peptides, *in vitro* digestion, LC-MS/MS

P69 Bioavailability of Pro-Hyp upon ingestion of collagen hydrolysate (CH) with the presence of rice protein hydrolysate (RPH)

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Collagen hydrolysate (CH) has been reported to exert various health benefits. Furthermore, Pro-Hyp is the major CH-derived peptide in human blood and plays important role in CH biological functions. Therefore, the bioavailability of CH-derived peptides is important to determine its biological activities. In the diet, usually different sources of protein are consumed together. The presence of peptides from different protein sources may affect the bioavailability of CH-derived peptides after ingestion. This study aimed to evaluate the effect of rice protein hydrolysate (RPH) on the bioavailability of CH-derived peptides in an animal model. Six-week-old male Wistar rats (Japan SLC) were divided into control, CH, RPH, and RPH+CH groups (n=3 each group). The amount of 200 mg CH or RPH, 200 mg CH + 200 mg RPH/kg BW in water and vehicle only were administered to CH, RPH, CH+RPH, and control groups respectively. Rats were sacrificed one hour after oral administration. The blood, inner content, and tissue of small intestine were collected immediately. The peptides with amino group were derivatized using AccQ. Pyroglutamyl peptides were collected using strong cation exchanger (AG50 Wx8). The samples were injected to LC-MS/MS in total ion, precursor ion, product ion, and MRM scan modes to identify and quantify each peptide. For precursor ion scanning m/z 171 and 84 were used as target ions for the detection of AccQ and pyroglutamyl peptides, respectively. One hour after ingestion, the content of CH-derived peptides, including Pro-Hyp, Phe-Hyp, Leu-Hyp, Ala-Hyp-Gly, and Pro-Hyp-Gly, significantly increased in the inner content of small intestine in CH and CH+RPH groups. These peptides were further absorbed into small intestinal tissue and blood. Pro-Hyp did not significantly increase in intestinal tissue and blood in CH group compared to control group. Interestingly, the presence of RPH increased Pro-Hyp in intestinal tissue and blood. Therefore, ingestion of CH in combination with RPH may enhance its bioavailability in human. The effects of this combination on peptides absorption mechanism and biological function remain to be solved.

Keyword: Collagen hydrolysate, rice protein hydrolysate, prolyl hydroxyproline, bioavailability

P70 Peptides in micro and macro algae and their digests by stomach and intestinal proteases

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Recently, micro- and macroalgae have attracted rising attention as an alternative source of protein, since their bio resources are large and livestock industry is one of the main cause of the greenhouse effect. Protein is not only source for amino acids but also precursors of bioactive peptides. However, there are few studies on peptides in micro and macro algae. The objective of this study is to identify peptides in some micro and macro algae and their protease digests. Dried powder of spirulina (*Arthrospira platensis*), chinorimo (*Porphyridium purpureum*), sea lettuce (*Ulva lectuca*), and pavlova (*Pavlovaceae*) were used. Amino acids and peptides were extracted with 0.1% formic acid. They were also digested with pepsin and pancreatin. The pepsin-pancreatin digests were further digested with crude extract of rat intestinal mucosa. Amino acids and peptides were derivatized with 6-aminoquinolyl-*N*-Hydroxylsuccinimidyl carbamate (AccQ) and analyzed by reversed phased LC-MS/MS. Free amino acids were detected in non-digest of all samples. Among them, spirulina contained relatively high contents of amino acids. In sea lettuce, Asn and Glu were predominantly contained. GABA was detected in spirulina and chinorimo. In spirulina, some dipeptides such as AT, TV, II, LE, and VI were contained without digestion. After digestion with pepsin and pancreatin, peptides such as IP, LP, GI and GL and amino acids were generated in all samples. However, further digestion with mucosa degraded most peptides in the pepsin-pancreatin digests. However, some peptides might survive in lumen and interact with gut cells and microbiota. To solve these problem, further studies on metabolic fate and activities of the peptides identified in the pepsin-pancreatin digest are in progress. Only negligible amounts of pyroglutamyl peptides were detected, which are generated industrial preparation of protease digest of food protein hydrolysate and fermentation process.

Keyword: Peptides, mucosa, algae, amino acids

P71 Validation and development for uncomplicated quantification by using a reversed-phase HPLC-UV method of fucosterol derived from *Sargassum* spp.

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Due to rapid climate change, the risk of ocean eutrophication is emerging, which is inducing the significant drifts of the eutraphically multiflied *Sargassum horneri* at the coast of China. The large-scale of *S. horneri* is easily floated to the coast of Jeju Island through the Kuroshio Current causing enormous economic losses on aquaculture and tourism issues. Therefore, research utilizing the increased overseas *S. horneri* biomass is being actively conducted. However, the blended utilization of edible domestic and overseas origin *S. horneri* has yet to be studied. So, it is important to establish the identification procedure for the differences between domestic and foreign to manage it as a high value-added resource. Fucosterol from *Sargassum* species is a dominant secondary metabolite which has studied its pharmacological activity. However, fucosterol detection is limited owing to the complicated preliminary analysis steps. Thus, an efficient isocratic method was developed using reverse-phase high-performance liquid chromatography-UV. It was verified system suitability, accuracy, and precision which were included as acceptable range. The linearity was indicated that has 0.998 correlation coefficeient (R^2). It was proved the method sensitivity through limit of detection (LOD) and limit of quantification (LOQ) were calculated by establishing linearity. The LOD and LOQ were 1.078 μg/mL and 3.265 μg/mL, respectively. Moreover, in lipopolysaccharide (LPS)-induced RAW264.7 cells, the anti-inflammatory effect was evaluated within non-toxic concentration by confirming the concentration-dependent inhibition of NO expression according to the fucosterol contents derived from *Sargassum* spp. These results verified that it is a method for uncomplicated to analyze fucosterol derived from *Sargassum* spp. Furthermore, it is presented as an analytical method that can be used as an anti-inflammatory agent.

Keyword: Fucosterol, *Sargassum* spp., HPLC-UV

P72 The effect of sulfated polysacchardies derived from *Sargassum thunbergii* on intestinal mucosal immunity in zebrafish model

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The polysaccharides derived from the marine brown algae *Sargassum thunbergii*, are known to have the effect of immune regulation, but no studies on intestinal mucosal immunity in zebrafish model have not yet been examined. In this study, we purified sulfated polysaccharides from *Sargassum thunbergii* (STPs) brown algae and evaluated their intestinal mucosal immunity in larvae and adult zebrafish model. After STPs and lipopolysaccharide (LPS) exposure, we conducted video recordings vessel or intestine and analyzed blood flow or motility in 10 days of post-fertilization (dpf). The STPs-exposed group significantly increased the blood flow of vessels and the number of cycles in the intestine. In addition, the adult zebrafish was treated with 3% STPs supplemented diets for 5 days. On the 3rd day of the 5 days feeding, we injected with 1 μg/g LPS. The decreased intestine length by LPS was improved by STPs supplementation. Moreover, STPs supplementation was shown to decrease goblet cells and mucopolysaccharides; this effect was associated with regulated intestinal mucosal immunity. Our results indicated that STPs supplementation promotes intestinal function to regulate immunity, thus indicating the potential use of STPs in enhancing intestinal immunity and may be used as an intestine function agent.

Keyword: Sulfated polysacchardies, *Sargassum thunbergii,* zebrafish

P73 Diphlorethohydroxycarmalol, a phlorotannin isolated from *Ishige okamurae*, induces Ca2+-dependent glucose uptake in C2C12 cells and zebrafish model

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Diphlorethohydroxycarmalol (DPHC), a type of phlorotannin isolated from the marine alga *Ishige okamurae*, reportedly alleviates impaired glucose tolerance. However, the molecular mechanisms of DPHC regulatory activity and by which it exerts potential beneficial effects on glucose transport into skeletal myotubes to control glucose homeostasis remain largely unexplored. The aim of this study was to evaluate the effect of DPHC on cytosolic Ca^{2+} levels and its correlation with blood glucose transport in skeletal myotubes *in vitro* and *in vivo*. Cytosolic Ca^{2+} levels upon DPHC treatment were evaluated in skeletal myotubes and zebrafish larvae by Ca^{2+} imaging using Fluo-4. We investigated the effect of DPHC on the blood glucose level and glucose transport pathway in a hyperglycemic zebrafish. DPHC was shown to control blood glucose levels by accelerating glucose transport; this effect was associated with elevated cytosolic Ca^{2+} levels in skeletal myotubes. Moreover, the increased cytosolic Ca^{2+} level caused by DPHC can facilitate the Glut4/AMPK pathways of the skeletal muscle in activating glucose metabolism, thereby regulating muscle contraction through the regulation of expression of troponin I/C, CaMKII, and ATP. Our findings provide insights into the mechanism of DPHC activity in skeletal myotubes, suggesting that increased cytosolic Ca^{2+} levels caused by DPHC can promote glucose transport into skeletal myotubes to modulate blood glucose levels, thus indicating the potential use of DPHC in the prevention of diabetes.

Keyword: *Ishige okamurae*, diphlorethohydroxycarmalol, cytosolic Ca2+ level, skeletal muscle, hyperglycemic zebrafish

P74 Antioxidant benefits of euryhaline microalgal species: An *in vitro* exploration

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Research studies have demonstrated that microalgae biomass, enriched in lipids, proteins, minerals, and pigments, can exert significant benefits to human health and nutrition. The phytonutrient components and antioxidant capability were assayed for euryhaline microalgal species (*Spirulina subsalsa, Scenedesmus* MKB, BGLR7, BGLR8 and BGLR-18), collected from waterlogged areas of Southwest zone of Punjab, India. The lyophilized biomass was estimated for phytonutrients *viz.,* bound and free phenols, flavonoids, phenolic acids, o-dihydroxyphenols, carotenoids, vitamin C, glutathione and free radical scavenging activities such as 2,2-diphenyl-1-picrylhydrazyl (DPPH), superoxide anion scavenging activity (SASA), total reducing power (TRP) and ferric reducing antioxidant power (FRAP). In comparison to the freshwater strains (*Spirulina* NCIM and *Chloerella* NCI), euryhaline microalgal strains showed significant rise in contents of phytonutrients indicating their magnificent defence strategy to survive under salinity-cum-alkalinity stress by producing various bioactive compounds in their body. We found a significant change in the free radical scavenging activities in euryhaline microalgal strains. Their robust antioxidant potential and augmented valuable phytonutrients could play a decent role as dietetic supplement and an alternative to synthetic nutrients.

P75 Bioaccessibility and transepithelial transportation of quercetin and rutin: Effects of supercritical antisolvent micronization process and food models

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In this study, antioxidant potential, *in vitro* bioaccessibility and bioavailability of quercetin and rutin as a response to supercritical antisolvent micronization as well as different food models were investigated by using combined gastrointestinal digestion and Caco-2 cell culture model. Unprocessed/micronized quercetin and rutin were used in two food models including, 10% ethanol for an aqueous hydrophilic food simulant and 3% acetic acid for an acidic food simulant. The supercritical antisolvent micronization of quercetin and rutin within polyvinylpyrrolidone (PVP) matrix resulted in a much higher recovery of these bioactives as well as greater retention of antioxidant capacity after gastrointestinal digestion in both hydrophilic and acidic food models. The present study also demonstrated that superciritical antisolvent micronization using PVP has a positive effect on the stability and transport of bioactives across the epithelial cell layer. According to the results, the supercritical antisolvent micronization using PVP can be a useful method in pharmaceutical and nutraceutical applications with high stability, bioaccessibility, bioavailability and thus enhanced nutritional value of the bioactive compound. In addition, current studies could be enriched with colonic fermentation to examine the fate of bioactive compounds in an entire approach; since the majority of the phenolic substances pass through the colon and they are metabolized by the colonic microbiota. Furthermore, owing to the significant effects on the transportation of the bioactive compounds across the gut epithelium, food-related factors like the matrix effect could also be included in future studies.

P76 Investigating the antioxidant potential of *Crataegus monogyna* Jackq. and *Crataegus orientalis* Pall. phenolics during gastrointestinal digestion

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Regular consuption of hawthorn fruit, which has a high phenolic content and antioxidant capacity, is known to have positive effects in the treatment of cardiovascular diseases and digestive disorders in humans. In this study, it was aimed to determine the total antioxidant capacity (TAC) and total phenolic content (TPC) of yellow hawthorn (*Cr. orientalis* Pall.) and red hawthorn (*Cr. orientalis* Jackq.) throughout gastrointestinal digestion. According to the results, the TPC value of the yellow hawthorn extract was found to be 1367+-213 mg GAE/100 g, while the red hawthorn extract had a higher TPC as 1796+-217 mg GAE/100 g. Regarding DPPH free radical scavenging ability of the extracts, red hawthorn had higher TAC compared to the yellow hawthorne, indicating a positive correlation between phenolic content and antioxidant potential of the extracts. On the other hand, the bioaccesibility of phenolics in yellow hawthorn fruit was found to be greater than that of red hawthorn fruit. After gastrointestinal digestion, the TPC value of the samples was calculated as 69,4+-8,5 and 120+-19,5 mg GAE /100 g; whereas, TAC value of the samples was calculated as 20,6+-2,8 and 31,8+-2,7 mg TE/100 g for red and yellow hawthorn, respectively. It can be deduced from the results that hawthorn can be considered as a valuable and potential source as a functional ingredient.

P77 Spent coffee phenolics improve the functionality of chickpea proteins

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Considering that we will need to produce more proteins in a sustainable manner due to the limitations in animal sources that we will face in the future, finding accessible, affordable, healthy and sustainable protein sources are becoming more and more important. Although plant-based proteins are significant alternative protein sources in this regard, their functional properties are not always as good as animal-based proteins. For this reason, different modification methods including chemical, physical and enzymatic approaches are applied to improve their functional properties. Likewise, interaction of proteins with phenolic compounds is also considered as a protein modification method due to its effect on the structure and functionality. In this study, it was aimed to investigate the changes in the functional properties of chickpea proteins as a result of their interactions with spent coffee phenolics. Spent coffee grounds is an important source of phenolics which has high production volume and do not have an effective valorization method. In this study, phenolic compounds extracted from spent coffee phenolics and prepared at varying concentrations were interacted with chickpea protein at two different pH values (7.0 and 9.0). Afterwards, functional properties of chickpea proteins including solubility, foaming and emulsifying were analyzed. Also, additional analyses to determine the changes on the structural properties including UV and fluorescence spectroscopies were carried out. Our results indicated that the interaction of phenolic extract caused structural changes in chickpea protein and improved its functional properties. The most significant effect was observed in foaming capacity for every tested condition. However, different results obtained for other parameters were found to be dependent on the interaction condition. Consequently, valorization of spent coffee phenolics to interact with chickpea protein might be considered as a promising method to boost the functional properties of chickpea protein isolates.

Keyword: Spent coffee phenolics, chickpea protein, protein phenolic interaction, functionality

P78 The effect of personality on chrononutrition during the COVID-19 lockdown in Qatar

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The COVID-19 lockdown has had a significant impact on people's lives worldwide. This study aimed to investigate the effect of personality on chrononutrition during the COVID-19 lockdown. Using a cross-sectional design, a convenient sample of 543 adults in Qatar completed an online questionnaire using validated tools to assess personality and chrononutrition behaviors during the first COVID-19 lockdown. Participants scoring high in openness were more likely to eat at night (mean difference (MD) = 0.41, 95% confidence interval (CI): 0.10, 0.72) compared to those scoring high in agreeableness, while those scoring high in extraversion and openness had a shorter eating window (MD = −76.6, 95%CI: −146.3, −6.93 and MD = −29.8, 95%CI: −56.5, −3.01, respectively). Participants high in extraversion had longer evening latency (MD = 66.3, 95%CI: 25.4, 107.3) and evening eating (MD = −62.0, 95%CI: −114.0, −9.0) compared those high in agreeableness. Participants high in conscientiousness showed evidence of first eating event misalignment during the weekend (MD = 22.0, 95%CI: 0.15, 43.9) and last eating event misalignment during weekdays (MD = −27.8, 95%CI: −47.3, −8.41) compared to those high in agreeableness. Lastly, participants high in openness showed evidence of eating window misalignment during the weekend (MD = 30.6, 95%CI: 5.01, 56.2). This study suggests that personality traits can inform personalized nutritional approaches when aiming for healthy habits during unexpected periods, such as the COVID-19 pandemic.

P79 Effects of *Cystoseira barbata* extracts as novel seaweed-based biostimulants on various crops

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Seaweed extracts are known to have biostimulant effect due to their rich bioactive compounds such as osmolytes, secondary metabolites and plant hormones, and have positive effects on germination, plant growth and development and formation of root structure. *Cystoseira barbata*, brown seaweed specie abundant in Türkiye, has not been the subject of research for use as a biostimulant. In this study, the potential biostimulant effects of different seaweed extracts (water, alkali and acid) obtained from *Cystoseira barbata* were evaluated and different concentrations of seaweed extracts (as seed treatment or soil drench application) were tested on different crop plants. Moreover, the biochemical characterization of the extracts was studied to explain the potential biostimulant effects. The results suggest that seaweed-based biostimulants could improve the wheat seedlings performance and positively affect various growth parameters. In broccoli plants, the dry weight of heads, the component with the highest economic value, showed increases of up to 55%, and the total dry weight of the plants increased by almost 43% with applications of *C. barbata* extracts. The use of seaweed extracts obtained from *C. barbata* as a biostimulant in agriculture may contribute to the reduction of economic losses in crop production, global food security and sustainable agriculture. It may be possible to transform macroalgae, which is seen as a source of pollution on coastal regions, into unique value-added bioeconomy resources which will be environmentally friendly, renewable, reliable, and sustainable commercial products that can at least partially contribute to reduce the need for chemical fertilizers.

Keyword: Biostimulant, *Cystoseira barbata*, seaweed extract, sustainable agriculture, macroalgae

P80 Extracts obtained from *Cistus creticus*, cultivated at varied levels of salinity, exhibit promising therapeutic potential for pancreatic cancer cell lines

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Cistus creticus L. subsp. *Creticus* is characteristic specie commonly distributed in the Mediterranean region. Traditionally, it has been used since ancient times in folk medicine as herbal tea or plant extract for its healing capabilities, phytotherapeutic features such as antifungal, anti-inflammatory, and anti-cancer effects. As a medicinal aromatic plant, *C. creticus* products are already commercially available and the plant has a great potential to be used for industrial, chemical, and pharmaceutical purposes. *C. creticus* is exposed to different stresses throughout its lifetime and has the ability to survive by helping its higher production of secondary metabolites. In this study, *C. creticus* plants were grown in hydroponic culture under different salinity levels and were extracted using two different (EtOH and water) solvents. The effect of salinity on plant growth and mineral homeostasis, biochemical content of extracts and, the therapeutic effects on cell death and cell survival in pancreatic cancer cell lines were studied. According to the results it was observed that stress conditions could be a major player to improve therapeutic effectiveness of *C. creticus*. Especially, EtOH extraction of *C. creticus* showed a remarkably therapeutic effect on cell death and cell survival. Ethanol extractions had richer content and were more effective than water extraction. It was found that *C. creticus* was an important mitochondria-targeted antioxidant in pancreatic cancer cells. This research could be important to evaluate how stress physiology relates to the chemical composition and the therapeutic effectiveness of *C. creticus*. It can be concluded that *C. creticus* can be an effective and promising natural source of antioxidants and it can play significant role in cancer prevention and treatment.

Keyword: Medicinal aromatic plant, plant extract, *Cistus creticus*, salinity stress, anti-cancer effect

P81 Biofortification of soilless lettuce with selenium and zinc

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Both selenium (Se) and zinc (Zn) are essential minerals for humans. Dietary deficiencies of micronutrients result in hidden hunger, which is estimated to adversely affect the health of at least two billion people. Among the different strategies that are used to fight hidden hunger, biofortification stands out as the most sustainable, cost-effective and socially acceptable option. Agronomic biofortification is a nutrition-smart agriculture strategy, which is based on specialized use of fertilizers to improve the mineral nutritional quality of crops. Most biofortification projects target single minerals in soil-grown staple crops but despite the rapidly growing interest in vertical indoor farms, biofortification studies on soilless leafy greens are rather limited, and a holistic approach, with multiple essential nutrients targeted simultaneously, is needed. Here, the aim was to biofortify soilless lettuce with Se and Zn at the same time. In deep water culture, increasing concentrations of Se in the nutrient solution resulted in increasing Se concentrations in lettuce without causing phytotoxicity. Higher Se levels, which resulted in, from a human nutrition perspective, excessively high tissue Se concentrations, were associated with significantly reduced tissue Zn and increased sulfur concentrations. With the application of lower levels of Se, which had a positive effect on biomass production, safe target concentrations for Se could be reached without any significant effects on other minerals. Combining an optimized Se treatment with high Zn in the nutrient recipe resulted in safe and nutritionally relevant tissue Zn concentrations that were 5 times as high as the Zn concentrations of soil-grown lettuce in our experiments. Biofortification of soilless lettuce with multiple elements enables a standardized and potentially superior nutritional profile when compared to soil-grown lettuce. More research is underway to transfer these findings to commercial vertical indoor farms.

Keyword: Biofortification, lettuce, nutritional quality, selenium, zinc

P82 Enhancing the health benefits of strawberry as a functional food by biofortification with selenium and iodine

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Due to high micronutrient levels and phytochemical content, Strawberry (*Fragaria x ananassa*) becomes a good strategic target plant for biofortification. The need to improve minerals like selenium (Se) and iodine (I) levels in foods for daily consumption is becoming a hot topic for their important physiological functions like regulation of body metabolism and being a factor that needs attention in brain health. The objective of this study is to evaluate the effects of Se and I on plant growth parameters as well as the health benefit potential and the effect on neuroprotection of the biofortified strawberry fruit extracts as a functional food. The strawberry plants, which were grown hydroponically under greenhouse conditions, were subjected to four treatment groups including control (0), Se (25 µM), I (2.5 µM) and their combination (25 µM Se and 2.5 µM I). Although the shoot biomass was not enhanced, all biofortification treatments significantly increased the strawberry fruit yield. According to the ICP-OES analysis, the Se concentrations reached to 10.0 mg/kg DW with Se application and to 7.1 with the combined application of Se and I. The ICP-MS measurements revealed that the I levels reached to 1.1 and 1.6 mg/kg DW with single and combination applications, respectively. In addition to the quality parameters, cell viability tests were carried out by using extracts of strawberry fruits. The results obtained in this study can be applied to increase the yield and quality of strawberry production. Moreover, the biofortified strawberries can also give the consumers the opportunity to reach healthier and functional strawberries which can be critical for brain health and neuroprotection.

Keyword: Strawberry, biofortification, selenium, iodine, neuroprotection

P83 Functionalizing commercial soilless tomatoes *via* Se biofortification

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Selenium (Se) is an essential micronutrient for vertebrates, including humans, but not for plants. In human populations, Se deficiency is a common malnutrition issue and an important part of the global 'hidden hunger' problem. Agronomic biofortification of crops with Se is a promising strategy for tackling Se deficiency and reducing the associated disease burden. As the most widely consumed vegetable globally, tomato is a promising target crop for Se biofortification. Although soils contain highly variable concentrations of available Se, there is typically no Se in nutrient recipes used in soilless farming systems, which promise high yields and quality. Soilless crops are, therefore, extremely poor in Se. In this study, five tomato cultivars were biofortified with Se via foliar applications in a commercial soilless tomato greenhouse located in Çan/Çanakkale. Half of the plants were sprayed with 30 mg/L sodium selenate once every 21 days in summer 2022 while the other half were left unsprayed as control. Selenium sprays did not significantly affect plant growth and yield parameters such as plant height, leaf size, stem diameter, fruit set and fruit size. There was also no consistent effect of foliar Se on nutritionally relevant minerals other than Se. During the season, Se concentrations of harvested tomatoes remained negligible in control groups whereas they exhibited an increasing trend in the treatment group and reached, depending on the cultivar, 15-30 µg per kg fresh weight. Accordingly, one portion (200 g) of biofortified tomatoes could meet 6-10% of the RDA for Se, which is 55 µg/day for adults. Optimized foliar Se applications can be successfully used in commercial soilless greenhouses to produce premium Se-biofortified tomatoes, which can contribute to public health as functional whole foods.

Keyword: Biofortification, nutritional quality, selenium, soilless

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Estonia

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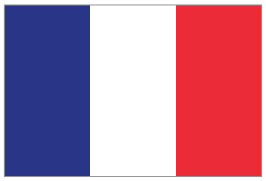

Barzegari , Abolfazl
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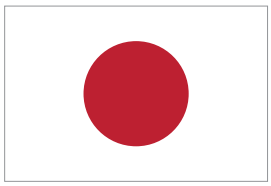

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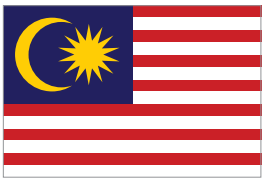

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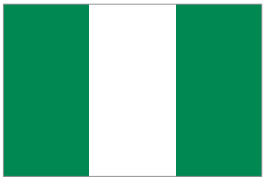

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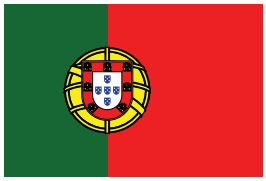

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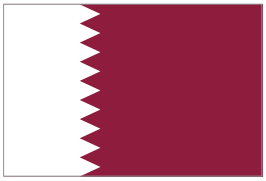

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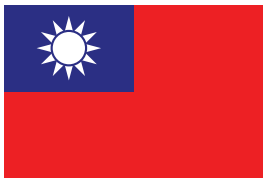

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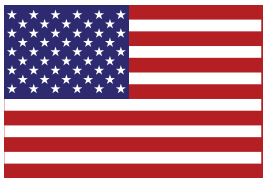

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